Garden Timeline

Month	Garden Events	Learning Activities K-2	Learning Activities 3-5
August	• Same as July • Fall garden preparation should be started such as tilling the plot and fertilizing • Some of the fall garden can be planted mid-August.		▪ Collector's Corner ▪ Parts of a Plant (celery) ????is this the "Colored Carnations and Celery" ▪ Seed Museum ▪ Leaf Museum
September	• Most summer crops will stop producing as well but can produce all the way up to first frost • First of September should have fall garden planted		▪ Soil Testing ▪ Insect Gathering (Good/Bad)
October	• Compost will be winding down as will most if not all summer crops • Fall garden will be producing		▪ Class Scarecrow/Pumpkins ▪ Composting ▪ Bottle Biology
November	• Plant garlic • Plant all crops in a high tunnel so they can establish and overwinter		▪ Engineer a Winter Garden
December	• Very little to do in the garden this time of year		▪ Bird Feeders (Eng.) ▪ Mapping a Garden (Upper)
January	• Reseed winter crops for constant harvest • Start another round of winter seedlings in heated greenhouse for transplant • Monitor weather for freezing temperatures, remove hose/faucet avoid damaged equipment		▪ Sweet Potato Germination ▪ Terrariums (Water Cycle) ▪
February	• Reseed winter crops for constant harvest • Plant brassica culitvars (kale, broccoli, cabbage), leafy greens (salad stuff), peas, etc in outdoor beds. • Monitor weather for freezing temperatures, remove hose/faucet to avoid damaged equipment		▪ Plant Trays of Peppers ▪ Planning a Salad Garden (3rd) ▪ Reg. Potato Germination ▪
March	• Reseed winter crops for constant harvest • Monitor weather for freezing temperatures, remove hose/faucet to avoid damaged equipment • Restart composting • Start summer seedlings (tomatoes, peppers, etc) in a heated greenhouse for transplant • Plant white potatoes		▪ 3 Sisters Garden ▪ Graphing Temps (bulbs, garlic, onions) ▪ Plant Trays of Tomatoes (could be Feb.) ▪

April	• Stop seeding winter crops • Composting going strong with longer daylight hours • Frost should be gone by the end of the month but keep non frost tolerant cultivars under row cover or in a high tunnel		▪ Planting ▪ Eating/Recipes
May	• Transplant summer seedlings to the garden when temperatures at night are above 50 degrees • Winter crops should still be producing but trailing off as temperatures rise. • Also a good time to plant any herbs (basil, thyme, rosemary, etc.) • Corn can be planted		▪ Farmer's Market (Is this "Market Garden Grow and Sell" and This Little Lettuce Went to Market" ▪ Pumpkin Planting ▪
June	• All summer crops should be out by now • Composting is a continual process throughout the summer • Weeding and watering		
July	• Summer garden should be in full swing • Harvesting, weeding, and watering is a full time job		

OUTDOORS ❀ GRADES 5-6 ❀ FALL, WINTER, SPRING ❀ PROJECT

A Warm Place to Grow

DESCRIPTION

Students design and test ways to protect plants from frost damage. This activity should be used during cool weather.

OBJECTIVE

To understand how mulch can protect plants from frost.

TEACHER BACKGROUND

Throughout agricultural history, farmers have attempted to control their local climates through technology. Examples include irrigation systems, wind generators to circulate air to prevent frost damage, and greenhouses to extend growing seasons. An early fall frost or late spring frost can easily destroy a crop. There are several common ways to protect plants from frost. Covering the plants with plastic heats up the soil during the day and traps some of the heat at night. Wind generators circulate the air and keep the cold air from falling onto the plants. Mulch (organic material applied loosely over the soil and around plants) insulates the soil and keeps it warm.

Mulch is also used to reduce evaporation of moisture from soil and reduce weed growth. Some of the more common mulches are: straw, leaves, aged animal manure, and ground tree bark. A mulch layer should be 3 to 6 inches (7.5 to 15 cm) deep.

MATERIALS

- ❀ Two experimental garden beds planted with the same crops
- ❀ Two minimum-maximum thermometers or one soil thermometer
- ❀ Organic materials for mulch: straw, leaves

PREPARATION

Prepare two garden beds for the experiment by planting both with the same number of the same crop, such as kale or broccoli.

CLASS DISCUSSION

What impact does the weather in our area have on local farmers? Are there times of the year when they cannot grow crops? Is there always enough rain to water the crops? Can wind be a problem? How do farmers try to solve these problems? *(greenhouses, not growing crops all year, irrigation, tree windbreaks)*

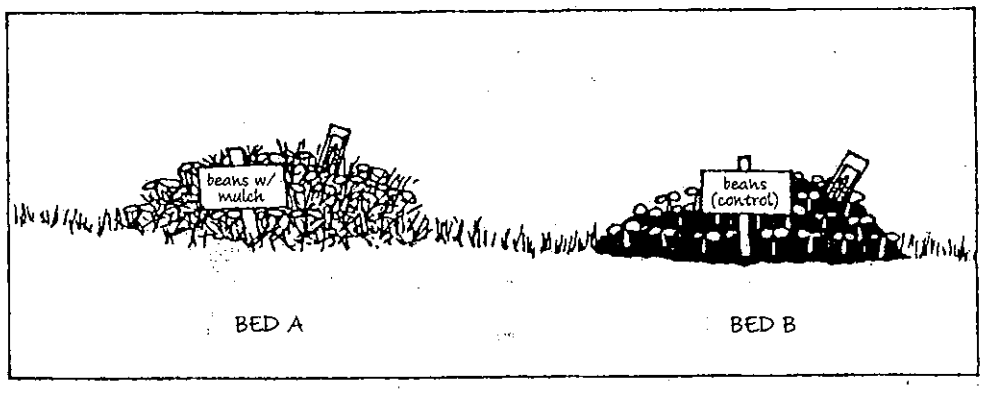
A common problem for farmers is an early frost in the fall or a late frost in the spring. Frost can kill some crops. Farmers must work with the weather and often must simply accept what weather may do to a crop, even though widespread frost damage to food crops may result in higher food prices that affect all of us.

As we prepare for cool temperatures, let's design some ways to protect plants from the cold. *(Discuss ideas.)*

ACTION

1. Have students design an experiment to test the effect of mulch on plant health in cool temperatures. Ask, *What is our hypothesis? How will we test it? What data (information) will we want from the experiment? How will we collect it? How will this data help us draw a conclusion?*

2. Have the class plant two beds (or two halves of a bed) with identical types of plants (we recommend planting a few different types, but make sure they are the same in each of the two beds). Have students carefully mulch around all the plants in one bed, Bed A, creating a 3- to 6-inch (7.6 to 15.2 cm) layer. As in the illustration below, the soil should not be visible after mulching.



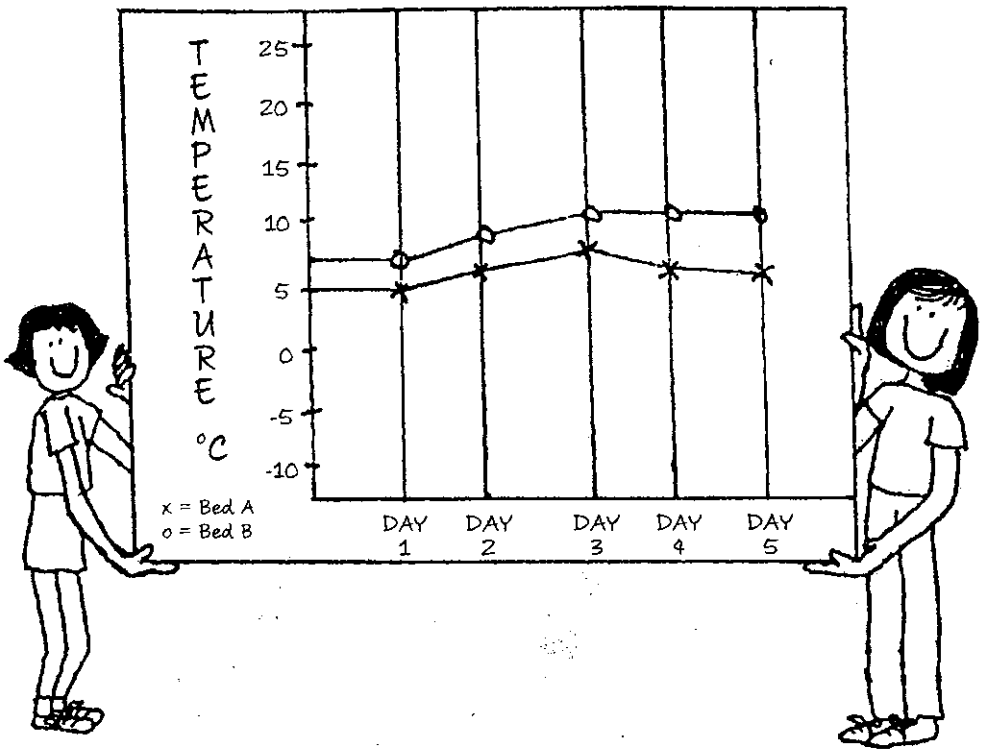
3. Leave the other bed (Bed B) without mulch. Label the beds.

4. Demonstrate the maximum-minimum thermometers to the class. Place one in each garden bed (the thermometer in Bed A should be placed under the mulch layer). The thermometers will record the coldest and hottest temperatures since the last time they were read. If these thermometers are not available, a simple soil thermometer can be used to read the soil temperature as early in the morning as possible.

5. Establish a time each day for the recording of temperatures and observations.

6. Record data on a class chart for two weeks (see illustration, page 105).

7. Have students compare results from each bed. Based on their observations of plant health and growth, do they conclude that the protection actually helps the plants?



WRAP UP

Did temperatures differ between the experimental and control beds? Why or why not? Was there a difference in plant growth between the two beds? Would a farmer be able to use this method of plant protection? What methods do farmers use in our area to protect their plants from frost? Did you observe any other ways mulch affected the plant growth and the soil?

DIGGING DEEPER

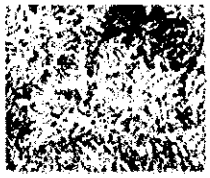
Have students test mulch for its ability to prevent evaporation from the soil and to slow weed growth.

Choosing Plants for Terrariums

Choose plants that are small, slow-growing, and perform well in humid environments. How the plants are arranged will depend on the size and location of the terrarium. If the terrarium will be viewed from only one side, then place the tallest plants in the back and shortest plants in the front. If your terrarium will be viewed from all sides or if you plan to rotate it, plant the tallest plants in the middle and the shorter plants along the outside.

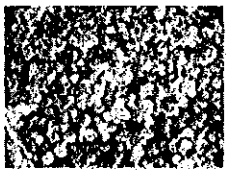
There is a wide range of plants to choose from. Most garden centers have an area reserved for indoor plants and you can usually find a variety of plants in 2-4 inch pots. Another option is to take cuttings/divide plants you already have or start plants from seed. This will allow you to not only save money, but begin your terrarium with small plants. Experiment with different plants. If they appear to grow too vigorously or respond poorly to the humidity, remove them and try something new. With closed-top terrariums, avoid planting cacti or succulents. These plants favor a drier environment as opposed to the humidity in a terrarium. Here are some recommended plants for terrariums:


African violet


Artillery fern


False aralia


Jade plant


Miniature peperomia

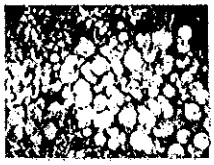

Nerve plant


Pink polka dot plant


Prayer plant


Strawberry begonia


Small philodendrons


Swedish ivy


Spider plant


Small ferns

Collect Soil Bugs

You can collect soil bugs (scientists call them arthropods) using a few simple items from home. Here are a couple of ways you can do it.

Pitfall Trap (for larger bugs)

Materials Needed

- A 1- to 4-cup sized container (yogurt container, soup can, or other container)
- Small shovel
- Magnifying glass (optional)

Steps

1. **Set up the trap**. Pick a spot to dig where the soil will not be disturbed for a week. Dig a hole as big as the container. Set the container into the hole so that the top is exactly even with the soil surface. If it is higher, the bugs will walk around the edge and not fall in. Smooth the soil up to the rim of the container.

2. **Collect the bugs**. Leave the trap in place for 1 week, but check it daily to see if you are collecting anything.

3. **Observe the bugs**. Look at the bugs you collected and notice how they are similar or different. How many legs do they have? Be careful. Some can bite!

Funnel Trap (for smaller bugs)

This trap is for smaller bugs you may not be able to see easily without a magnifying glass or microscope. You may need help from your parents or teacher for this activity.

Materials Needed

- Small shovel and plastic bags for collecting soil
- Large funnel (plastic milk jug or large plastic pop bottle will work)
- Mesh screen with 2 millimeter large holes
- Jar or cup
- 60 watt light bulb and fixture
- Rubbing alcohol or 50:50 rubbing alcohol/water mixture.

CAUTION: Rubbing alcohol is poisonous so do not drink it!

- Petri dish or small clear plastic dish
- Microscope or magnifying glass
- A piece of black paper and white paper

Steps

1. **Collect soil**. Look for soil that is not stepped on, not treated with bug killer, not dried out or flooded, and that has several different kinds of plants growing on it. Dig up about a quart of soil from the top few inches.

2. **Set up the funnel**. Cut off the bottom of the bottle or milk jug to make a funnel. Cut and place the screen in the bottom of the funnel to hold the soil. It may help to tape the edges of the screen to the funnel. Half fill the funnel with the soil. Set the funnel above a jar or cup with about an inch of rubbing alcohol covering the bottom. Hang the light bulb so it's about 4" above the soil.

3. **Collect the bugs**. Leave the light bulb on for 3 to 7 days to dry out the soil. As the soil dries, tiny soil bugs will move deeper into the soil and eventually fall into the alcohol. Avoid disturbing the setup and knocking soil into the alcohol.

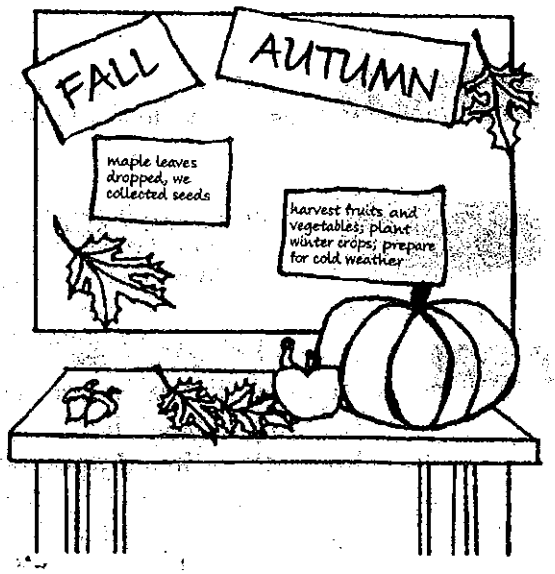
4. **Observe the bugs**. Pour the rubbing alcohol solution from the jar or cup into a petri dish (small clear plastic dish) and look at it under a microscope. Put black paper and then white paper behind the sample to show different bugs. Look at the bugs you collected and notice how they are the same or different.

OUTDOORS ❀ GRADES 2-4 ❀ FALL, WINTER, SPRING ❀ PROJECT

Collector's Corner

DESCRIPTION

Students gather natural objects from the garden and schoolyard throughout the year to create an ongoing season display in a corner of the classroom.



OBJECTIVE

To be able to categorize natural objects according to the appropriate season.

MATERIALS

- ❀ Corner of the classroom with display board and table
- ❀ Paper for decorative background
- ❀ Lettering to label the current season
- ❀ Materials gathered from the garden, schoolyard, or local area that are characteristic of the current season: acorns, twigs, leaves, flowers, rosehips, cast-off insect exoskeletons, abandoned cocoons or nests

PREPARATION

Create the basic structure for the Season Corner by decorating the display board and labeling it for the current season. You may also want to put up a few sample objects.

CLASS DISCUSSION

What changes in weather have you observed over the past year? We divide the year into four seasons based on these kinds of changes.

Can you name some objects that you would expect to find outside during the present season? Were those objects here last year at this time? Do you expect them to be here next year? Why?

ACTION

1. Accompany the students into the garden or schoolyard and ask each to find one object that is characteristic of the current season.

2. Return to the classroom and incorporate these objects into the Season Corner display.

3. You might want to use a grouping exercise to help the students organize their treasures. For example, material can be grouped according to whether it is a plant, animal, or mineral. Subgroupings could be made for the plant material, such as leaves, twigs, and seeds.

4. Suggest that students continue to observe the changes in their environment throughout the year. Encourage them to continue to bring in new objects they might find around them. Especially ask them to replace objects that have changed with new samples. For example, a closed pinecone put up in the fall could be replaced by an open or decomposing cone later in the year.

5. Be sure to have students return display objects to the environment where they were found when they are no longer appropriate in the display. Explain that these things are useful to plants and animals in the local ecosystem and shouldn't be wasted.

WRAP UP

In what ways are the objects part of the current season? How would this object have changed if left outside? What have you found that surprised you?

DIGGING DEEPER

1. Plan a monthly excursion into the garden or schoolyard to renew the display. When students bring in new objects, ask them to share information with the class about where the object was found and what kind of change it has been undergoing.

2. Invite a naturalist to class to talk about how the local seasons affect plants and animals in your area.

Colored Carnations and Celery

| PRINT |

Background

Vascular plants have a specialized system for transporting water and nutrients throughout their system. This works much like the human body's veins and arteries. Vascular plants include ferns, horsetails, angiosperms (flowering plants) and gymnosperms (pine-like trees). Thallophytes (water type plants) and bryophytes (mosses) do not have true roots, stems, and leaves and possess no specialized system for the conduction of food and water from one part of the plant to another. Plants that have a vascular system are larger and able to cope with a "land situation." There are no plants with a vascular system in a total water environment because the water provides the nutrients the plants require, so they do not have to "conduct" these substances.

The stem of a plant has two main highways of transportation: xylem and phloem. Xylem is the woody tissue that transports water and minerals from the roots to the leaves. Xylem is made of vessels that are connected end to end for the maximum speed to move water around. They also have a secondary function of support. When someone cuts an old tree down, they reveal a set of rings. Those rings are the remains of old xylem tissue; one ring for every year the tree was alive.

Phloem cells transport food from the leaves to the rest of the plant. The phloem is located around the larger xylem cells. When sugars are made during photosynthesis in the leaves, they need to be given to every cell in the plant for energy. Enter phloem. The phloem cells are laid out end-to-end throughout the entire plant, transporting the sugars and other molecules created by the plant. Phloem is always alive. Xylem tissue dies after one year and then develops anew (rings in the tree trunk). What is the best way to think about phloem? Think about sap coming out of a tree. That dripping sap usually comes from the phloem.

In this picture, the far left is the xylem and the center red portion is the phloem.

Background Source: http://www.msnucleus.org/membership/html/k-6/lc/plants/3/lcp3_4a.html
http://www.biology4kids.com/files/plants_xylemphloem.html

Plant celery seeds in greenhouse at the beginning of the fall. Move to garden beds once sturdy. Celery usually takes around 140-180 days until ready to harvest, although it can be harvested earlier for this activity.

Objectives

- Students will learn about plant transportation systems by splitting the stem of a carnation and making observations.
- Students will dissect a piece of celery to examine the xylem and phloem of a plant system.

Materials

- Carnations (one per student or pair)
- Celery stalk (one per student or pair)
- Food coloring (2 colors)
- Beakers or clear jars
- Water
- One copy of handout per student

Season

- Fall

Group Size

- Individual or pairs

California State Content Standards

L.S. 2.a, 2.e

Vocabulary

Xylem: the plant cells that move water and nutrients from the roots to the leaves
Phloem: the plant cells that move food from the leaves to the rest of the plant
Vascular plant: the kind of plant that has a specialized transportation system.

Attention Grabber

Show students a tree ring or a stump. Ask them what they already know about tree rings. Explain to them that each ring represents a year of life for the tree. The rings with more spacing between them represent a year with more precipitation than those that are closer. They are looking at Xylem! This is not living tissue.

Show students a bottle of maple syrup. Ask them where they think syrup is made. Explain that sap is taken from maple trees, refined, and made into syrup. Phloem produces sap!

Garden Activity

Top

Part 1

- Give each student (or pair) 2 stalks of celery
- Have the students put a drop of food coloring on the end of the stalk. The celery will show color in small dots. This is the xylem of the plant!
- One celery stalk should be placed whole in a cup of red-dyed water (or another color will work)
- With the second stalk, split the bottom of the celery. Half of the stem should be placed into a cup of red-dyed water; the other half should be placed in a cup of blue-dyed water.
- Discuss the xylem and phloem as the way plants transport food and water throughout their system. Have the students make a prediction (hypothesis) about what the celery will look like next class. (See Student Worksheet in Download Materials)
- Give each student (or pair) 2 white flowered carnations
- With the first carnation (or any plant with a white flower will work), students place the stem of their carnation in colored water
- With the second carnation, students will split the stem of a carnation. Half of the stem should be placed into a cup of blue-dyed water; the other half of the stem should be placed in a cup of red-dyed water. Allow the plants to sit at least 1 day.

Part 2

- Next class, have the students record the results of the split celery, the non-split celery, the split carnation and the non-split carnation by making observations using words and drawings. Use Colored Celery & Flowers worksheet.
- Using a magnifying lens (or microscope if available), have students cut a cross-section of the celery. To learn the parts and functions of the xylem and phloem, students should draw or share orally what they discovered.

Wrap Up & Assessment

Top

- Use the Colored Celery & Flowers worksheet to assess the students' understanding of the xylem and phloem.
  The students can write a song to help them remember the functions of xylem and phloem.
- Compare the experiment results as a class. Divide the board into four columns: Split Celery, Non-Split Celery, Split Carnation Stem, and Non-Split Carnation Stem. Tell the students to think of one observation they made. Give each student an opportunity to write their observation on the board in the correct column. Discuss as a class.

What's Next?

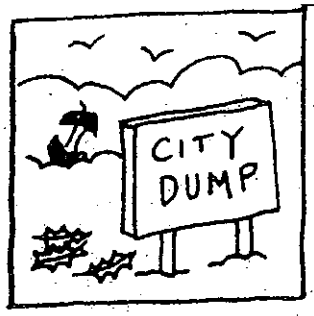
- Students can try the uptake of colored water on other plants. (Including non-vascular plants like moss to understand the differences between vascular and non-vascular)

Download Materials

Top

Student Worksheet

Colored Celery & Flowers



When is the end a beginning?

DECOMPOSITION COLUMN

The U.S. generates 190 million tons of solid waste a year — enough to fill a bumper-to-bumper convoy of garbage trucks halfway to the moon. So why aren't we up to our necks in garbage?

The key to staying on top of the garbage heap is recycling, by people and nature. People are just beginning to recycle some of the metal, glass and plastic that fill up a quarter of America's garbage pails.

Nature recycles garbage all the time, and this recycling is essential to the availability of nutrients for living things. Nature's recyclers are tiny bacteria and fungi, which break down plant and animal waste, making nutrients available for other living things in the process. This is known as decomposition.

Decomposition involves a whole community of large and small organisms that serve as food for each other, clean up each other's debris, control each other's populations and convert materials to forms that others can use. The bacteria and fungi that initiate the recycling process, for example, become food for other microbes, earthworms, snails, slugs, flies, beetles and mites, all of which in turn feed larger insects and birds.

You can think of the Decomposition Column as a miniature compost pile or landfill, or as leaf litter on a forest floor. Through the sides of the bottle you can observe different substances decompose and explore how moisture, air, temperature and light affect the process.

Many landfills seal garbage in the earth, excluding air and moisture. How might this affect decomposition? Will a foam cup *ever* rot? What happens to a fruit pie, or tea bag? Which do you think decomposes faster, banana peels or leaves? If you add layers of soil to the column, how might they affect the decomposition process? What would you like to watch decompose?

CONNECTIONS

microbial ecology, decomposition, food chains, carbon and nitrogen cycles, recycling, landfills. Scientific process skills — observing, predicting, asking questions, recording data, describing.

BUILD

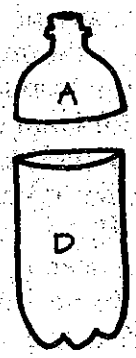
DECOMPOSITION COLUMN

MATERIALS:

- three 2-liter soda bottles
- one bottle cap
- Bottle Biology Tool Kit (p. 2)
- kitchen scraps, leaves, newspapers ... you decide!

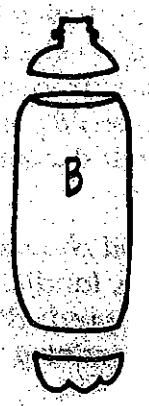
1. Remove labels from three 2-liter bottles (see p. 3).

2. Cut top off Bottle #1 2 to 3 cm below shoulder so that cylinder has straight sides.



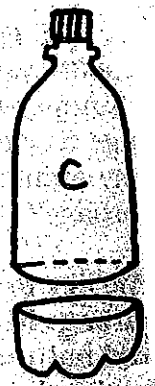
Bottle #1

3. Cut top off Bottle #2 2 to 3 cm above shoulder. Cut bottom off 2 to 3 cm below hip. The resulting cylinder will have two tapered ends.



Bottle #2

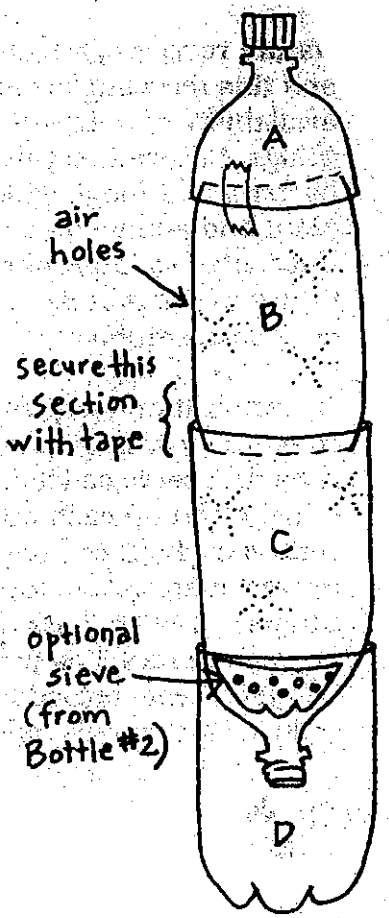
4. Cut bottom off Bottle #3, 1 to 2 cm above hip, so cylinder has a straight end.



Bottle #3

5. Invert "C" and stack into base "D." Stack "B" and tape middle seam securely. Poke air holes. Add top "A" with a piece of tape for a hinge to the bottle column.

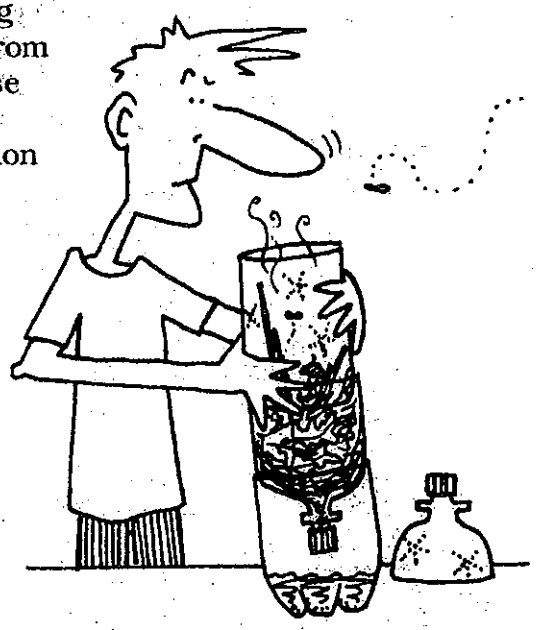
6. Poke air holes in column. *Optional: poke hole in cap.*



HANG hang this bottle (see p. 88)

FILL

Choosing ingredients: Decomposition Column ingredients can include leaves, grass and plant clippings, kitchen scraps, newspapers, animal manure and soil. If you are interested in how fast things decay, try building two identical columns, but fill them with leaves from two different species of trees. Try adding fertilizer to your column, or water from a pond or river. How do you suppose differences in temperature, light or moisture will affect the decomposition process?



The time it takes: You'll begin to see mold and other evidence of decomposition within the first few days after filling your column.

Two or three months is plenty of time to see soft **organic** material such as leaves, fruits, vegetables and grain products decompose dramatically. (The term organic applies to something that is derived directly from a living organism.) Bark, newspapers and wood chips all take longer to decompose, though they still undergo interesting changes in two to three months.

How wet?: Keep your column moist in order to observe more rapid decomposition. Avoid flooding your column or it will become waterlogged. This can create an **anaerobic** environment, or one completely lacking oxygen, in which certain microbes create particularly vigorous odors.

Using your nose: Odor is a by-product of decomposition, and can tell you a lot about the materials in your columns. Odors may be strong at first, but can mellow and become musty with time. Classrooms full of odorous Decomposition Columns, however, have been known to try the patience of colleagues and building supervisors. The strongest odors arise from animal products such as meat and dairy products. Grapefruit rinds and grass cuttings can also produce strong odors. Why is this so? If you use food scraps, mix in plant matter such as leaves, twigs and dried grass to temper odors. Layering soil on top of contents also lessens the odor.

Increasing the number and size of air holes in your column will increase air exchange. How do you think this will affect decomposition? Keep holes small so fruit flies stay inside.

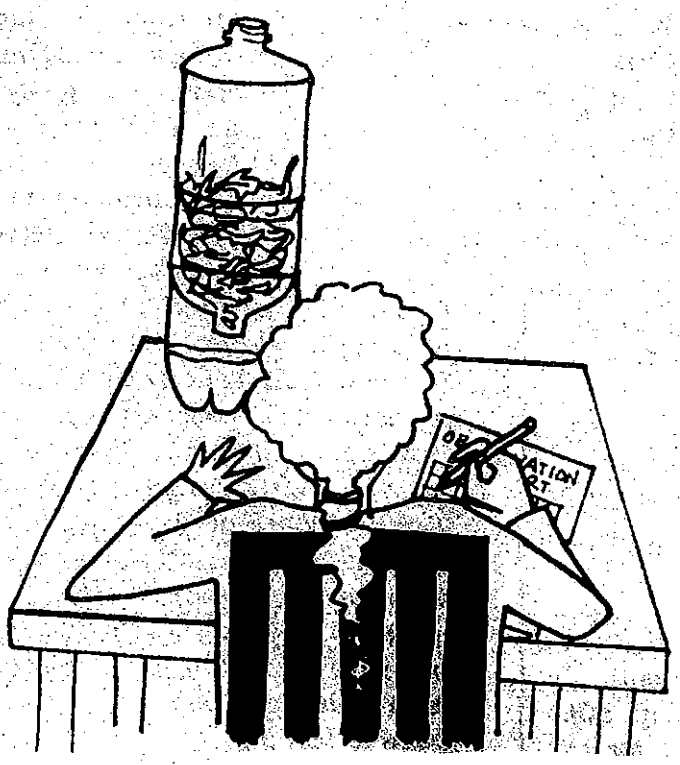
If your classroom fruit fly population booms anyway, make a Fruit Fly Trap! (p. 50). See Bottle Basics (p. 7), for more information on making holes.

OBSERVE

Recording data: Once you've decided how to fill your column, carefully observe what you put inside. In a notebook, describe the color, texture, smell and shape of everything you put in the bottle. Weigh everything before it goes into the column (see the Bottle Balance, p. 115).

Schedule column checks for at least once a week to record changes. Note changes in the column contents' height, color, shape, texture and odor. Hold a ruler next to the column to record changes in the height of the contents. Insert a thermometer from the top of the column to determine temperature changes. Can you figure out the rate of change? You can also test the pH of the leachate (the solution that drips through the column) or use it in a bioassay (p. 95). See p. 28 for more on pH.

Is anything moving?: Look for the appearance of any "critters," such as flies, beetles, slugs, millipedes, or snails. Decomposition Columns offer good opportunities for observation and description. Try using photographs or drawings to record changes. Write a story about what is going on in your column. What do you predict will happen during decomposition?



"On Top"

All this new stuff goes on
top
turn it over turn it over
wait and water down.
From the dark bottom
turn it inside out
let it spread through, sift
down,
even.
Watch it sprout.
A mind like compost.

Gary Snyder, 1983 *Axe Handles*

Leaf Museum

Objective: Make observations of leaves using simple tools and equipment (e.g. magnifiers/hand lenses)

Time: Varies

Materials:

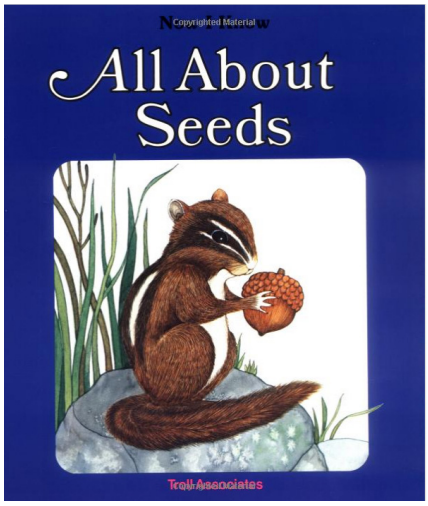
- Magnifiers
- Ziploc Sandwich Bags
- Leaf Identification Materials (i-pad, books, etc.)
- Small Labels
- Pencils

Vocabulary –

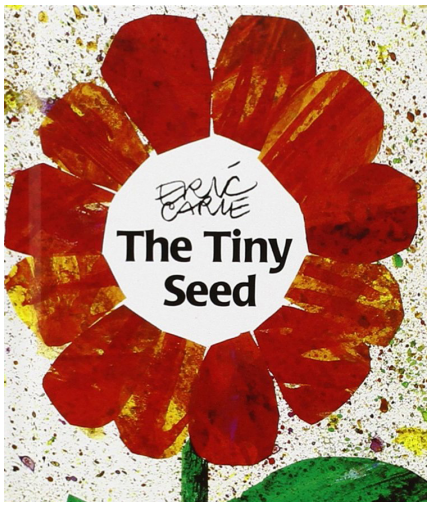
Activity:

- Read Leaf Man by Lois Ehlert
- Students collect leaves in the environment and display in labeled Ziploc bags.
- Challenge student to display in a creative way.

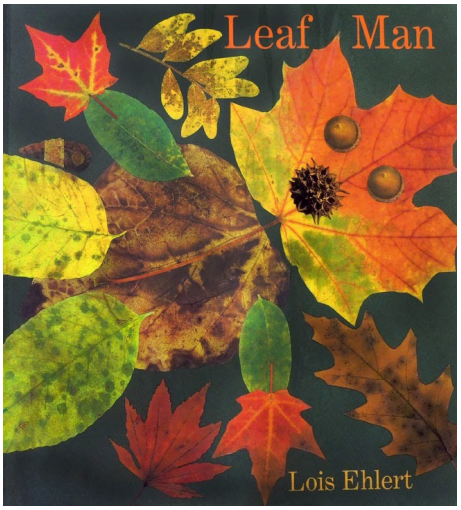
Library Resources



All About Seeds
by Susan Kuchalla and Jane McBee



The Tiny Seed
by Eric Carle



Leaf Man
by Lois Ehlert

OUTDOORS ❀ GRADES 2-6 ❀ FALL, SPRING ❀ PROJECT

Market Garden: Grow and Sell Time

DESCRIPTION

Students raise their own vegetables especially for the market, either their own or a local outlet.

OBJECTIVE

To develop awareness of some of the concerns of farming.

TEACHER BACKGROUND

The world's food supply depends on about 150 plant species. Of those 150 species, just 12 provide 3/4 of the world's food. More than half of the world's food energy comes from a limited number of varieties of three "mega-crops": rice, wheat, and maize. People have been actually growing rather than simply gathering plant foods for about 10,000 years. Until fairly recently, most people grew their own food. Today only two percent of the people in the U.S. are involved in agriculture. This project will give students an opportunity to use math and science skills in a real-life situation.

MATERIALS

- ❀ Garden plot
- ❀ Garden tools: shovel, rake, and trowels
- ❀ Seeds for chosen food crops such as beans, peas, squash, and tomatoes
- ❀ Water hose

CLASS DISCUSSION

What do you think the Top Ten food crops around the world are? (*sugar cane, maize, wheat, rice, potatoes, sugar beets, soybeans, palm oil, barley, tomatoes*) Are there any foods on the list that we could grow in this climate? Are there other vegetables or herbs we could grow to sell? Which crops might be difficult for us? Finally, where could we sell or distribute our crops? (*Set up your own stand, or sell at local stores or a Farmers' Market.*)

ACTION

1. Develop a garden plan for market vegetables such as potatoes, squash, corn, onions, radishes, lettuce, peppers, carrots, cucumbers, pole beans, tomatoes, and specialty herbs. Be sure to take into account the amount of time each takes from seed to harvest (see the Vegetable Planting Guide, p. 434).

2. Prepare garden beds in a group and then divide the class into individual crop groups or teams. They might want to name their group after their chosen crop or another garden topic: The Has-Beans, the Squash Squad, and so on.

3. Have each group plant their particular seeds and label the bed.

4. Have each group care for their plot by pulling weeds, keeping soil loosened, fertilizing, watering, controlling pests, and mulching.

5. Have students decide on a marketing or distribution plan and make arrangements for marketing their produce before harvest time. Possibilities might include a local farmers' market, a small vegetable stand of their own, or a nonprofit distribution to food banks or senior citizen groups. Local restaurants or the school food program might even be interested in buying good, fresh vegetables.

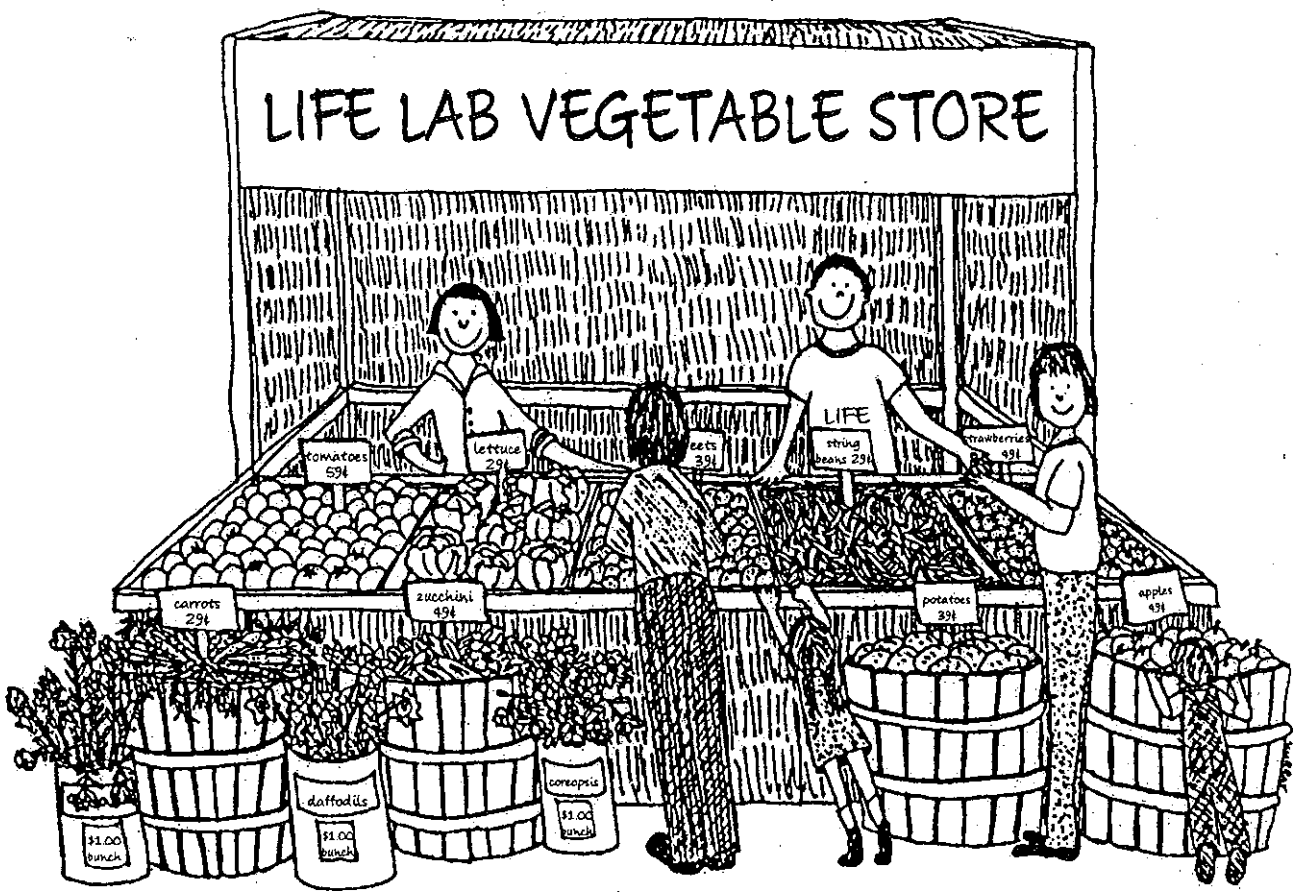
6. Have students harvest the crops as the vegetables ripen and take them to market.

WRAP UP

How did the climate in our area affect your choice of crops? How much of your crop would you have to grow in order to make a living? How do farmers market their crops? What expenses do farmers have that a small garden doesn't?

DIGGING DEEPER

Have students consider more ways to make a small garden's produce marketable and maybe even profitable. *(Growing and packaging fresh herbs such as dill, basil, and oregano, or fancy foods such as salad mix with edible flowers.)*



DRAFT 1

Lesson Plan Title: Phenomenal Plant Parts
Grade Level: 3
Content Area: Science
Setting: School garden, or classroom
Instructional Time: 60 to 90 minutes

Grade Level Expectations: **Life Science**

- L.OL.E3: Structures and Functions—Organisms have different structures that serve different functions in growth, survival, and reproduction.
- O3.31: Describe the function of the following plant parts: flower, stem, root, and leaf.
- 3.41: Classify plants on the basis of observable characteristics (roots, leaves, stems, and flowers).

3MNN Behavioral Outcomes

- Eat fruits and veggies, etc.

SNAP-Education Nutrition Messages
Eat fruits and veggies as healthy snacks, MyPyramid servings

Goal
Students will explore the different types of plant parts and their functions by comparing and contrasting a variety of nutritious foods. Students will observe a variety of plants and classify the parts and their functions in a number of ways, both as individuals and in collaboration with their peers.

Learning Objectives
Students will observe and classify different plants parts and their functions (roots, stems, leaves and flowers). Students will identify and discuss different plant parts as nutritious snacks.

Background
Plants have five distinct parts, each with its own function:

Roots, which are almost always underground, help to anchor the plants. They are also essential for absorbing water and nutrients from the soil. Finally roots also often serve as a place for the plant to store carbohydrates. For example, carrots and beets are two plants that store 'food' (carbohydrates) underground.

Stems provide support for the plant, as well as transport water and nutrients taken in by the roots up to the leaves. Food (carbohydrates) produced by the leaves moves to other parts of the plant through the stem.

The primary job of leaves is to absorb sunlight and manufacture food (carbohydrates) for the plant. During this process, called photosynthesis, leaves take in carbon dioxide and release oxygen (a byproduct which benefits living things that need oxygen!).

Flowers are responsible for sexual reproduction. Flowers are often showy and come in many different colors, shapes, and even with different smells. Pollinators (especially insects) are attracted to certain flowers, often feeding on nectar. In exchange, they help pollinate the flower. Further:

Once a flower has been fertilized, it will produce a fruit (or ripened ovary) containing seeds. Many fruits contain food, and attract animals – which often help spread the seeds around when they feed on them. Seeds are tiny plant embryos – that will grow into new plants once they have the right conditions to begin growing.

Vocabulary
Roots
Stem

Leaf
Flower
Fruit

Advance Preparation

- Slice up sample vegetables and fruits for taste testing.

Supplies for Each Group

Common vegetables to represent each plant part.

Root – carrot (use a full carrot with the green "top"), beet, turnip
Stem – celery
Leaf – lettuce,
Flower- flower – broccoli, cauliflower, artichoke
Fruit – apple, grape etc.

An "example" plant growing in soil (in a pot, outside, etc.) If the example plant does not have fruit or flowers, add paper ones. (Supply these)

Butcher paper and markers if working outside, chalkboard or chalk/whiteboard if inside.

Safety Notes

Wash hands before sampling foods.

Procedures

1. Introduction: Break students into groups and provide each group with one sample vegetable (a carrot, a celery stalk, etc.). If a school garden is available, do this part of the lesson outside. If not, students can work at their desks or tables. Provide the students with a graphic organizer to record their observations. (KWL chart) (Supply KWL chart)

2. Tell the students that they are going to be scientists and observe the specimen in from of them. Explain that it may seem like an ordinary item at first, but they should pause, and closely and carefully observe the item. What do they notice? Instruct them to take 10 minutes to fill in the "Know" and "Want to Know" portion of their graphic organizer in writing. (Lower level students can draw pictures instead). Remind them to keep the "Learned" portion blank as they will fill it in later.

3. Have volunteers from each group share their Know and Want to Know about their plant part with their group. Let them choose as a group which graphic organizer they would like to share with the whole class, one per group.

4. Have one student from each group read their Know and Want to Know aloud. Watch for words that relate to health, food and plant parts. (Delicious, root, vitamins, leafy, etc.) After each read aloud, praise the student and write key words in a chart on the board (if inside) or on butcher paper (if outside) pointing out some the terms the students described.

For example:

Carrot	Celery	Lettuce	Flower	Bean
good for eyesight, crunchy, sweet	healthy crunchy good snack, yummy with peanut butter	dark green/red color, salad	looks like a little tree, (broccoli), can be eaten cooked or raw	green or red, sometimes has seeds

5. Point out that these observations fall into two basic categories. Can the students tell based on the chart? Answer #1: they are all HEALTHY SNACKS. Ask students where the items fall into MyPyramid for Kids. Point out that beans fall into both the Meat and Beans Group, and the Vegetable Group. Answer #2: They are all examples of DIFFERENT PLANT PARTS.

6. Add a third category to the chart. This time ask the students if they can identify what part of the plant each healthy snack is? To help them visualize, use a new and full plant (just about any plant growing in the garden or plant plug will do, including a potted flower or houseplant in a pot that can demonstrate the different plant parts. If the plant doesn't have flowers or fruit, add a fake one cut from paper or from a dollar store.) Walk the students through the process of comparing. Hold the stalk of celery next to the stem of the sample plant, if you can expose the roots of the plant, compare them to the carrot, etc. Add the plant parts to the chart.

Carrot	Celery	Lettuce	Flower	Bean
good for eyesight, crunchy, sweet	healthy crunchy good snack, yummy with peanut butter	dark green/red color, salad	broccoli	filling, canned, makes delicious tacos
root	stem	leaf	flower	fruit

7. Have students brainstorm other plant parts they eat. Add them as examples to the chart.

8. Ask students what they think the different plant parts do for the plant. Walk them through this hypothesizing process with hints. Water the plant and ask how the plant drinks (roots), how the plant reaches sunlight, etc. Add this information to the chart.

Carrot	Celery	Grapes	Lettuce	Flower
good for eyesight, crunchy, sweet	healthy crunchy good snack, yummy with peanut butter	filling, canned, makes delicious tacos	dark green/red color, salad	bright red (hibiscus) makes tea, tart and tangy
root	stalk	Grapes	leaf	flower
drinks water and nutrients anchors plant in ground, stores energy,	absorbs water	protects seed	makes food (photosynthesizes)	makes the seed

9. Reinforcement: Repeat the plant part identification of plant parts with other plants in the garden setting or with another sample plant in the classroom. Do this aloud with students. They have them work in pairs (or alone) to draw and label the plant parts of a plant of their choice in the garden of classroom. Be sure they add the function for each part.

9. Assessment. Have students complete the L portion of their KWL chart. While students are working taste test the example plant parts as a healthy snack for students to eat.

END

Expansion:

- Have students create a “wacky plant” including all 5 plant parts (so the plant can live of course!). Imagine, what if the plant had a stem like celery, and a root like a carrot. What a really healthy snack this would make! Have the students color and label the wacky plant. Be sure the add the function for each plant part.
- Have students create a “Giant Wacky Plant” for the classroom wall or hallway using butcher paper and markers. Break the students into 5 groups and assign them each a plant part. Have them draw, color and cut out each plant part. Be sure they label the plant part and briefly describe the function. Put all the parts together to create one big wacky plant to serve as reinforcement on the wall of the classroom.

- Play the plant parts stem game: Have students stand in two lines on a flat surface. Explain that one one line is the part of the stem that transports water up the stem. The other line brings sugar back down. Using cups, do the relay. (Ask Jessica Albright for directions.)

- Create a plant part cook book as a class. Have students bring in healthy recipes that have a plant part as a main ingredient. Break students into 5 groups to design a page that discusses one plant part and the function of that plant part. Each recipe should include the name of the plant part that is being eaten, and the Food Group that it falls into. Divide the cook book by plant part.

(Provide book template)

Index:
Plant Parts and Their Functions:
- Roots
- Stems
- Leaves
- Flowers
- Fruits

MyPyramid: The Food Groups & How Much We Should Eat In Each Group
Root Recipes
Stem Recipes
Leaf Recipes
Flower Recipes
Fruit Recipes

- Plant a “Plant Parts Garden” In the classroom or outside. Plant different plants that have interesting, edible and showy plant parts. Roots – turnip, Shoots – curly willow (celery, asparagus), Leaves (lettuce) etc.

- Taste test some more exotic edible plants available in major grocery stores. Examples include cactus leaf, sugar cane stems, tamarind, star fruit, edamame (soybeans) bamboo shoots (available canned), artichoke, squash flowers

- When cutting up the vegetables save seeds and distribute them to students who wish to plant them to grow their own plants. Encourage them to do so. OR plant the seeds in cups in the windowsill.

- Grow the tops of root vegetables in the windowsill or garden. Carrot tops, beets, or turnips work well. (Provide directions)

Assessment

- KWL Chart

Student Page

KWL Chart

Visual Aid

Strategies for Below Level Readers
Flash cards for vocabulary
Have students draw pictures in their KWL chart rather than writing observations.

Strategies for Above Level Readers
Compare Jack and the Bean Stalk with Kate and the Bean Stalk (by Mary Pope Osbome)

Extension Ideas

Supporting Resources

Teacher Resources

Literature
Math in the Garden (White, Baritee, Kopp)

Websites
- squarefootgardening.com
- www.jmgkids.com

Interactive Technology Opportunities

Wonder wall

FUN FACT: Did you know? Banana "Trees" aren't trees at all! They are plants with a very large and strong stem. We often confuse the large stem with the trunk of a tree. We eat the banana fruit, but the flower is also edible.

Seed Museum

Objective: Make observations of seeds using simple tools and equipment (eg. Magnifiers/hand lenses)

Time: Varies

Materials:

- Magnifiers
- Ziploc Snack Bags
- Seed Identification Materials (Ipad, books, ect.)
- Small Labels
- Pencils

Vocabulary:

Activity:

- Read The Tiny Seed by Eric Carle and All About Seeds.
- Students collect seeds in the environment and display in labeled ziplock bags.
- Challenge student to display in a creative way.

Perkin' Through the Pores

Slip Slidin' Away

Purpose
Students will determine the water holding and draining capacities of different soils and investigate how organic matter affects the amount of water soil will hold.

Time: Three 30-minute activities

Grade Level: Elementary

Materials
- ❑ Funnels (2-liter bottles cut in half, 1 per group)
- ❑ Coffee filters (cupcake-shaped, 4 per group)
- ❑ 2 cups each of 4–5 different dry soil samples (use a variety of textures from sandy to clayey; samples are available for purchase at utah.agclassroom.org; search keywords *soil samples*)
- ❑ Measuring cups
- ❑ Water
- ❑ Stopwatches or a clock with a second hand
- ❑ "Comparison Graph" activity sheet
- ❑ 4–5 cups of potting soil

Vocabulary
humus: thoroughly decomposed organic matter

organic matter: products derived from the decay of living organisms, like plants and animals

pores: the spaces between soil particles and between soil aggregates; pores can be filled with air or water

soil structure: the arrangement of soil particles into aggregates, which contain solids and pore space

Background

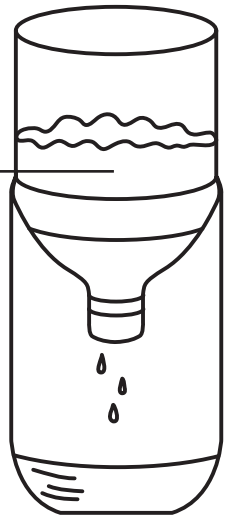
Sand, silt, and clay particles make up the inorganic, mineral component of soil. Sand particles are the largest and can be seen with the naked eye. Sand has a coarse feel and allows water to move through very quickly. Silt particles are too small to see with the naked eye. They are often found in places that have flooded and dried out again. Clay particles are the smallest, fitting together so closely that it is difficult for water to flow through.

The best soil for plants allows water to move through slowly so that some is held in the soil for plants to use. Water moves too quickly through sand, meaning that plant roots can dry out rapidly. Water moves very slowly through clay, but clay can hold water so tightly that plants can't get to it. Soil that is good for plants has a mixture of sand, silt, and clay particles, as well as organic matter. Organic matter, also known as humus, acts like a sponge to help the soil capture water. Organic matter is formed by the decomposition of dead plants and animals or plant and animal waste.

Organic matter helps sand, silt, and clay particles stick together, forming good soil structure. Hundreds of soil particles are glued together by organic matter into groups called aggregates. Aggregation of soil particles creates pore space, making it easier for water, air, and plant roots to move through the soil. A soil with lots of organic matter will be crumbly. The thoroughly decomposed organic matter in a crumbly soil can absorb lots of water. On a dry weight basis, humus has a water-holding capacity of several hundred percent.

While water is absorbed by organic matter and held in the small pores within aggregates, the large pores in between aggregates allow water to move quickly through the soil. Well-managed soils that are high in organic matter tend to be more porous, allowing them to rapidly absorb rain and snowmelt (if the soil is not frozen). This reduces erosion. Of course, when the soil is saturated by a long period of rainfall, any additional water then runs off. But until the soil is saturated, it will store up water and let it go gradually.

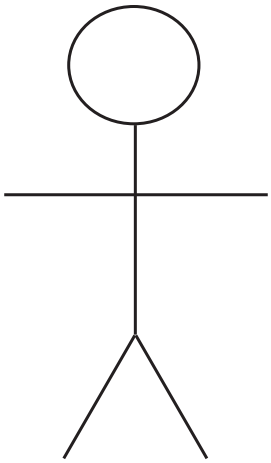
Crops use lots of water. Summers are dry in the western United States, and most crops will not grow without irrigation. Sometimes irrigation water is scarce and farmers have to take turns, irrigating only at their assigned times. In the eastern United States it rains throughout the summer, so many crops are grown without irrigation. But farmers can't control the rain. Sometimes it may not rain for several days, or it may rain so hard that the soil gets completely saturated. Organic matter helps soil store more water, prevents erosion, and produces better crops.



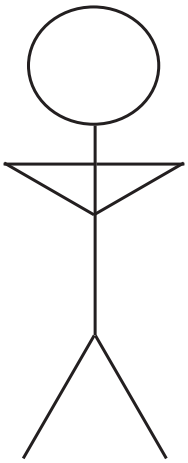
Activity Procedures

Activity 1: Mark, Get Set, Go

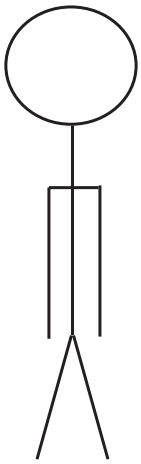
1. Prepare the funnels made from 2-liter bottles as shown in the picture to the right (make a mark 5½ inches up from the bottom of each bottle, cut each bottle in half at the mark, invert the bottle tops, and nestle the tops into the bottoms).



Sand



Silt



Clay

2. Divide the class into four or five groups, depending on how many soil samples you have. Provide each group with a funnel and bottom, 2 coffee filters, 1 cup of a soil sample, a measuring cup, and water. Make sure each group has a different type of soil sample.
3. Instruct students to place one coffee filter into the funnel and then add 1 cup of soil into the filter. Cover the sample with another filter. This will ensure even coverage and avoid splashing.
4. Designate one person in each group as a time keeper and another as the water pourer. When the time keeper says "go," the water pourer should pour 1 cup of water into the funnel.
5. Time should be kept until most of the water has gone through the soil sample. Some samples will drain quite quickly, while others could take 30 minutes or more. Proceed with Activity 3 while keeping an eye on the samples and waiting for them all to finish draining.
6. Compare the time it took for water to percolate through each sample. Add the data to the "Comparison Graph" activity sheet.
7. Pour out and measure the water that percolated through each sample. Record this on the activity sheet as well.

Activity 2: Adding Organic Matter

1. Instruct the students to return to their groups and empty out their funnels. Starting with new, dry soil will ensure consistent, representative results.
2. Proceed to duplicate the experiment with one change: after placing a new, dry coffee filter into the funnel, add ½ cup of dry soil into the filter and ½ cup of potting soil (to increase organic matter; most potting soils are largely made up of organic matter). One student should mix in the organic matter with his or her finger, being careful not to puncture the filter. Cover the sample with another new filter.
3. Duplicate steps 4 through 7 in Activity 1. Be sure to record the data on the "Comparison Graph" activity sheet.
4. Discuss the background material and ask students to identify which sample had the most sand and which had the most clay. Add this evaluation to the graph.

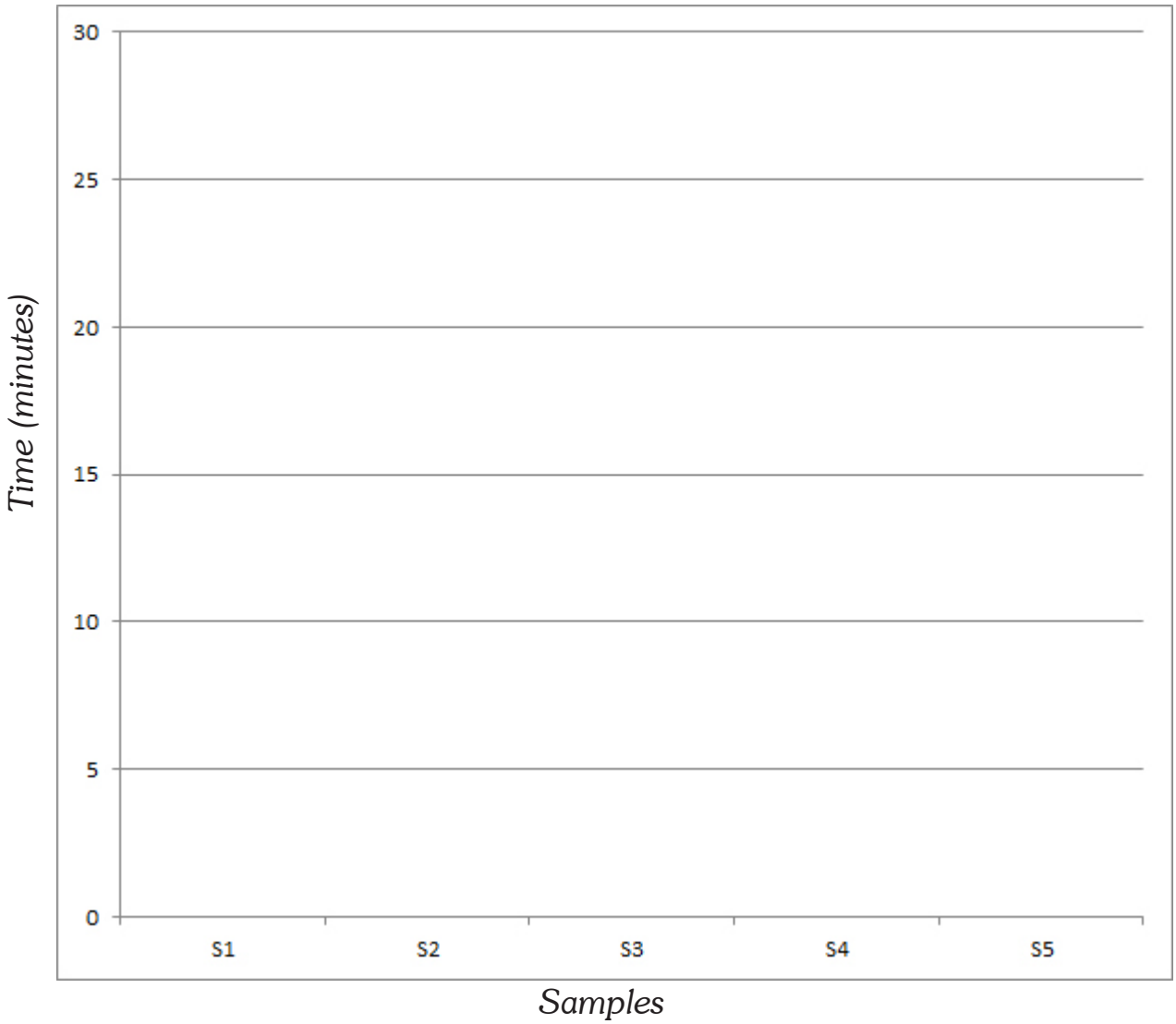
Activity 3: Pick a Path

1. Divide the class into four groups. Assign each group one of the following roles: water, sand, silt, and clay. Explain to students that there are three soil particle sizes; sand is the largest, followed by silt, and the smallest is clay.
2. Soil particles should position their arms like the examples in the drawing to the left.
3. Group the sand particles together so that each particle is touching another (finger tip to finger tip). Now tell students in the water group to try to run through the sand group (under their arms). They should be able to run through will little difficulty.
4. Repeat the above step for silt and clay. Silt particles should be touching elbows, and clay particles should be touching shoulders. Discuss the results.
5. Mix up the sand, silt, and clay particles (students) to make a loam. Ask the water group to run through.

6. Discuss the following questions:
   - Which group did the water have more difficulty running through?
   - Which types of soils hold more moisture?
   - Does the amount of organic matter affect the water holding capacity of soil?
   - Looking at the completed "Comparison Graph" activity sheet, which soil had the most sand? Which had the most clay?
   - Can you figure out the water holding capacity of the soil?
   - Why is it important to know how water percolates through soil? Who can use that information?

Activities 1 and 2 adapted from USDA Soil Conservation Service publication *Soil and Water Conservation Activities* by Albert B. Foster and Adrian C. Fox.

Perkin' Through the Pores—Comparison Graph



What was the amount of water collected after percolation in each sample?

_____	_____	_____	_____	_____
S1	S2	S3	S4	S5

Which samples do you think had the most sand? _____

Which sample had the most clay? _____

Which sample had the most organic matter? _____

(*Hint: Compare the amount of water collected, the speed of percolation, and the visual evidence.*)

The Water Cycle: Exploring Terrariums

Grade Level: K-2
Time: 45 minutes to build terrarium; 45 minutes for observation/inquiry
Objectives: Students will learn about the importance of water for living objects by observing a desktop terrarium.
Materials:
- Clear plastic bottles (large enough to hold at least 1 liter)
- Scissors
- Clear tape
- Soil
- Small plants
- Filtering charcoal (optional)
- *Living or Non-living* worksheet, for every student
- *Choosing Plants for Terrariums*, handout

Student Vocabulary

Terrarium:	miniature garden enclosed in a clear container
Living:	anything that ever has, is, or will be alive (breathes, moves independently, requires food and water, can grow and reproduce)
Non-living:	anything that never has, is, or will be alive

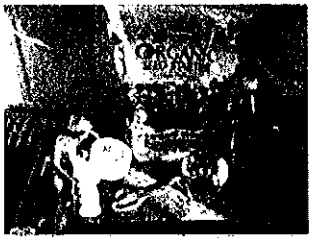
Background:
Plants release water vapor into the air (transpiration) when there is light and heat present. Since the terrarium is an enclosed environment, when the water vapor leaves the plant (evaporation) and comes in contact with the side of the container, it forms droplets of water on the inside of the container (condensation). Once enough water accumulates or the temperature decreases, the condensation will then fall back (precipitation) down the sides of the container into the soil. The water gathers on the ground whether in the soil, a body of water, or elsewhere (collection), until it evaporates and the water cycle continues.

Water is essential for living things. Students often don't consider plants to be living things because the plants don't appear to be moving/breathing/drinking water/etc. Through this terrarium activity, students will both recognize that plants are living things and living things require water.

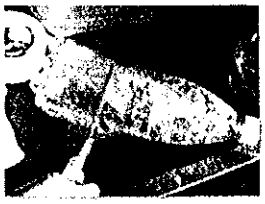
Laying the Groundwork:
Ask, "*How do we know if something is living? How do we know if something is non-living?*" Make a list on the board to illustrate the comparison (i.e., living: can move on its own, breathes, can grow, requires energy in the form of food, require water; non-living: can't move on its own, doesn't breathe, doesn't grow, doesn't require food/water) "*How are living and*

non-living things similar/different? Are all things that move alive? What kinds of non-living things move?" (i.e., water, air, etc.)

Show students two living plants that are the same and two artificial plants that are the same. Allow students to pass them around and look carefully at the two plants. Ask, "*Are these plants living or non-living?*" (Depending on their responses, phrase the next question to continue the discussion about components of living and non-living things.) "*How do you know this plant is living/non-living?*" Ask, "*What do you think would happen to a living thing if it didn't get what it needed to stay alive?*" (It would die.) Explain to the students that they will participate in building a terrarium. Instruct them that a terrarium is a miniature garden, which, when water is added can be closed for a longer period of time because the water will remain in the container and the plant will have what it needs to survive.



Exploration:



1. Cut the bottom off the plastic bottle leaving at least five inches remaining on the bottom portion of the bottle. (Some alternate options for terrarium containers include: glass jars, fish bowls, food containers, etc. Just make sure the container is big enough for you to reach your hand in for planting and maintenance.) If you choose to make one terrarium for the entire class rather than individual/group terrariums, you could use a larger container.
2. Clean the container using soapy water and rinse well. Dry completely.
3. (Optional) You can put some filtering charcoal (not the type used for barbecuing) on the bottom of the container to help control odors. The charcoal is not necessary as long as the terrarium maintains proper moisture levels.
4. Fill the container approximately one-third full with moist potting mix. The amount of soil you put in will depend on the size of the container. (You need to have enough room for plant roots.)
   Teacher Tip:
   Use a sterilized potting soil mix to avoid problems with mold and fungi. (Small bags of potting soil are available at most garden centers.) The moisture level of the soil put into the terrarium is very important. Pour the soil into a bowl or tub and mix with water until the soil is moist enough to cling together in a ball when pressed into your hand. If water drips from the soil when pressed into a ball, then it is too wet and you should add more dry potting soil to your mixture. Once you find the perfect balance, place the soil in your container. Try to avoid getting soil particles stuck on the sides of the container above the soil level.

5. Add the plants. (See handout "*Choosing Plants for Terrariums*")
6. After planting, attach the container lid, or cover the opening of the terrarium with plastic. Place the terrarium in a windowsill with indirect lighting or under grow lights. Do not place it in strong direct sunlight or water will evaporate too quickly and the plants may burn.
7. Observe your terrarium closely for the first few days to make sure you have the proper moisture level. The top and sides of the terrarium should get misty with water droplets when in bright light, indicating the proper moisture level. If there is no moisture along the sides, then you need to add more water. If the top and sides remain very wet continuously making it hard to see the plants, remove the cover for a few hours. This will allow the water vapor to escape (evaporate). Once your terrarium has the proper moisture level it should not need frequent attention.
8. Check on your terrarium periodically. Prune or remove plants with excessive growth. Try to keep plant leaves from touching the sides of the container to prevent them from having water constantly on the foliage. Also, monitor the moisture levels since water may evaporate over time.

Digging Deeper

1. Provide the students with the worksheet, "*Living and Non-living*". Have them circle all of the living things (i.e., trees, animals, grass, flowers). Remind students to ask themselves how they know each thing is living. Refer them to the classification of living versus non-living things. If time allows, students may color the worksheet.
2. Take the students out to the garden and continue to discuss how water affects plants outside. Point out that the garden must be watered by people when there isn't enough rain. Help them to understand that sometimes people help plants because plants help keep people fed and healthy. Although water is not living, it is essential for all living things to continue to thrive.
3. Create an additional terrarium with a plant in dry soil and do not add water. Allow students to watch as the plant begins to wilt as a result of not having its need for water met.

This lesson plan was developed by Cynthia Domenghini, NGA staff.

INDOORS ❀ GRADES 4-6 ❀ FALL, WINTER, SPRING ❀ ACTIVITY, PROJECT

This Little Lettuce Went to Market

DESCRIPTION

Students investigate and compare the trip to market for local produce and produce grown far away. You can enhance this lesson by inviting a farmer and a supermarket produce manager to class.

OBJECTIVE

To investigate the steps from farmer to supermarket in marketing produce.

MATERIALS

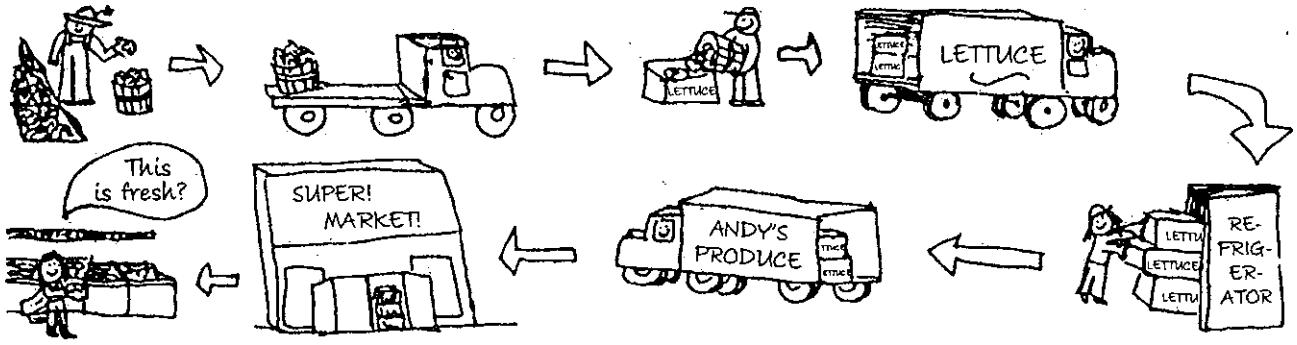
- ❀ Seasonal list of locally grown fruits and vegetables, available from County Agricultural Extension or Agriculture Commissioner
- ❀ One grocery store newspaper ad per group of four

CLASS DISCUSSION

Review with students a list of locally grown fruits and vegetables and their seasons.

ACTION

1. Divide the class into groups of four. Give each group a grocery store ad from the local newspaper.
2. Have students list the fresh produce advertised and where they think it was grown.
3. Have students choose one item grown locally and one transported from far away and list the different steps each had to go through to get from harvest to the supermarket. What are the costs and energy uses with each step?



4. Invite a farmer to class to explain how local farmers sell their produce. Have the farmer trace the steps from the farm to the market, and the costs along the way. How much of the produce is sold locally?

5. Invite a supermarket chain's produce manager to class. Interview the manager to find out how stores purchase produce. Can they buy direct from local farmers? How does out-of-season produce get to the store from where it is grown?

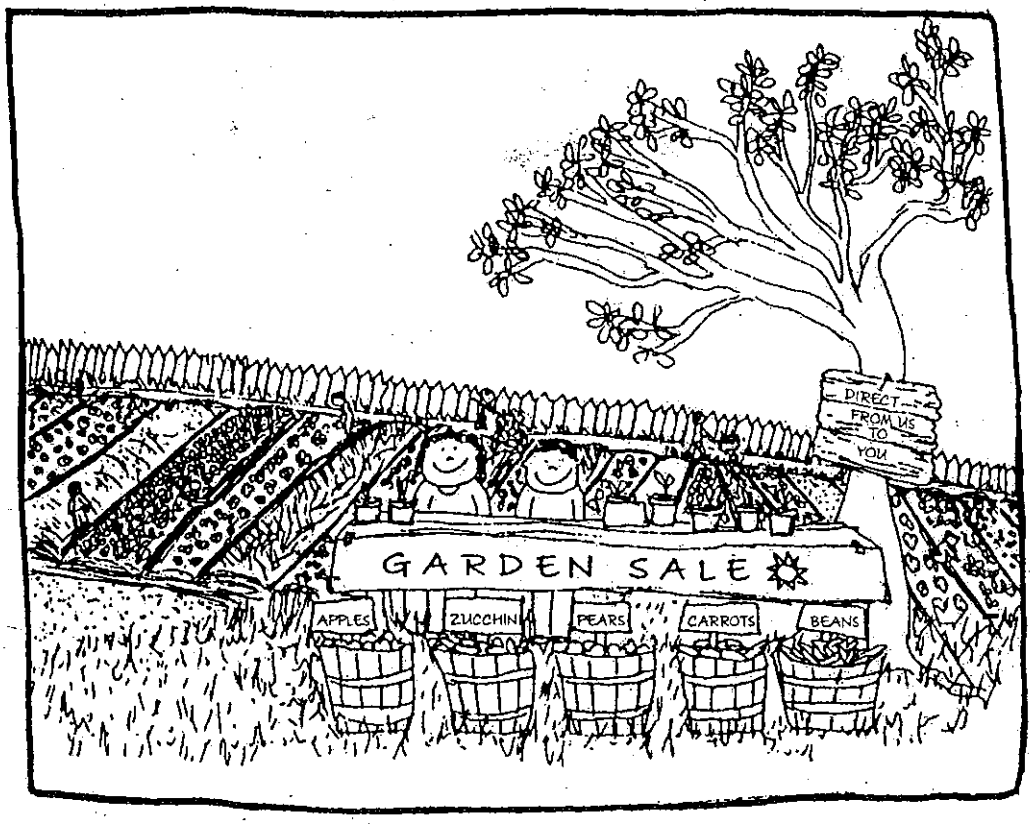
WRAP UP

Why don't stores carry only local produce? How many people handle the food between the farmer and the store?

DIGGING DEEPER

1. Have students harvest some produce from the garden and determine its price at a farmers' market or produce stand.

2. Make a stew with fresh seasonal fruits or vegetables that are available locally.



OUTDOORS ❀ GRADES 3-6 ❀ FALL, SPRING ❀ PROJECT

Who Lives Here?

DESCRIPTION

This lesson has two sections. In Part One (optional), students make insect-collecting nets. In Part Two, students collect and identify insects.

OBJECTIVE

To introduce a method of insect collection and demonstrate the variety of insects in a habitat.

TEACHER BACKGROUND

Insect nets are fun and easy to construct, as shown in Part One. However, if you don't have time to make them, they are inexpensive to buy. Part Two is important in demonstrating how different habitats support different insects. Try to select as many different habitats as possible (garden, landscaped area, field, and so on). When comparing insects within one habitat, you will often find they consume different food resources and thereby avoid competing with each other. Thus some will have chewing mouthparts, others sucking, and so on. Bug boxes are great for studying insects because one side is magnified for closer observation. After observation, release the insects to their habitat.

MATERIALS

- ❀ One copy of the Insect-Collecting Net instructions per group, p. 457
- ❀ Net materials for each group (see list, p. 457)
- ❀ One jar with air holes per group or several bug boxes per group
- ❀ Insect reference guides
- ❀ Magnifying lenses

PREPARATION

Cut net materials for each group.

CLASS DISCUSSION

Where do insects live? *(everywhere)* What determines where they live? *(availability of food, water, light, shade, shelter)* If you were to look under a log or a rock, what insects and other animals would you expect to find? *(earwigs, snails, slugs)* Would you find the same insects in a sunny spot? *(no)* Insects, like other animals, live in habitats that provide them with the food, water, and shelter they need. Let's list some habitats we can explore around this school to find insects.

PART ONE

ACTION

1. Determine how many insect-collecting nets you want to make. Divide the class into small groups and have each group make one net, following the directions on the Insect-Collecting Net handout.

PART TWO

ACTION

1. Have each group choose a different habitat for collecting insects (garden, orchard, field, rocks, baseball field, and so on).

2. Students should spend approximately 20 minutes collecting. Instruct them to brush the net through weeds, bushes, and branches of trees, sweeping insects off the plants. After a few sweeps, students may flip the end of the net over the rim to trap the insects, flip it again to force the insects to the bottom of the net, and examine the catch.

3. Discuss gentle handling of insects so that wings and legs are not damaged. Have students trap the insects they wish to observe and transfer them to the jar or bug box.

4. Have each group record the habitat explored and describe the characteristics of each insect. Are the wings leathery or transparent? Does the insect have sucking or chewing mouthparts? Is the abdomen exposed or covered by the wings? Does the insect have two or four wings? Have students compare one insect to another.

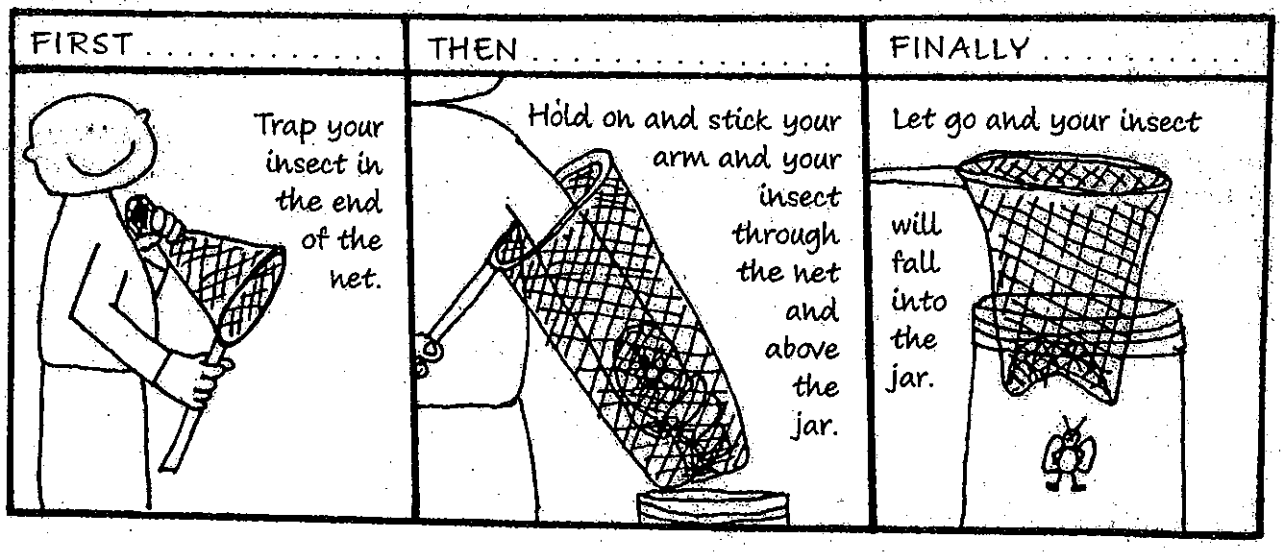
5. Help students use the insect reference guides to identify the insects.

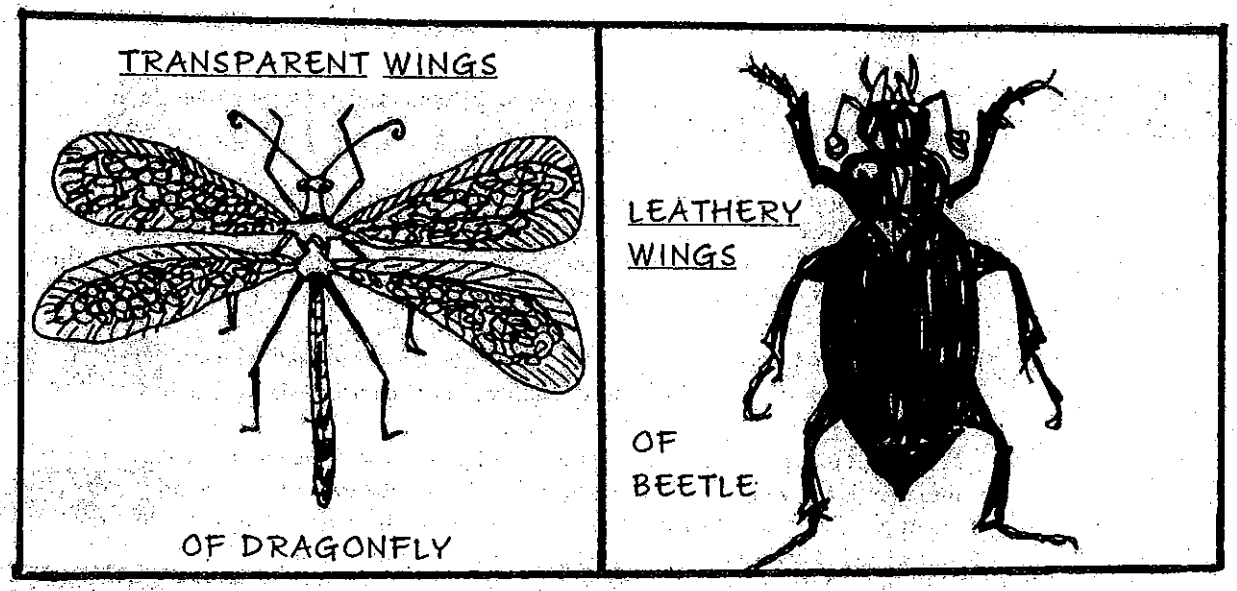
6. Have students determine each insect's food requirements from books or observation of mouthparts. What characteristics do insects that eat the same food have in common?

7. Have each group draw a picture of the habitat, showing the plants, insects, and other organisms they find. How does each insect live in this habitat?

8. Have each group share its discoveries with the class.

9. Release the insects in their habitats.





WRAP UP

Do different insects live in different habitats? Do different insects live in the same habitat? What are some characteristics that insects share? How do they differ? Name insects in your habitat that had the same food resource. How could you tell? Give an example of how one of the insects you collected depended on its habitat. How were any of the insects you found beneficial to their habitat?

DIGGING DEEPER

1. Have students choose one insect and write a story about it. Encourage them to imagine why the insect developed its characteristics (wings, chewing mouth, color, and so on) to live in its environment.

2. Have students make an insect habitat mural, showing insects in their varied environments.