Recommended Grade Level:
2-5

Season:
All

Indoor

Form and Function — Think Like A Botanist

Description:

Students will learn about the photosynthesis cycle in plants. Students will compare and contrast a plant grown in the dark for a week to another grown in light at regular intervals up to a month. Students will also discuss what they need to help them grow and be healthy.

Background:

Photosynthesis is the process in which green plants use sunlight, carbon dioxide and water to make sugar (food) and release oxygen into the air for us to breathe. Photosynthesis takes place in the green leaves of plants in tiny organelles called chloroplasts. Each chloroplast has chlorophyll, which absorbs sunlight and gives leaves their green color. Carbon dioxide is absorbed through small holes in leaves called stomata, and water is absorbed by the roots of the plant. Students will learn the needs of plants (water, light, air and nutrients) and how these elements contribute to the process of photosynthesis.

Materials:

- Two identical plants, planted in the same soil
- Water
- Garden journals
- Plant Parts Sheet
- Photosynthesis Cycle Worksheet (optional)
- Photosynthesis Vocabulary Worksheet (optional)

Preparation:

1. Review the photosynthesis cycle and Plant Parts Sheet.
2. Make copies of the Photosynthesis Cycle Worksheet and the Photosynthesis Vocabulary Worksheet for each student.

Activity:

1. Explain to students that all living things need food for energy. We grow food to eat and our bodies make the energy we need after we eat the food. Plants are also living things and need energy, but they make their own "food" for energy.
2. Then ask:
   - What are the different parts of a plant and what do they do?
     Roots take in water and nutrients; stem transports the water and nutrients.
     Leaves take in sunlight and water.
     Flowers produce seeds and seeds make new plants.
   - What do plants need to grow?
     Water, soil, sunlight, nutrients
   - What is photosynthesis?
     The process that a plant uses to make its food and make oxygen for us to breathe.
3. Tell the students that you're going to eliminate sunlight from the growth process of a plant to see what happens.
4. In their garden journals, have students draw and label Day 1 of the experiment and make predictions of what will happen during the experiment.
5. Over the next 14 days, water both plants each day, but leave one in the dark.
6. Check the plants on days 1, 4, 7, 11 and 14. Have students record their observations and draw the results for each day in their garden journals. Each time the data is recorded, talk about the changes and the differences in both plants.

Tying it Together:

1. What happened to the plant with no sunlight?
2. What happened to the plant with sunlight?
3. Since plants need sunlight to make food, what were the results of having no sunlight?
4. Could the plant in the dark create oxygen?
   No, because it needs sunlight to make oxygen.
5. What were the results of having sunlight? Review the photosynthesis cycle.
   Water + Light + Carbon Dioxide goes into the plant's leaves. Then the plant makes sugar for food and oxygen for us to breathe.
6. Plants have needs that help them live and grow. What do we need to grow and be healthy?
   Clean air, water, healthy foods like fruits and vegetables, physical activity, sleep

Digging Deeper:

Review the Plant Parts Sheet for a more in depth study of plant processes and stages of development.

Special Care:

Showing students a visual representation of learning concepts helps them assimilate new information. This model will help students gain a visual understanding of the steps of photosynthesis. Using a six-cup muffin pan, add each of the following items to one of the cups to show what is needed for photosynthesis:

- Sunlight: Two small yellow balloons that have been slightly inflated
- Carbon dioxide: Two small red balloons that have been slightly inflated
- Water

Then, place the muffin pan by a window that gets sunshine. After a few minutes, replace the items in the muffin pan with the following to represent the products of photosynthesis:

- Oxygen: Three small white balloons that have been slightly inflated
- Sugar: Three small sugar packets or fill three cups half way with sugar

Have students illustrate the model and label them in their journals or complete the Photosynthesis Cycle Worksheet.

National Standards:

CCSS.ELA: Writing: Text types and purposes.

CCSS.ELA: Writing: Research to build and present knowledge.

NGSS: Structure and properties of matter.

NGSS: Interdependent relationships in ecosystems.

NGSS: Energy

Lesson Extensions:

Science: Students can collect more plant data over time. Decide what to test (height, number of leaves, etc.) and observe and record data at regular intervals over a month.

Math: Add more plants to the mix to get a broader range of data. Use calculations to compare the growth rates of different plant or the mean, median and mode.

Language Arts: Publish data in a class scientific journal. Report on the development, growth and findings of the study. Students can work as a class or in small groups to summarize the data. Remind students to focus on the process and outcomes that occurred during the study.

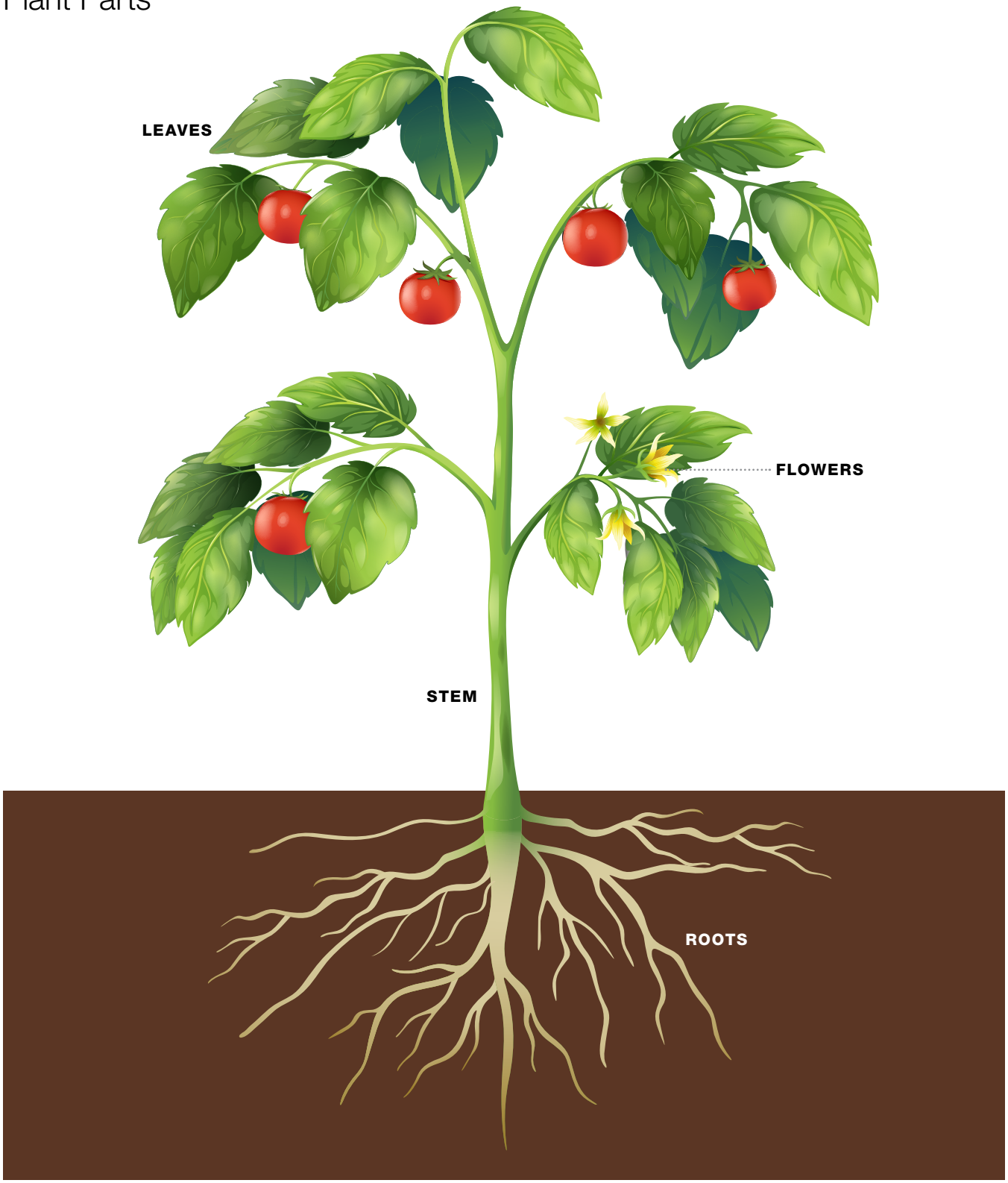
Use the Photosynthesis Vocabulary Worksheet to show students' level of understanding of the key vocabulary words and concepts. Students can write a composition based on the data they collected, listing the process and outcomes of the experiment.

Career Investigation: Show students the Plant Scientists video clip and lead them in a discussion about the different types of plant scientists. Have students imagine they are plant scientists and brainstorm ways they can improve plants and agriculture.
https://www.youtube.com/watch?v=cBryPpsfcHU

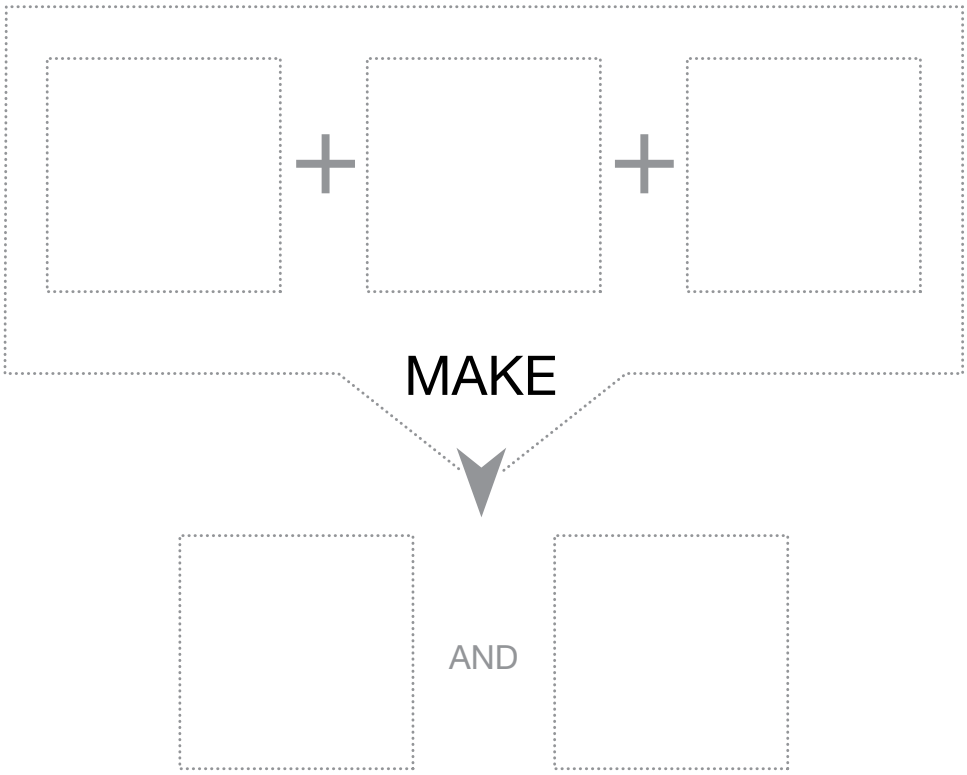
Literature Connections:

Photosynthesis by Torey Maloof
Photosynthesis: Changing Sunlight Into Food by Bobbie Kalman

Plant Parts



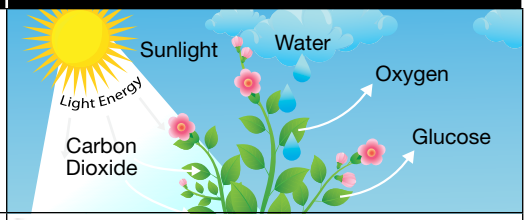
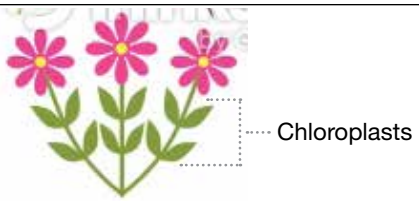
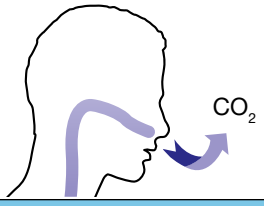
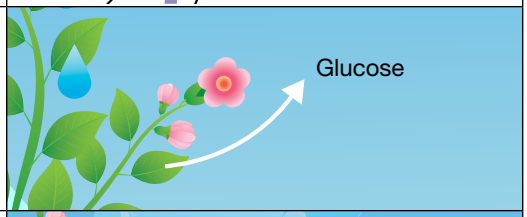
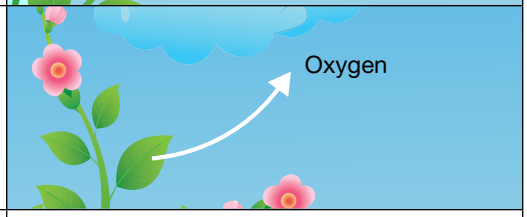
Photosynthesis Cycle



Photosynthesis Vocabulary

Vocabulary	What it means	What it looks like
Photosynthesis		
Chlorophyll		
Chloroplasts		
Carbon Dioxide		
Glucose		
Oxygen		
Stomata		

Photosynthesis Vocabulary Answer Key

Vocabulary	What it means	What it looks like
Photosynthesis	The way that plants make food or sugar. Uses sunlight, water and carbon dioxide.	
Chlorophyll	Green color in plants that is formed using energy from sunlight.	
Chloroplasts	Special parts of plant cells where photosynthesis takes place.	
Carbon Dioxide	The gas that we breathe out and plants take in and use during photosynthesis.	
Glucose	The sugar that plants make and use for food.	
Oxygen	The gas that plants make during photosynthesis that we breathe in.	
Stomata	Really small holes in plants that take in carbon dioxide.