
Lesson 3

# Availability of Clean Water

## Teacher's Guide

In part one, students will learn about the difficulties many people in the developing world face each day in obtaining water for their personal use and consumption. Through a water hauling activity, students will experience the physical hardship involved in carrying water from a distant source.

In part two, students will determine how much water they personally use each day.

This lesson is most suitable for students in grades 5-8 working in a cooperative learning environment in teams of four students each. This lesson will take approximately one or two 50-minute class periods to complete.

SafeWaterScience
lessons for life

# National Science Content Standards: Grades 5-8

### Content Standard A: Science as Inquiry
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry

### Content Standard F: Science in Personal and Social Perspectives
Personal Health
Populations, resources, and environments
Natural hazards
Risks and benefits

# Teacher Materials

### The following materials are needed by the teacher:

- 1 large bucket containing 2.5 gallons of dirty water prepared by mixing ¼ cup of finely ground soil/dirt in 2.5 gallons of tap water.

# Student Materials

### For Part 1, each team of 4 students should have:

- Access to the Internet*
- Calculator*
- 4 copies of the Student Activity Packet

### For Part 2, each team of 4 students should have:

- Calculator*
- 4 copies of the Student Activity Packet

*Not supplied in kit

# Local Water Sources

The students will work within their teams to write a set of definitions in the Warm Up activity, observe a "Water Haul" demonstration, and individually complete a set of Cool Down questions.

## I. Warm Up

Hand out a copy of the Student Activity Packet to each student. Allow the students about 10 minutes to work together in their cooperative teams on the Warm Up activity. Students should discuss answers within their teams but record their answers individually in their own words. Each team should have at least one computer with Internet access or a dictionary.

After most of the teams are finished, discuss the answers as a class. A glossary of Key Words is provided at the end of these teacher pages for your use.

## II. Activity: Water Haul


**Classroom Procedure**
Prepare 2.5 gallons of dirty water for each class (see Teacher Materials), and select two or more students to serve as water carriers.

- Select a route over which the students will carry the 2.5 gal-containing bucket of dirty water. Possible routes are: 10-15 loops around the perimeter of your classroom, 3-4 times up and down a long hallway outside your classroom, or a route of your choosing.

- Monitor the water carriers as they haul the water over the route. Change carriers, if you choose.

- During and after the water haul activity, have the water carriers describe their experiences. Students should discuss these experiences within their teams and individually answer the questions in the procedure section of the Student Activity Packet. To answer one of these questions, student will need you to provide them with the name of a local site approximately 1.9 miles (or 3 km) from your school.

## III. Cool Down

Students should work individually to complete the Cool Down questions, either in class or as a homework assignment. After the questions have been completed, lead the class through a guided discussion.

1. **How could you carry this water more easily?**

   Answers will vary. Possible answers include: carry the bucket on their head, suspend the bucket from a pole across their shoulders, use a cart with wheels, use an animal, etc.

2. **If the water supply in your community is turned off, where could you get water for your personal use?**

   Answers will vary. Possible answers include: buy bottled water at the grocery store, go to a friend's house in another community, get water from a river, lake, or pond, etc.

Lesson 3: Part 2

# Personal Water Use

The students will work within their teams to answer a set of Warm Up questions, determine the amount of water they personally use in a 24-hour period, and individually complete a set of Cool Down questions.

## I. Warm Up

Hand out a copy of the Student Activity Packet to each student. Allow the students about 5 minutes to work together in their cooperative teams on the Warm Up activity. Students should discuss answers within their teams but record their answers individually in their own words.

After most of the teams are finished, discuss the answers as a class.

## II. Activity: Calculating Personal Water Use

Have the students tally the number of times they perform over a 24-hour period each of the activities listed on the Daily Personal Water Use table in the Student Activity Packet (student procedure step A). Assign this activity as a homework assignment at least 24 hours before the students will be doing their calculations in class.

**Classroom Procedure**

- Have the students individually perform the calculations indicated on the table and determine the total amount of water they use in a 24-hour period in both gallons and liters (student procedure steps B and C).
- Have the students discuss within their teams the questions in student procedure step D, and then individually answer the questions in their own words.

## III. Cool Down

Students should work individually to complete the Cool Down questions, either in class or as a homework assignment. After the questions have been completed, lead the class through a guided discussion.

1. **If you had to carry to your house the amount of water you personally use every day and could only carry 5 gallons of water on each trip, how many trips would you have to make?**

   Answers will vary.

2. **If you had to carry this amount of water a distance of 3.75 miles, how would you reduce the amount you personally use each day?**

   Answers will vary. Possible answers include: cutting off running water while washing dishes, brushing teeth, or washing hands; taking shorter showers; washing linens, towels, and clothing less often, etc.

# Glossary of Key Words

**Access**
The ability or right to make use of.

**Developed country**
A developed country has a relatively high standard of living and is advanced in industrial capability, technological sophistication, and economic productivity. Some examples are the United States and most of Europe.

**Developing country**
A developing country has a relatively low standard of living, an undeveloped industrial base, and a relatively low Human Development Index score (HDI). In developing countries, there is low per capita income, widespread poverty, and low capital formation. Examples are: Algeria, Botswana, Armenia, Azerbaijan, Guatemala, Brazil, Paraguay (source: http://en.wikipedia.org/wiki/Developing_country).

**Hygiene**
Conditions and practices that serve to promote health.

**Purify**
To become clean or pure.
Synonym: clean.

**Sewage**
Liquid and solid waste carried off in sewers or drains.

source: http://education.yahoo.com/

# Acknowledgements

Many of the resources used for these lessons were provided by the following organizations:

**Peace Corps: Worldwise Schools**
http://www.peacecorps.gov/wws/

**WHO: World Health Organization**
http://www.who.int/en/

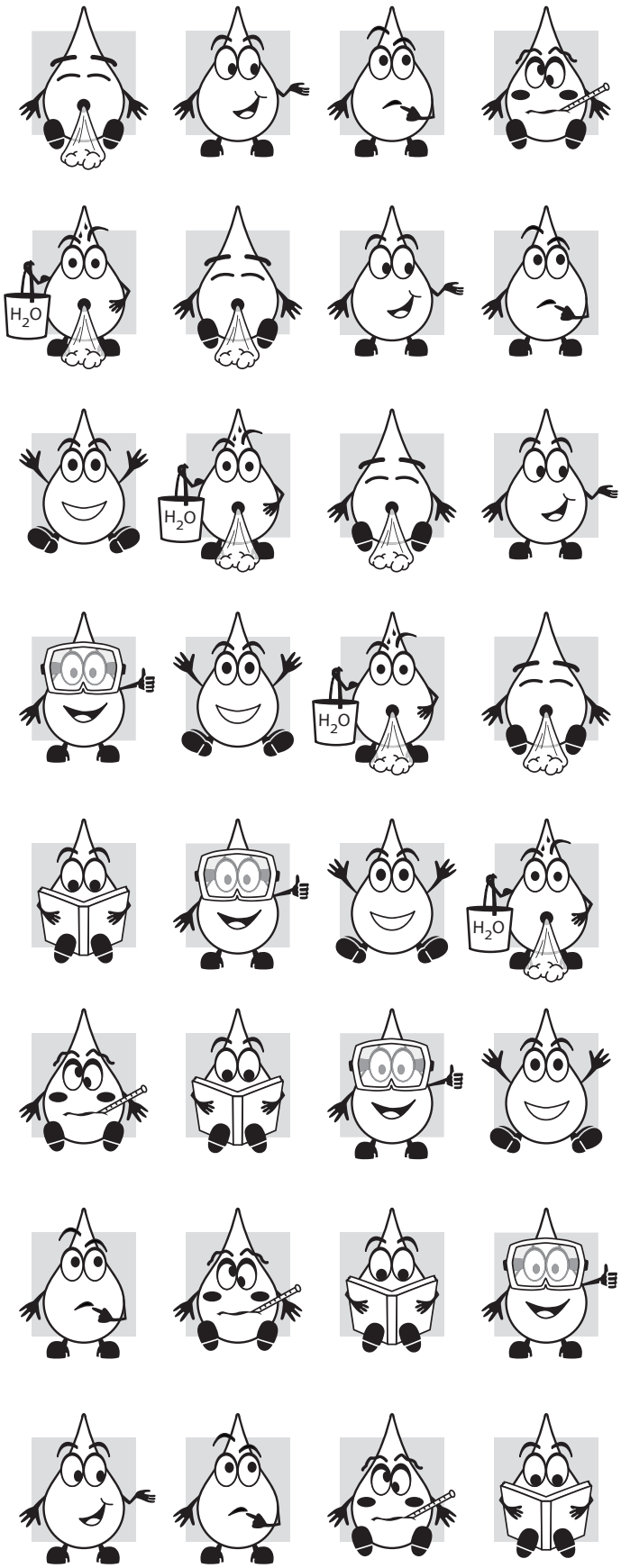
**CDC: Centers for Disease Control and Prevention**
http://www.cdc.gov/education/default.html

**UNICEF: United Nations Children's Fund**
http://www.unicef.org/

# Need Help?

For assistance with chemistry and other scientific concepts, please contact Martha Brosz (martha.brosz@cincinnatistate.edu) or Mary Repaske (mary.repaske@cincinnatistate.edu) – Chemistry Instructors at Cincinnati State Technical and Community College.

For assistance with the structure of the lesson plans, help with materials, or classroom management techniques as they relate to the lessons, please contact Teresa Null (teresa.null@gmail.com) – Middle School Educator.




**Lesson 3, Part 1**

# Availability of Clean Water

Student Activity Packet

Lesson 3
Part 1
Warm Up

Name _____

# Local Water Sources

**Challenge:** Understand the difficulties many people in the world face each day as they obtain water for drinking, cooking, and cleaning.

In many developing countries, water is not easily available. People often walk long distances (up to several miles) to get water from rivers, streams, or ponds. Sometimes the water carriers, usually women and girls, make several trips every day and carry as much as 40-50 pounds of water on each trip. Often the water they are carrying is not safe to drink. At the water source, people may be washing clothes, bathing, watering animals, and more. All of these activities make the water unsafe to drink.

Use the website: http://education.yahoo.com/ to find the meaning of the following words (use the dictionary link at the site) or use a class dictionary. Discuss within your team and write the definitions using your own words.

Access _____

_____

_____

Developed country _____

_____

_____

Developing country _____

_____

_____

Hygiene _____

_____

_____

Purify _____

_____

_____

Sewage _____

_____

_____


Lesson 3
Part 1
Activity

Name _____

# Water Haul

In this activity, you will experience the physical hardship involved in carrying all of the water that you and your family personally use each day from a distant site. You teacher will select two of your classmates to be water carriers. The water carriers will carry a large bucket of dirty water around the classroom or down a hallway (as directed by your teacher). The water carriers will then describe this experience.

Discuss the following questions within your teams, and write your answers individually.

1. Describe the experiences of the water carriers during the first 30 seconds of the activity.

   _____

2. Describe the experiences of the water carriers as they continued to carry the water. Did the activity become more difficult as time went on?

   _____

3. What did the water carriers find to be the most difficult part of their experience?

   _____

4. Imagine carrying a bucket twice as heavy. (The average size of water jugs carried in the developing world is 5.2 gallons or 20 liters.) How would this change have affected the experiences of your water carriers?

   _____

   _____

5. Imagine carrying the bucket 3.75 miles (or 6 km), which is the distance that many women and children in developing countries carry water each day. Your teacher will give you a local site one-half this distance from your school (a round-trip to this site would be 3.75 miles), so you have an idea of how far this distance is. How would this change have affected the experiences of your water carriers?

   _____

   _____

   _____

6. Imagine making several trips of 3.75 miles to collect enough water for your family's daily use. Would you be willing to do this?

   _____

   _____

   _____

Lesson 3
Part 1
Cool Down

Name _____

# Local Water Sources

Answer the following questions on your own using complete sentences.

1. How could you carry this water more easily?

_____

_____

_____

_____

_____

2. If the water supply in your community is turned off, where would you get water for your personal use?

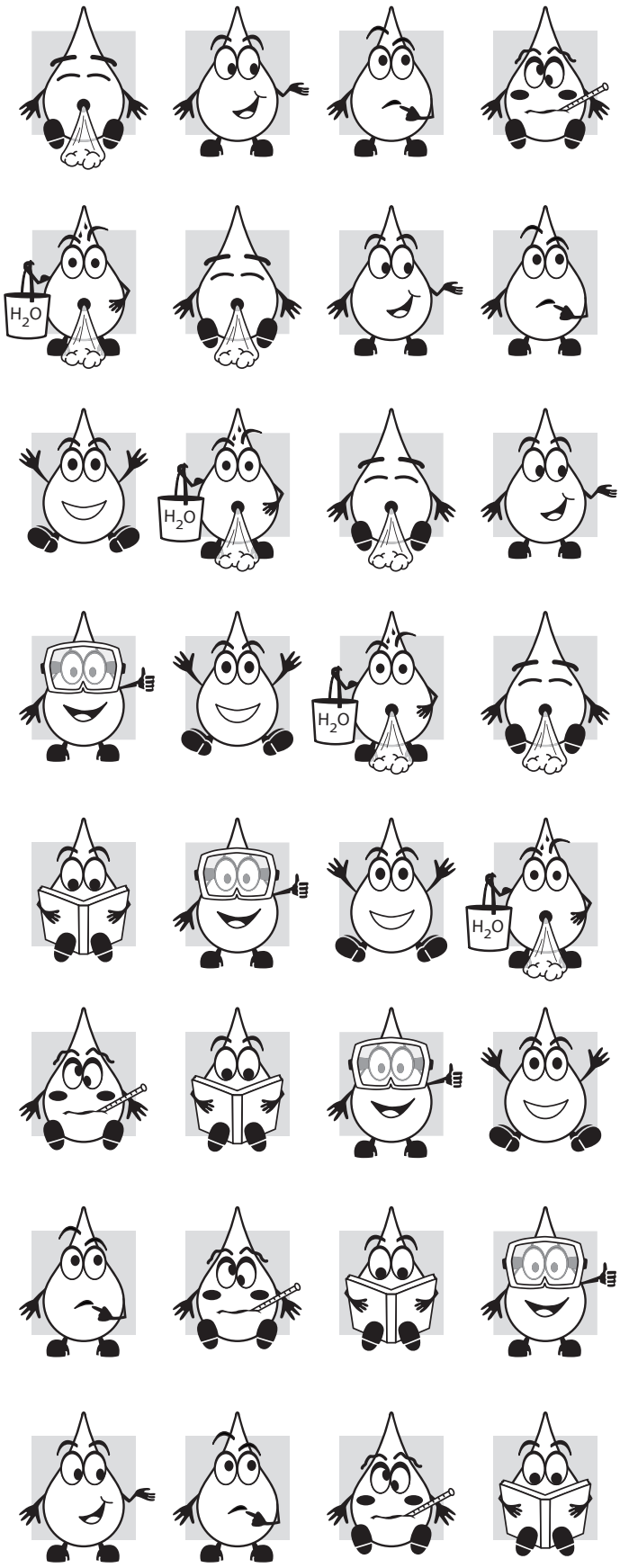
_____

_____

_____

_____

_____




**Lesson 3, Part 2**

# Availability of Clean Water

Student Activity Packet

Lesson 3
Part 2
Warm Up

Name _____

# Personal Water Use

**Challenge:** Determine how much water you personally use each day.

Discuss the following questions within your team, and write your answers on your own. Be sure to use complete sentences.

1. How many gallons of water were carried in the water haul activity in the first part of this lesson?

_____

_____

_____

_____

_____

2. After you get up in the morning, how long would it take you to use this amount of water? For example, consider the water you use to brush your teeth, make oatmeal for breakfast, flush the toilet, etc.

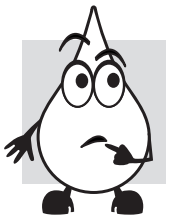
_____

_____

_____

_____

_____



Lesson 3
Part 2
Activity

Name _____

# Daily Personal Water Use

In this activity, you will calculate the amount of water you personally use during a 24-hour period.

A. Use the Daily Personal Water Use table (next page) and keep track of the number of times you perform each of the listed activities over a 24-hour period.

B. Complete the table by calculating the amount of water used for each activity and then total the amount of water used during one day.

C. You water total will be in gallons. Change this to liters (the volume measurement used by many other countries around the world) by multiplying by 3.8 (the number of liters in 1 gallon).

D. The minimum amount of water recommended per person per day in the developing world to cover drinking water, waste disposal, and daily hygiene (washing hands, bathing etc.) is 20 liters or 5.2 gallons. Discuss the following questions within your teams, and write your answers individually.

1. How did your personal water use for one day compare with this value?

_____

_____

2. How did the amount of water you drank compare with the amount you used for other purposes?

_____

_____

3. Are there ways you consumed water other than drinking that are not listed on the table?

_____

_____

4. How did the amount of water you used in one day compare with the values of your teammates?

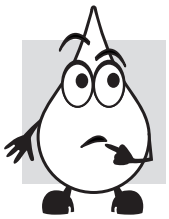
_____

_____

5. What water is used by your family for your benefit that you did not include in the above calculations?

_____

_____



Lesson 3
Part 2
Activity

Name _____

# Daily Personal Water Use Calculator

| Activity | # of times/day | | # of gallons/day** |
|---|---|---|---|
| **Drinking**<br>Glasses of water*<br>Cans of pop<br>Glasses of milk/juice | _____ | x | 0.1 gallon (0.38 liter) = _____ |
| **Washing hands** | _____ | x | 0.25 gallon (0.95 liter) = _____ |
| **Brushing teeth** | _____ | x | 1 gallon (3.8 liters) = _____ |
| **Flushing toilet**<br>(modern low-flow model) | _____ | x | 1.6 gallons (6 liters) = _____ |
| **Flushing toilet**<br>(older model) | _____ | x | 5 gallons (19 liters) = _____ |
| **Showering** | _____ | x | 30 gallons (114 liters) = _____ |
| **Bathing** | _____ | x | 40 gallons (152 liters) = _____ |
| **Washing dishes**<br>(by hand, water running) | _____ | x | 10 gallons (38 liters) = _____ |
| **Washing dishes**<br>(dishwashing machine) | _____ | x | 15 gallons (57 liters) = _____ |
| **Washing clothes**<br>(per load) | _____ | x | 30 gallons (114 liters) = _____ |
| TOTAL (in gallons): | | | _____ |
| (in liters): | | | _____ |

*Glasses and cans of drink are assumed to be 12 fluid ounces or approximately 0.1 gallon.
**Amounts of water used for each activity are estimates.

Data are taken from the National Geographic Society Geography Action! Rivers 2001 website: http://www.nationalgeographic.com/geographyaction/rivers/ax/PDF1_WaterTally.pdf.

Lesson 3
Part 2
Cool Down

Name _____

# Personal Water Use

Answer the following questions on your own using complete sentences.

1. If you had to carry to your house the amount of water you personally use every day and could only carry 5 gallons of water on each trip, how many trips would you have to make?

_____

_____

_____

_____

_____

2. If you had to carry this amount of water a distance of 3.75 miles, how would you reduce the amount you personally use each day?

_____

_____

_____

_____

_____