



GLOBAL WATER

Adapted from Project H2O,
<http://www.thirteen.org/h2o/educators.html>

Subject: Science, Geography

Grade Level: 3-5

Time Allotment: Three 45-minute class periods and three days out of class to conduct H2O Diary Survey

Not all drinking water comes from the same source. In this lesson, students will collect data on their household water use and calculate how many gallons of water a person uses per day. Students will learn how children in different parts of the world get their drinking water. They will then discover three methods for obtaining drinking water and evaluate the effectiveness of each method.

LEARNING OBJECTIVES

Students will be able to:

- Examine and calculate personal water use
- Collect data
- Estimate water use for one day, three days, one week, one month, and one year using mathematical equations
- Identify countries on a world map
- Analyze different methods for obtaining drinking water
- Assess the advantages and disadvantages of different methods of obtaining drinking water

MATERIALS

- Notebook
- Pen/pencil
- One large world map or individual world maps for each student

HANDOUTS (see pages 8-12)

- H2O Diary Survey
- H2O Diary Worksheet
- Global Stories
- Global Stories Worksheet

CONTENT STANDARDS

See pages 4-7 for Michigan GLCS met by this lesson.

BOOKMARK THE FOLLOWING WEBSITES:

Domestic Roofwater Harvesting Programme

<http://www.eng.warwick.ac.uk/DTU/rwh/index.html>

This site provides information on harvesting rainwater for domestic use in the poorest societies of the world.

Bergey WindPower

<http://www.bergey.com/>

Search this site for examples of wind-powered drinking water, irrigation, and electricity projects.

China Daily

http://www.chinadaily.com.cn/english/doc/2004-04/18/content_324209.htm

Read about China's decision to tap the Yangtze River as the main source for Shanghai's drinking water.

U.S. Environmental Protection Agency: Source Water Protection

<http://www.epa.gov/OGWDW/protect.html>

Learn about untreated source water and how to prevent drinking water contamination.

U.S. Environmental Protection Agency: Public Drinking Water Systems

<http://www.epa.gov/safewater/pws/index.html>

This site contains information about public drinking water systems and EPA drinking water standards.

U.S. Environmental Protection Agency: Private Wells

<http://www.epa.gov/OGWDW/privatewells/index2.html>

The information on this website will help answer questions about types of private drinking water wells, health risks, and guidelines for construction.

Food and Agriculture Organization of the United Nations

<http://www.fao.org/ag/agl/aglw/aquastat/main/index.stm>

The United Nation's global information system on agricultural water management across the world. Search by country, region, institution, or publication.

BUILDING BACKGROUND

Step 1

Ask for a student volunteer, but do not explain why to the class. Whisper to the student to pour a glass of water and take only a couple of swallows and then announce out loud, "I'm finished."

When the student finishes, ask the class what the students should do with the unwanted water.

If there is a sink, ask another student to wash his or her hands in front of the class. Ask

the class whether they leave the water running when they wash their hands, brush their teeth, or do the dishes. Have students estimate how often they do this.

Use the class's comments as talking points for a discussion on water usage.

Step 2

Pass out H2O Diary Survey. Have students take the form home and complete the survey for three days.

LEARNING ACTIVITY 1

In this activity, students will monitor their household use of water and calculate how many gallons of water one person uses each day for three days.

Step 1

Have students to take out their completed H2O Diaries.

Ask students if they had any interesting observations of their household water use or comments about the survey.

Step 2

Pass out the H2O Diary Worksheet. Students complete the worksheet in class.

Discuss results of the H2O Diary Worksheet. Brainstorm where drinking water comes from.

LEARNING ACTIVITY 2

In this activity, students will read personal accounts from three children from Sri Lanka, Morocco, and China. They will then use reading comprehension and geography skills to establish what methods are used to obtain drinking water around the world.

Step 1

Tell students that drinking water is obtained by using one of three methods: from a lake or reservoir, from a well in the ground, or by collecting rainwater.

Explain that they will be learning about all three methods from three children around the world.

Pass out Global Stories handout.

Read each Global Story and complete the Global Stories worksheet.

Step 2

As a class or in groups, locate each region on the map and discuss the three methods for obtaining drinking water.

CONCLUSION

Step 1

In pairs, students complete the final section of the Global Story Worksheet, filling in their region's climate and water obtaining methods.

Step 2

Class discusses how they get their drinking water

- Talk specifically about your local region and whether the water is from aqueducts, rivers, lakes, reservoirs, wells, or rainwater collection.
- What are some advantages and disadvantages of these methods?

EXTENSION ACTIVITIES

Students choose another region in the world to research. Research the village and water method and prepare visual presentations about what they learned.

Students write opinion essays about what method of obtaining drinking water they think is best and why.

Students draw pictures demonstrating different ways to obtain drinking water and display them as a class quilt or mural.

MICHIGAN CONTENT STANDARDS

Third Grade

Science GLCS:

- S.IP.03.11** Make purposeful observation of the natural world using the appropriate senses.
- S.IP.03.12** Generate questions based on observations.
- S.IP.03.13** Plan and conduct simple and fair investigations.
- S.IP.03.16** Construct simple charts and graphs from data and observations.
- S.IA.03.12** Share ideas about science through purposeful conversation in collaborative groups.
- S.IA.03.13** Communicate and present findings of observations and investigations.
- S.IA.03.13** Communicate and present findings of observations and investigations.
- S.IA.03.14** Develop research strategies and skills for information gathering and problem solving.
- S.RS.03.11** Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
- E.ES.03.41** Identify natural resources (metals, fuels, fresh water, farmland, and forests).
- E.ES.03.42** Classify renewable (fresh water, farmland, forests) and non-renewable (fuels, metals) resources.
- E.ES.03.43** Describe ways humans are protecting, extending, and restoring resources (recycle, reuse, reduce, renewal).

E.ES.03.51 Describe ways humans are dependent on the natural environment (forests, water, clean air, earth materials) and constructed environments (homes, neighborhoods, shopping malls, factories, and industry).

E.ES.03.52 Describe helpful or harmful effects of humans on the environment (garbage, habitat destruction, land management, renewable and non-renewable resources).

Social Studies GLCS:

3 – G5.0.1 Locate natural resources in Michigan and explain the consequences of their use.

3 – G5.0.2 Describe how people adapt to, use, and modify the natural resources of Michigan. (H)

3 – P3.1.1 Identify public issues in Michigan that influence the daily lives of its citizens.

3 – P4.2.1 Develop and implement an action plan and know how, when, and where to address or inform others about a public issue.

English Language Arts:

R.CM.03.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

S.CN.03.01 use common grammatical structures correctly when speaking including time relationships, verb tenses, and causal and temporal relationships.

S.CN.03.02 adjust their use of language to communicate effectively with a variety of audiences and for different purposes including gathering information, making requests, discussing, classroom presentations, and playground interactions.

S.S.DS.03.01 engage in interactive, extended discourse to socially construct meaning in book clubs, literature circles, partnerships, or other conversation protocols.

S.DS.03.04 plan and deliver presentations using an effective informational organizational pattern (e.g., descriptive, problem/solution, cause/effect) supportive facts and details reflecting a variety of sources; and varying the pace for effect.

L.CN.03.02 listen to or view knowledgeably while demonstrating appropriate social skills of audience behaviors (e.g., eye contact, attentive, supportive) in small and large group settings.

Mathematics:

N.FL.03.06 *Add and subtract fluently two numbers through 999 with regrouping and through 9,999 without regrouping.**

N.FL.03.07 Estimate the sum and difference of two numbers with three digits (sums up to 1,000), and judge reasonableness of estimates.

N.FL.03.08 Use mental strategies to fluently add and subtract two-digit numbers.

N.MR.03.10 *Recognize situations that can be solved using multiplication and division including finding “How many groups?” and “How many in a group?” and write mathematical statements to represent those situations.**

Fourth Grade

Science GLCS:

S.IP.04.11 Make purposeful observation of the natural world using the appropriate senses.

S.IP.04.12 Generate questions based on observations.

S.IP.04.13 Plan and conduct simple and fair investigations.

S.IP.04.16 Construct simple charts and graphs from data and observations.

S.IA.04.11 Summarize information from charts and graphs to answer scientific questions.

S.IA.04.12 Share ideas about science through purposeful conversation in collaborative groups.

S.IA.04.13 Communicate and present findings of observations and investigations.

S.IA.04.14 Develop research strategies and skills for information gathering and problem solving.

S.RS.04.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.

S.RS.04.18 Describe the effect humans and other organisms have on the balance of the natural world.

Social Studies GLCS:

4 – G1.0.3 Identify and describe the characteristics and purposes (e.g., measure distance, determine relative location, classify a region) of a variety of geographic tools and technologies (e.g., globe, map, satellite image)

4 – P3.1.1 Identify public issues in Michigan that influence the daily lives of its citizens.

4 – P3.1.2 Use graphic data and other sources to analyze information about a public issue in the United States and evaluate alternative resolutions.

English Language Arts:

R.CM.04.02 retell through concise summarization grade-level narrative and informational text.

R.CM.04.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

S.S.DS.04.01 engage in interactive, extended discourse to socially construct meaning in book clubs, literature circles, partnerships, or other conversation protocols.

S.DS.04.04 plan and deliver presentations using an effective informational organizational pattern (e.g., descriptive, problem/solution, cause/effect) supportive facts and details reflecting a variety of sources; and varying the pace for effect.

L.CN.03.02 listen to or view knowledgeably while demonstrating appropriate social skills of audience behaviors (e.g., eye contact, attentive, supportive) in small and large group settings.

Mathematics:

N.FL.04.08 Add and subtract whole numbers fluently.

N.FL.04.10 Multiply fluently any whole number by a one-digit number and a three-digit number by a two-digit number; for a two-digit by one-digit multiplication use distributive property to develop meaning for the algorithm.

*N.MR.04.14 Solve contextual problems involving whole number multiplication and division.**

N.FL.04.34 Estimate the answers to calculations involving addition, subtraction, or multiplication.

N.FL.04.35 Know when approximation is appropriate and use it to check the reasonableness of answers; be familiar with common place-value errors in calculations.

N.FL.04.36 Make appropriate estimations and calculations fluently with whole numbers using mental math strategies.

M.TE.04.05 Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations).

Fifth Grade

Science GLCS:

S.IP.05.11 Generate scientific questions based on observations, investigations, and research.

S.IP.05.12 Design and conduct scientific investigations.

S.IP.05.13 Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens) appropriate to scientific investigations.

S.IP.05.14 Use metric measurement devices in an investigation.

S.IP.05.15 Construct charts and graphs from data and observations.

S.IP.05.16 Identify patterns in data.

S.RS.05.15 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.

S.RS.05.17 Describe the effect humans and other organisms have on the balance in the natural world.

Social Studies GLCS:

English Language Arts:

R.CM.05.02 retell through concise summarization grade-level narrative and informational text.

R.CM.05.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

S.S.DS.05.01 engage in interactive, extended discourse to socially construct meaning in book clubs, literature circles, partnerships, or other conversation protocols.

S.DS.05.04 plan and deliver persuasive presentations or reports using an informational organizational pattern for a specific purpose (e.g., to persuade, describe, inform) that conveys and supports the point they want to make, while varying voice modulation, volume, and pace of speech to emphasize meaning.

Mathematics:

N.FL.05.04 Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors such as not accounting for place value.

*N.FL.05.05 Solve applied problems involving multiplication and division of whole numbers.**

M.UN.05.01 Recognize the equivalence of 1 liter, 1,000 ml and 1,000 cm³ and include conversions among liters, milliliters, and cubic centimeters.

D.AN.05.03 Given a set of data, find and interpret the mean (using the concept of fair share) and mode.

D.AN.05.04 Solve multi-step problems involving means.

Name: _____ Date: _____

H2O Diary Survey

Question: How many gallons of water does the average person use per day?

Number of Adults in Household: _____

Number of Children in Household: _____

For three days, put a mark in the proper row each time someone in your household uses water.

Type of Water Use	Number of Times
Taking a bath	
Taking a shower	
Flushing a toilet	
Washing face or hands	
Brushing teeth	
Washing clothes	
Washing dishes	
Drinking water (includes coffee and tea)	
Others	

Name: _____

Date: _____

H2O Diary Worksheet

Activity	Average Amount (gallons)	Number of Times	Total Use in gallons (average amount multiplied by number of times)
Taking a bath	25		
Taking a shower	30		
Flushing a toilet	5		
Washing face or hands	2		
Brushing teeth	1		
Washing clothes	40		
Washing dishes	35		
Drinking water (includes coffee and tea)	0.25		
Others			

Water Use Per Person

Use the equations below to calculate the gallons of water each person in used in your household per day, three days, week, month, and year.

Three Day Estimate: _____gallons (Three day total use/people in household)

One Day Estimate: _____gallons (Three day per person estimate / 3)

One Week Estimate: _____gallons (One day estimate * 7)

One Month Estimate: _____gallons (One week estimate * 4)

One Year Estimate: _____gallons (One month estimate * 12)

Where does your household water come from before it gets to your tap?

Name: _____ Date: _____

Global Stories

Hi, My name is Sanuthi and I live in the city of Udhamulla in Southwestern Sri Lanka. Udhamulla has a population of 367,123 people. Sri Lanka has a tropical climate, which means that it is always very, very hot and humid. It rains almost all the time from June to October. This period is called a tropical monsoon season. Because it rains and rains fresh water for months, my family and many others in Udhamulla use our home's roof to collect rainwater. The rainwater runs off our roof into big square wooden tanks. We use the water in our rainwater tank to drink, cook, and even wash our dishes.

Hello. I am Najet. I come from a small village called Ain Tolba in Northeast Morocco. Northeastern Morocco is a desert climate and there are very few supplies for water. When I was very young we had to walk 2.5 miles to get to the nearest drinking water. While there is very little water above ground, there is a fresh water spring running deep below the soil. Last year, my village dug a well that reached down into the spring. We use a wind pump system that spins (as long as the wind is blowing, which is often) and moves the spring water up the well and into a large tank in the middle of the village. Instead of walking many miles, my friends and I now go to the water tank and collect fresh spring water in jugs. We bring them home for our whole families to use. Sometimes I have to go fetch water two or three times a day.

It's very nice to meet you. My name is Ling and I live in an apartment in Shanghai. It is a huge city on the east coast of China. There are more than eight million people living in Shanghai and all of us need to use water for washing our clothes, showering, drinking, and cooking food. The people of Shanghai use more than 238 million gallons of tap water per day. All this water originated in the Yangtze River, the third longest river in the world. The river water flows into a huge reservoir and then pipelines send the water to places called treatment plants made of concrete. If I drank water straight from the Yangtze River it would make me very sick because the water is very dirty. But, at the treatment plants, the water is filtered and cleaned and then sent through more pipes right into the faucets in my apartment.

Name: _____ Date: _____

Global Stories Worksheet

Sanuthi

Where does Sanuthi live? _____

What is the climate of this country? _____

What method does Sanuthi use to obtain drinking water?

What are some benefits of this method?

What are some disadvantages of this method?

Najet

Where does Najet live? _____

What is the climate of this country? _____

What method does Najet use to obtain drinking water?

What are some benefits of this method?

What are some disadvantages of this method?

Ling

Where does Ling live? _____

How many people live in Ling's city? _____

What method does Ling use to obtain drinking water?

What are some benefits of this method?

What are some disadvantages of this method?

_____ **(Put your name here)**

Where do you live? _____

What is the climate of this region of the country?

What method does you use to obtain drinking water?

What are some benefits of this method?

What are some disadvantages of this method?
