

Every Drop Counts

EARTH'S WATER CYCLE

Respect Rule: Look, Listen, Learn, and Leave Alone (until instructed).

Overview

Students will simulate the journey of a water molecule through earth's water cycle.

Background

In foothill communities, many students drink water pumped from ground water below their homes. A discussion of weather (winter fog, clouds, and rain) should prompt students to reflect on gaseous forms of water and the precipitation of that water vapor as rain. Discuss the evaporation of water during hot summers. Evaporation occurs off the surface of lakes, as well as from animals (perspiration and respiration) and plants (transpiration). Water even evaporates from moist soil. Finally, the solid state of water, as snow and ice, is significant in the high-country portions of the western Sierra Nevada. However, the persistence of that snow and ice as a glacier may not be a firsthand experience for students.

Viewing a tidy water cycle in their science textbook will not give students a clear understanding of its dynamic nature. Since most of water is present as salt water, a large percentage of the water in the water cycle remains in the ocean's reservoir, the main exit from this reserve is through evaporation in clouds. Once water molecules are in clouds, precipitation can likely return water to the ocean. This important portion of the water cycle is clearly simulated in this lesson.

Before-or-After-the-Field-Trip Activities

Activity 1: Water Cycling Adventure

Time: 1 hour

Materials: My Journey through the Water Cycle Student Worksheet, one transparency of My Journey through the Water Cycle, pencils, writing paper, *Water Cycle Kit* (STE Lending Library): nine station identifiers (mats or posters) for nine states of water: clouds, animals, rivers, oceans, lakes, soil, plants, groundwater, and glacier; nine dice and spinners (as a math extension).

1. Ask students to identify places on earth where there is water. Write responses on the board. Encourage students to think of water that is inside soil, plants, and animals.
2. When the students' responses reflect the nine stations within the water cycle, ask them how water moves through the water cycle. For example: Can water move from clouds to soil? What is this process called? Can water move from the ocean to clouds? What is this process called? Can water move from plants to clouds? Remind students of the terms and definitions for evaporation, condensation, precipitation, and transpiration.
3. Have students become a water molecule and travel through the water cycle. Remind students that some may never journey to all the stations.
4. Place station identifiers and die or spinners around classroom or playground in the same order as on their worksheet. For example, the clouds and oceans would be in the front corners of the classroom, and the groundwater and glaciers in the back. This will make it easier for children to diagram their journey.



Objectives

Students will:

1. describe the movement of water within the water cycle;
2. identify the states of water as it moves through the water cycle

Grade Levels

2-8

Adult/Student Ratio

1 to 32

Where

Classroom, playground or open field site

Skills

Analyzing, interpreting, organizing, communicating

Key Words

Condensation, Evaporation, Precipitation, Glacier, Ground water

“**Don't be concerned if you don't know much about natural history; the most important thing to communicate is your love and appreciation.**”

—Joseph Cornell,
Listening to Nature

5. On the overhead, simulate how the children will complete their diagrams. Students may need explicit instruction on how to draw an arrow and how to show a return arrow to the same location. For example, a student rolls a die and stays frozen in a glacier. These return arrows are important, since it will give the student an idea of how much time water stays in certain places, particularly the ocean and glaciers.
 6. Model rolling the die. If the student is asked to stay at this station, they need to go to the end of the line.
 7. Pass out My Journey Through the Water Cycle Student Worksheet and pencils. Remind students of the appropriate behavior when moving from station to station. Check for student understanding.
 8. Assign students a station at which to start. Fewer children at the ocean and clouds will smooth traffic initially. Students will be clumped in the clouds and ocean since this is a significant part of the water cycle.
 9. Begin the game. Circulate and discuss students' journeys. What is happening? Are they feeling frustrated that they can't leave the ocean? Did they expect to visit every station and they can't get somewhere?
 10. Stop game when students have experienced the real dynamics of the water cycle. Ask students to write on the back of the Student Worksheet about their journey as a water molecule. Remind them to use their science words (e.g. transpiration, evaporation, condensation) to describe legs of their journey. They may choose to personify the water molecule and describe the emotions their water molecule felt as it traveled around the world. Elaborate on personification and tie this part of the lesson to the language arts standards of understanding the use of figurative language in literature.
3. Student uses most science terms appropriately. Figurative language benefits the entry. A few water cycle stages are omitted.
 4. Student uses science terms appropriately. Figurative language benefits the entry. Student includes all water cycle stages to enhance the writing.

Student Writing Examples

My Water Drop Cycle, by Mallory, Grade 5

“I started frozen in a glacier. Then I was happy when I was evaporated into a cloud. I always wanted to be up in a cloud where I could fly on the wind's back. Then, sadly, I fell to the ocean. Way, way down. I went back to my beloved cloud, then to the ocean, then cloud, ocean, then cloud. I continued this journey until I started a new life in a frog. Bouncing around made me dizzy, so I was glad when I dropped into soil. Then the roots of a big pine tree sucked me up. Then I evaporated back up to a cloud and then to the ocean...back to my old routine. But I still dream of the day when I can flow in a river, stream, or lake flowing among the fish and even children that swim and play.”

Water Cycle, by Ian, Grade 5

“Once there was a water molecule. He wished to become a glacier, but it never happened. He did experience being in the clouds for quite some time. He was mostly in the ocean though.

After witnessing raging rapids and high winds, he thought it would be nice to be in a plant, but instead he was slurped up by an animal. ‘How nice of a feeling,’ he thought. But then he felt a nice cool breeze as the animal sweated and he was outside at once. ‘So hot, hoooot!’ the molecule thought. He felt it getting cooler. ‘Oops! Here we go!’ he said as evaporation started.

‘Ahhh!’ He said later, as he got rained into the ocean. He hit the water with a ‘Plop!’

“Ohh...I wonder how long I'll stay here. Hopefully not too long.’ He's stayed there ever since.”

Incredible Journey, by Max, Grade 5

“I was just another droplet of water, waiting, waiting, for my lifelong adventure to begin. Then all at once, I started sliding, then I found myself in a river. And as soon as I got there I kept on sliding into a lake. Then I started

Writing Rubric

Use the following writing rubric to help assess student understanding:

1. Student uses no science terms to describe water cycle processes. Figurative language is missing. Many water cycle stages are omitted.
2. Student uses few science terms. Figurative language does not aid interpretation of the entry. Some water cycle stages are omitted.

feeling weird, and all of a sudden, I was evaporating into a cloud! Then I started slipping off the cloud and found myself precipitating, down to earth. I landed in nice soft soil, but my adventure didn't end there. I once again started moving and sliding until I once again was in a river. I stayed in the river awhile. Then an animal came and drank me all up! From there I started evaporating again, and found myself in another cloud. Then I precipitated down into ground where I still sit waiting, just waiting for another adventure."

Activity 2: Water Cycle in a Jar
(grades K–5)

Time: 45 minutes

Materials: Water Cycle in a Jar Student Worksheet, *The Magic School Bus at the Waterworks* by Joanna Cole, gallon glass jar, plastic wrap, rubber band, very warm water, Polar Pack (or ice cubes in a sealed plastic bag), paper and pencils

1. Ask how water gets into the atmosphere so it can fall as rain. Let the students share what they know about the water cycle.
2. Read *The Magic School Bus at the Waterworks* aloud.
3. Tell the class that they are going to make a working model of the water cycle right in the classroom, and ask them to predict how it can be done.
4. Pour about three inches of very warm water into the glass jar. Quickly cover it with the plastic wrap and secure with the rubber band. Place the Polar Pack or the bag of ice cubes on the plastic wrap. A "cloud" will form almost immediately, and within a few minutes, water will start to condense at the top and it will "rain" in the jar.
5. Ask the students to trace the path of a drop of water in the jar, using the terms evaporation, condensation, and precipitation. What would happen if there was no water cycle on earth? (No rain for crops, no fresh water, etc.) Have students draw and label the water cycle in the jar.

Activity 3: Water Cycle Role Play

Time: 45 minutes

Materials: Desks and chairs

1. Push the desks into a line to become the mountains. Chairs on both sides are foot-

hills. Students are water molecules in the water cycle.

2. As they leave the floor and climb the foothills, they wave their fingers upward and chant "evaporation."
3. On top of the mountain range, they make fists and chant "condensation."
4. With fingers fluttering downward, they descend the foothills on the other side of the mountain range chanting "precipitation."
5. Do the activity a few times until the students "get it" or until all are laughing too hard to continue, whichever happens first.

Source

Adapted with permission from
Project WET, "The Incredible Journey."

Resources

For the Teacher:

The American Water Works Association's, *The Story of Drinking Water*. 1992, American Water Works Association. To obtain this document or additional information relevant to the drinking water industry, visit [http://www.awwa.org/AW-WA's Web Site](http://www.awwa.org/AW-WA's%20Web%20Site) or call 800-926-7337.

Where Does Your Water Come From?—The Drinking Water Source Book. For grades 5–8, this booklet teaches students about the sources of drinking water. Children learn about the water cycle, watersheds, surface water, ground water, aquatic ecosystems, water quality and its effect on living things, sources of water pollution, and how to prevent pollution in their own communities. The information in this 32-page, color book can support many different curriculum programs designed to teach about watersheds and water quality, or stand alone as an insight into the wonder of the life-giving resource we all need: water. Development of this booklet was funded by a grant from the U.S. Environmental Protection Agency and the National Environmental Education Training Foundation. Discounts are available for orders of 31 books or more. Contact the Water Education Foundation, 916-444-6240, for more information or www.water-ed.org.

California Water Story. A multi-disciplinary approach to teaching about water as one of California's most important resources, *California Water Story* is designed for use in grades 4-6. The lessons integrate many subject areas (geography, history, science, math and art) and are designed to help students develop specific skills (critical thinking, organizing data, predicting, mapping and graphing). The program set includes a 24-page lesson plan booklet with worksheets and

evaluation devices which may be duplicated, teacher instructions and background material, a video, the California Water Map, the Layperson's Guide to California Water, Water Fact Card, Hydrologic Cycle Poster and water awareness stickers. Materials can be duplicated for years of use. Contact the Water Education Foundation, 916-444-6240, for more information or www.water-ed.org.

Water Dance by T. Locker. Water talks of its existence in clouds, rainbows, mist and rivers.

A Drop Around the World by B.S. McKinney. This book presents the water cycle through the journey of raindrop around the world in the form of a solid, liquid and gas.

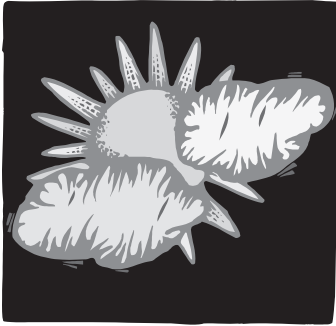
For the Student:

The Magic School Bus at the Waterworks by Joanna Cole.

My Journey Through the Water Cycle

Student Worksheet

As your water drop travels, draw an arrow to each place in the water cycle you visited. If you stayed in one place for a turn, draw an arrow back to that same place.



CLOUDS



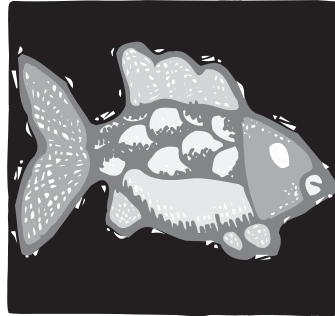
LAKES



OCEAN



SOIL



ANIMALS



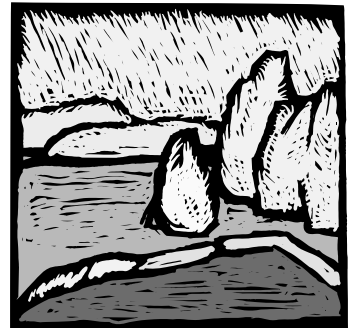
RIVERS



PLANTS



**GROUND-
WATER**



GLACIER

Name _____

Date _____

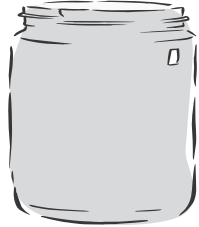
Water Cycle in a Jar

Student Worksheet

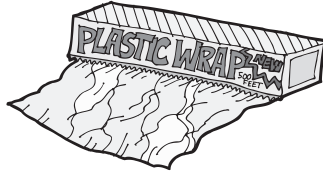
You need:



Hot Water



Jar



Plastic Wrap



Ice



Rubber Band

What Happened?

Draw What Happened

Evaporation, condensation, precipitation

A large, empty rectangular box with a green border, intended for the student to draw their observations of the water cycle experiment.

Water Cycle

Die or Spinner Choices

Teacher Worksheet

When you make a die or spinner for each stage of the water cycle, there are only certain ways water can move from that stage to another stage. Those choices are based on the most likely ways water moves in the water cycle. For example, the only way water leaves the ocean is through evaporation into clouds. Water remains in the ocean for a substantial amount of time. Therefore in this game, evaporation to clouds is the only way out of the ocean. In real life, ocean animals would uptake some water through the food chain and eventually some would travel to land animals, like humans. However, water transported from the ocean in that pathway is so small as to not be represented in this game. Make sure you base your game on these choices, or the children will not get the real sense of how the water cycle really works.

Color code the die, so they are easier to lay out when preparing the game.

Water Cycle Stage	# of Sides	Title
Soil	1	Water is absorbed by PLANT roots.
	1	Soil is saturated; water runs off into a RIVER.
	1	Water is pulled by gravity; it filters into the SOIL.
	2	Water evaporates and forms a CLOUD.
	1	Water remains in a puddle; it stays at SOIL.
Plant	4	Water leaves plant through transpiration. Goes up into CLOUD.
	2	Water is used by plant and stays in PLANT cells.
River	1	Water flows into a LAKE.
	1	Water flows into the OCEAN.
	1	An ANIMAL drinks water.
	1	Water evaporates and goes to the CLOUDS.
	1	Water remains in the current of the RIVER.
	1	Water is pulled into GROUND-WATER.

Water Cycle

Die or Spinner Choices

Teacher Worksheet (continued)

Clouds	1 1 1 2 1	Water condenses and falls on SOIL. Water condenses and falls as snow onto a GLACIER. Water condenses and falls into a LAKE. Water condenses and falls into the OCEAN. Water remains as a water droplet in the CLOUD.
Ocean	2 4	Water evaporates and goes to CLOUDS. Water remains in OCEAN.
Lake	1 1 1 1 2	Water seeps into GROUNDWATER. An ANIMAL drinks water. Water flows into a RIVER. Water evaporates and goes into CLOUDS Water remains in LAKE.
Animal	2 3 1	Water is excreted through feces and urine. Water goes to SOIL. Water is respired or evaporated from body. Water goes to CLOUDS. Water stays in the cells of the ANIMAL.
Ground Water	1 2 3	Water filters into a RIVER. Water filters into a LAKE. Water stays underground in GROUND-WATER.
Glacier	1 1 1 3	Ice melts and water filters into GROUND-WATER. Ice evaporates and water goes into CLOUDS. Ice melts and water flows into a RIVER. Ice stays frozen in the GLACIER.