

Title: Home Water Use

Source: The Water Sourcebook Series, U.S. Environmental Protection Agency

Subject(s): Science, Math

Grade(s): 6-8

Objectives: Students will calculate the volume of water used when taking a bath and when taking a shower. They will reflect on their current water usage and identify potential actions for conserving water at home.

Summary: This activity begins with a discussion of water conservation and estimated daily water use. Students will measure the dimensions of their bathtubs at home and compare the amount of water used when taking a bath and when taking a shower. They will answer follow-up questions about the factors that determine the amount of water required for each activity. Students will then reflect on the water conserving activities their families use at home and engage in a group activity to discuss water conservation methods and what they can do to save water.

Standards: M6M2. Students will use appropriate units of measure for finding length, perimeter, area and volume and will express each quantity using the appropriate unit.

M6D1. M7D1. Students will pose questions, collect data, represent and analyze the data, and interpret results.

M6P4. M7P4. M8P4. Students will make connections among mathematical ideas and to other disciplines.

S6CS3. S7CS3. S8CS3. Students will use computation and estimation skills necessary for analyzing data and following scientific explanations.

HOME WATER USE

6 - 8

OBJECTIVES

The student will do the following:

1. Calculate the volume of water used in the home.
2. Identify methods of conserving water in the home.

BACKGROUND INFORMATION

Which requires less water, a bath or a shower? Did you know 30 percent of your indoor water is used in flushing the toilet? The average toilet uses five to seven gallons per flush. An average household can save about \$100 a year and help conserve thousands of gallons of water by installing water-efficient toilets. These “improved” toilets rely on an efficient bowl design and increased flushing velocity—instead of extra water—to remove wastes.

Which uses more water—washing dishes by hand or in a dishwasher? The average dishwasher uses about 10 gallons of water per load, while washing the same number of dishes by hand takes about 16 gallons (though you’ll use less water if you use the sink or a dishpan for washing and rinsing). Newer, efficient dishwashers use as little as five gallons per cycle, which means they also consume less energy to heat the water.

Showers and baths account for one-third of most families’ water use. The typical shower head allows a water flow of eight to 10 gallons per minute. Installing a flow restrictor or low-flow shower head will reduce this flow by one-half, and most people can’t tell the difference. A faucet that drips once per second wastes 2,300 gallons of water a year. Most household leaks are easily fixed by replacing worn parts, like the washer.

Terms

natural resource: something (as a mineral, forest, or kind of animal) that is found in nature and is valuable to humans.

freshwater: water containing an insignificant amount of salts, such as in inland rivers and lakes.

renewable resource: a resource or substance, such as a forest, that can be replenished through natural or artificial means.

conserve: to save a natural resource, such as water, through intelligent management and use.

ADVANCE PREPARATION

- A. Discuss with students the importance of conserving water.
- B. Make sure each student has a plastic ruler.

PROCEDURE

I. Setting the stage

- A. Ask students to estimate how many gallons of water they use daily.

SUBJECTS:

Ecology, Math

TIME:

20 minutes

MATERIALS:

plastic ruler
bath tub with shower
student sheet

- B. Ask students to estimate how many gallons of water they use when taking a bath or shower.

II. Activities

- A. Have students measure the amount of water they use when taking a bath by following these steps:
 1. Run the bath.
 2. Before getting into the tub, measure the depth of the water with a plastic ruler.
 3. Record the depth of the water on the Student sheet.
- B. Have students measure the amount of water they use when taking a shower by following these steps:
 1. Close the bathtub drain.
 2. Take a shower using your usual amount of time.
 3. Before draining the bathtub, measure the depth of the water with a plastic ruler. (Do not stand in the tub when measuring.)
 4. Record the depth of the water on the Student sheet.

III. Follow-Up

- A. Have the students answer the following questions on Student Sheet 1.
 1. Which requires more water, a bath or a shower?
 2. Should the procedure have included a specific length of time for the shower?
 3. Why is it important that the depth of the water in the tub be measured without a person in the tub?
- B. Have the students review Home Water Use - Ways to Save Water: Student Sheet 2. Ask students to check each one they already use in their home to save water. Have them circle the ones they will plan to use in the future.
- C. Have students answer the questions on the Home Water Student Sheet 3. Have them answer questions individually first. Then put them into small groups and have them compare answers.

IV. Extensions

- A. Ask the students to imagine their city is experiencing a severe water shortage. Have them list ways in which they, as citizens, can conserve water during the crisis.
- B. Ask students to keep track of how many baths and showers are taken in their home each day for a week. Calculate how much water is used in the house for baths and showers.
- C. Have students go to a hardware store or call one and find out about shower flow restricters. How do they work? How much water do they save? Calculate how much water could be saved in their house if one was installed in each shower.
- D. Call the city or county water department. Find out where the city water comes from and how much it costs per 1,000 gallons.

RESOURCE

Earth Science. Prentice Hall, Englewood Cliffs, NJ, 1991.

STUDENT SHEET 1

HOME WATER USE

6 - 8

Directions: Measure the length and width of the bathtub or shower. Then measure the depth of the water used for a bath and for a shower. Record these measurements below:

Bath:

Shower:

To determine how much water is used in one bath or shower, use the formula for volume, $V = \text{length} \times \text{width} \times \text{height}$. Use your measurements from above.

Bath:

Shower:

Using the chart below, figure the amount of water used in one day, one week, one month, and one year, by multiplying the volume of water used in one bath or shower by the number of baths and showers taken during each of those times.

	1 Day	1 Week	1 Month	1 Year
Bath Tub				
Shower				

Now, answer the following questions:

1. Which requires more water, a bath or a shower?
2. Should the procedure have included a specific length of time for the shower?
3. Why is it important that the depth of the water in the tub be measured without a person in the tub?

Ways to Save Water

1. Never put water down the drain when there may be another use for it, such as watering a plant or garden or cleaning.
2. Verify that your home is leak-free because many homes have hidden water leaks. Read your water meter before and after a two-hour period when no water is being used. If the meter does not read exactly the same, there is a leak.
3. Repair dripping faucets by replacing washers. If a faucet is dripping at the rate of one drop per second, 2,700 gallons per year can be wasted, which adds to the cost of water and sewer utilities and places strain on septic systems.
4. Check for toilet tank leaks by adding food coloring to the tank. If the toilet is leaking, color will appear within 30 minutes.
5. Avoid flushing the toilet unnecessarily. Dispose of tissues, insects, and other waste in the trash rather than the toilet.
6. Take shorter showers. Replace shower heads with ultra-low-flow versions.
7. Use the minimum amount of water needed for a bath by closing the drain first and filling the tub only 1/3 full.
8. Operate automatic dishwashers and clothes washers only when they are fully loaded, or properly set the water level for the size of load being washed.
9. When washing dishes by hand, fill one sink or basin with soapy water. Quickly rinse them under a slow-moving stream from the faucet.
10. Store drinking water in the refrigerator rather than letting the tap run every time cold water is needed.
11. Do not use running water to thaw meat or other frozen foods. Defrost food overnight in a refrigerator or by using the defrost setting on a microwave.
12. Kitchen sink disposals require lots of water to operate properly. Start a compost pile as an alternate method of disposing food waste instead of using a garbage disposal. Garbage disposals also can add 50% to the volume of solids in a septic tank which can lead to malfunctions and maintenance problems.
13. Insulate water pipes. Hot water is available faster, and this avoids wasting water while it heats up.
14. Don't over water the lawn. As a general rule, lawns only need watering of one inch every 5 to 7 days in the summer. A hearty rain eliminates the need for watering for as long as two weeks.
15. Water lawns during the early morning hours when temperatures and wind speed are the lowest. This reduces losses from evaporation.
16. Don't water the street, driveway, or sidewalk. Position sprinklers so that water lands on the lawn and shrubs — not the paved areas.
17. Raise the lawn mower blade to at least three inches. A lawn cut higher encourages grass roots to grow deeper, shades the root system, and holds soil moisture better than a closely clipped lawn.
18. Avoid over-fertilizing the lawn. The application of fertilizers increases the need for water.
19. Plant native and/or drought-tolerant grasses, ground covers, shrubs and trees. Once established, they do not need to be watered as frequently, and they usually will survive a dry period without any watering.
20. Do not hose down the driveway or sidewalk. Use a broom to clean leaves and other debris from these areas. Using a hose to clean a driveway can waste hundreds of gallons of water.
21. Consider using a commercial car wash that recycles water. At home, park the car on the grass when washing it.
22. Avoid the installation of ornamental water features (such as fountains) unless the water is recycled.
23. Consider a new water-saving pool filter for swimming pools. A single back-flushing with a traditional filter uses from 180 to 250 gallons or more of water.

Directions: Answer the following questions in complete sentences.

1. How many gallons of water can you expect per year if a faucet drips at the rate of one drop per second?
2. How can you verify that your home is leak free?
3. Please explain how you can check for toilet leaks.
4. Why should you avoid over-fertilizing your lawn?
5. Why should you use a commercial car wash instead of washing your car by hand?
6. Is it possible to have an ornamental water feature (such as a fountain) and not waste water? Please explain.
7. Please list two reasons you should not use a garbage disposal.
8. What time of day should you water your lawn?
9. How can insulating your water pipes help to conserve water?
10. How does raising the blade on your lawn mower help to conserve water?