# Lesson 2: Photosynthesis and Transpiration

## Objective:

Students will be able to explain photosynthesis and transpiration in plants. Students will compare and contrast the growth of plants under varying conditions.

Students will learn about both photosynthesis and transpiration in this lesson. Photosynthesis is the process by which plants make their food. In this process, the energy from the sun is changed into both sugar and oxygen for the plant. Plants are producers because they can produce their own food using sunlight. Plants get rid of water through leaves in a process called transpiration.

## NGSS:

LS1.C. Plants acquire their material for growth chiefly from air and water. 5-LS-1. Support an argument with evidence, data, or a model.

Crosscutting Concepts:

Matter is transported into, out of, and within systems. (5-LS-1).

## Essential Questions:

1. What is photosynthesis?
2. What is transpiration?
3. What do plants need in order to live?
4. How do plants grow?
5. What benefits do plants provide to humans?

## Materials:

* Bean seeds that have been soaked in water overnight just prior to the experiment
* •2 cups for each group of students (Students should be placed into teams of 3–4, or pairs if a smaller class)
* Marker or something to make a tactile indicator on each cup
* Soil
* Pencil
* Access to a dark location and a sunny location
* Clear glass jar for each group

## Lesson Sequence:

1. Have students place enough potting soil in each cup to fill it approximately three-quarters full.
2. Take a pencil and make a hole in the center large enough for two seeds to fit.
3. Place the seeds in the hole and have students cover the hole with soil.
4. Do this same procedure for the second cup.
5. Be sure to label one cup “Sunny” and another cup “Dark.” Be sure to note the names of the students in each group so that they can monitor and water their own cups.
6. Place the sunny cup in a sunny location and the dark cup in a dark location.
7. Leave the cups there for about a week. Monitor the moisture level of each cup. Be sure to water when the soil is dry.
8. While the plants are growing, have students research the parts of a plant. Students can use the Internet, their textbooks, or use the APH “Sense of Science: Plants” kit and a lightbox to learn more about the parts of the plant. This is available at: <https://www.aph.org/product/sense-of-science-plants>.
9. Be sure to discuss with the class the parts of the plant and their roles in keeping the plant alive. [The roots take in water, or H2O. The stoma allows the plant to breathe. The leaves help take in carbon dioxide from the air and leave clean oxygen for humans to breathe. Within the plant, water is transformed into oxygen. Plants get rid of too much water through their leaves through transpiration. Plants can take in dirty water and release clean water through transpiration.]
10. Based on their experiences in learning about plants, ask students why ecologists and environmental engineers study plants and use them to benefit humans. [Plants take in carbon dioxide and convert it to clean oxygen for humans. Plants take in water from the ground and release clean water vapor through transpiration.]
11. After a week, bring both plants to the classroom. Ask students to record observations of their plants that grew in the sun and those that grew in the dark. Ask them to record measurements of their plants (both height and width of leaves and stem).
12. Tell students to carefully pull one plant from each of their cups to observe the roots. Lead a class discussion about the root systems of both plants. Discuss with students the important functions of the roots in the plant.
13. Lead a class discussion on what they observed from each plant in the sun and in the dark. Make sure to emphasize using data from their observations to support their answers.
14. Now, ask students what they know about photosynthesis from their research. Discuss with students the importance of light in the growth of the plant. Ask students where the best place and worst place would be to grow plants. [Best: sunny locations. Worst: a closet or enclosed room.]

## Transpiration:

For this part, be sure that you will have a sunny day when completing the activity!

1. Take the two sun plant seedlings (root and plant) and put each into a clear jar in a sunny location. Be sure to note the jars of each group. A slip of paper placed near the jar is best. Do not label or put anything on the jar to disturb the light entering the jar.
2. Leave the seedlings covered under the jars overnight.
3. Upon return to the class, tell students to carefully remove the plants from their jars and make observations. Tell them to feel the inside of the jars. What do they feel? [Condensation as tiny droplets of water should form inside the jar.]
4. Discuss transpiration with the students and how this activity models process. [The roots absorbed water when they were in the cups and now the water has been released into the jar through the leaves.] Be sure to tell students that this is happening all the time with plants but that we just cannot see it.
5. Talk to students about a greenhouse, or, if available, visit your school’s greenhouse or a greenhouse nearby. Talk to them about the conditions inside the greenhouse. [Full of plants, very humid. Condensation forms near the windows.]
6. Discuss with students the benefits of having plants and their environmental impacts. [They take in dirty water through their roots and release clean water through transpiration.]
7. To wrap up the lesson, ask students to think of ways in which plants could be beneficial to their communities. Are there ways that people or industry leaders can use plants to make their water and air cleaner? What should we do to encourage a cleaner environment?

*Note*. Lesson plan adapted from “Plant Cycles: Photosynthesis and Transpiration,” <https://www.sciencebuddies.org/teacher-resources/lesson-plans/plant-cycles-photosynthesis-transpiration>.