WATER GOES AROUND AND COMES AROUND

OBJECTIVES

The student will do the following:

1. Build a model of a water system from the source to users.

2. Learn to read and interpret a water meter.

3. Plan ways of water conservation at the community level.

SUBJECTS:
Science, Social Studies, Math

TIME:
120 minutes

MATERIALS:
large piece of cardboard
paper towel or bathroom tissue tubes
straws
different sizes of pasta (spaghetti, manicotti, etc.)
glue
paste or glue sticks
small boxes (matchboxes, small milk cartons)
markers
construction paper
student sheets (included)
teacher sheet (included)

BACKGROUND INFORMATION

It has been determined that each person in the United States uses about 150 gallons of water a day. Experts add the number of people who live in a city, town, or community, and multiply that number by 150 to determine how much water is used daily by that community.

People use water for drinking, cooking, bathing, flushing the toilet, laundry, washing cars, and watering lawns. Factories, farms, stores, public utilities, and homes use millions of gallons of water daily. It is a big job for water treatment facilities to supply clean drinkable water to a town, city, or community.

After the water treatment plant cleans the water, it sends it out to the users. As the water travels through a distribution system, it is diverted down different pathways to homes and businesses. The diameter of a pipe determines the quantity of water the pipe can hold and determines the rate the water can travel through the pipe. The volume of water needed for homes or businesses represents a small portion of the volume leaving the water plant. Therefore, smaller pipes are needed near the point of distribution, whereas larger pipes are needed near the treatment plant.

Water treatment plants pump water from a source (lake, river, or groundwater), treat the water, and pump it to holding tanks or water towers. If the water goes to a water tower, it flows by gravitational force from the water tower throughout the distribution system. Otherwise, water distribution is driven by motorized pumps.

Drinkable water is not free. Water treatment facilities and the distribution of drinking water are costly. Customers are charged according to the amount of water they use. A water meter is used to measure how many gallons (liters) or cubic feet (cubic meters) a household or business uses.

Because users pay for water and because there is only so much fresh water available for use, we must conserve our supplies, using them as wisely and efficiently as possible. We must not use water wastefully. Many communities have already experienced shortages in water supplies due to lengthy droughts, growth in population that has outstripped the water system's capacity, or other problems. People in these communities have learned to eliminate unnecessary water uses.

Terms

community water cycle: the distribution of water from the source to user and back to the source.

water source: a place where water is collected and stored for use.

water meter: a device for measuring and recording the amount of water used.

ADVANCE PREPARATION

A. Gather materials for constructing the model. (NOTE: You may want to ask the students to bring in small boxes [matchboxes, milk cartons, etc.] to represent buildings in the community, or you may choose to use construction paper to draw and cut "buildings.")

1. A large sheet of cardboard for each group to build model on.

2. Paper towel tubes, straws, and pasta.

3. The students may cut a river, stream, or lake from blue construction paper or draw this on the cardboard.

B. Prepare copies of student sheets and/or transparencies.

PROCEDURE

I. Setting the stage

Ask the students the following questions (which assume your students and school have water from a water utility):

A. How does the water that you drink get to your house? (It is piped from the river to the treatment plant, to a reservoir or storage tank, then to your homes.)

B. How does the water get to your school? (the same process)

C. What happens to the water when it leaves your home or school? (It goes to a wastewater treatment plant, then is discharged back to the river or lake.)

D. Where do people get water who do not live near water bodies and do not have city water systems? (wells) Where does wastewater from homes not connected to sewer systems go? (septic systems)

E. What do all these processes represent? (water cycles created by people)

F. Compare/contrast this human-created water cycle to the natural water (hydrologic) cycle. (The human water cycle comes from a lake or river, is distributed through the community, then goes to a treatment plant and back to the water supply. The hydrologic cycle is the movement of water from the atmosphere to the earth and its return to the atmosphere. Both cycles are continuous.)

G. Make very simple diagrams on the board to show a community water cycle and the natural water cycle.

II. Activities

A. Divide the students into groups of four or five and have each group build a model of your community water supply system from the source to the user.

1. Draw or cut from construction paper a river or lake and glue it to the cardboard.

2. Either draw houses and other buildings or construct them from small boxes to represent the community.

3. Show each group the illustration of the model of the water supply system to show them how to connect the "pipes" (paper towel tubes, straws, and pasta) with glue and lay them on the large piece of cardboard.

4. (Optional) The students may also show another set of "pipes" going to the wastewater treatment plant and returning to the source. (Use markers to color the wastewater lines a dark color.)

B. Ask the students the following questions:

1. How is the amount of water a home, school, or business uses measured? (A water meter measures the amount of water that is used so the customer can be billed correctly.)

2. Who reads the amount of water you use? (a meter reader from the water utility)

3. Explain to the students that water is not free and users must pay for its use. Water is paid for by the gallon (liter) or sometimes it is measured in cubic feet (cubic meters). What else is measured by the gallon (liter)? (gas, milk, juice)

C. Distribute the student sheet "Meet Your Meter" or you may want to use it as a transparency. Discuss and explain how to read a water meter. (You can get a meter face from your local water department. If you wish to concentrate on the meters most common in your community, call the billing department of your local water utility and ask about the meters where you live. Some people, like those who live in apartments, do not have individual meters. Their rent includes an estimated fee for water usage.)

1. The first meter is measured in gallons. Read and record the first meter that represents gallons. ______103,836

2. The second meter measures water in cubic feet. Read and record this amount.____192,787

3. The third meter is read like a digital clock. Read and record this amount.____3,429

D. Ask the students to read the meters on the student sheet "Meter Reader" to reinforce the skill. The answers are: 1. 136,092; 2. 072,150; 3. 824,736.

IV. Extensions

A. Have students complete “Read Your Meter,” a take-home survey.

B. Brainstorm ways to conserve water.

1. List these suggestions on the blackboard or overhead projector.

a. Check toilets and faucets for leaks.

b. Keep a container of drinking water in the refrigerator.

c. Turn off the water while you brush your teeth.

d. Wash clothes only when you have a full load.

e. Wash dishes only when you have a full load.

f. Take shorter showers, or get a low-flow shower head.

2. Discuss the question, “Why should we conserve water?”

a. Water is a natural resource that we all share.

b. Wasting water wastes energy.

c. Conservation will save money and make clean water supplies last longer.

C. Appoint a water patrol of 3 or 4 students to check bathrooms and water fountains for leaks or to see if they are left running. Report their findings to the janitor or principal.

D. The students may check the newspapers and clip out articles that concern water.

1. These may be placed on the bulletin board.

2. Students may write reports on their findings.

RESOURCES

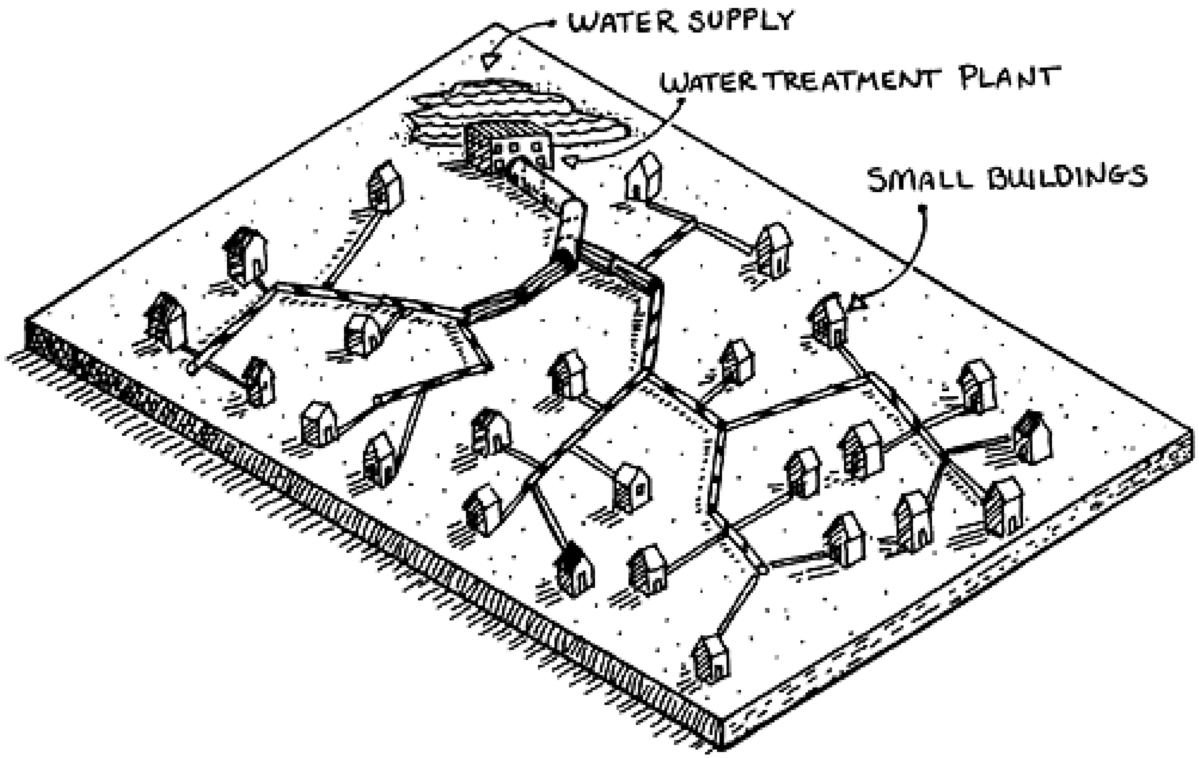
Cobb, V., The Trip of the Drip, Little, Brown and Company, Boston, Massachusetts, 1986.

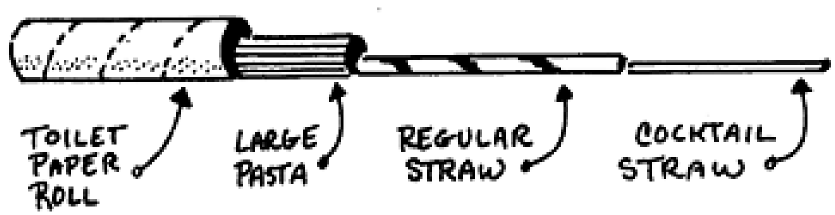
“Science Demonstration Projects in Drinking Water, Grades K-12,” U.S. Environmental Protection Agency, Washington, DC, 1990.

“The Story of Drinking Water” (student booklet), American Water Works Association, Denver, Colorado, 1984.

“The Story of Drinking Water: Teacher’s Guide, Intermediate Level, Grades 4, 5, 6,” 2nd ed., American Water Works Association, Denver, Colorado, 1988, pp. 23-24.

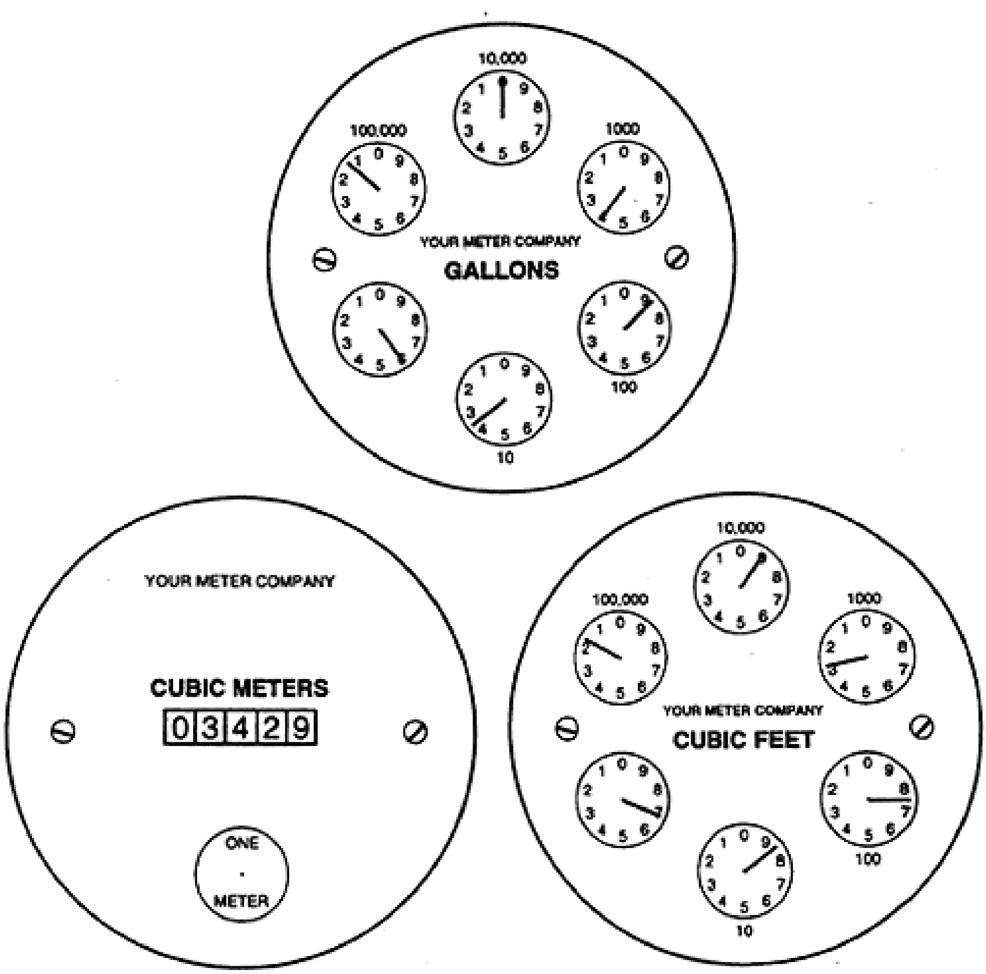
COMMUNITY WATER SUPPLY SYSTEM MODEL





MEET YOUR METER

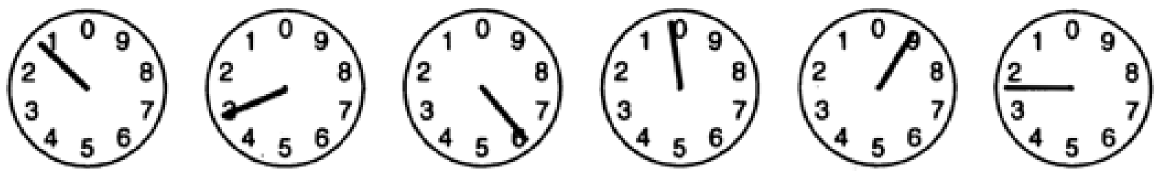
Your water meter probably looks like one of these. The first meter is read clockwise and measures water in gallons. The second meter measures water in cubic feet and is read in the same manner. (To convert cubic feet to gallons you must multiply the number on the meter by 7.5.) The third meter is read like a digital clock. Meters 1 and 2 have six dials, which are read clockwise. Begin with the “100,000” dial and read each dial to the “1” dial. Remember that when the dial is between two numbers, you read the smaller number. Read and record the number shown on each meter.



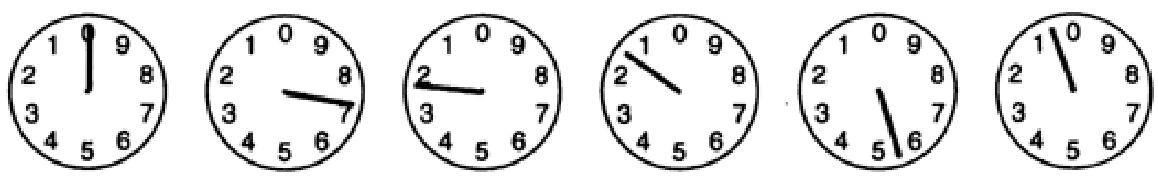
METER READER

Directions: Read the dials from left to right. When the dial is between two numbers, read the smaller number. Write the numbers in the blanks below the dials.

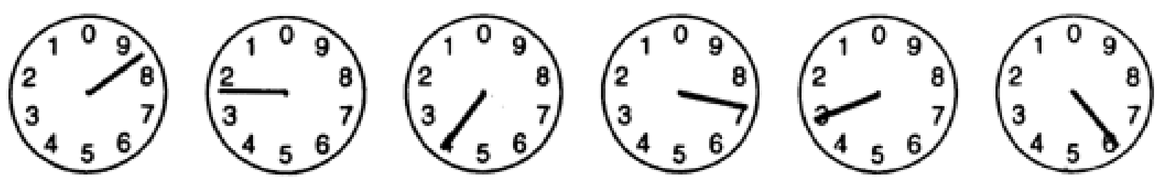
1.



2.



3.



READ YOUR METER

1. Does the meter at your home measure water in gallons or cubic feet?_____

2. Does your meter at home have a single dial (odometer- digital type) or a solid dial meter (like the three you read on the other student sheet)?___________

3. Which type of water meter does the school have?_____________ How can you find out?____

4. How many of gallons of water were used in your home last month? (Ask your parents to show you the water bill.)_______________

5. How many days were in the billing period?_____________

6. What was the average number of gallons your family used per day? (Divide the total number of gallons of water used by the number of days in the billing period.)

7. Find your meter at home and read your meter every day for the next week. If you don't have a meter at home, check with the janitor to see if you can read the meter at school.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Date							
Reading							
Daily Units							
Add all the daily units for your weekly total:						Weekly Total	

8. What was your family's average daily use? Add the weekly total, then divide the weekly total by the total number of readings (7).

____

9. Compare the daily average with the daily units. What did you find out?

____

10. What day of the week did your family use the most water?_______________
What day did they use the least?______________________________________