LESSON 1 EVERYBODY'S WATER

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We all depend on water in more ways than we realize, as individuals, families and communities. These three activities follow that progression. In the first, students first estimate, then calculate their personal use. In the second, they consider which uses are most important to their families. The final activity broadens the concept of water supply to its significance in the community. As they devise a community conservation plan, students learn that water supports not only themselves and their families, but hospitals, schools, stores and industries.

LESSON 1 EVERYBODY'S WATER

ACTIVITY 1-1 SHOWER MATH

SUMMARY Students will guess and then calculate an estimate of how much water they use during one day.

CONTENT AREAS environmental science, math, social studies

GOAL to help students become aware of their own water use

TIME two sessions

ADVANCE PREPARATION

- Create student working groups.
- Copy student pages.
- Make an overhead of the **Water Use Data Table**.

BACKGROUND INFORMATION

The average person uses about sixty gallons of water a day at home. This amount includes bathing, flushing the toilet, and washing dishes and clothes, but not washing the car, watering the lawn, or other outdoor use. We have included some average usage amounts in the **Water Information Chart**. These are accepted rates, but will not be the exact amount used in every case. They are certainly appropriate for this exercise. You will probably find that middle school students use more than 60 gallons each day due to the length of their showers. In the next activity there will be an opportunity for discussing how to conserve water.

During the first class discussion students will probably realize they need several pieces of information to calculate a daily water use estimate. Water use can be measured in two different ways: by number of gallons per minute (as in taking a shower), or by the number of gallons per use (as in flushing the toilet). There are two ways water is used in a home: by individuals (as in taking a shower) or by families (as in washing dishes). Therefore, students will need to use four different equations to calculate their estimates.

1. Individual uses by **flow rate** ("individual rate")

   individual volume = rate (gallons/min.) x time (min.)

2. Individual uses by **frequency** ("individual frequency")

   individual volume = amount (gallons/use) x number of uses

3. Family uses by **flow rate** ("family rate")

   student share = family volume (rate x time) ÷ # in family

4. Family uses by **frequency** ("family frequency")

   student share = family volume (number of uses x gallons/use) ÷ # in family

These equations are included in the four tables where students calculate their estimates. There are extra spaces on each table for water uses that students may think of on their own. They can use the **Water Information Chart** to determine the amounts for these uses.

TEACHER PROCEDURE

1. Ask student groups to consider how much water they use in one day.

2. Display the overhead **Water Use Data Table** (or create one on the board). Show only the column for guesses. You will uncover or create the other columns as you go through the activity. Record the students' guesses.

2. The class numbers should generate a discussion about individual water use. Some questions you might ask about the data are: what is the lowest guess? What is the highest? What is the difference between those two numbers?

3. Now you want the students to start thinking about water use. To generate this discussion you might ask: What are the different ways you use water during the day? What information would you need to know to calculate daily water use?

4. Distribute the **Water Information Chart** and **Calculating Your Water Use Estimate.** Students will use this information to calculate an estimate for their daily water use.

5. Explain to the students how to do the calculations. You might want to do some sample problems or write the equations on the board. (Note: sometimes after several copies are made, the division symbol looks like a plus sign. Make sure students know they are to divide in steps 3 and 4.)

6. Uncover the next five columns on the **Water Use Data Table**: individual rate, individual frequency, family frequency, family rate, and calculated estimate.

7. When students have completed the calculations they should be recorded on the **Water Use Data Table**.

8. Use the data for a class discussion on water use. Some questions you might use in the discussion are: In what category did students use the most water? In what category is there the most variability? Were there any surprises in these numbers?

9. Students should use their own data to complete the **Conclusion** questions.

WATER USE DATA TABLE

Name	Guess	Individual rate	Individual frequency	Family rate	Family frequency	Calculated estimate

ACTIVITY 1-1 SHOWER MATH

NAME _____

DATE _____

INTRODUCTION

How much water do you use every day? You will make two estimates about this question. First, you will guess how much you use. Then you will calculate an estimate using standard water use information and your own water habits.

PROCEDURE

1. How many gallons of water do you think you use every day? _____

2. Using the **Water Information Chart** complete the four steps for calculating your estimate for your daily water use.

3. Be ready to share your information in a class discussion.

4. Complete the **Conclusion** questions using your information.

WATER INFORMATION CHART

Water Use	Gallons
flushing the toilet	1.6 gallons per flush (low flow) 3 gallons per flush (pre 1989)
showering	3 gallons per minute (low flow) 5 gallons per minute (less efficient)
bathtub faucet (6 minutes to fill the tub)	5 gallons per minute
bathroom faucet	2 gallons per minute
kitchen faucet	4 gallons per minute
dishwasher	20 gallons per use
washing machine	35 gallons per use

Water use can be measured in different ways in your home. For example, when you take a shower, water comes out at a certain rate and for a certain amount of time. We will call that type of use "rate use." However, when you flush the toilet you use a certain amount of water each time. We'll call that type of use "frequency use."

You will also need to calculate your share of water from your family's use. For example, when clothes are washed it is usually for the whole family and not an individual. Even if you are not responsible for washing dishes or your own clothes, you should still include those calculations.

You will not include any outdoor use in these calculations.

CALCULATING YOUR WATER USE ESTIMATE

Step 1: Calculating your individual rate use
Remember: rate x time = volume

Water use	Rate (gallons/min.)	Time (min.)	Volume (gallons)
showering			
taking a bath			
brushing teeth			

Total _____

Step 2: Calculating your individual frequency use
Remember: number of uses x gallons per use = volume

Water use	Gallons per use	Number of uses	Volume (gallons)
flushing the toilet			

Total _____

CALCULATING YOUR WATER USE ESTIMATE

Step 3: Calculating <u>your share</u> of family rate use.
Remember: your share = family volume(rate x time) ÷ number in family

Water use	Rate gal/min	Time min	Family volume gal	Number in family	Your share gal
washing dishes by hand					

Total _____

Step 4: Calculating your share of family frequency use.
Remember: your share = family volume(frequency x gallons) ÷ number in family

Water use	Frequency	Gallons per use	Family volume gal	Number in family	Your share gal
dishwasher					
washing machine					

Total _____

Add together your totals from step 1 through step 4 to calculate your daily water use estimate.

Daily Water Use Estimate _____

CONCLUSION

1. What was your first daily water use estimate (guess)?

2. What was your calculated estimate?

3. Using your calculated estimate, determine your use for one week, one month, and one year.

Water Use	Gallons Used
one week	
one month	
one year	

4. In what category did you use the most water?

5. What are two conservation strategies you could use to save water?

6. If you used one of those strategies, how much water could you conserve in one day?

7. How much could you conserve in a week, a month, and a year?

Time	Water Saved
one week	
one month	
one year	

ACTIVITY 1-2 FAMILY WATER USE

SUMMARY Students will work in groups to prioritize water use.

CONTENT AREAS environmental science, social studies, math, reading

GOAL to evaluate family water use

TIME one session

ADVANCE PREPARATION

- Create student groups.
- Copy student pages.

BACKGROUND INFORMATION

Use the **Water Information Chart** from **Activity 1** (page 7) for the students to determine amounts of water used.

TEACHER PROCEDURE

1. Distribute student pages.
2. Explain that each student group is a family. There is a problem with the pump to the water tower and the water has been rationed. The problem will last for four days. The entire family will be allowed to use 100 gallons of water during the four day emergency. Each person must have one half-gallon of water to drink each day. The group's task is to decide how to use the water during the four days.
3. Each group should begin the task by listing all of the things that they might use water for. Then estimate how many gallons it would take for each.
4. Students should try to reduce or eliminate uses of water until each family is down to 100 gallons for four days.
5. Each group should present its plan to the rest of the class.

ACTIVITY 1-2 FAMILY WATER USE

There is a problem with the pump to the water tower in your neighborhood and the water has been rationed. Your family will be allowed to use 100 gallons of water (25 gallons per day) for the next four days. Each person must have one half gallon per day to drink in order to survive. How you use the rest of the water is up to your group.

Your challenge is to agree within your group how to use the water over the next four days. Be ready to present your results to the class.

PROCEDURE

1. Make a list of all the ways that you might need to use water over the next four days.

2. Calculate how much water you would use for each of those activities.

3. Decide which of those activities is the most important. Put a "1" next to it.

4. Decide which activity is the second most important. Put a "2" next to it.

5. Continue with that process until you have put a number next to each water use.

6. Add up how the total number of gallons your group would use if they did all of the activities.

7. Reduce or eliminate water uses until you are down to 100 gallons for your family for the four days.

8. Prepare to present your results to the class.

NAME _____

GROUP MEMBERS _____

_____

DATE _____

WATER USE DATA TABLE

Water use	Amount	Priority

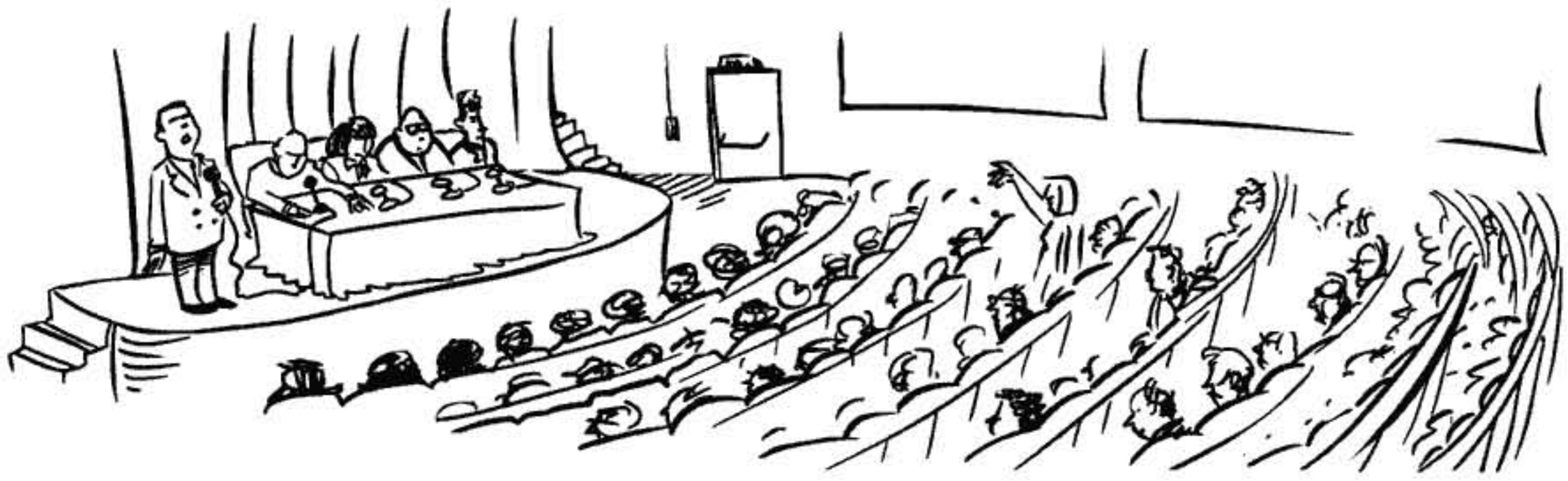
ACTIVITY 1-3 COMMUNITY WATER USE

SUMMARY Student groups will create water conservation plans for a community.

CONTENT AREAS social studies, language arts

GOAL to understand that water conservation affects entire communities

TIME two sessions



ADVANCE PREPARATION

- Create five student groups.
- Copy planning pages for each group.
- Copy four evaluation forms for each student.

TEACHER PROCEDURE

1. Describe the following situation to students:

   Your community's water supply is getting low. Several groups in the community will create water conservation plans for the next 25 years. Plans should include water conservation strategies, implementation methods, and ways to make sure people are following the plan. Each group will present its plan to everyone in the "community" (the rest of the class). Other community members will evaluate the plan presented. You may want to remind students that sometimes fines are imposed when people or corporations do not follow laws.

2. Divide your class into their five community groups.
3. Give each group the appropriate planning page.
4. Students will work together to create their group plans.
5. Each group will present its plan to the class. Other students in the class will complete the evaluation form as they listen to the presentation.

ACTIVITY 1-3 COMMUNITY WATER USE

NAME _____

GROUP MEMBERS _____

_____

DATE _____

WATER CONSERVATION PLANNING PAGE

Community group: Residential

This group includes homeowners, renters, and landlords of apartment buildings and houses.

NAME _____

GROUP MEMBERS _____

_____

DATE _____

WATER CONSERVATION PLANNING PAGE

Community group: Industry

This group includes factories and companies that use water for manufacturing.

NAME _____

GROUP MEMBERS _____

_____

DATE _____

WATER CONSERVATION PLANNING PAGE

Community group: Small business

This group includes restaurants, grocery stores, banks, and other businesses.

NAME _____

GROUP MEMBERS _____

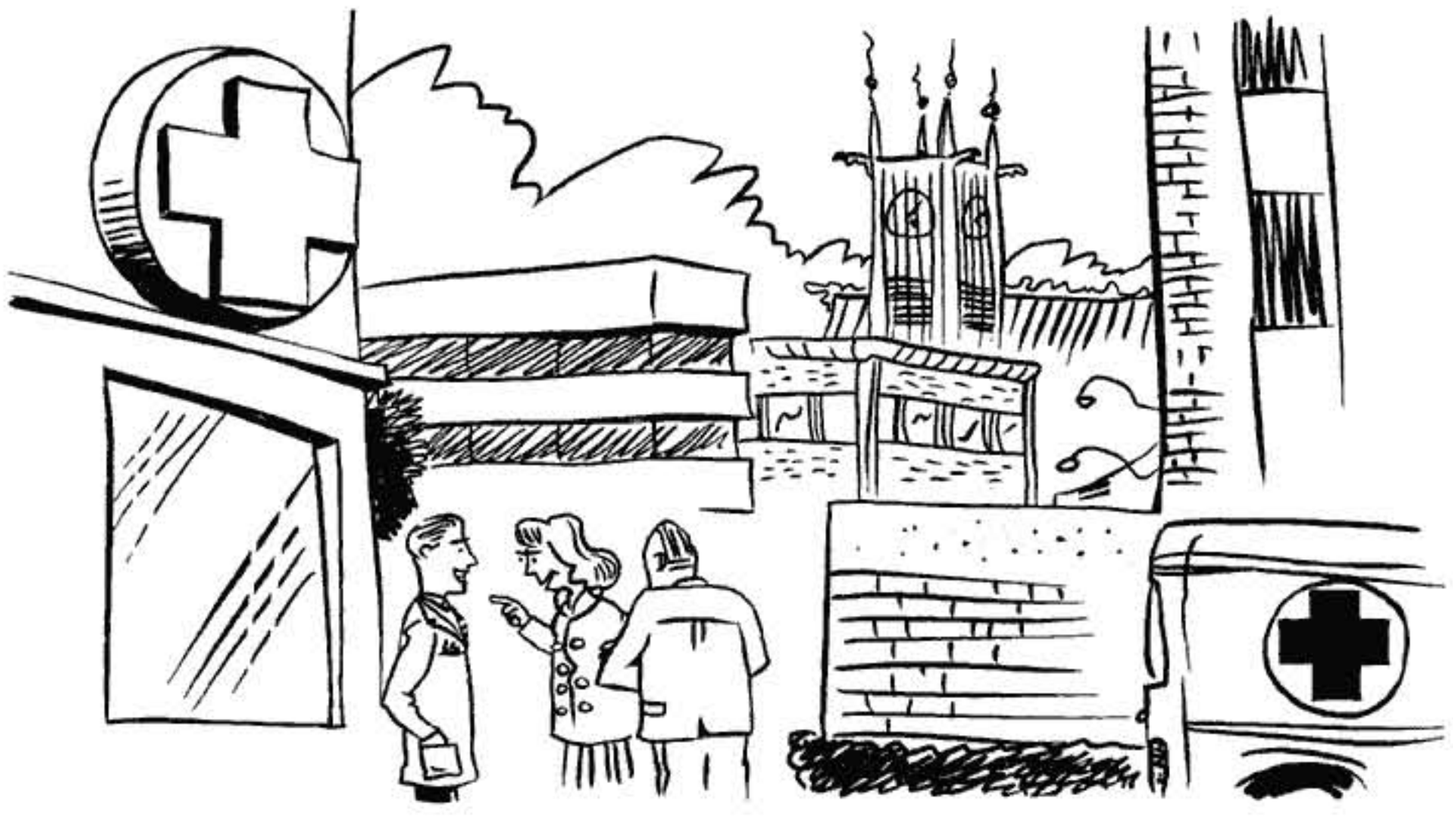
_____

DATE _____

WATER CONSERVATION PLANNING PAGE

Community group: Institutions

This group includes hospitals, schools, and universities.



NAME _____

GROUP MEMBERS _____

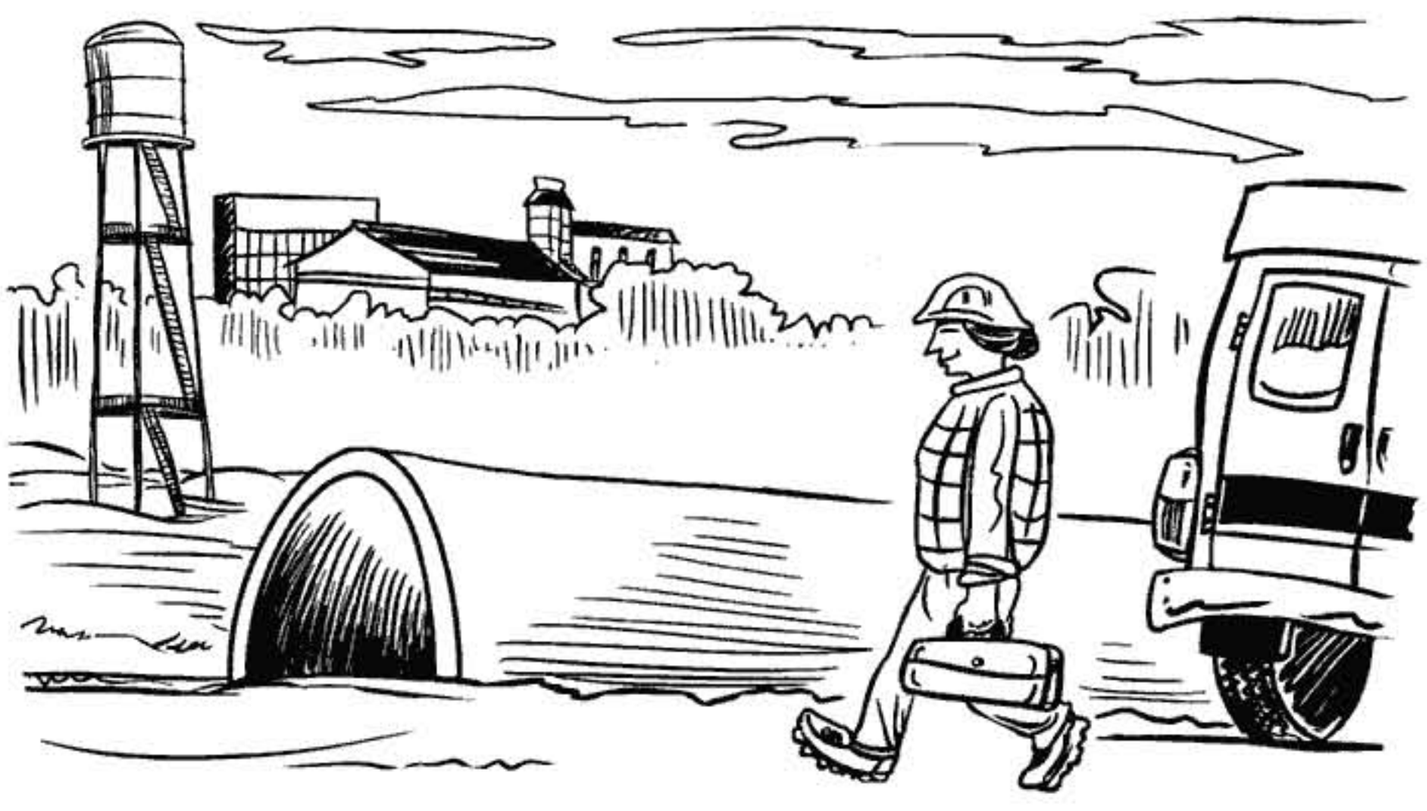
_____

DATE _____

WATER CONSERVATION PLANNING PAGE

Community group: The water company

This group is responsible for delivering the water through pipes, controlling water rates, taking care of pipes and reservoirs.



NAME _____

DATE _____

WATER CONSERVATION PLAN EVALUATION FORM

Use this form during the presentation of the plans.

1. What were three of the main points of the plan?

2. What incentives did the plan include to help members of the community to conserve water?

3. Did the plan include ways to assess if members of the community are conserving water? What were they?