My World and Me™

Living Things and Their Needs

Needs of Plants

Written by Nancy Moreno, Ph.D., Barbara Tharp, M.S., and Paula Cutler, B.A.

from *Living Things and Their Needs Teacher's Guide* and for *Tillena Lou's Day in the Sun*.

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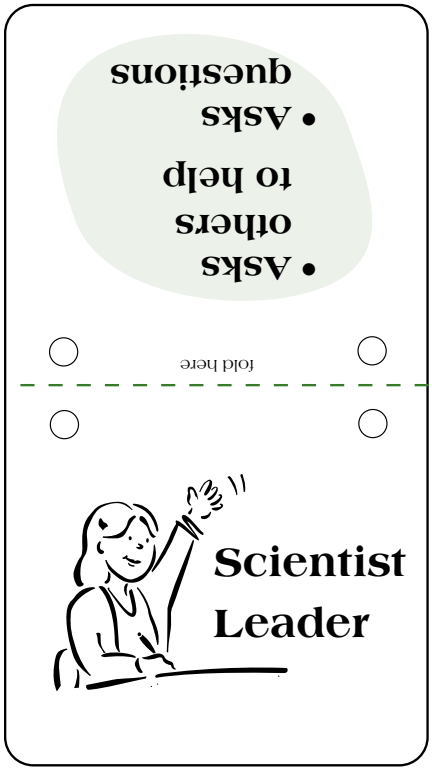
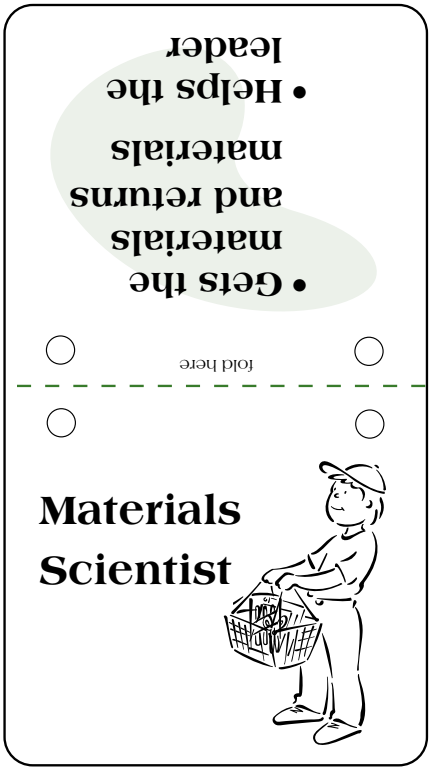
Using Cooperative Groups

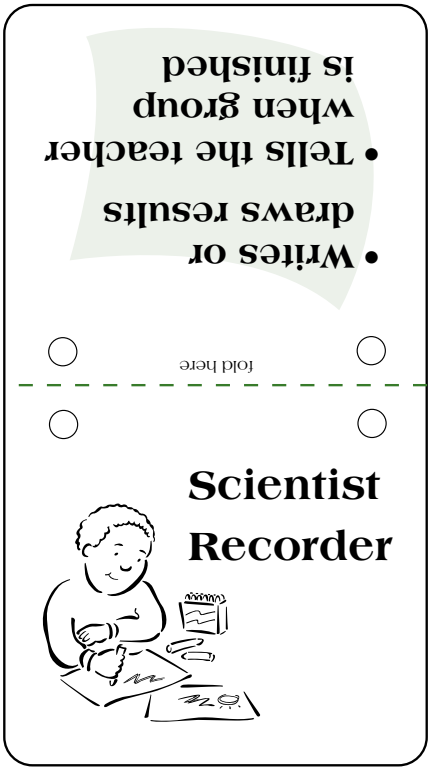
Cooperative learning is a systematic way for students to work together in groups of two to four. Quite often, early primary students need to have their own materials, but can work in groups to share ideas and to learn from one another. Through such interactions, students are more likely to take responsibility for their own learning. The use of cooperative groups provides necessary support for reluctant learners, models community settings where cooperation is necessary, and enables the teacher to conduct hands-on investigations in a more manageable environment.

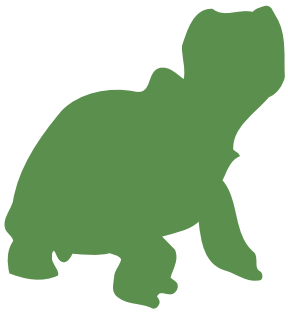
Students wear job badges that describe their duties. Tasks are rotated within each group for different activities so that each student has an opportunity to experience all roles. Teachers even may want to make class charts to coordinate job assignments within groups.

Once a cooperative model for learning has been established in the classroom, students are able to conduct science activities in an organized and effective manner. All students are aware of their responsibilities and are able to contribute to successful group efforts.









Needs of Plants

Each student will make his/her own mini-garden and will observe the growth and development of radishes. To help students learn about requirements for plant growth, the teacher will make four experimental gardens and place them in different locations with different conditions.

CONCEPTS

- Plants have basic needs.
- Plants need sunlight, water, air and nutrients from soil.
- Plants can survive and grow only when all their needs are met.

SKILLS

Science: Observing, predicting, comparing, contrasting, recording data, interpreting data, generalizing, graphing
Mathematics: Observing, charting, identifying patterns, measuring, sequencing, graphing
Language Arts: Listening, communicating, identifying words, developing vocabulary, understanding word meanings, developing comprehension skills, writing, using descriptive language, following directions

TIME

Set-up: 15 minutes
Class: Two sessions of 15 minutes per group for Parts 1 and 2

MATERIALS

See p. 5.

Almost all life on Earth depends on energy from the sun. Green plants and other organisms, such as algae (seaweeds) and some bacteria, are able to trap and store energy from the sun through a process called photosynthesis. The green color of plants and algae is caused by chlorophyll, a green pigment that is primarily responsible for the "light-trapping" part of the process. Sugar is the initial product of photosynthesis. In fact, more than 150 million tons of sugar are produced by the plants on Earth each year! Plants use some of this sugar to provide energy for life. They also use it as raw material to make starches, which are long molecules that can store energy until it is needed.

Plants need light energy, water and carbon dioxide from air for photosynthesis. They need additional chemicals, called nutrients, to manufacture the many other molecules necessary for life. Nutrients must be dissolved in water before they can be absorbed. Aquatic plants and algae can take the nutrients they need from the water around them. Land plants absorb dissolved nutrients from water in soil through their roots. Three of the most important plant nutrients—nitrogen, potassium and phosphorous—are common ingredients in most lawn fertilizers.

Plants cannot walk from place to place in search of resources. However, they are capable of some kinds of movement. For example, flowers open and close, stems bend toward light, and leaves and flowers follow the movement of the sun.

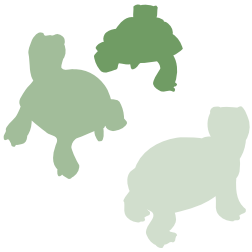
Plants and other photosynthetic organisms are called producers. Other organisms, such as animals and fungi (mushrooms, molds and their relatives), rely on foods consisting of the sugars, starches and other molecules "produced" by plants.

SETUP

Part 1 requires at least three weeks to complete. Part 2 requires one to two weeks to complete, depending on how quickly the radish seeds sprout. To save time, you may want to begin Part 2 shortly after setting up student mini-gardens in Part 1.

Part 1. Place materials for each group on trays in a central location. In advance, fill each peat pot two-thirds full of soil for students. Small disposable cups, with a hole punched through the bottom, can be substituted for peat pots (prepare as above). Also, place about 40 radish seeds in each of six cups (at least 6–10 seeds per student in each group).

Part 2. Assemble supplies for the teacher-led activity: four small plastic plates, paper towels, plastic spoon, radish seeds, water mister,



and four gallon-sized resealable plastic bags that are labeled "Garden 1," "Garden 2," "Garden 3" and "Garden 4."

PROCEDURE

Part 1. Create individual radish gardens

1. Ask students, *Are plants living or nonliving? How do we know?* (Plants are living because they grow, have offspring, use resources, have a life cycle). *Are seeds plants?* Help students understand that seeds are living parts of plants and that seeds contain all the necessary materials to start a new plant under the right conditions. Ask, *What do you think plants need to grow?* Record responses on a classroom chart. For younger students, you may need to use drawings or pictures to indicate needs (sunlight, water, nutrients, air, space).
2. Introduce the radish planting activity by discussing radishes with the students. Ask, *What do you know about radishes?* (plant, red, small, vegetable, etc.). Show the class a radish and give each group of students a radish and a few radish seeds. Have students cut their radishes apart. You may wish to cut radishes for younger students. Have them observe the radish and seeds with their hand lenses.
3. Distribute the student sheets. Explain that each student will plant his or her own radish seeds and watch them grow over the next few weeks. Using a spoon, demonstrate how to plant radish seeds just under the soil in a peat pot, and how to mist the soil lightly.
4. Label the pots with each student's name. Give each student his or her own peat pot.
5. Give each group of students a cup of radish seeds and a plastic spoon. Have each student plant about 6–10 seeds in his or her own pot.
6. Have students place their pots in a sunny place or under a grow light. Students should wash their hands when the planting is completed.
7. Each day, ask students to observe their radishes. Have them record the radishes' growth by writing or drawing on their "My Own Radish Garden" student sheets at least once per week. When the soil in the cup is dry to the touch, students should mist it lightly. You also may want students to measure the changes in plant height, using a paper clip chain or marked straws, every 2–3 days. They also may create graphs to record the growth of their plants.
8. After the radishes have developed (approximately 3–4 weeks), allow students to remove them from the pots. Have students wash the radishes thoroughly. They should use descriptive language to record their

MATERIALS

- 20 cups of potting soil (approx. 3 lbs)
- 4 resealable plastic bags, 12 in. x 15 in. (gallon-sized)
- 4 plastic plates, 10¼ in.
- Fresh radish
- Package of radish seeds (approx. 500 seeds, see Setup)
- Paper towels
- Permanent marker
- Plastic knife
- Plastic teaspoon

Per group

- 4 peat pots, 3 in. (prepared, see Setup)
- Clear plastic cup, 9 oz (prepared, see Setup)
- Fresh radish
- Plastic knife
- Plastic teaspoon
- Plastic tray
- Spray bottle (water mister)

Per student

- Hand lens
- Paper towel
- Plastic teaspoon
- Copy of "My Own Radish Garden" and "My Science Journal" student sheets

observations about their radishes. Point out to students that the edible portion of the radish plant actually is part of the root system. Older students may want to measure the circumference (distance around) or length of their radishes.

Part 2. Investigating needs of plants

1. Ask students, *What would happen to the radishes if one or more needs for plant growth were left out?* (e.g., no water, no sunlight or no soil). After students respond, mention that their suggestions will be applied to create four experimental radish gardens.
2. Explain to students that they will observe, over the next week or so, the progress of radish gardens that have four different sets of growing conditions. Begin assembling Garden 1 (control) and explain the steps you are taking as you assemble it.
   - Fold a paper towel in half and place it on a plastic plate.
   - Sprinkle 2 heaping teaspoons of potting soil across the top of the paper towel.
   - Sprinkle approximately 10–20 radish seeds onto the soil.
   - Lightly spray the soil surface with the water mister so that it is moist, but not soaking wet.
   - Carefully slide the plastic plate into a gallon-sized resealable plastic bag that is labeled "Garden 1." Seal the bag.
   - Place Garden 1 in a sunny spot.
3. Ask students, *Does this radish garden provide everything that the seeds will need to grow?* Make sure that students identify soil, water and sunlight as being present. Air also is present inside the bag.
4. Include students in the preparation of the other gardens, each of which will be missing one requirement for healthy seed germination (sunlight, water or soil). See Garden Treatments chart to the left.
   - Place Garden 2 (same as Garden 1) in a dark place.
   - Place Garden 3 (no water) in a sunny spot or under a growlight.
   - Place Garden 4 (no soil) in a sunny place or under a growlight.

Garden Treatments

	Sunlight	Water	Soil
Garden 1 (control)	☼	〰	☁
Garden 2	no sun	〰	☁
Garden 3	☼	no water	☁
Garden 4	☼	〰	no soil

☼ Sunlight 〰 Water ☁ Soil

Part 3. Observing experimental gardens

1. Each day, have students check the gardens to make sure that the towel or soil is moist (Gardens 1, 2 and 4 only). Allow assigned students to mist the gardens with water when necessary. If bags become clouded with condensation, leave them partially open to allow the excess moisture to evaporate.

   Note. Bags that are allowed to stay too damp probably will develop a growth of mold. If mold appears, seal the bags and do not reopen.
2. Students should observe the gardens daily or every other day and record their observations on their science journal student sheets. The

Garden Observations

	Garden 1 (control)	Garden 2 no sun	Garden 3 no water	Garden 4 no soil
Day 1				
Day 4				
Day 7				
Day 8				
Day 9				
Day 11				
Day 14				
Day 16				

Sunlight Water Soil

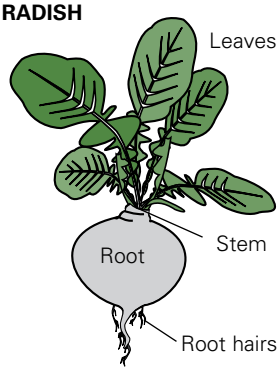
observations also can be recorded during the week on a class chart (see Garden Observations chart above).

3. At the end of one or two weeks, as a culminating activity, ask the class, *What differences have you observed about the seeds (sprouts) in the experimental gardens?* Prompt students to notice that the seeds with sunlight (Garden 1) developed green leaves and are growing normally; the seeds in the dark (Garden 2) germinated, but did not turn green or develop normally; the seeds without water (Garden 3) did not germinate; and that the seeds without soil (Garden 4) did not grow very much.
4. Guide students toward understanding that seeds need water to germinate, but that they also need nutrients (in soil) and sunlight to grow and develop. You may want to point out that air, also needed by plants, was present in all of the bags.

WHAT ARE RADISHES?

Radishes belong to the mustard family of plants. The part we eat is the root. Other roots that we eat are carrots, turnips, parsnips and beets.

RADISH



EXTENSIONS

- Make radish roses, dip or a salad with radishes to share with the class.
- Bring other examples of vegetables to class for students to identify and examine.

My Own Radish Garden

Name _____ Date _____

WEEK 1

WEEK 2

WEEK 3

WEEK 4

My Science Journal

Name _____ Date _____

Project Name _____

DRAWING

KEY WORD TO USE

I OBSERVED . . .

_____

_____

_____

_____

_____

_____