

# Activity 3: Color Transpiration Activity

In this activity, learners will set up an experiment to investigate how plants absorb water and observe it over time. They will examine the different parts of a plant and make predictions about how it will move water throughout its body. **\*Background information can be found at the end of this activity guide\***

## Activity

Water is essential for growing plants. However, there is little to no evidence of liquid water anywhere else in the solar system. There will be little to spare for plants as astronauts inhabit other planets. In order to understand how much water a plant needs to survive, and how it uses it, our next project will experiment with transpiration!

1. Gather your learners and the materials needed!
2. Begin with a discussion, using some of the questions below:
  - a. *Why do you think plants need water to survive?*
  - b. *How do you think plants absorb water, or take it in?*
3. Gather 2-4 cups and fill them with water.
4. In each cup, add 10 or more drops of a different food coloring dye.
5. Grab 2-4 stalks of celery (or lettuce, flower, etc.) and use a knife to cut ~2 inches off the bottom. Save one for dissection.
6. Place one plant into each jar and come up with a hypothesis:
  - a. *What do you think will happen to each celery/plant?*
  - b. *Do you think anything will change about them? Why or why not?*
7. Cut the extra celery stalk into three pieces. Cut one length-wise, one width-wise, and leave the other piece intact. Record your observations of each piece using the following questions and data sheet:
  - a. *What do you notice about the celery/plant?*
  - b. *What color is it? Do you see any shapes? Do you notice any patterns? How does it feel?*
  - c. *Why do you think they are like that?*
8. Clean up the dissected parts, or eat them as a healthy snack!



## Suggested Materials

- [Data Sheet \(printable version\)](#)
- 2-5 stalks of celery with leaves still on
- Romaine, white cabbage, or white flowers also work well
- Knife
- 2-4 cups or jars of water
- Food coloring
- Writing utensils

### \*Safety\*

Adult supervision is recommended throughout this experiment. A knife is required when cutting the ends of the celery/plant.

9. Each day, over the next few days, check on the celery/plant stalks. Record observations and track the changes:
  - a. Do you notice anything different about the plants?
  - b. Why do you think that is/is not?
  - c. How long did it take before you saw something change? Did it vary by cup?
10. Eventually, you will begin to see color appearing on the leaves of the plant. Once you begin to see these colors appear, discuss what could be happening with your learners.
  - a. What color do you see on each plant? Where?
  - b. Why do you think that is happening?
  - c. How do you think the color moved from the cup to the leaves/petals?
11. This experiment shows how plants pull water from their roots to their leaves. Scientists are trying to determine if transpiration happens the same way in space as it does on Earth. Expand further with some of the following questions:
  - a. How does water move up, against the forces of gravity pulling it down?
  - b. Is gravity the same in space as it is on Earth? What about The Moon? Mars?
  - c. How do you think plants might grow differently without gravity?

Understanding how plants utilize water is just one important factor to understand before growing plants in space. For example, if scientists were to discover that plants require less water to grow on The Moon, then more water could be conserved for human use. If this were to be true for other vital resources, then it would change the way resources are shared between humans and plants. Scientists on the ISS are currently studying how plant growth differs in space to answer these exact questions. Check out this video about it [here!](#)

## Background

### **What is happening?**

*This experiment highlights the concept of transpiration. Transpiration is the process of water moving throughout a plant and evaporating out of its surfaces. This movement is typically invisible to the naked eye. However, by dyeing water a color, it can be tracked as it moves from the bottom to the top!*

### **How do plants absorb water, or take it in?**

*First, water is absorbed through the roots and transferred to the Xylem. The Xylem is a tube-like structure that runs along the length of a plant and transports water upward. Once the Xylem distributes water to the stems and leaves, it evaporates through tiny pores called Stomata. These pores can open or close, which affects how quickly water transpires.*

### **How is water moving up, against the forces of gravity pulling it down?**

Water is able to move upward, along the Xylem because of two forces: cohesion and adhesion. Water molecules are attracted to the sides of the Xylem because they are different (adhesion). As they move along, they attract nearby water molecules because they are similar (cohesion) which moves them along the Xylem too. This molecule to molecule attraction is what allows water to move upward in a plant, against the forces of gravity.

### **Is gravity the same in space as it is on Earth? The Moon? Mars?**

In space, there is a tiny amount of gravity, called microgravity. It is barely noticeable and creates the feeling of floating because there is nothing pulling down, up, or any specific direction. The Moon has about 1/6th the gravity of Earth, and Mars has a little over 1/3rd. This means an astronaut wouldn't float away entirely, but would weigh less and be able to jump much farther with each step! 3 times as far on Mars and 6 times as far on the Moon!

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What do you think will happen to each plant?

I predict...



Record your dissection observations:

Observation Notes (color, shapes, patterns, feel, sketches, other):

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Sketch or write your observations over the next few days:

DAY 1	DAY ____	DAY ____

Do you notice anything different about the plants?

I observed...

What do you think is happening? How do you think it happens?

I think...

