

The Hydrologic Cycle

Strand Geology

Topic Investigating the Hydrologic Cycle

Primary SOL ES.8 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include

d) identification of sources of fresh water, including rivers, springs, and aquifers, with reference to the hydrologic cycle.

Related SOL ES.2 The student will demonstrate an understanding of the nature of science and scientific reasoning and logic. Key concepts include

c) observation and logic are essential for reaching a conclusion.

Background Information

The Earth's water supply is finite, but water can be found just about everywhere on the planet—e.g., in rivers, oceans, glaciers, lakes, air, soil, living tissue. As water moves through these various reservoirs, it is evident that water moves in a cycle. This hydrologic cycle has many complex pathways. A few of the major processes that can be observed in this cycle are evaporation, transpiration, condensation, precipitation, run-off, and infiltration.

Materials

- Hot plate
- 450-ml beaker
- Water
- Heat-resistant gloves
- 20 x 20 cm piece of cardboard with a handle
- Aluminum foil
- Ice cubes
- 2-liter plastic bottles
- Scissors
- 3-ounce cups of sand
- Duct tape
- Small rocks
- Drawn and printed copies of Hydrologic Cycle in a bottle
- Hydrologic Cycle Model Observation Sheet (attached)

Vocabulary

condensation, evaporation, precipitation, transpiration

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Complete a Know, Want to Know, and Learned (KWL) chart with the students to find out what they know about the hydraulic cycle and what it is that they are curious about for the

prelesson activity. At the end of the lesson, have the students complete the section describing what they have learned during the lesson.

2. As a demonstration, place a hot plate on a lab station at the front of the room. Place a 450-ml beaker of water on the hot plate and bring the water to a boil. Place several ice cubes on the foil-wrapped cardboard square. Wearing heat-resistant gloves, hold the cardboard square and ice cubes above the rising water vapor.
3. Have students make a list of observations and explain each one.
4. Have students identify the processes that are occurring (evaporation, condensation, and precipitation) and explain how these processes are exhibited in an ecosystem.

Procedure - Hydrologic Cycle in a Bottle

1. Provide each group of four students with a copy of the attached Hydrologic Cycle Model Observation Sheet for recording.
2. Have each group cut off 11 cm from the top of each of two identical 2-liter plastic bottles.
3. Have each group put two 3-oz cups of sand in one bottle and saturate them with water. Have them put a small rock on each cup of sand.
4. Instruct each group to tape together the open ends of the two bottles and put their resulting model near a sunny window.
5. Have students observe their models several times during the day for a period of one week.
6. Direct each group to summarize their observations, identifying and explaining the processes of evaporation, condensation, and precipitation.
7. Have the students break up into four groups. Each group will be responsible for designing a solution for the same problem.

Assessment

- **Journal/Writing Prompts**
 - Have students think of instances in an ecosystem that evaporation, condensation, and precipitation occur. The students should write a descriptive essay offering detailed information on the situation and the phase change that occurred including any impact the change may have had on the ecosystem.
- **Other**
 - Complete the questions on the Hydrologic Cycle Model Observation Sheet.
 - To demonstrate understanding of the hydrologic cycle, have students create models simulating the hydrologic cycle in different kinds of environments.

Extensions and Connections (for all students)

- Discuss where the evaporated water goes.
- Challenge students to retrieve water from the air.

Strategies for Differentiation

- Have the students draw a diagram that shows the full cycle. Explain to them that they are to write a story as if they were a raindrop and they need to tell the story of them moving through the entire cycle ending up where they started off.

Hydrologic Cycle Model Observation Sheet

The Hydrologic Cycle

<u>Know</u>	<u>Want to know</u>	<u>Learned</u>

Names of Group Members: _____

	Day 1	Day 2	Day 3	Day 4	Day 5
Solar Energy Record: Good/Fair/Poor	Obs. 1: Obs. 2: Obs. 3:				
Evaporation Record: Good/Fair/Poor	Obs. 1: Obs. 2: Obs. 3:				
Condensation Record: Good/Fair/Poor	Obs. 1: Obs. 2: Obs. 3:				
Precipitation (in centimeters)	Obs. 1: Obs. 2: Obs. 3:				

1. What time of day does condensation usually appear?
2. What processes are occurring to make these changes?
3. What is the role of sunlight and temperature?

Conclusion:

You are stranded on a desert island with no source of drinking water since you know that you cannot drink any of the salt water that surrounds you. All that you have been able to salvage is a tarp, some drinking cups and the clothes you have on. Design a way to separate the water from the salt to stay alive for the coast guard to save you. Think about the individual parts of the water cycle when you design your setup! Diagram and explain below. Be sure to explain in terms of the water cycle how you separated the water and salt!


