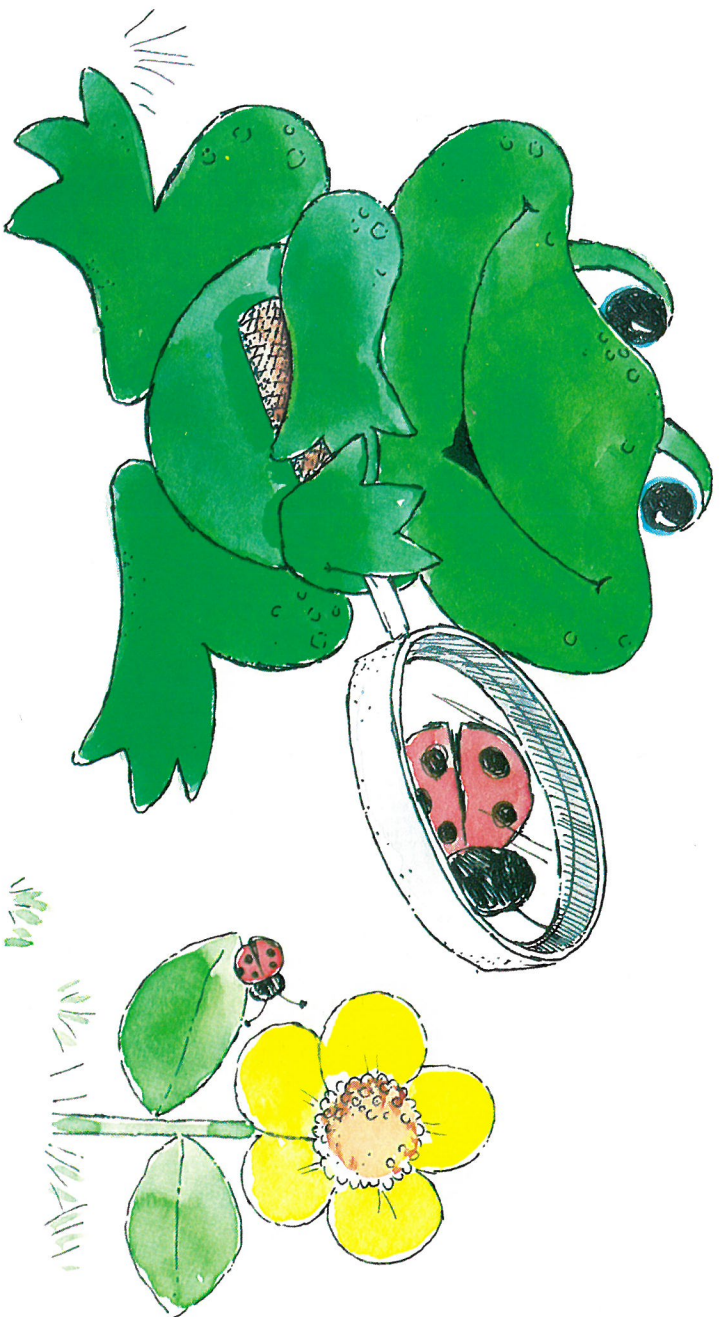


# Nature and Science



Macmillan Early Skills Program

**You need:**

soil  
wide-mouthed quart glass jar  
small plastic bottlecap (from a shampoo or spice bottle)  
water  
twig and plant leaves or grass  
insects to observe: moth, caterpillar, grasshopper, cricket, ladybug, and so on  
cheesecloth  
rubber band

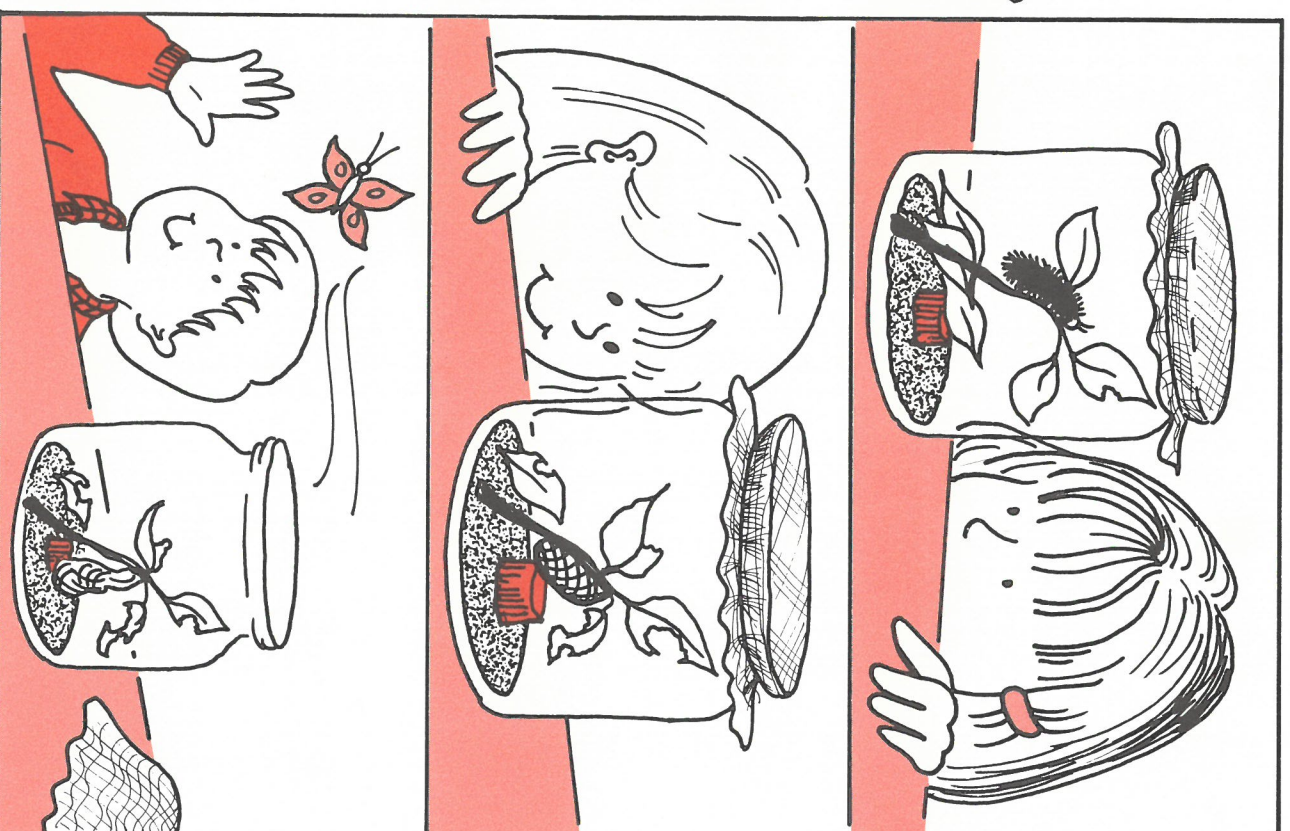


**Steps:**

1. Place a thin layer of soil on the bottom of the wide-mouthed quart glass jar.
2. Rinse a small bottlecap thoroughly and fill with water. Press it down into the soil.
3. Next, place a twig and several plant leaves or grass in the jar. Use grass or leaves that are found in the natural environment of the insect to be observed. (Collect the leaves or grass when you capture the insect for observation.)
4. Then place the insect inside the jar. Cover the mouth of the jar with cheesecloth, and secure it in place with a rubber band.
5. Let children observe the insect for several days. Then set the insect free.

**Variation:**

See if you can find a chrysalis or cocoon in the springtime. Place it inside the insect cage and wait for a butterfly or moth to emerge. Then release it outdoors.

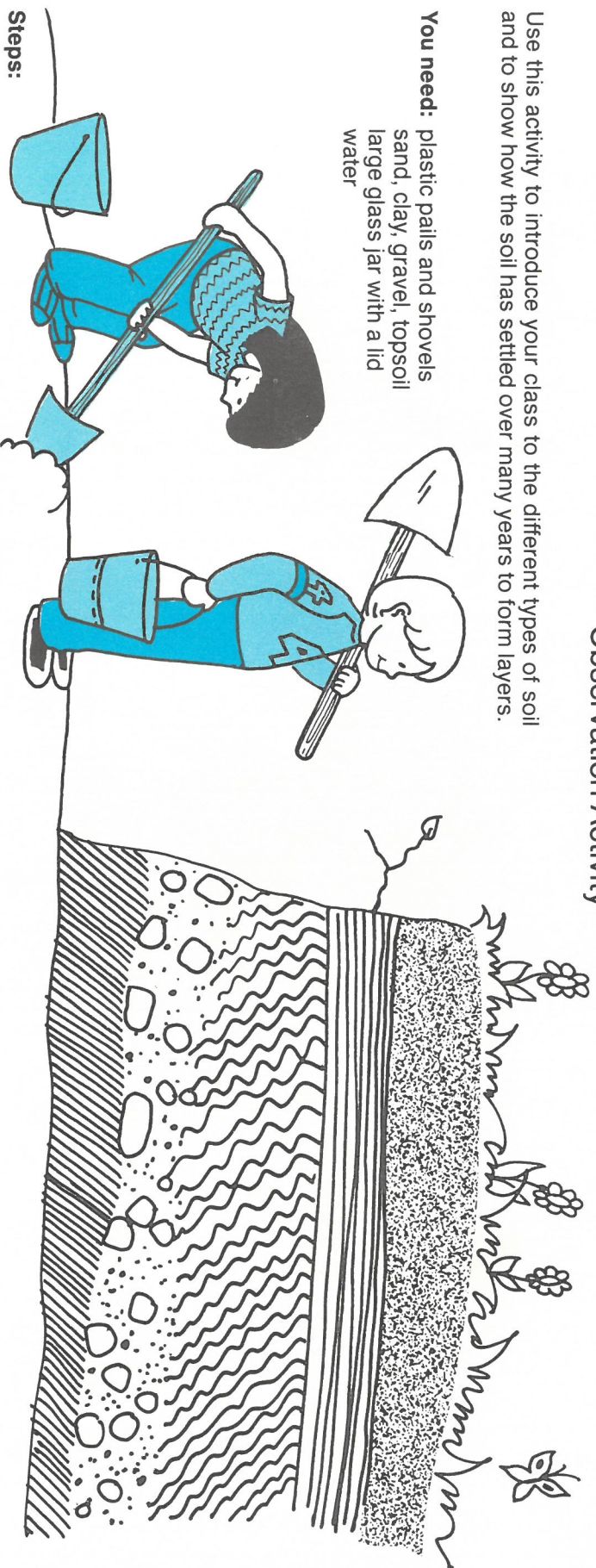




Observation Activity

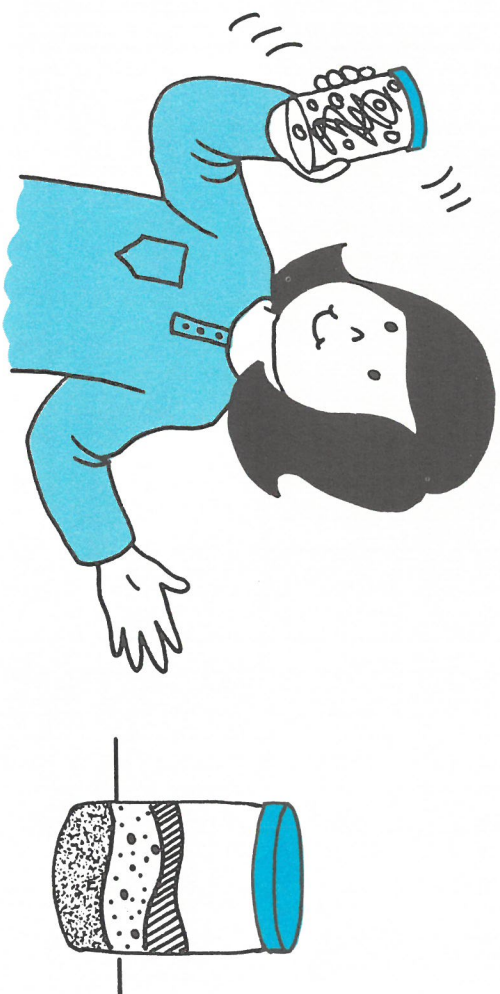
Use this activity to introduce your class to the different types of soil and to show how the soil has settled over many years to form layers.

**You need:** plastic pails and shovels  
sand, clay, gravel, topsoil  
large glass jar with a lid  
water



**Steps:**

1. Give children plastic pails and shovels. Go out into the schoolyard or take a short walk around the neighborhood with your class. Look for different types and textures of soil.
2. Have children collect some sand, clay, gravel, and topsoil. If all types are not available, bring some from home, or purchase from a greenhouse or nursery.
3. Fill a large glass jar halfway with the different types of soil, arranging them in layers.
4. Then fill the jar with water and screw the lid on tightly.
5. Ask children: What will happen when the jar is shaken? (The soil will get all mixed up.)
6. After receiving several responses, pass the jar around the room, giving each child a chance to shake it.
7. Then let the soil settle for about an hour.
8. Ask: What happened? (The soil settled in layers.) Why? (Some soils are heavier than others, and they sink to the bottom of the jar faster.)



# GROWING PLANTS

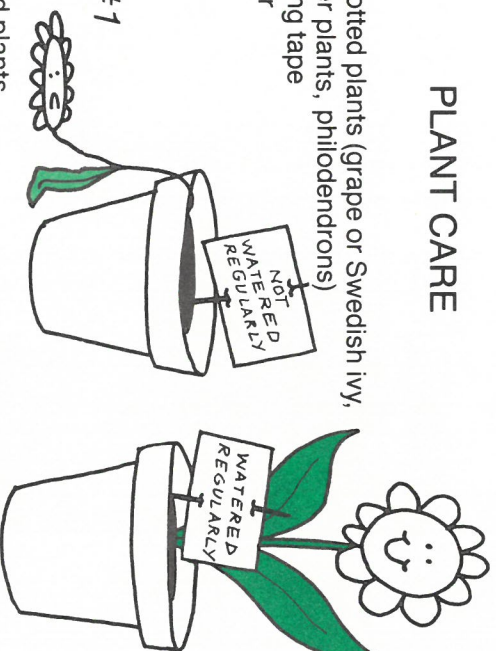
## Experiments / Windowsill Terrarium

Use these activities to teach children what plants need in order to grow.

### PLANT CARE

**You need:** four potted plants (grape or Swedish ivy, spider plants, philodendrons)

masking tape  
marker  
water  
closet



### Experiment #1

#### Steps:

1. Take two potted plants.
2. Use masking tape and a marker to label one potted plant "Watered Regularly" and the other "Not Watered Regularly."
3. Put them next to one another on a windowsill.
4. Water the plant labeled "Watered Regularly" every three days. Water the plant labeled "Not Watered Regularly" very rarely and very little.
5. After several weeks, ask children to describe what happened. Then have children draw a conclusion. (Plants need to be watered regularly to grow well.)

### Experiment #2

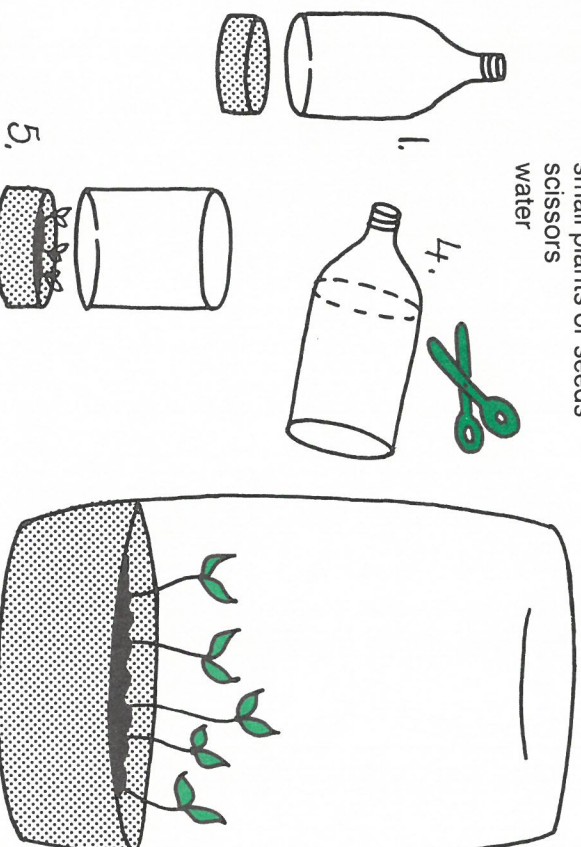
#### Steps:

1. Take two potted plants.
2. With masking tape and a marker, label one potted plant "In Light" and the other "No Light."
3. Put the plant labeled "In Light" in a sunny window.
4. Place the other plant in a closet.
5. Water them both regularly.
6. After two weeks, ask children to describe what happened and then come to a conclusion. (Plants need light to grow.)

### WINDOWSILL TERRARIUM

**You need:** 64-oz. plastic soda bottle

potting soil  
small plants or seeds  
scissors  
water



#### Steps:

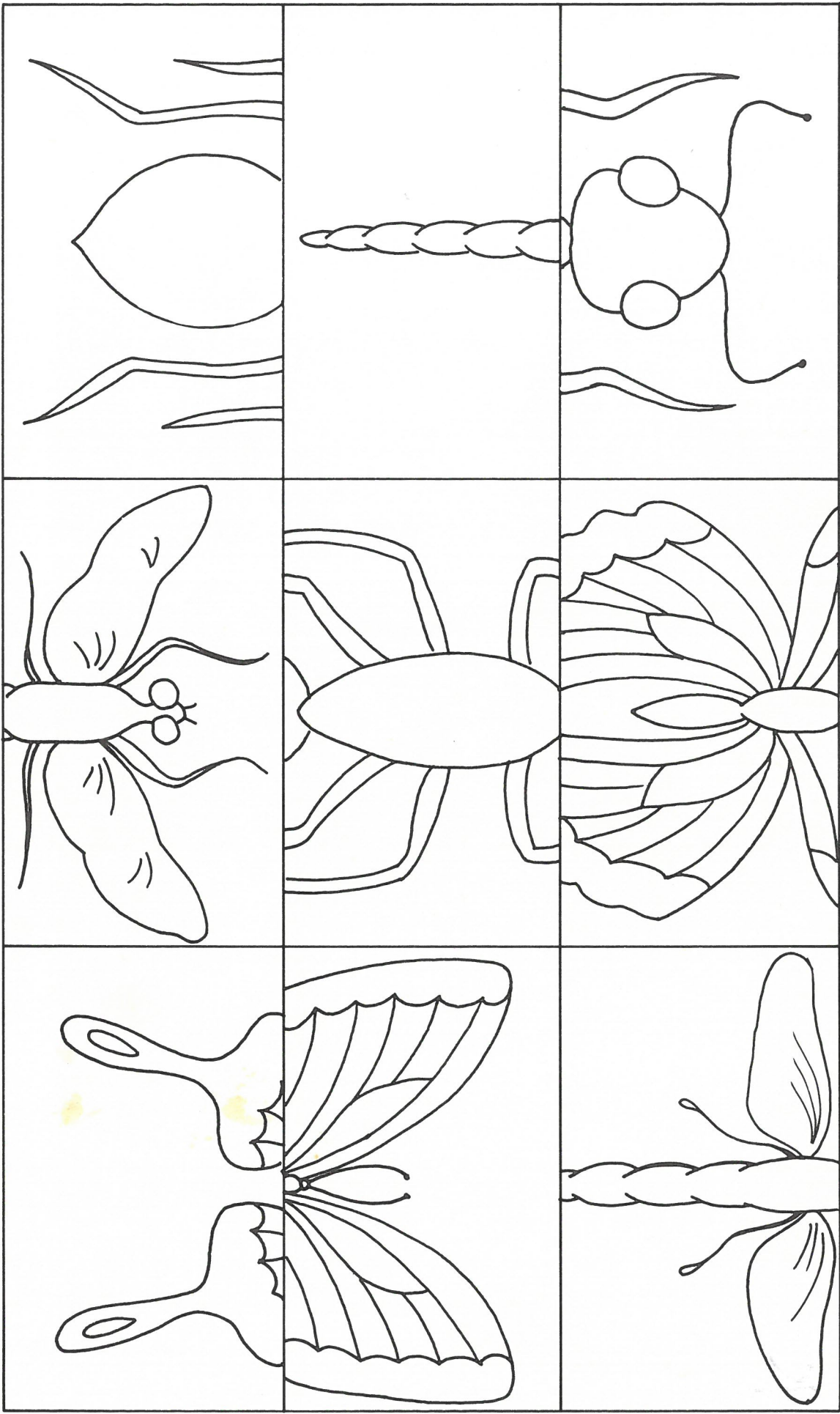
1. Remove the base from the soda bottle. (The bottle and base separate easily when pulled.)
2. Fill the base with potting soil.
3. Plant seeds or small plants in it.
4. With scissors, cut off the top third from the remainder of the bottle.
5. After watering the plants so that the soil is moist, place the remaining two-thirds of the bottle upside down over the plants.
6. Place the terrarium in a sunny spot and watch your plants grow!

#### Suggestion:

If you cut the bottle tops in advance for the children, they can prepare their own terrariums to give as presents for Mother's or Father's Day.

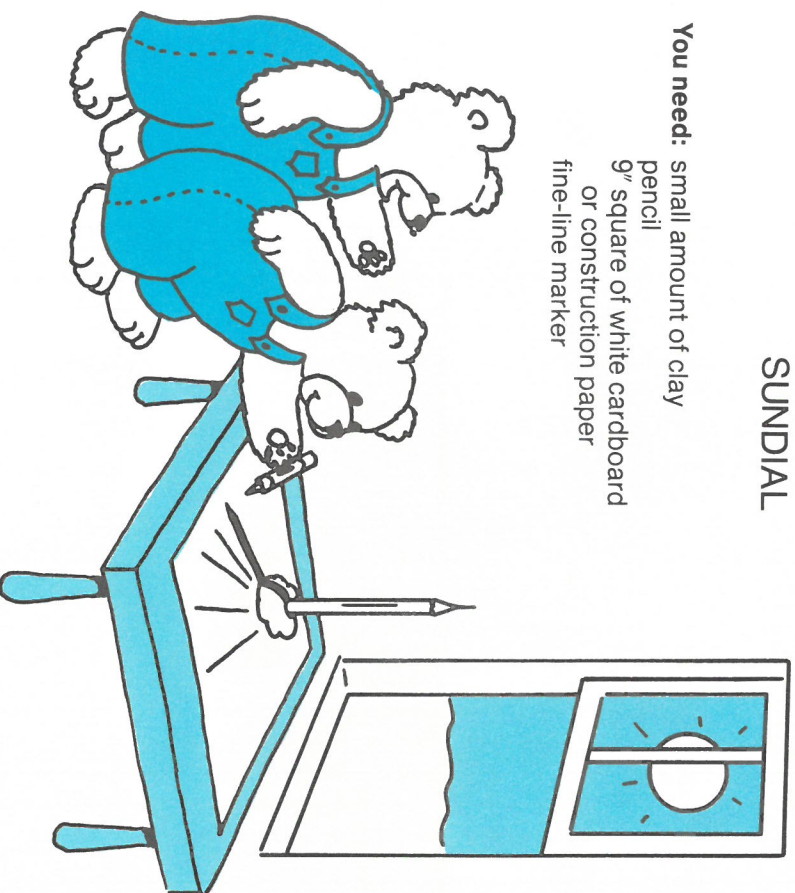


Cut out the nine boxes below.  
On a separate sheet of paper, piece the boxes together, in groups of three, to make three different insects. Then paste the pieces onto the paper and color each insect.



## SUNDIAL

**You need:** small amount of clay  
pencil  
9" square of white cardboard  
or construction paper  
fine-line marker

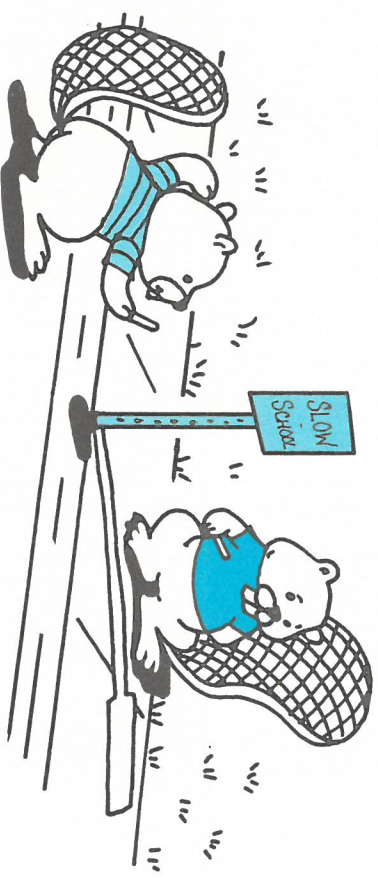


### Steps:

1. Explain to children that, before clocks were invented, people used the sun to help them tell time. Tell children that the earth revolves like a top that is slowly turning. As the earth turns, the shadows created by the sunlight change, becoming different lengths.
2. To make a simple sundial, roll a small amount of clay into a ball.
3. Push the eraser end of a pencil into the clay so that the pencil is standing upright. Then press the clay into the center of a 9" square of white cardboard or construction paper.
4. Place the cardboard or construction paper next to a sunny window.
5. Every hour on the hour, have the class observe how the pencil's shadow moves and changes in length. With a fine-line marker, indicate the position of the shadow on the paper each time.

## SHIFTING SHADOWS

**You need:** chalk



### Steps:

1. On a sunny morning, go outside with your class.
2. Find the shadow of a stationary object (fire hydrant, fence post, street sign, bush, and so on). Trace the object's shadow in chalk onto the blacktop or sidewalk.
3. At noon, outline the object's shadow again.
4. Trace the object's shadow a third time in the afternoon, before the children go home from school. Then discuss the changes in the shadow's shape with your class.

### Variation:

Let children observe the changes in their own shadows. Divide the class into pairs of children, and give each couple a piece of chalk. Have the children choose their places on the playground. Each child will write his or her name on the playground in chalk. While one child stands on his or her name, the partner will trace the child's shadow. Then the partners will switch functions so that each child gets his or her shadow traced on the ground. Repeat this procedure three times during the day—in the morning, at noon, and in the afternoon, each time having the children stand in the same spots as before, while their shadows are retraced.



This experiment will help demonstrate that water is absorbed by plants and travels to all parts of a plant.

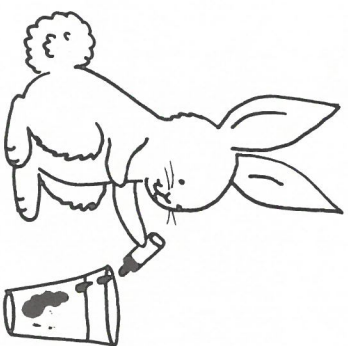
**You need:** tall, clear glass or jar

water

red food coloring

knife

celery stalk with leaves

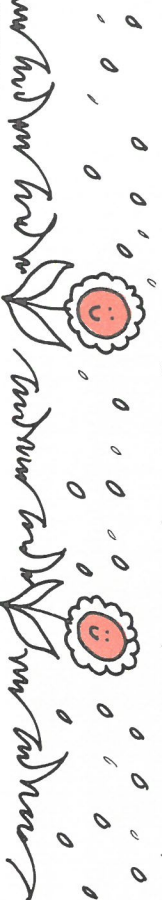
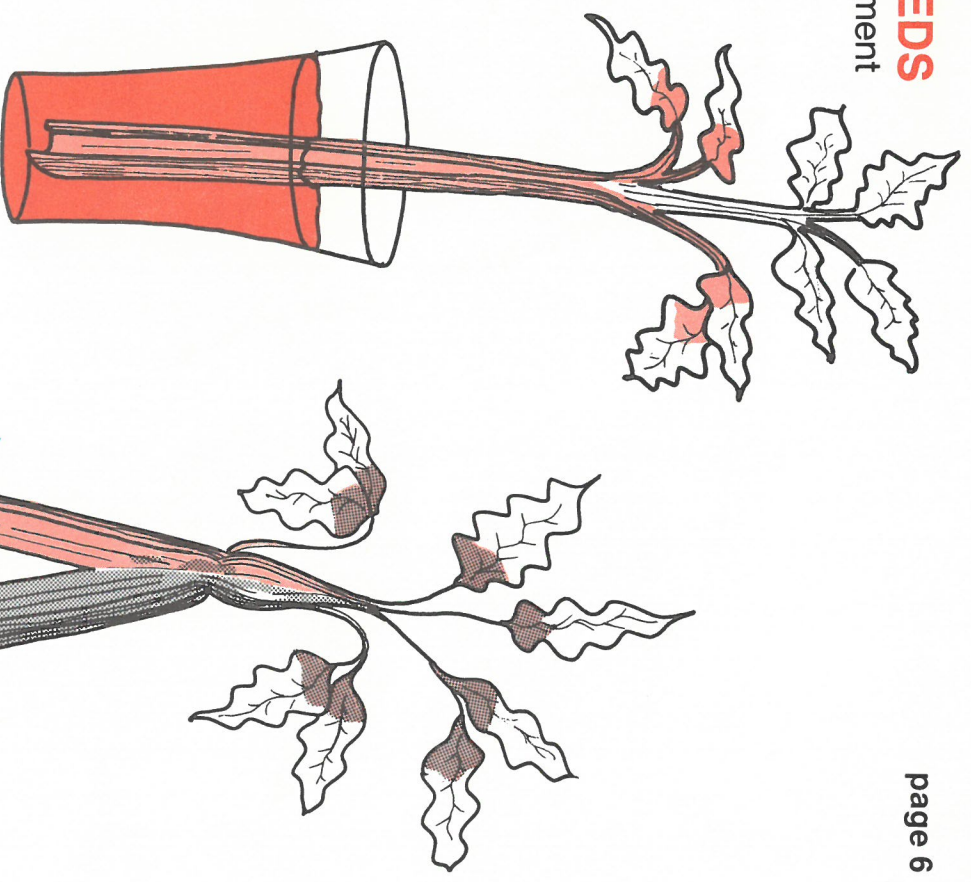


**Steps:**

1. Fill a tall, clear glass or jar half-full with water.
  2. Add a few drops of red food coloring and mix well.
  3. Trim the bottom of a large stalk of celery. Leave the leaves on.
  4. Put the celery stalk in the glass or jar. Leave overnight.
  5. The next morning, observe what has happened. Let the children tell you where the water has gone. (The water has been absorbed into the celery stalk, tinting the stem and leaves red.)
- Ask: Does the whole plant get water for food? (Yes.)

**Follow-up Activity:**

Take a celery stalk that has leaves. Trim the bottom. With a knife, make a slit up the middle of the celery stalk, stopping an inch below the leaves. Fill two tall, clear glasses or jars half-full with water. Add a few drops of food coloring to one glass or jar. Place several drops of a different food coloring in the second glass or jar. Mix the food coloring in each glass or jar well, and place the glasses next to each other. Put one-half of the celery stalk in one glass or jar, and the other half in the other glass or jar. Leave overnight. Observe what happens. (Each half of the celery stalk will have absorbed the colored water, and the two colors will have blended together as they moved up inside the stalk.)





## SOLAR PRINTS

### Art Activity

Plan this activity for a sunny day when the air is still.  
Children will see the effects sunlight has on light-sensitive paper.

**You need:** blueprint or sunprint paper (can be obtained from a graphic supply store)

folder

two aluminum trays, approximately 9" × 12"

tablespoon and measuring cup

3% hydrogen peroxide (available at drugstores)

water

8" × 10" pieces of cardboard

variety of small objects to be printed:

leaves, dried flowers, acorns, seashells,

cookie cutters, nails, bolts, and so on

newspapers

glue

9" × 12" colored construction paper

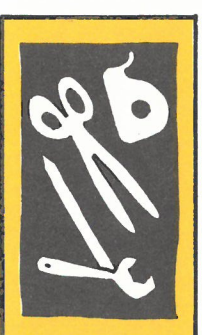
**Optional:** 8" × 10" piece of clear, hard plastic

timer



#### Steps:

1. Keep the blueprint or sunprint paper covered in a folder until ready for use.
2. Prepare one aluminum tray with a fixer solution. To make the fixer solution, mix 1 tablespoon hydrogen peroxide with 1 cup water.
3. Put clear, cold water in the other aluminum tray.
4. Demonstrate to the class the procedure for making solar prints. Set up the equipment in a darkened corner of the room. Children may observe this procedure, but do not allow them to handle the fixer solution.
  - a. On a piece of cardboard, arrange the objects to be printed.
  - b. When you have made a pleasing design, remove the objects and place the blueprint or sunprint paper, blue side up, on the cardboard. Arrange the objects on the paper in the same design.
  - c. If the objects are flat, a piece of clear, hard plastic can be placed on top of the objects to keep them in place.
  - d. Expose the paper to sunlight by carefully carrying it outside or placing it in a sunny window. (Fluorescent lights will not
  - e. Remove the objects from the paper and quickly place the paper in the fixer solution for one minute. (Set a timer or ask children to count slowly to 60.) The images of the objects will appear light, and the parts of the paper that were exposed to sunlight will appear blue.
  - f. Then rinse the paper in the cold-water tray for one minute.
  - g. Lay the solar print on a piece of newspaper to dry.
  - h. Change the fixer solution frequently so that the solar prints are clear. Pour used fixer down the sink.
  5. Let each child make an original solar print, using a variety of small objects. Completed solar prints can be mounted on colored construction paper.

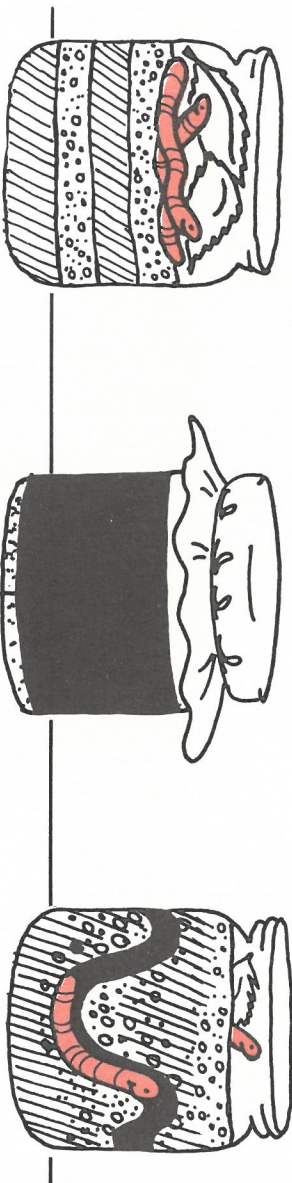




Observation Activity

Use this activity to show children how worms help mix soil so that plants can grow well.

**You need:** damp soil  
glass jar (approximately 1 quart)  
sand  
two or three worms  
fresh leaves  
cheesecloth  
rubber band  
tape  
black paper



**Steps:**

1. Initiate a discussion on worms:

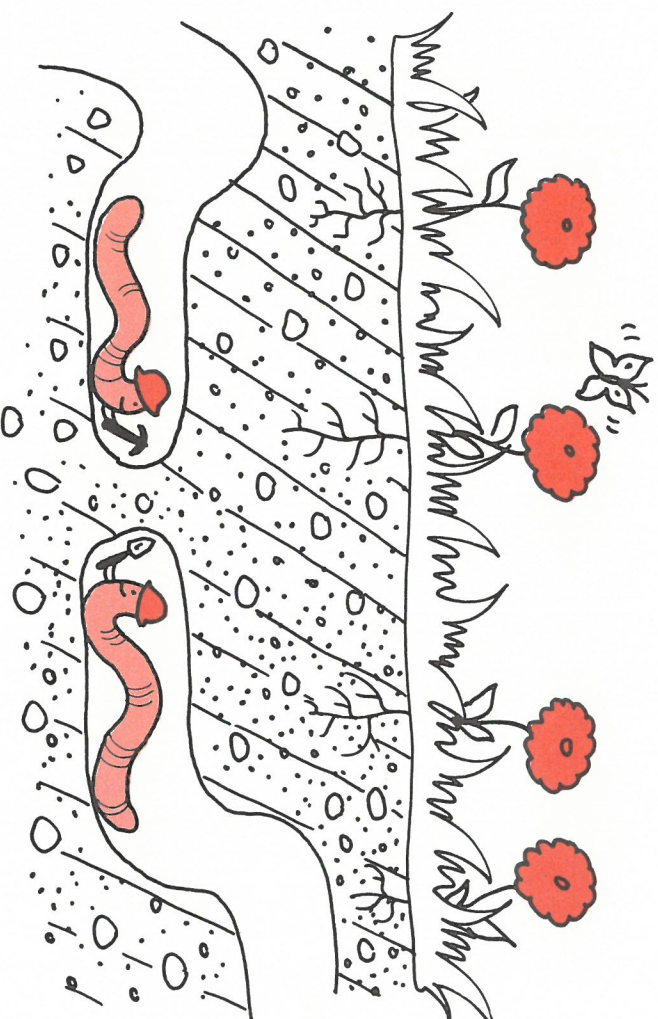
Have you ever touched a worm? Picked one up?  
Do you like worms?  
What do people use them for?  
Why, do you think, are there worms in our soil?

Children can learn the usefulness of worms by seeing what happens to soil in a jar when some worms are allowed to go to work in it.

2. First, put a 1½" layer of damp soil in the bottom of a glass jar.
3. Add a 1½" layer of sand, another layer of damp soil, and then a layer of sand.
4. Put two or three worms in the jar.
5. Place several fresh leaves in the jar for the worms to eat.
6. Stretch cheesecloth over the mouth of the jar and secure in place with a rubber band.
7. Tape black paper around the jar so that the worms think they are underground. Set the jar in a quiet corner for a few days.
8. Then, remove the black paper and let children look at the contents of the jar. Ask questions to help children draw conclusions.

Are the layers of sand and soil the same as they were when the worms were first put into the jar? (No. The sand and soil are mixed together in places.)

Why did the layers begin to get mixed together? (The worms dug tunnels through the layers and mixed them together.)



Explain that worms are helpful because they keep the soil broken up so that plants can grow roots easily. After children have observed the changes in the layers in the jar, release the worms outside in a shady place where the soil is loose.