

**STEAM Subject:** Botany

**Lab:** Transpiration

**Grades:** 3<sup>rd</sup>-8<sup>th</sup>

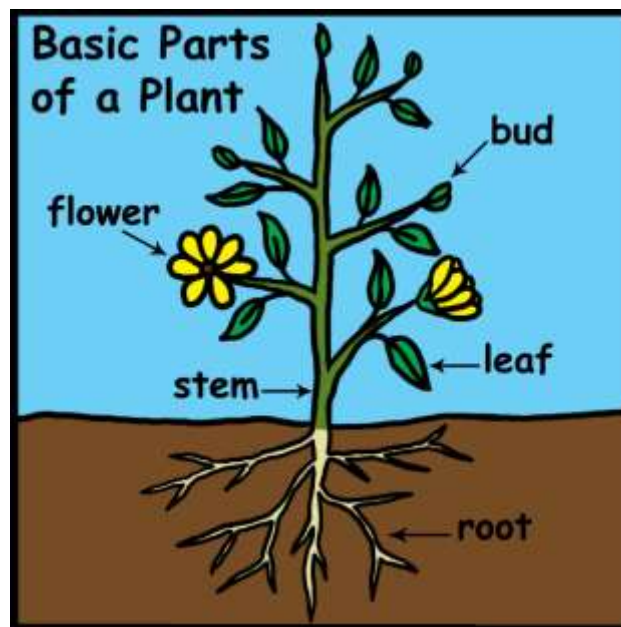
**Learning objective:**

Students will learn how to use scientific evidence to explain the functions of the different parts of a plant. This activity will focus on the role of the stem in transporting water up through a plant.

**ENGAGE:**

**Review with the students:**

- You may have learned about the parts of a plant- the leaves, stem, flowers, and roots. Did you know that each of these parts has an important role? Take a moment to brainstorm what you think each part of the plant does.



- Let's review the roles of some parts of the plant, and discuss how you can use evidence to support these statements.
- Flowers are important for attracting pollinators (which they need in order to reproduce and make seeds). You can tell because they are brightly colored and often have sweet scents.
- Leaves are an important site for photosynthesis- which is the way that plants use sunlight to make food. Have you ever stained your pants green after sliding in grass? Leaves contain a pigment (a substance that can dye or stain) called chlorophyll which is necessary in performing photosynthesis. The presence of this pigment is evidence that the leaves are photosynthetic.

- Stems are important for supporting the plant, as well as for transporting water and nutrients through the plant. Plants have small tubes that carry water from the roots up through the plant. Is there a way to provide evidence for the idea that stems transport water?

One way to test this is with an experiment using celery. A celery stalk is a stem. You can track how water moves up the stalk with the help of dye or food coloring.

## EXPLORE:

### Transpiration Activity

**Materials** needed per student:

- 1 Cup
- Food Coloring
- Celery Stalk
- Optional: Camera to take before and after pictures

### Directions:

Students will add food coloring to a cup of water. 10 drops are sufficient or until the water is richly colored.

Set up one stalk of celery in the cup- it is best to use celery with leaves at the top.

Set up just one cup with celery, or several with various colors, and compare.

Observe what happens over the course of the next 24 hours. You can take photos to record your observations.



Image source: FunctionalWellness.com

**EXPLAIN:** After the first day, students should see that the leaves of the celery have changed color- the same color as their food coloring. How did the water get up there? If you remove the celery stalk and cut it in half widthwise, you will see the pin-sized tubes that are carrying the dyed water. They will be stained with the food coloring. These tubes carry water up to the leaves as a result of transpiration.

### Review Science Vocabulary:

Transpiration: is the process by which water travels up a plant, due to the force provided by evaporation.

Evaporation: water evaporates from tiny openings in the leaves of the plants (celery) and due to the magnetic nature of water molecules, the water leaving pulls other water molecules nearby upwards. This explains how water gets from the base of the celery stalk to the leaves- seemingly defying gravity.

Photosynthesis: process where plants, some microorganisms, and algae use sunlight to make their own food.

Optional Activity:

- Try the same experiment with a white flower (carnations pictured below) to see the dye travel up and dye the flower.



- Watch a video explaining how transpiration occurs in this experiment: <https://www.youtube.com/watch?v=Klug9Fouu3s>

**EVALUATE:**

Ask students

- Why did we use food coloring in our water instead of pure water? *To track the progress up the stem, and see how far the water goes up.*
- What is the function of the stem? *To transport water, as well as nutrients through the plant. It also provides structural support to the plant.*
- What do plants need to live and grow? *Water and sunlight.*

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