STRUCTURE AND FUNCTION OF PLANT LEAVES

BIG IDEA 14: ORGANIZATION AND DEVELOPMENT OF LIVING ORGANISMS

BENCHMARKS AND TASK ANALYSES

SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.

The student:

- describes leaves as the structure for food production.
- describes stems or trunks and roots as the structures for support.
- describes roots and stems or trunks as the structures for water and nutrient transport.
- describes flowers, cones, or spores as the structures for reproduction.

SC.3.L.17.2 Recognize that plants use energy from the Sun, air, and water to make their own food.

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

- poses and investigates questions individually and collaboratively through free exploration and systematic investigations.
- draws conclusions based on the results of the explorations.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

The student:

- works in a group using the same tools as other groups to gather common data.
- compares groups' data and explains differences.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

- records in a science notebook, pictorial or written information or simple charts and graphs of investigations conducted.

KEY QUESTION

What is the main function of a plant's leaves?

How do the structures of plants support their roles in food production?

BACKGROUND INFORMATION

Most plants have several things in common. They need sunshine, water, and air to grow. They are not able to move around. Their cells have stiff walls made of a tough material called cellulose. All green plants use the sun's energy, water, and a gas called carbon dioxide to make their own food. This process is called photosynthesis.

Leaves come in many varieties. Some are large, small, slender, or wide. Leaves can be prickly, hairy, soft, or hard. Some leaves are smooth, toothed or lobed. Leaves can be classified as simple or compound. Most leaves have two parts, the blade and the petiole. The broad, flat part of a leaf is called the blade. The petiole is the stem-like part of the leaf that joins the blade to the stem.

But all leaves change sunlight into energy through photosynthesis. The leaves are the primary food-making part of the plant. The leaves absorb carbon dioxide from the air and with water that comes through the roots of the plant, combines these elements and releases oxygen into the air. Oxygen is necessary for all living things. Many leaves are edible such as lettuce, spinach, field greens, parsley, and cabbage.

MATERIALS

Teacher
variety of leafy plants for groups
paper bags

Per student
pencil
science notebook
magnifier

Per group
one teaspoon of petroleum jelly
a leafy plant
a piece of cardboard
paper clips
small plastic bags
clear tape
small pot with potting soil

SAFETY

Do allow students to put things into their mouths.
Always follow OCPS science safety guidelines.

TEACHING TIPS

1. Photosynthesis is too difficult for third grade students to understand and will not be explored in elementary school. Third grade students will observe the different parts of plants, record their observations, and discuss the function of each part.
2. Remove the soil from the roots of the plants so that all parts of the plant are exposed for students to explore.
3. Place one leafy in a paper bag for each group. You may want to include some edible plants in the bags for students to explore.

ENGAGE

1. Place a plant in each bag and have students collaborate with their groups to play *Twenty Questions* to determine what is in the bag.
2. Allow students time to make observations about the plant and record those observations in their science notebook. Ask students to discuss the different parts of the plants with their group members. (e.g., flower, stem, leaf, and roots). Tell students that each part of a plant serve a vital function needed for plant survival.
3. Ask: *Why do you think the roots of a plant are important? Why do you think the stem is important? Why do you think the leaves are important?* Discuss and record student predictions on the dry erase board. Explain the importance of each part of the plant to students.
4. Tell students that plants make their own food. Ask: *Which part of the plant is vital in order for it to be able to make its own food?* (leaves) *What helps the leaf make food for the plant?* (the sun)

EXPLORE Part 1

1. Have the students repot their plants using the small cup of potting soil.
2. Have the students cut pieces of cardboard large enough to make a patch on their plant leaf.
3. Use paper clips to attach patches to a few of the leaves. Be sure that students do not cover all of the leaves. The uncovered leaves should be able to continue to absorb sunlight. This exploration will need to be set up for five days.
4. After five days, remove the patches. Have students record their observations in their science notebooks.
5. Have students to examine the lighter-colored spots on the leaves.
6. Ask: *What do you think happened to create lighter-colored spots in the leaves?* (The patches prevented the light from reaching the leaves.)

EXPLAIN Part 1

Tell the students that food production could not take place because the cardboard blocked the sun from the leaves. At night, when there is no sunlight, plants can not make their food.

EXPLORE Part 2

1. Have the students to tear a leaf into two parts and look closely along the tear using a magnifier. (Students should be able to see a thin film like lay on the underside of the leaf.)
2. Have students to look at a piece of the leaf under the microscope. (Students should see tiny openings called stomata.)
3. Tell students that plants breathe through the stomata. In this exploration, students will cover the tiny openings with petroleum jelly.
4. Have the students cover a leaf on their plant with petroleum jelly.
5. Place a small bag over the leaf. Tape the bag to the stem so that no air can enter the bag with the petroleum covered leaf.
6. This exploration will need to be set up for five days.
7. After five days, ask: *What happened to leaf covered with petroleum jelly?*

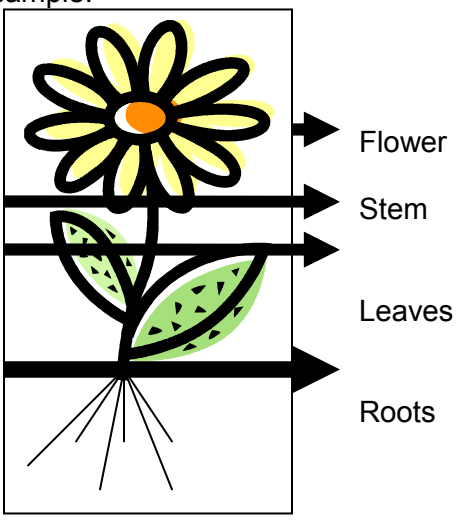
EXPLAIN Part 2

Ask: *How do plants breathe?* (through tiny openings called stomata) Tell students that a plant gets much of its carbon dioxide through the stomata. The jelly blocks the stomata, but allows the sunlight to come through. Tell students that plants take in carbon dioxide and give off a waste product called oxygen. Much of the oxygen animals and humans require is made by green plants.

EXTEND AND APPLY

1. Have students to create a foldable to review the functions of the parts of a plant. The students will need to take an 8 ½ x 11 in. sheet of paper and fold it horizontally.
2. Have students to draw a plant and its parts on the outside of the folded paper. The inside of the sheet will be used for recording the functions of plants.

3. Cut parts of the drawn plant into four sections (flower, stem, leaves, and roots). Please see the sample.



4. Have students to record the function the leaves for plants.
5. The students will revisit this foldable to complete the function portions for roots, stem, and flower sections as those concepts are studied in later labs.

ASSESSMENT

Review science notebook to determine if students understand the purpose of leaves. Students should include that leaves need sunlight to produce food.

STRUCTURE AND FUNCTION OF PLANT STEMS

BIG IDEA 14: ORGANIZATION AND DEVELOPMENT OF LIVING ORGANISMS

BENCHMARKS AND TASK ANALYSES

SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.

The student:

- describes leaves as the structure for food production.
- describes stems or trunks and roots as the structures for support.
- describes roots and stems or trunks as the structures for water and nutrient transport.
- describes flowers, cones, or spores as the structures for reproduction.

SC.3.L.17.2 Recognize that plants use energy from the Sun, air, and water to make their own food.

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

- poses and investigates questions individually and collaboratively through free exploration and systematic investigations.
- draws conclusions based on the results of the explorations.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

The student:

- works in a group using the same tools as other groups to gather common data.
- compares groups' data and explains differences.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

- records in a science notebook, pictorial or written information or simple charts and graphs of investigations conducted.

KEY QUESTIONS

What is the main function of a plant's stem?

How do the structures of plants support their roles in food production?

BACKGROUND INFORMATION

Most plants have several things in common. They need sunshine, water, and air to grow. They are not able to move around. Their cells have stiff walls made of a tough material called cellulose. All green plants use the sun's energy, water, and a gas called carbon dioxide to make their own food. This process is called photosynthesis.

The main function of a stem is to support the leaves and flowers of a plant and to connect them with the roots, which supply water, minerals, and nutrients. Plants absorb water through their roots in the soil. As water evaporates from the leaves, a vacuum is created that pulls the root water upward through the stem to the leaves. This principle is the same as sipping through a straw. (The narrowness of the tubes through which the water travels also contributes to this capillary action.)

MATERIALS

Per pair of students

fresh celery stalk with leaves
clear cup of water
red food coloring
magnifier
drawing paper
plastic knife
straws
2 cups of drinking water (for students to sip with the straws)
science notebook

Teacher

plant

TEACHING TIPS

1. The celery experiment should be started in the morning and observed during the day. Keep it overnight.
2. Discuss the physical features of celery with students so that they can understand the concepts being taught.

ENGAGE

1. Give each student a drink with a straw. Allow them to sip. Ask: *What happens to the water when you drink from a straw?* Tell students there is a plant part that acts much like a straw.
2. Show a plant to the class. Ask: *Which plant part do you think that might be? Why do you think so?* Tell students they will do an experiment to help them decide.

EXPLORE

1. Divide the class into pairs. Distribute materials to each pair.
2. Have groups fill a cup 2/3 full of water and add a few drops of red food coloring.
3. Show students how to use a plastic knife to cut off the bottom of a stalk of celery. (You may choose to do this ahead of time.)
4. Have the students examine the celery stalk including the bottom. Have students discuss and record what the bottom of the celery stalk look like in science notebooks.
5. Ask: *What do you think will happen to the celery stalk?* Have students record the predictions in the science notebook.
6. Have the students label the containers with their names and place the celery stalk in the cup. Set the cups out of the way, but in a location where they can be observed.
7. Students should observe the celery at given intervals during the day. Any movement of the color up the stem of the celery should be in the science notebook.
8. When the observations are complete, have students cut off a small portion from the bottom of the stalk and view it through a magnifier. (Students can use a magnifier to see little dots of color.)

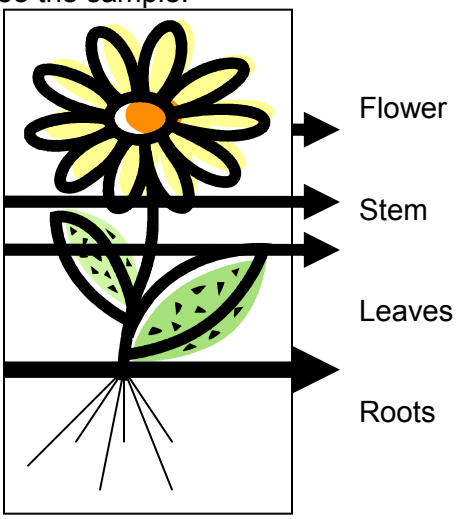
EXPLAIN

1. Bring the class together to discuss their observations. Ask: *What did you observe? What are the little dots of color on the bottom of the celery stalk?* (These are the tubes that carry the water through the plant.)
2. Cut the celery lengthwise and allow students to try to follow a tube up the stalk to a leaf. Cut leaves off of the stalk. After students have observed the leaves, ask:
   Has the color reached the plant leaves?
   How did the water get pulled to the leaves?
   How could the water going up the stem help the plant?
3. Ask students what other functions of the plant stems serve? (Stems support the leaves and flowers of the plant.)
4. Have students explain what happened to their celery after one day in their science notebooks.

EXTEND AND APPLY

1. Take students on a stem walk. Look for a variety of plants.
2. Ask: *Which part of the tree is the stem?* (The trunk and the branches)
   Can you find the stem on a vine? Grass?
3. Make a partial cut in a new celery stalk halfway up the stalk. Place the stalk in colored water. Leave overnight.
4. The next day, discuss their observations.
5. Have students to revisit their foldable.
6. Students should record the functions of roots inside of the foldable for the roots section.

Please see the sample.



ASSESSMENT

Review science notebook to determine if students understand the purpose of stems. Students should include that the stem carries water and nutrients to the leaves.

STRUCTURE AND FUNCTION OF PLANT ROOTS

BIG IDEA 14: ORGANIZATION AND DEVELOPMENT OF LIVING ORGANISMS

BENCHMARKS AND TASK ANALYSES

SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.

The student:

- describes leaves as the structure for food production.
- describes stems or trunks and roots as the structures for support.
- describes roots and stems or trunks as the structures for water and nutrient transport.
- describes flowers, cones, or spores as the structures for reproduction.

SC.3.L.17.2 Recognize that plants use energy from the Sun, air, and water to make their own food.

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

- poses and investigates questions individually and collaboratively through free exploration and systematic investigations.
- draws conclusions based on the results of the explorations.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

The student:

- works in a group using the same tools as other groups to gather common data.
- compares groups' data and explains differences.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.

- records in a science notebook, pictorial or written information or simple charts and graphs of investigations conducted.

KEY QUESTIONS

What is the main function of a plant's roots?

How do the structures of plants support their roles in food production?

BACKGROUND INFORMATION

Most plants have several things in common. They need sunshine, water, and air to grow. They are not able to move around. Their cells have stiff walls made of a tough material called cellulose. All green plants use the sun's energy, water, and a gas called carbon dioxide to make their own food. This process is called photosynthesis.

Roots serve two main purposes: they anchor the plant to the ground and help to keep it upright, and they absorb and store raw materials, such as water, minerals, and nutrients. The tiny hairs growing on the root absorb water. (Do not share this information with students – they will draw conclusions about root function during this activity.)

The root is one of the first parts of a plant that starts to grow. No matter which way you plant a seed; it responds to gravity – it always manages to grow roots downward and the stem up towards the sun.

MATERIALS

Teacher

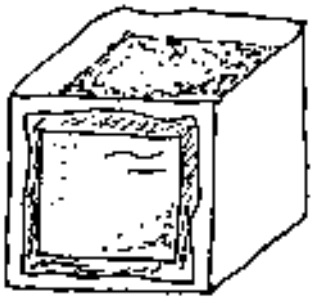
waterproof glue
scissors
Tops and Bottoms by Janet Stevens
*see teaching tips

Per student

2-liter bottle
potting soil
pebbles
2 or 3 plants (weeds are fine)
magnifier
clear plastic wrap
rubber band
science notebook

Per group

seeds (pea, bean, radish, mung bean)
weed or small potted plant
newspaper
milk carton root view box
potting soil
measuring tape
one piece of plastic wrap
dark cloth or paper
piece of pre-cut transparency film
clipboard
pencil



TEACHING TIPS

1. Well before doing this activity, tell students to bring in an empty, clean, 2-liter soda bottle.
2. Cut the top from the bottle about 3 or 4 inches from the top.
3. Prepare a milk carton root view box for each group:
   Cut the top from a half-gallon milk carton.
   Cut out a window area from one side, leaving about 2 cm of carton around the edges. Cut a piece of acetate (transparency film) to fit tightly into the window area. Use waterproof glue for a tight seal.
   Cut material (dark paper or cloth) to cover each viewing window. Velcro or tape material over window.
4. The top of the soil should be moistened as needed.
5. The roots will be easier to see if the view box is kept at a slant so the roots grow against the window.
6. The box should also be covered with a dark cloth or paper to simulate the darkness most roots require for growth.
7. Locate an area on the playground where students can pull weeds. If this is not possible, purchase a small potted plant and allow the class to work together.

ENGAGE

1. Take a walk and find some weeds on the playground. Have students observe and sketch the plant parts that are visible above the ground.
2. Next have them think about what the rest of the plant looks like underground. Allow time for students to sketch what they think the underground part of the plant looks like. Let students pull the weeds and take them back to the classroom.

EXPLORE Part 1

1. Have the students cover their work areas with newspaper. Let them soak the roots of their weeds in water, if necessary, to remove the soil. Have students observe and sketch the root system in their science notebooks. The students can use magnifiers to see the fine root hairs.
2. Ask the students to measure the length of the root and compare it to the length of the above ground part of the plant and record the information in their science notebooks.
3. Have students discuss their ideas about the function of a plant's root system.
4. Distribute the rest of the materials (milk carton, soil, seeds, plastic wrap) to each group. Have students dampen the potting soil, fill the view box almost to the top with potting soil and water thoroughly.
4. Students should plant seeds about 1 cm from the plastic window, and the box should be covered with plastic wrap to slow down evaporation.
5. Have students observe the view box daily and make note of any changes in their science notebook. Keep top of soil moistened as needed. Keep box at a slant for easy viewing and cover the box with a dark cloth or paper to simulate darkness. Remove the paper or cloth only during observations.

EXPLAIN Part 1

Ask the students to describe the changes they saw as they made observations through the window of the root view box.

Ask:

- *How could you tell that the seeds had started to grow?*
- *Where was the first visible sign of growth?*
- *Why do you think a plant needs roots?*
- *What is the white fuzz that appeared on the roots?* (root hairs)
- *What do you think the root hairs do for the plant?* (They absorb moisture and nutrients. Explain that the water moves through the roots to the plant.)
- *How do you think the root helps the plant in addition to absorbing moisture and nutrients?*
- *Which was the longer part of the weed – the root or the above – ground part of the plant?*
- *Do all roots look alike?*
- *What happens if you do not water the plant?*
- *What happens if the plant does not get sunlight?*

EXPLORE Part 2

Have the students construct a terrarium using their 2-liter bottle. Demonstrate each instruction as they make it with you.

1. Put pebbles in the bottom of the bottle.
2. Add potting soil.
3. Carefully place your plants into small holes in the soil.
4. Cover the roots with soil and add water.
5. Place clear plastic wrap over the top and secure with a rubber band.

EXPLAIN Part 2

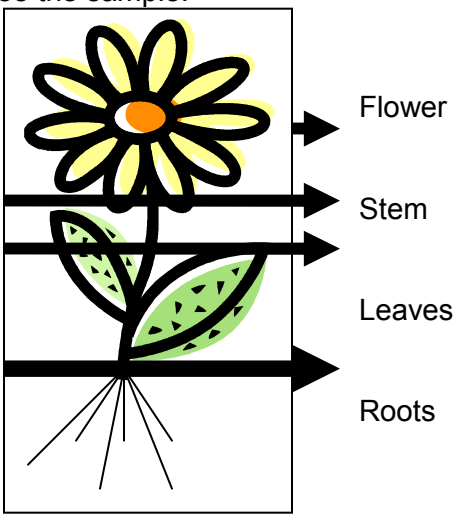
Ask:

What do our plants need to survive?
Where should we place our terrariums?
How will we know if our plants are thriving?
How will we be able to help our plants if they need it?

EXTEND AND APPLY

1. Have students revisit their foldable.
2. Students should record the functions of roots inside of the foldable for the stem section.

   Please see the sample.



3. Relate the terrariums to greenhouses. If possible, visit a nursery with greenhouses.

ASSESSMENT

Teachers should use observation and review the completion of student notebook entries. Observe that students take proper care of the terrarium.

HOW DO ENVIRONMENTAL FACTORS AFFECT THE WAY PLANTS GROW?

BIG IDEA 14: ORGANIZATION AND DEVELOPMENT OF LIVING ORGANISMS

BENCHMARKS AND TASK ANALYSES

SC.3.L.14.2 Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.
The student:

- predicts, investigates, and describes how plants respond to heat.
- predicts, investigates, and describes how plants respond to light.
- predicts, investigates, and describes how plants respond to gravity.

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
The student:

- poses and investigates questions individually and collaboratively through free exploration and systematic investigations.
- draws conclusions based on the results of the explorations.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
The student:

- records in a science notebook, pictorial or written information or simple charts and graphs of investigations conducted.

SC.3.N.1.6 Infer based on observation.
The student:

- explains that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.

KEY QUESTION

How do environmental factors affect the way plants grow?

TEACHER BACKGROUND INFORMATION

Plants are affected by many environmental factors. Plants grow towards light. This movement is called phototropism (photo means light and tropism means movement). A buildup of a chemical, auxin, on the dark side of the stems causes cells to grow longer on the dark side. This forces the stem to bend toward light.

Seeds remain dormant until conditions are right for them to sprout. Different plants need different temperatures to grow. For example, bean seeds require warmth to grow. Few seeds sprout during the fall and winter months. Most lay dormant during the cold months of the year. They start to grow when the ground warms.

Roots will generally grow in any direction where the correct environment of air, mineral nutrients and water exists to meet the plant's needs. At germination, roots grow

downward due to gravitropism. Gravitropism (or geotropism) is a turning or growth movement by a plant in response to gravity. Roots show positive gravitropism and stems show negative gravitropism. That is, roots grow in the direction of gravitational pull (i.e., downward) and stems grow in the opposite direction (i.e., upwards).

Plants adapt themselves to their environment. An example is the Venus flytrap plant. It grows in boggy areas that are nitrogen-poor. It traps and digests insects to supply the nitrogen that its environment does not provide. Dandelions and cacti are examples of other plants that have adapted to their environment.

MATERIALS

Per group

1 shoebox with lid
1 plastic cup (must fit inside the shoe box)
3 pinto beans
potting soil
cardboard strips (for maze)
scissors
tape
water
bucket with lid and handle
rope
coffee filter

Per class

chart paper and markers
1 potted plant
1 spray bottle or mister

Per student

science notebook

SAFETY

- Always follow OCPS science safety guidelines.
- Review how to use scissors properly.
- Do not eat the pinto beans.

TEACHING TIPS

This lesson will take place over a period of time.

1. Write *Environmental Factors* at the top of one page of chart paper. Then divide the page in half vertically and label the columns *healthy plants* and *unhealthy plants*.
2. Save the chart to use as a reference during the entire plant activity.
3. Save the maze boxes and buckets for the next year.
4. Pre-cut holes in the bottom of the bucket and lid (about 2 in. or larger in diameter depending on the size of bucket).
5. The bucket activity can be done using upside-down, or topsy-turvy, planters and can be purchased at Walmart and Home Depot.

ENGAGE

1. Take the class on a walk around the campus. Have students observe plants that appear to be healthy/thriving and some that appear to be unhealthy/dead. Look for factors in the environment that students think might affect the health of plants.

2. Back in the classroom, record student hypotheses on the *Environmental Factors* chart. Discuss: *What environmental factors might cause the plants to be unhealthy? What environmental factors might result in healthy plants?*

EXPLORE Part 1

1. Ask students what they think seeds need to sprout. Responses may include soil, water, light, heat, etc. Tell them you wonder about whether seeds need warmth to sprout. How could we test this idea? Accept responses. Lead students to the idea that we could put some seeds in a cold environment and some in a warm environment and see which sprout. Remind students that we have to keep all other factors the same.
2. Each group will fill a cup halfway with soil. Place 3 pinto beans in the cup and then cover with more soil until two-thirds full. Moisten the soil with spray bottle.
3. Divide the groups in half. Place half of the cups in the cool refrigerator and the other half in a cardboard box in a sunny window. Ask: *Why do we need to keep the "warm" cups in a box?* Explain that the seeds in the refrigerator will not have any light, so we can't allow the seeds in the sunny window to have light either. The sun will shine on the box and heat it up without letting light in. When you do an experiment, you have to keep everything the same except the one thing you are testing. The only thing we are testing right now is heat. We also have to make sure to give each plant the exact same amount of water each day for this reason.
4. Allow the beans to sprout. This will take about 5-7 days. Students should record their observations in their science notebooks daily. Discuss results. Save the cups that sprouted for Part 2.

EXPLAIN Part 1

Did adding or taking away heat from the seeds affect how they sprouted? How do you know? Why do you think that is? Few seeds sprout during the fall and winter months. Most lay dormant during the cold months of the year. They start to grow when the ground warms. *Let's go back to our Environmental Factors chart. Is there anything we can change or add now?*

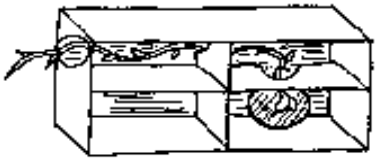
EXPLORE Part 2

Now that we have plant sprouts to work with, we can test how other environmental factors affect plant growth. Tell them you wonder why stems grow upwards and roots grow downwards. How could we test these ideas? Accept responses. Lead students to the idea that we could put some plants upside down and some sideways. Remind students that we have to keep all other factors the same. Divide the class in half again. Explain that half of the groups will be testing how stems and leaves grow and half will be testing how roots grow.

Group 1: Stems and Leaves

1. Demonstrate how to cut two cardboard pieces and tape them inside a shoebox to form a maze for the plants. Have groups prepare their own maze boxes. (see diagram)

2. Then tell them to cut a hole in one end of the lid. (You may want to demonstrate this or have a sample for them to look at. A circle or rectangle a couple of inches wide allows enough light for this activity.)
3. Place the sprouted bean plant inside the shoebox at one end of the maze.
4. Have the students put the lid on the box so that the hole is on the opposite end from the plant.
5. Ask: *What do you think will happen as the bean seeds sprout and begin to grow?*
6. Have students make written or pictorial entries in their science notebooks to explain what they have done to set up the investigation and to predict what they think will happen to the plants.
7. Have students spray a fine mist of water on the soil as needed.
8. Students will continue to make daily observations and recordings in their science notebooks until the plants grow out through the holes.



Group 2: Roots

1. Hand the other group the buckets with lids and holes cut at both ends.
2. Cut a slit through a coffee filter and place the established seedling through the slit so that the coffee filter is covering the soil but the plant is poking out.
3. Next place the seedling upside down through the hole in the bottom of the bucket.
4. Remove the cup from the seedling.
5. Fill the rest of the bucket with soil and cover with the lid. The hole in the lid is for watering.
6. Hang the bucket by the handle on a pole or hook so that the plant hangs upside down.
7. Have students spray a fine mist of water on the soil as needed.
8. Students will continue to make daily observations on how the plant and its roots are growing and record in their science notebooks.

EXPLAIN Part 2

What did you observe about the bean plant's growth?
What adaptations or changes do you see the plant making?
What differences did you see in the two groups?
How does this compare to plants growing outdoors?
Did changing the direction of the plant affect how it grew? How do you know? Why do you think that is? Roots grow in the direction of gravitational pull (i.e., downward) and stems grow in the opposite direction (i.e., upwards). Also, plants grow towards light.
Let's go back to our Environmental Factors chart. Is there anything we can change or add now?

EXTEND AND APPLY

Based on what they have observed in this lesson, ask students to predict what they think will happen if you place a plant next to the window for a short period of growing time and

then turn it away from the window for a short period of growing time. (The plant will grow towards the window at first. After you rotate the plant, it will again grow towards the light.) Discuss what would happen to the upside-down plant if it doesn't get enough sunlight.

Have students choose partners. Tell them they are going to adopt a plant to observe.

- Take the class outside. Have each pair find a plant they want to observe during a given amount of time.
- Have students observe and describe all they can about the habitat of their plants.
- Have them record the height, color, and flowers or fruit of their plant.
- Students should also include the name of the plant (this may require research), the location, and current date. Take students out periodically to record observations.

ASSESSMENT

Have students explain in their science notebooks how environmental factors affect plant growth.