

Freshwater Conservation

Companion Lesson to X-STEM All Access Episode “[Exploring Our Planet](#)”

Grade/ Grade Band 6-12	Topic: Oceanography	
Brief Lesson Description: In this video, Jill Heinerth discusses exploring the water systems on earth. This lesson examines the water systems available for human use and ways to conserve freshwater. Students will develop a model of the Earth's water cycle and energy flow to understand the limited supply of freshwater on our planet and why we need to conserve it.		
Performance Expectation(s): MS-ESS2-1 Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.		
Specific Learning Outcomes: Students will gain a visual perspective on global water distribution. Students will understand the limited supply of freshwater that exists on the earth. Students will persuade others to conserve our freshwater supply		
Narrative / Background Information		
Prior Student Knowledge: Students should understand the water cycle. Students should be able to define watersheds and groundwater.		
Science & Engineering Practices: Developing and Using Models Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. <ul style="list-style-type: none"> Develop and use a model to describe phenomena. (MS-ESS2-1) 	Disciplinary Core Ideas: ESS2.A: Earth Materials and Systems All Earth processes are the results of energy flowing and matter cycling within and among the planet’s systems. This energy is derived from the sun and Earth’s hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth’s materials and living organisms. (MS-ESS2-1)	Crosscutting Concepts: Stability and Change Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)
Possible Preconceptions/Misconceptions: Students know that water is cycled through the water cycle and therefore believe it cannot be wasted. Students don’t understand the time required to refill the aquifers, which can be thousands of years. Students may also believe that lack of water is not a problem in the United States. California has experienced a record-setting drought. Demand for water continues to climb. Water managers in 40 states are planning for shortages in the next decade.		
LESSON PLAN – 5-E Model		
ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions: Gather the following materials for this demonstration: <ul style="list-style-type: none"> Tupperware container 6 inches deep lasagna pan hammer hot water DEMO Fill the Tupperware container with water and freeze. Then turn the container upside down and empty the block of ice onto the lasagna tray. Tell the students that the block of ice represents limestone. Hit the block of ice once or twice with the hammer to create small cracks in the ice. Ask students how limestone might become cracked (possible answers: earthquakes/uplift). Ask students where does rainwater go once it hits the ground? (possible answers: evaporates into the air, rolls along the surface to watersheds, and seeps into the ground). Elevate one end of the pan before pouring hot water over the ice. Ask students to observe what happens and record it in their notebooks. Share with students that there are several kinds of formation processes: stream erosion, lava tubes, sea caves, ice caves, acid-formed caves, etc.		
EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions: Ask students to describe the world beneath their feet, give them 2 minutes to think and write down their ideas, and another 2 minutes to share with a partner. After students share their ideas show the video Exploring Our Planet with Jill Heinerth . Then have students record what Jill Heinerth finds under our feet.		

EXPLAIN: Concepts Explained and Vocabulary Defined:

Explain to students that 71% of the Earth's surface is covered in water.

96.5% of all water on Earth is held in oceans; water also exists in the air as water vapor, in rivers, lakes, and streams, as icecaps and glaciers, and in the ground as soil moisture, and underground in aquifers.

Assign students to read one of the following articles:

- [How Much Water is There on Earth?](#)
- [Aquifers and Groundwater](#)
- [Where is Earth's Water?](#)
- [45 Ways to Conserve Water in the Home and Yard](#)
- [Water Conservation Tips for Kids](#)
- [Native Plants Help Conserve Water](#)

Students identify a claim (relating to water conservation), evidence, and reasoning to write a summary of the article.

Vocabulary:

freshwater- naturally occurring water that is not salty and suitable for consumption.

saltwater- naturally occurring salty water found in seawater/oceans.

groundwater- water held underground in the soil or in pores and crevices in rock.

aquifers- a body of permeable rock which can contain or transmit groundwater.

ELABORATE: Applications and Extensions:

Prior to starting the elaboration section of this lesson, you will need to gather the following materials (per group):

- 1000 ml beakers (2)
- 100 ml graduated cylinder
- stirring rod
- water
- vegetable oil
- blue food coloring

Students will work in teams of 4. Each team should collect two 1000 ml beakers and label one *world's water supply* and the other *US water use*. In the beaker labeled *world's water supply* measure out 970 ml of water and add 2 drops of blue food coloring. Pour 30 ml of vegetable oil into the beaker. Ask students to draw and label their diagram saltwater and freshwater.

In the 2nd beaker labeled *US water use*, add a portion of water in the following amounts:

Faucets (handwashing, rinsing fruits/vegetables, dampening a cloth)	120 ml
Glass of Water	50ml
Baths	90 ml
Showers	210 ml
Washing Machines	220 ml
Dishwasher	30 ml
Toilet Flush	280 ml

Ask students to compare their water use to the amount of available freshwater. Then students should answer the following questions:

1. Where is most of the world's water found?
2. Is all the water on Earth fit for human use? Explain.
3. What percent of the world's water is fit for human use?
4. Based on the *US water use*, what accounts for the smallest water use? largest water use?
5. List 3 ways you could conserve water around your home.

Students then write a report about the limited amount of water on the planet. State a claim, and provide evidence, and clear reasoning.

EVALUATE:

Formative Monitoring (Questioning / Discussion): Students responses to questions during the demonstrations and activity.

Summative Assessment (Quiz / Project / Report): Claim Evidence Reasoning Report

Elaborate Further / Reflect: Enrichment: Students create an ad campaign for water conservation to convince their families to reduce their water consumption.

SOCIAL EMOTIONAL LEARNING ACTIVITY

CASEL Competency: SOCIAL AWARENESS

Listening carefully is a communication skill. It is also an important factor in being socially aware. This activity, Sandwiches and Hamburgers, is a group activity that requires students to listen very carefully.

Instructions:

1. Give students the verbal cues: when I say sandwiches, pull on your earlobe, and when you hear the word hamburgers fold your hands.
2. Practice saying “sandwiches, hamburgers” repeatedly a few times and have students touch their earlobes or fold their hands to correspond with what is said.
3. Now tell a story involving sandwiches and hamburgers. And watch.

This game can be a lot of fun, with people misjudging the verbal cues and the actions, leading to some good-hearted laughs. Be sure to follow the activity with a discussion about social awareness and listening carefully.

INTERDISCIPLINARY CONNECTIONS/IDEAS

SL.8.5 - Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
SL.8.2 Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Materials Required for This Lesson/Activity

Quantity	Description
for class demonstration	water
	Tupperware container (at least 6 inches deep)
	lasagna pan
	hammer
	hot water
per group (4)	1000 ml beakers (2)
	100 ml graduated cylinder
	stirring rod
	vegetable oil
	blue food coloring



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