

MOVING UP

Background Information for Activity Leaders

Overview

Children will explore capillary action, and how it facilitates the movement of water from the roots, to the stem, and finally the leaves of a plant. In *A Penny for Your Drops*, participants learned about surface tension, which helps water molecules on the surface stick together. Water has another property called capillary action, which helps it stick to surfaces and make it able to climb through small tubes.

Key Concepts

- **Capillary action** is the ability of a liquid to flow in narrow spaces without the assistance of, and in opposition to, external forces like **gravity**.
- This **property** is very important to plants, since it helps move water up from the roots, to the stem and finally to the leaves.
- The effect of capillary action can be seen in the drawing up of liquids in a straw. The liquid in the inside the straw will climb higher than the liquid in the cup.
- This occurs because forces between the water molecules, and between the liquid and surrounding surface of the straw work together to draw water together helping it cling to surfaces. If the diameter of the tube is sufficiently small, then the combination of surface tension between the water molecules and adhesive forces between the liquid and container act to lift the liquid.
- The water lost through plant leaves must be continuously replaced by absorbing water from the soil. In time, if water is not absorbed the plant may become limp, eventually dry out, and die.

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What to Expect

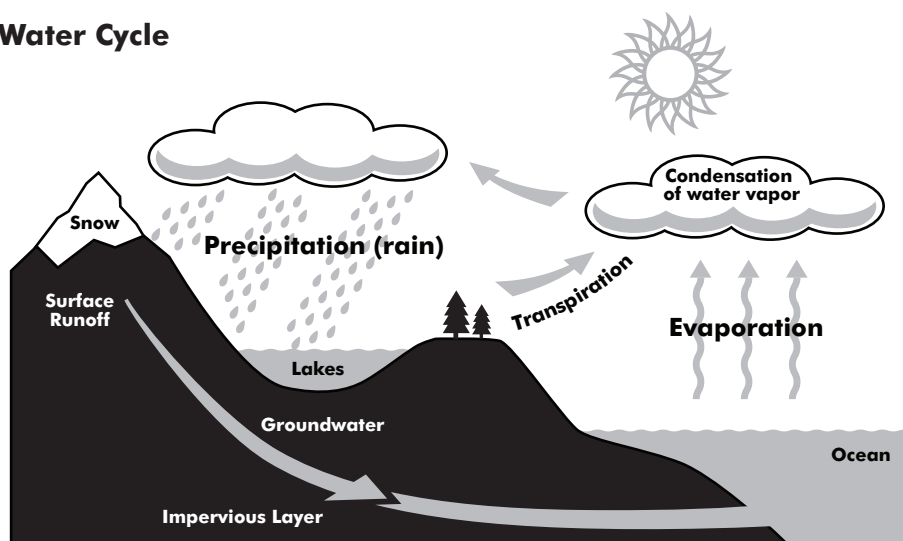
- Waiting for the water to travel through the string can take up to 10 minutes. Some children may have a hard time staying on task during this time.
- Some seeds will not germinate. If a seed does not begin to germinate within three days, replace it. Distribute these to children whose seeds did not germinate or have fungi growing on the plants or cotton.

Common Misconceptions

- *Children may think: "Plants use up water."*

Plants absorb water through their roots; it travels through their stem and is released through transpiration by the leaves. The water does not get used up or destroyed by the plant. It returns to the atmosphere as water vapor, and once again condenses in the form of clouds. Then it begins the journey back to the land or bodies of water in the form of rain.

Water Cycle



- *Children may think: "The bulk created by plant growth (for example, leaves, stems, and branches) is due to plants absorbing nutrients from the soil."*

Plants make their own food. This process is called photosynthesis. The food they make is called glucose (a kind of sugar). Plants make glucose out of carbon dioxide gas in the air, water from their water supply, and energy from sunlight.

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Data Collection Sheet

Name: _____

Date: _____

WONDER How do plants move water from the ground to their leaves?

RECORD

Data Table

color of water	1 minute	2 minutes	3 minutes	4 minutes	5 minutes
red	height ____ cm	height ____ cm	height ____ cm	height ____ cm	height ____ cm
blue	height ____ cm	height ____ cm	height ____ cm	height ____ cm	height ____ cm

CONCLUDE What did you notice about the way water flows through the string? Where did the colored water go?

How is the string similar to the stem of a plant?

Set Up the Expedition

Materials

For the activity leader:

- (1) two-liter soda bottles filled with tap water
- (1) bag of beans (optional)
- (1) bag of cotton balls (optional)

For each group:

- **Moving Up** Learning Cards
- (1) set of food coloring bottles (red and blue)
- (1) ruler
- (2) droppers

For each participant:

- (1) **Moving Up** Data Collection Sheet
- (2) small containers
- (2) clear disposable plastic cups
- (9) large cotton balls (optional)
- (2) beans (optional)
- (2) 7 cm lengths of string

Prepare the demonstration:

1. Display a plant that has the roots exposed. Such as a sweet potato that has been allowed to grow for 2 weeks inside a clear cup filled with water.

Prepare the exploration:

1. In an empty two-liter soda bottle mix one liter of water and 20 drops of red food coloring.
2. Repeat step 1 using another two-liter soda bottle using a different food coloring (blue).
3. Pour the different color water into two separate small containers for each group. Label each cup with the color of the water it contains.

For the EXPAND:

1. Refill the two bottles of colored water for the children to use as they water their plants.
2. Set up the tables in each group with enough clear plastic cups, cotton and beans for each child in the group. Give each group two small containers of colored water (blue and red).

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Activity Leader's Guide

Group Size: 4 children

Time: 45 minutes

Engage

1

Gather the children together. Display a plant that has the roots exposed.

Say:

"All living things need water to live."

Ask:

"How does this plant get water to its leaves?"

Give children an opportunity to describe how water get to the leaves.

Ask:

"What force does the plant need to overcome to get water to the leaves?" Help children notice that gravity is responsible.

Say:

"Plants make use of one of the properties of water to overcome gravity and get water to the leaves. It's called capillary action."

Say:

"Today you will see how capillary action works."

Explore

- 2** If you are working with more than 4-6 children, divide the children into groups. Distribute the Data Collection Sheets and the Learning Cards. On the first day of the activity, children will plant two beans; they will continue to watch them grow during the following two weeks. Encourage children to notice all they can as the plant grows.

Say:

“Follow the directions on the Learning Card to investigate how capillary action helps water travel up.”

- 3** Allow children enough time to complete the WONDER, EXPLORE, RECORD and CONCLUDE sections of their Learning Card.

Conclude

- 4** Gather the children together, ask them :
- “What did you notice after the 5 minutes were up?”*
- “What made the water travel up the string?”*
- Ask the children to follow the EXPAND instructions on their Learning Card.
- If time permits, have children grow their own bean plant.

Expand

- 5** By watering it with colored water they can observe the path of the water through the plant during the span of two weeks.

Ask:

“Did you observe the path of the water through the plant?”

Ask:

“Did you notice anything about the leaves?”

Say:

- 6** *“Congratulations! You have earned your ‘Ask Me About Water’ stamp. You are ready to tell people about the water cycle.”*

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Expedition Learning Card

? How does water travel up towards leaves?

capillary action
gravity
property

Explore how water flows through plants.

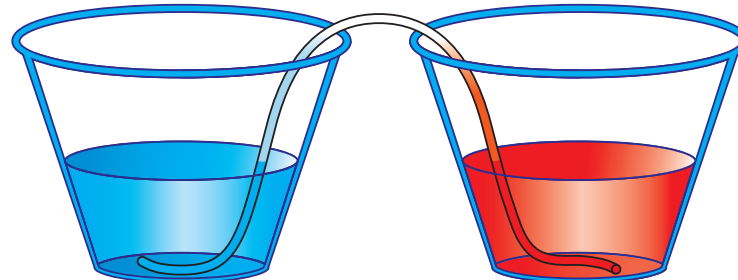
1 WONDER How does capillary action move water? How do plants use this property of water?

 Write or draw your ideas on your Data Collection Sheet.

2 EXPLORE

Watch water use capillary action to make its way through a piece of string.

- Fill two bowls with water.
- Place one two drops of red food coloring in one bowl and two drops of blue food coloring in the other bowl.
- Place one end of the string in the **RED** colored water and the other end of the string in the **BLUE** colored water.



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Expedition Learning Card

3 RECORD Notice everything you can about how the water travels up the string. How long did it take for the blue water to reach the red water?

 Write or draw what you notice.

4 CONCLUDE Use what you notice about the way water moves in the string to think about how water moves in a plant. Where does the water come from? Where does it come in and out?

 Record what you noticed on your Data Collection Sheet.

5 EXPAND Place a bean on a moist cotton ball. Water the plant daily with a few drops of colored water. Notice everything you can about the growth of the bean plant. Notice where the colored water you pour into the cotton goes. Use a magnifier to observe the roots, stems and surface of the leaves.



Discovery

Why did we do that?

- Plants take in water from the environment through their roots.
- Water must travel against gravity to reach the stem and leaves.
- Water has properties that help living things.

Congratulations!

You have earned your "Ask Me About Water" stamp! Now you are ready to tell people about water!

