

Every Drop Counts

Strand	Earth's Patterns, Cycle, and Changes
Topic	Water conservation
Primary SOL	3.9 The student will investigate and understand the water cycle and its relationship to life on Earth. Key concepts include d) water is essential for living things; e) water on Earth is limited and needs to be conserved.
Related SOL	3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques; h) data are gathered, charted, graphed, and analyzed; l) models are designed and built; m) current applications are used to reinforce science concepts. 3.6 The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include d) the human role in conserving limited resources.

Background Information

Water is essential for life on Earth. The human body is more than $\frac{3}{4}$ water. Living cells are made up of mostly water and the chemicals necessary for life are dissolved in water.

Approximately 97% of the water is found in the oceans and the other 3%, which is fresh water, is found in glaciers, icecaps, rivers, lakes, underground, and in the atmosphere. Of this 3%, only 1% is suitable for drinking. Water continuously circulates between Earth's surface, the air, and underground. This circulation is driven by the sun's energy. As the sun warms the surface of oceans and other water sources, the movements of water molecules increase until some molecules change state from liquid water to gaseous water (water vapor). When energy is lost, the water vapor condenses, forming liquid water again. When the droplets get large enough, they fall back to Earth as precipitation.

Materials

Per student:

- "Water Conservation Primer" handout (attached)

Per group of students:

- "Constructing a Water-Flow Cup" instruction sheet (attached)
- Two large paper cups
- Heavy tape
- Bowl
- Stopwatch

Vocabulary

conserve, limited resource

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

Introduction

1. Have students list the many ways they use water and then describe or draw pictures of situations in which they believe water is being wasted.
2. Have students share their pictures and discuss ways that they could use this water more efficiently.
3. Have students list ways water can be conserved and not be wasted.

Water Conservation Chart

Use Category	Water Used*	
	Usage	Amount in liters
Drinking	Daily requirement	3
Toilet device	Per flush	20
Brushing teeth	Leave water on for 2 minutes	40
Washing hands	Leave water on for 1 minute	20
Shower	5-minute shower	100
Washing clothes	1 load	120
Washing dishes	1 load, automatic dishwasher	100
Washing car	5 minutes to complete	100
Lawn Watering	Apply 2.5 centimeters to 10 square meters	250

Source: Denver Water Department, Colorado River Water Conservation District.

*Based on the flow of water from a faucet, shower head, or hose of 20 liters per minute.

Procedure

1. Have the students keep track, in a journal, of the water they use over a one-week period. Students will complete a chart to record the number of liters used, using the information in the chart above. As students monitor their water use, they should ask themselves: “Am I using this water wisely? Am I ever wasting it?”
2. Discuss reasons water should not be wasted. Students should consider such things as saving water for future use, sharing of a limited resource, sustaining a limited resource, and the fact that clean water costs money.
3. Have students research water conservation strategies and develop a set of behaviors they can use to conserve water at school and home. Supplement their research with the “Water Conservation Primer” provided.
4. Have students identify three-to-five water conservation habits they can individually adopt. Ask them to write these down, and challenge them to practice these habits during the next week. Instruct students to record results in their charts. Remind students that forming new habits takes time and effort.
5. Have students participate in one or more of the Conservation Capers.
6. Divide the students in small groups and give out materials necessary to perform the “Constructing a water-flow cup” project.
7. Have students work together to create water-flow cup and complete construction and experimentation.

Conclusion

1. Have the student groups share what they learned about the water-flow cup system.
2. Have students make a generalization about the flow cup systems and water conservation.

Assessment

- **Questions**
 - What will happen in the future if we don’t conserve water now?
 - What can you as a child do to influence adults to conserve?
- **Journal/writing prompts**
 - You have woken up 30 years from now and no one conserved water in your time. How has the world changed? Tell the results as if you are seeing them for the first time.
 - Water conservation is important to me because...
- **Other**
 - Have students create a poster to advertise the importance of water conservation.
 - Have students create a poster to display at school with reminders of how water can be conserved at school and at home.

Extensions and Connections (for all students)

- Students can design their own water usage chart.

Strategies for Differentiation

- Preteach vocabulary: to waste, to conserve (example: provide pictures or point out recycling container).
- Provide time to check and record school water usage.
- When researching, provide books and resources at varying reading levels and guided Internet searches.
- Create a graphic organizer with picture cues for water conservation chart.
- Allow students to visit the school media center or their local library to check out materials related to water conservation.
- Have groups of three students draw and present water conservation posters to other students.
- Have the students assess water conservation at home or school and develop a plan for conserving water at home or school.
- Invite a representative from your local water utilities office to discuss water conservation strategies.

Water Conservation

- Turn off the water when it's not in use. Don't leave it running when brushing your teeth. Turn it off between soaping and rinsing your hands.
- Run the dishwasher or washing machine only when it has a full load.
- Keep a bottle of cold drinking water in the refrigerator instead of running the tap water until it gets cold.
- Limit your shower time to 10 minutes or less.
- Take showers instead of baths. (When taking baths, limit the amount of water you use.)
- Put one or more capped bottles of rocks or marbles in the toilet tank to reduce the amount of water it takes to fill it up. Don't use the toilet for a trash can.
- When washing dishes by hand, use a sink full of rinse water rather than letting the water run.
- Use a broom instead of a hose to sweep sidewalks and driveways.
- When washing the car, use a hose with an on/off nozzle or use buckets of rinse water.
- Water lawns in the mornings or evenings when the water will not evaporate as quickly. Make sure the water lands on vegetation and not on streets or sidewalks. If possible, save rainwater for watering lawns.
- If you need to run the water before it becomes hot, store the cool running water in a bottle for future use. Unheated water can be used for rinsing dishes and washing vegetables and hands.
- Fix leaking faucets!
- Install a low-flow showerhead.

Constructing a Water-Flow Cup

Names: _____ Date: _____

How could you easily save water when taking a shower? Cooperate with other members of your group to find out how!

1. Using a nail, punch five holes in the bottom of a large paper cup. Using a pin, punch five holes in the bottom of a second cup. The location of the holes should be the same for each cup.
2. Cover the holes of each cup with a piece of tape placed on the *outside* of the bottom.
3. Fill the large-holes cup with water.
4. Have one member of your group hold the cup above a bowl. Then, have another member remove the tape and a third member use a stopwatch to time how long it takes for the water to drain out of the cup. Be careful not to squeeze the cup. Repeat the procedure two more times, making sure the starting water level is exactly the same each time. Use the three trial times to calculate the average time.
5. Fill the small-holes cup with water, and repeat the procedure in step 4.
6. Now, compare the flow rates of the two cups:
 - What is the difference in the drainage times of the two cups?
 - How do the streams of water coming out of the two cups compare?
 - Would one cup make a better showerhead than the other? If so, which one?
 - How could you use the flow-restrictor data from this activity to help your family save water?