EPA832-F-09-002

Fix a Leak Week Teacher's Guide

Grade Level: 3-5

Key Concepts: Water meter/measurement, leak detection, toilet components, water efficiency, water conservation, water savings calculations

Goal: Students will learn how much water leaks can waste in homes across the country; understand how to measure the water used in their homes; examine possible sources of leaks at home; determine whether their toilet(s) leak; and calculate savings from fixing leaks.

Background Information

What Is Fix a Leak Week?

Leaks account for approximately 1 trillion gallons of water wasted in the United States each year. The U.S. Environmental Protection Agency's (EPA's) WaterSense® program promotes its annual Fix a Leak Week the third week in March as part of its efforts to encourage Americans to use water efficiently. The average home can waste more than 10,000 gallons of water per year—more than enough to fill a backyard swimming pool. By finding and fixing running toilets, leaky faucets, and dripping showerheads, a family can save as much as 10 percent on its utility bills and save water for future generations.

Why Save Water?

Water is a precious resource. Even though our water sources in some parts of the country can replenish themselves through precipitation, our changing climate, growing population, and ever-increasing thirst for water threaten these supplies. (Note: See the accompanying *Teacher's Guide to Using A Day in the Life of a Drop* for more information about water supplies.) In fact, from 1950 to 2005, our country's population doubled, but our demand for water more than tripled. Water efficiency is a way for families to use less water without sacrificing their quality of life. Taking simple steps such as finding and fixing leaks and looking for the WaterSense label when shopping for plumbing products can make a big difference.

What Is WaterSense?

WaterSense is a partnership program sponsored by EPA that makes it easy for consumers to identify water-efficient products and learn water-saving behaviors. The WaterSense label can be found on water-using fixtures that use less water but still perform as well or better than conventional models. The WaterSense website, **www.epa.gov/watersense**, has a wealth of information on water-efficient products, facts, and figures about water use in the United States, as well as simple steps consumers can take to save water.

Fix a Leak Week Lesson Plan

While Fix a Leak Week itself (usually the third week in March) is a good time to cover this topic, saving water can be taught at any time of the year. Students can be encouraged to conduct water-saving audits of their homes and experiments on leaky toilets to celebrate Earth Day in April, promote Drinking Water

Week in May, or participate in their local science fair. Your local utility may also be interested in your efforts; WaterSense utility partners often celebrate Fix a Leak Week in March with educational campaigns and distribute free materials to help their customers find and fix leaks. This curriculum covers a range of subjects (reading, science, math, social studies), and lessons were developed to ensure this work can help meet relevant standards in the various curriculum areas. It can be adapted to different grade levels and class abilities.

Lesson 1: Water Meters and Measurement

Goal(s): To introduce Fix a Leak Week
To discuss how water meters can give clues as to whether a house has a leak

Estimated Class Time: 45 minutes

Materials Needed: *Fix a Leak Week Student Worksheet* and *Fix a Leak Week Family Fact Sheet*

Curriculum Focus:

- *English:* Students will improve reading comprehension by learning new vocabulary about water use.
- *Math:* Students will develop greater understanding of multiplication or division by learning to convert water measures.

Homework:

- Students will locate the water meter in their homes, answer questions about water meters, and record meter readings at the start and finish of a period when water isn't being used.
- Students will convert reading from gallons to cubic feet, or vice-versa.

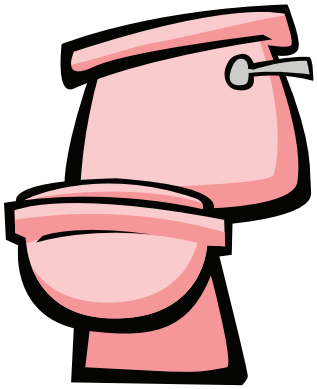
Use this first lesson to get students excited about finding and fixing leaks—and for explaining why saving water matters. Encourage students to read the *Fix a Leak Week Family Fact Sheet* either in class or at their homes. To expand this reading activity, you can create a pre-reading and post-reading questionnaire for students to fill out individually or as a class.

Before students see how much water can be wasted by leaks in their homes, they need to learn how much water their families use. A meter that tracks water consumption in gallons or cubic feet can be found on the outside of most homes or under a metal cover marked "Water" on the sidewalk. Ask your students to find out where the water meter is located at their homes, seeking help from a parent if necessary. If the meter records cubic feet (or ccf, a hundred cubic feet), it will be necessary to convert this measurement to gallons. 1 cubic foot of water = 7.48 gallons. A good source for how to read a water meter can be found at **www.h2ouse.org/resources/meter/index.cfm**.

A simple way to determine if a home has silent water leaks is to take a water meter reading at a time when no one is using water, maybe when everyone is away from home. Wait at least two hours, during which time no one should use water in the house, even to flush the toilet, then take a meter reading again. If the number changed, there is probably a leak. Note: When water is measured in cubic feet it may take several hours to show a change in water use. Students can instead try taking a meter reading before school and after school, if no water is used at home during the school day.

Another activity involving the water meter is having the students take a reading once per week for a semester. Adding up the weeks and dividing by the number of days in the period will results in an average daily water use rate for the family. For Earth Day or during Fix a Leak Week, students and their parents can be encouraged to take the pledge on the WaterSense website, **www.epa.gov/watersense/pledge**, and see if their water-saving behaviors have resulted in daily savings.

Lesson 2: Experiment in the Tank



Goal(s): To understand how a toilet works
To learn how to check toilets for leaks

Estimated Class Time: 45 minutes

Materials Needed: *Fix a Leak Week Student Worksheet*

Curriculum Focus:

- *Science:* Students will gain greater understanding of science and technology by conducting an at-home experiment.

Homework:

- Students will check a toilet for leaks using food coloring or dye tablets.

Before conducting this fun, at-home experiment, students will need to understand how a toilet works: the bowl is the part that they normally see, where a small amount of water is kept. The tank is the area behind the bowl that holds the water waiting to flush the toilet, and it has a lid over the top of it.

For this experiment, students will need either dissolvable food coloring or a dye tablet (these "potty tabs" are often available at your local utility or on the Internet; **www.culverco.com** is one site that has dye tabs available for purchase, but there are many other sources as well). They should remove the lid from the toilet tank (parental assistance may be necessary, as lids are often heavy and awkward to move) and drop a dye tablet or a few drops of food coloring into the tank, then wait 10 minutes without flushing the toilet. If color appears in the toilet bowl after 10 minutes without flushing, the toilet has a leak.

Note: Students should flush the toilet after 10 minutes have elapsed, to avoid staining the inside of the tank. It may take several flushes to remove the coloring completely from the tank water. Have an adult help replace the tank lid, and record findings. If this experiment is for a science fair project, the student may want to conduct it again for accuracy and test every toilet in the house for leaks. Teachers can also conduct this experiment at school, if any tank-type toilets are installed in the building; however, most schoolchildren's restrooms use flushometer valve toilets, not tanks.

Lesson 3: Detecting Other Leaks Around the Home

Goal(s): To learn how little leaks can add up to a lot of water loss
To learn how to find leaks

Estimated Class Time: 30 minutes

Materials Needed: *Fix a Leak Week Student Worksheet*, water dropper, stopwatch or clock

Curriculum Focus:

- *Math:* Students will develop greater understanding of multiplication and division by converting drips to gallons.
- *Science:* Students will search for potential water leaks in their homes and develop greater understanding of scientific inquiry.

Homework:

- Students will do a "drip scavenger hunt" at home.
- Students will solve drip-related math questions.

The easiest way to find leaks is simply to look for them. Students can use the *Fix a Leak Week Student Worksheet* as a checklist to search for dripping faucets, showerheads, pipes, sprinklers, and hoses. If they find a drip, they

should time how often a drop of water comes out of the fixture by timing it for one minute, then multiplying that rate by 60 minutes, 24 hours, and 365 days to get an annual water waste rate. A showerhead leaking at a rate of just 10 drips per minute, for example, wastes more than 500 gallons per year—enough water to wash 60 loads of dishes in your dishwasher. Students may find it helpful if you demonstrate how to measure the speed of a drip in class by using a water dropper to simulate a drip and timing it with a stop watch or clock with a second hand.

WaterSense has prepared a *Fix a Leak Week Student Worksheet* to help walk children through all of the steps described above, as well as calculate potential waste from leaks and savings from fixing them. Please review the worksheet to determine whether the math knowledge required is level-appropriate for your students. You can also reorganize the drip scavenger hunt as a scientific inquiry. Instruct students to formulate what they predict the scavenger hunt's outcome will be (e.g., drips or no drips? or drips in the bathroom sink but not the kitchen sink?), and then walk them through the scientific method to discover whether they guessed correctly (question, background research, hypothesis, procedure, data, and conclusion).

Lesson 4: Students Share What They Learned

Goal: To encourage students to share Fix a Leak Week with their families

Estimated Class Time: 30-45 minutes

Materials Needed: I'm for Water pledge and *Test Your WaterSense* quiz and interactive game (students can access these tools online or a teacher can provide paper copies from the WaterSense website)

Curriculum Focus:

- *Social Studies:* Students will develop greater understanding of their roles as citizens.

Homework:

- Students will sit down with their families to take the I'm for Water pledge.
- Students will play the *Test Your WaterSense* online quiz and interactive game.

For the final Fix a Leak Week lesson, encourage students to take their learning home and reflect on why saving water matters. Encourage students to think and write about the connections between being a responsible citizen and water use. Here are some questions to consider as a class:

1. What do you think are our rights to drinking water? Do all citizens have the right to have water? Do citizens have the right to waste water? Why or why not?
2. What do you think are our responsibilities regarding drinking water? Are we responsible for protecting our water? Are we responsible for using it wisely? Why or why not?

If families take the I'm for Water pledge and are interested in fixing leaks that students identify around the home, you can refer them to the WaterSense website at **www.epa.gov/watersense** for links to resources on do-it-yourself repairs. EPA encourages consumers who need to replace plumbing fixtures to look for WaterSense labeled models, which use at least 20 percent less water and have been independently tested to perform as well or better than standard fixtures. A simple WaterSense labeled faucet aerator, for example, can be screwed onto most bathroom faucets to reduce water from the tap by 30 percent compared to standard models without a noticeable difference in flow.

Kids can also have fun learning about water waste and how to stop it by visiting the *Test Your WaterSense* quiz and interactive game found at **www.epa.gov/watersense/kids/games.html**.

For more information and teaching resources on water efficiency, visit "WaterSense for Kids" **www.epa.gov/watersense**.