



6. Create a Lasting Water Cycle

Concepts

- Water can be found naturally as a solid, a liquid and a gas.
- Water circulates among these three states in the water cycle.

Overview

Students will observe a simple model of the water cycle.

Science and Math Skills

- Predicting
- Making and recording observations
- Drawing conclusions

Standards

- Organisms can survive only in environments where their needs can be met.
- All organisms cause change in their environments. Some changes are detrimental, others are beneficial.

Time

Preparation: 10 minutes

Class: 15 minutes to set up; 30 minutes to observe and draw conclusions

Materials

All students:

- science journal or notebook

Per class:

- 1 large see-through plastic box (at least shoebox-sized)
- plastic wrap to cover top of box

- large rubber band, 7 x 1/8 in. (to fit over box)
- 2 cups sand
- plastic graduated cup, 8 oz
- lamp with incandescent bulb if sunny window is not available
- 20 ice cubes (approx.)
- 4 oz. of boiling water
- transparency of the *Water Cycle* (see attached PDF in this document)
- glass of liquid water (6 oz.)
- glass of frozen water (6 oz.)

Setup

Prepare a transparency of the *Water Cycle* page. Freeze a glass of water for the demonstration. Conduct this activity with the students observing.

Safety

1. Follow all district and school laboratory safety procedures.
2. Exercise caution and wear safety goggles while handling boiling water in front of the class. Make certain that all students are a safe distance from boiling water.
3. It is good laboratory practice to have students wash hands before and after laboratory investigations.

Background

Water is constantly moving in a cycle. When talking about this important resource, we usually think of liquid water. However, water is one of the few substances that can be

found in all three states—solid, liquid and gas—at any given time somewhere on Earth. For example, snow and ice always are present at the poles, as well as on the tops of high mountains. Liquid water is abundant in many places on Earth, including lakes, rivers, oceans, and underground. Water vapor, the gas phase of water, usually makes up a tiny component of the air around us (up to 5%), and can be observed as steam when liquid water is heated.

If water were not constantly cycling among its three states, the world's freshwater quickly would become depleted or too polluted to use. Fortunately, our supply of freshwater continually is collected, purified and redistributed through the water cycle. This process replenishes our water sources through precipitation (rain, mist, snow and sleet, for example). Some water from precipitation soaks into the ground. The rest runs off into streams, lakes and the oceans. Heat from the sun soaks up water from the oceans, lakes, rivers, trees, plants and land in a process called evaporation. As water mixes with the air, it forms water vapor. As it cools, the water vapor forms clouds. This is called condensation. Water vapor collects in the atmosphere until there is too much for the air to hold in clouds, leading to rain or snow.

This activity allows students to explore properties of water that are important to the water cycle. For additional activities in this series, see K-5 Teacher Resources at <http://www.bioedonline.org/k%2D5/>.

Procedure

1. In front of the class, compare a glass of water to a glass of ice. Ask, *How are the water and ice alike and how are they different?* Point out that the water and

ice are two different states of matter, much like the liquid and solid chocolate on the *banana pop* (see activity on BioEd Online entitled, *Banana - Natural to Processed*).

2. Explain that water can exist not only as a liquid and solid, but also as a gas. Pour boiling water into a cup and point out the steam coming from the surface of the water. Ask students, *What is happening to the water?* Explain that the water is changing states from liquid to gas. Make sure that students understand the difference between the gas in a car and the air (gas) that is the atmosphere.
3. In front of the students, measure out two cups of sand and place them in a pile at one end of the plastic box.
4. Smooth the sand to create a hill at one end of the box, gradually sloping it to cover about 2/3 of the box bottom. This will form the "land" in the model.
4. Place 20 ice cubes on top of the "hill" in the box. The ice cubes will be "snow" and "ice" in the model.
5. Cover the box with a sheet of clear plastic wrap and secure the wrap with a large rubber band and/or tape. (If using plastic storage boxes, cover securely.)
6. Discuss the model with the class. Ask, *Which part of the box and its contents could represent land? Which part could represent snow on the tops of mountains, or ice in the winter? Do you think a lake could form? Where might it be? What does the box represent?*

7. Ask students, *What do you think will happen if we put the box in the sun?* Record predictions or have students draw prediction pictures.
8. Place the box in a sunny window, outside, or a under a lamp with an incandescent (not fluorescent) light bulb. If possible, have students observe the box at intervals throughout the day. Otherwise, have them observe the box within the next day or so.
9. Instruct students to draw the water cycle box in their science journals and compare with their initial predictions.

Session 2: Looking at results

1. Have the students observe the box without removing the cover. Ask them to note the changes that have occurred inside the box since they last saw it. Ask, *What happened to the ice cubes? What else is different about the inside of the box?* In most cases, at least a few drops of water will have condensed on the inside of the covering. Ask, *Where did the drops of water come from?*
2. Help students understand that all three states of water have been present in the box. Review the different states in which water can be found—ice or snow (solid), liquid water, and water vapor. Breathe on a mirror or piece of glass to demonstrate how water vapor condenses on a surface; OR boil a small container of water, so that students may observe the cloud of steam. Hold a glass or mirror above the steam.
3. Remove the cover from the box. Ask students to observe the surface of the sand. *Has the surface of the sand changed? In what ways has it changed?*

4. Talk about where the water has gone. *Where was all of the water in the box when we started? Where is the water now?* If students have not noticed that the surface of the sand is wet, point out that some of the water has run into the bottom of the box to make a "lake" and some has soaked into the sand. Help students understand that the same processes take place outside when it rains and snows.
5. Show the students an overhead transparency of the Water Cycle page. Have students identify the forms in which water is present in the diagram (for example, snow on mountain tops is a "solid" form of water, and water evaporating from the ocean represents water in a "gas" phase). If students are very young, you may wish to make a copy of the Water Cycle page for each student and direct students to place a sticker everywhere on the page where he or she can find some form of water.

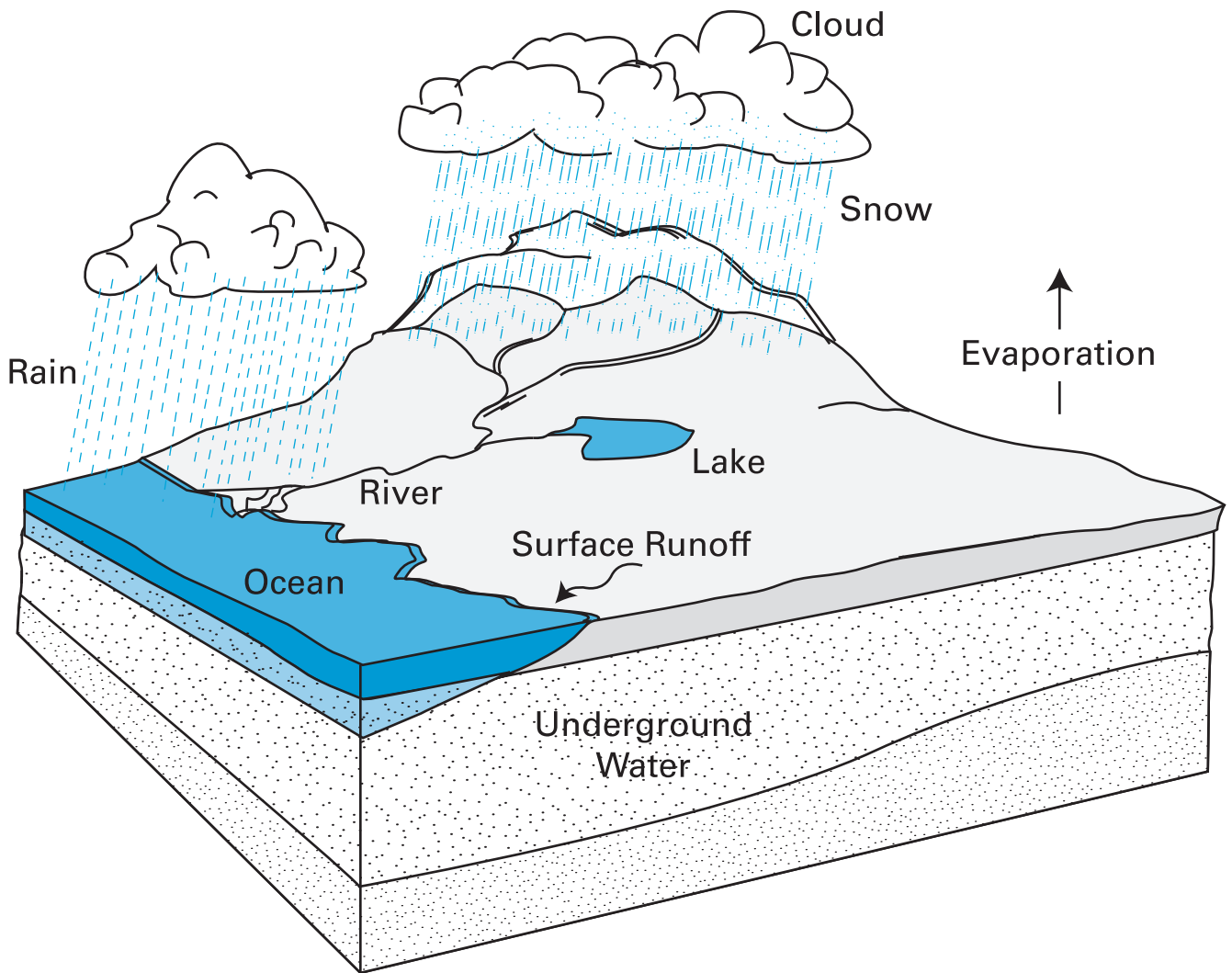
Extensions

- Have students design experiments to test what happens when water passes through soil that contains various chemicals. For example, students could add drops of food coloring on the sand before adding the ice cubes. Ask them to note where the colors end up in the system.
- The activity also can be conducted using re-sealable plastic bags. Add small amounts of sand and ice to each bag; then tape the bags to a window.
- To help students understand evaporation, fill a pie pan with water that is colored with blue food coloring. Set the pan out in the classroom where students can observe it. The initial water level will leave a blue stain. Encourage students to

note the water level each day, so that they can witness its evaporation. Mark the water level each day and chart it until the water is gone.

- Teach the students the *Water Cycle* song to the tune of *Clementine*. "Evaporation, Condensation, Precipitation on my mind. It is called the water cycle and it happens all the time." Add hand movements or point to a chart of the water cycle as you sing.
- Challenge students to think about what would happen if other substances (for example, chemicals, oils, etc.) also were present either on the surface or mixed in the sand.
- Discuss erosion and/or weathering.

The Water Cycle



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