ACTIVITIES 12&13

Plants and Solar Energy
(Sessions I and II)

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 5—Quarter 2
Activity 12 & 13

SC.B.1.2.1
The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem).

SC.B.1.2.2
The student recognizes various forms of energy (e.g., heat, light, and electricity).

SC.B.1.2.4
The student knows the many ways in which energy can be transformed from one type to another.

SC.H.1.2.2
The student knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results.

SC.H.1.2.3
The student knows that to work collaboratively, all team members should be free to reach, explain, and justify their own individual conclusions.

SC.H.1.2.4
The student knows that to compare and contrast observations and results is an essential skill in science.

SC.H.3.2.2
The student knows that data are collected and interpreted in order to explain an event or concept.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 39 hands-on activities at your grade.

1. **Session I—Activity 12:** Ask the class if they think this activity is a fair test to see if sunlight affects plant growth. (Yes, it is a fair test because we only changed one factor, the amount of sunlight the plant receives.) Ask, What factors were kept the same in both containers? (Among the factors we kept the same were: size, material and shape of the terrarium; amount of water added and frequency of watering; type and amount of soil used; type and amount of grass seed; source of water.)

2. **Session II—Activity 13:** Remind students that they are acting as scientists do. Have them write a sentence for each of the following categories: problem being studied; prediction; observations; conclusion. (Problem—What happens to a plant when it doesn't get sunlight? Prediction—Based on past experience, I think plants that don't get sunlight will not grow, or will grow poorly. Observations—Plants that do not get enough sunlight turn a lighter color, wilt, and die. Conclusion—Plants need sunlight to live.)

3. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

ACTIVITIES 12&13

Plants and Solar Energy

OBJECTIVES

Students investigate the importance of solar energy to plant growth.

The students

- discuss photosynthesis
- plant two terrariums with grass seed and place one in the Sun and one in the dark
- compare the rate of growth in the two terrariums
- conclude that solar energy is necessary for the growth and good health of plants

SCHEDULE

Session 1—Activity 12 About 50 minutes

Session 1—Activity 13 About 20 minutes, 7–10 days after completing Session 1

VOCABULARY

photosynthesis
terrarium

MATERIALS

For each student

1	Activity Sheet 12
1 pr	safety goggles*

For the class

2	containers, fluted
2 pkg	seeds, grass
1 bag	soil
1	tumbler, large
1	VCR*
1	video, *Solar Energy*
2 c	water, tap*
	DSR *Earth, Moon, and Sun*
	DSR *Plants in Our World*

*provided by the teacher

PREPARATION

1. Make a copy of Activity Sheet 12 for each student.
2. Select two areas in the classroom to store the terrariums that will be prepared in this activity. The terrariums should be placed where they will not be disturbed yet will still be accessible to students. One should be exposed to sunlight during the day; the other should receive no light at all. Make sure that the terrariums will not be subjected to extreme temperatures, particularly if placed near a window.

BACKGROUND INFORMATION

Photosynthesis is the process by which plants use chlorophyll to trap solar energy (energy from the Sun) to make their own food. Plants use the energy from sunlight to convert water in soil and carbon dioxide from the air into glucose, a simple sugar. Plants use the chemical energy in glucose to fuel cell growth and other life processes and to synthesize other substances, such as starch, lipids, proteins, and cellulose.

Plants play a crucial role in the existence of other forms of life on Earth. Nearly all of the food that humans and other animals eat is either the product of plants or the product of animals that eat plants. For this reason, plants can be considered the original source of food for life on Earth. But without sunlight, plants would die, and so would all of the living things that depend on plants or plant-eating animals for food.

In this activity, two ***terrariums*** are planted with grass seed. One is placed where it will receive sunlight, while the other is placed in the dark. While seeds will sprout in the absence of light (seeds contain stored food that provides for this growth), students will discover in 7 to 10 days that plants need sunlight for continued growth and good health.

Part One of the *Solar Energy* video is titled "Capturing Solar Energy." Show Part One to the class at the end of Session I, after they have planted the grass in their terrariums. Alternatively, you may show Part One of the video at the beginning of Activity 14.

▼ **Activity Sheet 12**

Plants and Solar Energy

Session I—Activity 12

1. Draw and describe the two terrariums. Include details such as depth of soil, arrangement and number of seeds, where in the classroom each will be stored, and so on.

terrarium in sunlight | **terrarium in darkness**

Session II—Activity 13

2. Draw and describe the two terrariums after 7 to 10 days of growth.

terrarium in sunlight | **terrarium in darkness**

3. Based on your observations, do you think plants need solar energy to live? Explain.

Yes. Plants need solar energy to make food and to grow. The grass that was exposed to sunlight looks healthier and is taller than the grass that was grown in darkness.

Guiding the Activity

1 Session I—Activity 12

Write the term *photosynthesis* on the board. Ask, **What do you think photosynthesis is?**

Explain that sunlight is one form of energy; chemical energy is another. Plants are able to transform the energy from sunlight into the chemical energy they need to carry out life processes. This chemical energy is contained in the food that plants make within their cells.

Tell students that the word *photosynthesis* can be broken into two parts: *photo,* which means "light," and *synthesis,* which means "put together." Explain that **photosynthesis** is the process by which plants use the green coloring in their cells (called chlorophyll) to trap light energy to manufacture food that contains chemical energy for growth and development.

Additional Information

Some students may know that photosynthesis is in some way related to plants. Others may know that it is the process by which plants make their own food.

Guiding the Activity

Additional Information

As appropriate, read or review page 3 from the Delta Science Reader *Plants in Our World*.

2 Write the word *terrarium* on the board. Ask, **What do you think a terrarium is?**

Students may give a variety of answers.

Explain that a **terrarium** is similar to an aquarium except that a terrarium contains land plants and/or animals.

Tell students that terra means "land" and aqua means "water."

Explain to students that grass seed will be planted in two terrariums. One terrarium will be placed in the sunlight and the other in a dark place. In about 7 to 10 days, students will determine whether there is any difference in the growth rates of the grass in the two terrariums.

3 Place the materials on a centrally located work table or desk. Have volunteers fill each of the two fluted containers to within 2 cm of the top with soil (see Figure 12-1). Invite other volunteers to sprinkle half of the grass seeds on one container and half on the other. Then have them cover the seeds with two or three handfuls of soil and pat the surface gently.

▲ ***Figure 12-1.*** *Planting the terrariums.*

Finally, have the volunteers use a tumbler of tap water (about 1 cup) to moisten the soil in each terrarium.

Make sure that both terrariums are watered equally. Do not overwater.

4 Distribute a copy of **Activity Sheet 12** to each student. Have the students draw and describe both terrariums on the activity sheet.

The soil in the terrariums should be kept moist. Half a tumblerful (about 0.5 cup) of tap water per terrarium every two to three days should be sufficient, but check that the soil does not become too wet or too dry. If the seeds in either terrarium have not germinated after five days, replant both terrariums.

Guiding the Activity

Place one of the terrariums where it will be exposed to sunlight during the day. Place the other terrariums where it will receive no light, such as inside a cabinet or closet.

Have students check on both terrariums every other day for the next 7 to 10 days.

5 Session II—Activity 13

Seven to ten days after the grass seed was planted (or a few days after the grass seed has sprouted), have the students complete the bottom half of the activity sheet.

Ask, **Do you think that sunlight is necessary for plants to live?**

Remind students that photosynthesis is the process by which plants use solar energy (the energy from sunlight) to make their own food. Explain that without solar energy, plants would die, and so would all of the animals—including humans—that rely on plants or on other plant-eating animals for food.

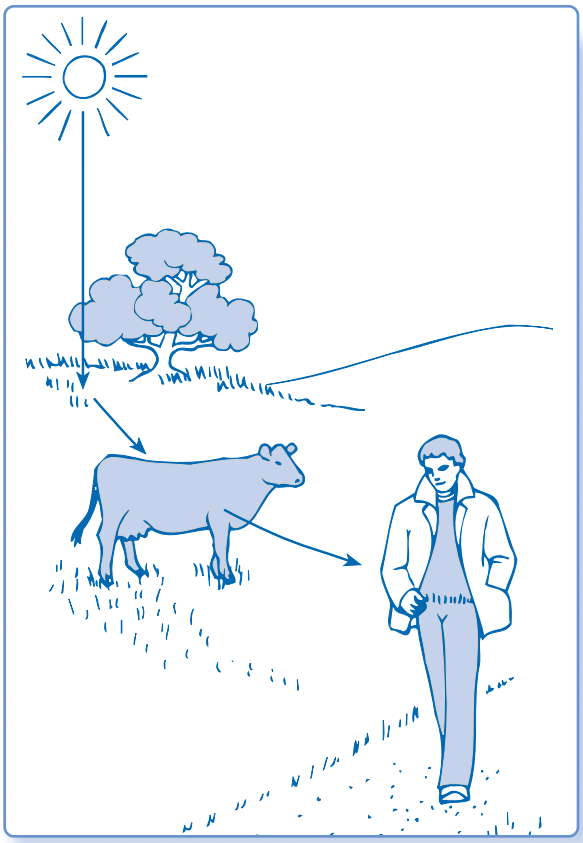
Challenge students to trace the origins of their favorite food. Use Figure 13–1 as an example. Invariably, the food item can be traced back to a plant, which made its food using energy from the Sun.

As appropriate, read or review page 6 from the Delta Science Reader *Earth, Moon, and Sun*.

Additional Information

The seeds in both terrariums should have germinated and grown, but the grass that has been exposed to the sunlight should be noticeably taller and healthier.

Students will probably agree that it is necessary, based on their observations of the two terrariums.



▲ ***Figure 13-1.*** *The energy chain.*

Reinforcement

Invite students to obtain two identical, healthy plants and to place one in a sunny area and one in a completely dark area. After several days, tell students to compare the health of the two plants and to relate their findings to the presence or absence of solar energy (sunlight). Then tell them to return the weakened plant to a sunny location and observe its recovery over the next several days.

Cleanup

Discard the grass. The soil may be used again for other classroom projects or added to planters or flower beds outdoors. Rinse, air-dry, and return the fluted containers and the tumbler to the kit.

Connections

Science Challenge

Explain (or remind students) that plants store food in the form of starch and that iodine can be used to test for the presence of starch. Provide a variety of raw vegetables and foods derived from plants (such as bread, crackers, rice, and cereal), and have students test them for starch. *CAUTION:* Iodine solution is poisonous if swallowed. Since iodine solution can stain clothing and skin, direct students to wash spills and splashes with water. Have students wear an old shirt or apron to protect clothing.

Science and the Arts

Suggest that students research the layers of the Sun and the size of each layer. (The *corona,* the outermost layer, extends for millions of miles into space; the *chromosphere* is about 35,000 miles thick; the *photosphere,* about 250,000 miles thick; and the *core,* about 150,000 miles thick.) Encourage students to use illustrations in library books and science textbooks to make their own pictures or 3D models of the Sun's structure.

Science and Careers

Invite a plant nursery owner, manager, or worker to visit the class to describe how the nursery raises and cares for many different types of plants. Suggest that the visitor bring some unusual small plants that require special conditions or care. Also ask the visitor to describe the education and training needed for his or her work.

Science Extension

Help students visualize the size and distance relationships between the Sun and Earth by doing the following demonstration outdoors or in a large open area such as a cafeteria or gym. (*Note:* You may want to do the Science and Math activity below as a lead-in to this demonstration.) Use a soccer ball or basketball to represent the Sun and a pea to represent Earth. Ask one student to hold the "Sun." Have another student hold "Earth" and stand 100 feet from the "Sun." Explain that these are the actual relative sizes of the Sun and Earth and the distance between them.

Show students how to use a prism to separate sunlight, "white" light, into its visible colors. Explain that only some of the Sun's energy is visible to us. Radio waves, infrared rays, X-rays, and gamma rays are also components of the energy given off by the Sun. We cannot see infrared rays, although we can feel them as heat, or ultraviolet rays, the rays that cause tanning and sunburning.

Science and Language Arts

Photosynthesis is only one of many words containing the prefix *photo-,* from the Greek *phōs*. The definitions of all these words relate to light in some way. Ask each student to look up at least three other words that contain the prefix *photo-* and to write a brief definition of each word.

Science and Math

Ask students to research the diameter of the Sun and of Earth. (the Sun = 864,000 miles; Earth = 7,900 miles) Then have them calculate the relative sizes of the Sun and Earth. (The Sun's diameter is about 109 times the diameter of Earth.) Demonstrate these relative sizes with a soccer ball or basketball and a pea, as described in the Science Extension above.