

Photosynthesis

Subject Area: Science

Unit Title: Plants & Photosynthesis

Grade Level: 4th & 5th grade

Objectives: To understand the process of photosynthesis, and what happens if you change the pattern of a light source.

Colorado Content Standards to be covered:

SCIENCE

Standard I - Students understand the processes of scientific investigation; and design, conduct, communicate about, and evaluate such investigations.

Standard III - Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.

Materials:

- sticky notes (or scraps of paper)
- Small shrub, tree or house plant
- Cardboard or aluminum foil
- Scissors
- Paper clips
- How Photosynthesis Works handout (last page)

Anticipatory Set: Pass out the How Photosynthesis Works handout, and go over the basic steps with students. Ask them to predict what will happen if you cover part of a plant's leaf. Have them write their answer on a sticky note.

Input:

Photosynthesis is a process in which plants convert sunlight, water, and carbon dioxide into food energy (sugars and starches), oxygen and water. Chlorophyll or closely-related pigments (substances that color the plant) are essential to the photosynthetic process.

Of all the organisms in the natural world, green plants are the only ones that manufacture their own food. This process is called photosynthesis and begins when light strikes the plant's leaves (both sunlight and artificial light can power this process). Cells in the plant's leaves, called chloroplasts, contain a green pigment called chlorophyll which interacts with sunlight to split the water in the plant into its basic components.

Carbon dioxide enters the leaf through holes called stomata and combines with the stored energy in the chloroplasts through a chemical reaction to produce a simple sugar. The sugar is then transported through tubes in the leaf to the roots, stems and fruits of the plants. Some of the sugar is used immediately by the plant for energy; some is stored as starch; and some is built into a more complex substance, like plant tissue or cellulose.

Fortunately for us, plants often produce more food than they need, which they store in stems, roots, seeds or fruit. We can obtain this energy directly by eating the plant itself or its products, like carrots,

rice or potatoes. Photosynthesis is the first step in the food chain which connects all living things. Every creature on earth depends to some degree on green plants.

The oxygen that is released by the process of photosynthesis is an essential exchange for all living things. Forests have been called the "lungs of the earth" because animals inhale oxygen and exhale carbon dioxide in the process of breathing, and plants take in carbon dioxide and give off oxygen in the process of photosynthesis.

Vocabulary

Chlorophyll-A green substance which gives leaves their color. Chlorophyll absorbs energy from sunlight which a plant uses to make food.

Chloroplast-A small particle that contains chlorophyll and is the site where photosynthesis and starch formation occur.

Photosynthesis-The formation of carbohydrates in the chlorophyll-containing tissues of plants exposed to light.

Stomata-Very small holes in the surface of a leaf. Oxygen and carbon dioxide from the air enter through the stomata; oxygen, carbon dioxide and water vapor leave through the stomata.

Checking for Understanding: At the end of this section choose one of the following for a quick check: ask the students to partner share and think, pair and share, do a quick 3 word write up as an exit slip, do a quick sketch or give each other a quick thumbs up or down to check for understanding. Determine the level of mastery for each student and provide individual remediation as needed.

Procedures/Activities:

Lights Out

1. Pick a shrub, tree or houseplant that you can use for an experiment.
2. Using the cardboard or aluminum foil, cut out some geometrical shapes like a circle, square or triangle. Make sure your shapes are big enough to make a patch that will cover nearly half of the plant leaf.
3. Paper-clip each shape on a different leaf.
4. If you use a house plant, place it near a south, west or east window where it will get plenty of sunlight. Make notes about the weather each day and add them to your observations.
5. After four days, remove the shapes from the leaves and observe each of the leaves that had a shape covering it.
6. Compare the areas of the leaf that were covered with the shape to other parts of the leaf.

Closure:

Ask your students the following questions:

1. What has happened to the leaves? Describe the effects that the lack of sunshine has on leaves. What has or hasn't happened in the different parts of the leaf?
2. What is the best environment for a house plant? Why?
3. Where have you seen effects like these in nature?
4. Where would you expect to find fewer plants outside because of a lack of sunlight?

from Newton's Apple website

HOW PHOTOSYNTHESIS WORKS

