Student Home Water Conservation Audit

Teacher Instructions

CASCADE WATER ALLIANCE

Water for Today…

And Tomorrow

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SUMMARY

Students will independently audit the water used where they live. The data collected will be entered into a water use calculator where students can assess the potential for water, energy, and CO2 Equivalent (a greenhouse gas) savings.

LEARNING OBJECTIVES

Students will be able to:

- Collect data on the water consumed where they live, and calculate the potential savings if selected water conserving measures are taken.
- Use tools such as a water flow rate bag to measure water volume, dye test strips to check toilets for leaks, an excel spreadsheet to calculate water, energy and greenhouse gas potential savings.

RATIONALE

Students will collect real world data to contribute to classroom data that will demonstrate the benefits of water conservation. Through the audit students will learn what actions they can take and how those actions benefit the environment around them through quantifiable data.

"Don't ask kids what they want to be when they grow up but what problems do you want to solve. This changes the conversation from who do I want for, to what do I need to learn to be able to do that."

Jaime Casap, Google Global Education Evangelist

Grade Level:
6-12

Subjects:
Science, Social Studies, Math, and School Green Teams

Time Requirements:
3 class periods plus time between for students to complete the home audit

Safety:
Students will be asked to inspect their toilets for leaks. It is strongly suggested that they get help from an adult with this. The toilet lids area heavy and fragile.

Students who live in multi-housing units (apartments, condos, multifamily residences) where students are presented with the opportunity to discuss water saving opportunities with the landlord or residence manager. If the student has reservations about this for any reason, skip this portion of the course work.

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MATERIALS

- Student home conservation audit worksheet[1]
- Student home conservation audit analysis worksheet[2]
- Conservation calculator[3]
- Sample water bills PowerPoint[4]
- Outdoor Best Practices Handout
- Indoor Best Practices Handout
- Glossary of Terms[5]
- Pledge Card[6]
- Home water audit kit[7]

BACKGROUND FOR TEACHERS

Water conservation is the reduction or elimination of unnecessary water use or waste. Water conservation can include new technologies, such as low flow toilets, or behavior changes, such as taking shorter showers.

The choices we make in terms of water use have financial and environmental impacts. Reducing the amount of water we use can save families and communities money. Any water we use that is heated needs energy to heat it. Depending on the energy source this can release greenhouse gases into the atmosphere that contribute to climate change. Greenhouse gases that are released from combustion of fossil fuels include carbon dioxide, methane, and nitrous oxide. In this unit, a greenhouse gas equivalent is used (CO_{2e}) to put all three into an equivalent of pounds of CO_2.

Cascade Water Alliance (Cascade) provides the water to the City in which you teach. Overall Cascade provides water to approximately 350,000 homes and 20,000 businesses over seven eastside cities. Cascade is dedicated to water sustainability and one of the most effective ways to encourage and support these efforts is through education. Cascade has provided the resources to develop and implement this water resource sustainability tool designed for educators and students.

Cascade Water Alliance provides water to the following cities:

Kirkland
Issaquah
Sammamish
Redmond
Skyway
Bellevue
Tukwila

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[1] Provided as a separate but complete document. When you order the supplies for the audit, you will also order the printed copies of the audit worksheet. The audit instructions and data collection materials can be found at http://www.sustainabilityambassadors.org/home-water-audit.

[2] Provided as a separate but complete document. When you order the supplies for the audit, you will also order the printed copies of the audit worksheet. The audit instructions and data collection materials can be found at http://www.sustainabilityambassadors.org/home-water-audit.

[3] Provided as a separate tool and is located at http://www.sustainabilityambassadors.org/home-water-audit Can be used by each individual student or as a classroom.

[4] Sample water bills along with a tutorial water bill has been provided and is located at http://www.sustainabilityambassadors.org/home-water-audit. The sample water bill is an actual bill from the utility. The tutorial water bill outlines how to find information including how much water is used, what units the water is reported in (gallons, cubic feet, or one-hundred cubic feet), and how often the water bill is sent to the customer.

[5] A master Glossary of Terms can be found at http://www.sustainabilityambassadors.org/home-water-audit. It is up to the teacher how this is best used.

[6] Students can choose to participate in sharing their water sustainability efforts. By doing so their will receive a free water bottle from Cascade Water Alliance (their water supplier).

[7] **MUST BE ORDERED 2 WEEKS PRIOR TO STARTING THIS MODULE.** Ordering instructions are included as part of these instructions and a kit must be ordered for each of your students participating in this student home water audit.

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PRE-AUDIT INSTRUCTIONS

Cascadewater.org. Order your Water Audit Kits from Cascade Water Alliance. E-mail or call Mike Brent at least **2 weeks in advance** of starting the unit.
Include the following information:

- ✓ Your name
- ✓ Name and address of your school
- ✓ Number of students participating in the Student Home Water Audit

Mike Brent, Water Resource Manager
Cascade Water Alliance
Phone: 425.453.1810
E-mail: mbrent@cascadewater.org

When you order your supplies order one of the following for each of your students:

- water flow testing bag
- dye strip for each student
- home water audit student worksheet and instructions (to be used at home)
- home conservation audit analysis (to be used with excel spreadsheet)
- pledge cards
- water bottles (for students who complete the pledge card)
- outdoor and indoor water conservation best management practices

2. Familiarize yourself with the Conservation Calculator Excel spreadsheet that will be used to tabulate the data collected during this audit. The Conservation Calculator spreadsheet can be found at the Cascade Water Alliance website under Classroom Resources.

3. Review student home conservation audit worksheet and student conservation audit analysis worksheet and the additional resources available.

4. Review the sample and tutorial water bills with students. Students will be asked to input water bill information onto their student home water audit and data collection worksheet.

This lesson assumes students have prior knowledge of the water cycle and climate change.

{15 min} Show this short PBS video on Home Water

DAY 1 AUDIT PREPARATIONS

Use http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.conserve/conserving-water-at-home/

Lead a class discussion about how humans use water. Potential questions include:

- How many ways do you use water at home?
- What appliances can you can think of in your home that use water?
- How much water do you think your faucet uses every minute? What about your shower? Your sprinklers?
- How long do you think each of these appliances are left running every day?
- Overall, how much water do you estimate your house uses every day?
- How many ways do you use water at school?

Share with students that the average American uses 60 gallons of water a day. Have students think-pair-share about why we might want to reduce the amount of water we use. Potential answers include to save energy and money, because there might be a limited amount of water, and to reduce our impact on the ecosystem.
{5min} Show this short National Geographic Video on why we should care about water

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http://video.nationalgeographic.com/video/env-freshwater-whycare

{20 min} Explain to students that they will be conducting a water audit of where they live. Hand out the Student Water Conservation Audit Worksheet. Walk students through all the different types of data they will be collecting. Read the directions to students stopping to show them the different tools they will be using such as the dye stripes and the water flow bags.

Make sure to highlight for students the safety issues and that they will need the help of an adult for many of the steps.

(10 min} Show students the section of the worksheet where they will need to use a water bill.

Note for students who live in apartments, condos, subleased housing, public assistance housing, etc. a water bill may not be available. There is an option in the conservation calculator to calculate approximate water use based on the number of people that reside where they live. To find that open the "Start Here" tab and click on the "Water Bill Not Available Calculate Water Use" button.

Review the sample and tutorial water bills PowerPoint with students. Have a class discussion about the water bills. Potential questions include:

Question: When you compare water bills from different cities, which one is easiest to read?

Sample Answer: The Kirkland water bill seems the easiest to read and includes the most information. It is includes a conversion factor so you can calculate water use from cubic feet to gallons and the exact current and prior dates the meter was read.

Question: What suggestions would you make to improve the readability of your water bill?

Sample Answers:

1. Convert water units to gallons, a unit that is more common to most people.

2. Include a price per gallon or details on how much the water actually costs.

3. Develop a standard bill format so the bills include the same information regardless of where you live.

Question: How does the City or water utility know how much water you use?

Answer: There is a water meter near the street in the front of where you live or just outside your neighborhood depending on where you live. The water district sends personnel out to read those meters every other month. The information that is read off the water meter is used to generate the water bill.

(5 min) At the end of class hand out the water flow bags and dye stripes to students.

(10 min) Project the conservation calculator so all

DAY 2-3 DATA ANALYSIS and TAKING ACTION

students can see it. Hand out the Student Audit Analysis Worksheet. Walk the students through the calculator showing them what data they will be entering.

- Open the conservation calculator tool.
- It is recommended that you start on the "Start Here" tab.
- From the "Start Here" tab go to the "Water" tab.
- The information entered on the "Water" tab will automatically populate the "Energy" and "CO_2 Equivalent" tabs.

(20 min) Students will then enter their data into the calculator. The conservation calculator tool can be used by each individual student, a group

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of student, or by an entire classroom. This is up to the teacher's discretion.

(30 min) Students will take their data from the calculator and enter it on their Data Analysis Worksheet. Students will then finish answering the questions on their worksheet which will help them analyze the data and reflect on what they found.

(15 min) Have students share their data and what they found for where they live. Potential discussion questions include:

- What was the greatest water saving potential where you live?
- What were you the most surprised about?
- What could you change to conserve water where you live?

{10 min} Review Best Management Practices (BMP) for Indoor and Outdoor water use. Discuss what a Best Management Practice is. Review BMPs. Ask students what BMPs they practice. Brainstorm other ideas to conserve water or how they conserve water at their home.

(10 min) Have students choose one change they want to make where they live. Have students report out how much water that would save and how much greenhouse gasses it would save. Tally up the class totals so all students can see how if everyone made one small change what a big difference it could make.

(10 min) Cascade Water Alliance will help students by providing efficient showerheads, efficient bathroom and kitchen aerators, as well as shower timers. Talley up the number of efficient low flow showerheads, efficient low flow bathroom and kitchen aerators, as well as shower timers students would like to order.
To order these supplies contact:

Mike Brent, Water Resource Manager
Cascade Water Alliance
Phone: 425.453.1810
E-mail: mbrent@cascadewater.org

Mike Brent will need the following information

- ✓ Your name and classroom information
- ✓ Name and address of your school
- ✓ Total number of low flow showerheads needed
- ✓ Total number of efficient low flow bathroom and kitchen aerators needed
- ✓ Total number of shower timers needed

(5 min) Explain to students that when the devices arrive they will take the new devices home and help install them. They are then encouraged to recycle the old devices either at home or at school. Collection bins will be provided for the old showerheads, and faucet aerators.

(10 min) Hand out the pledge cards. Explain to students pledge card can be mailed in for a free reusable water bottle from Cascade Water Alliance OR you can order water bottles from Mike Brent at Cascade for each of your students that completes the pledge card. Create a pledge wall in your classroom or school. Take a picture and post to the weneedwaterbecasue.org website.

IMPACT! DAY 4 & BEYOND

1. Distribute the supplies the students ordered for their home.

2. Distribute water bottles to those who opted to participate in the water conservation pledge.

3. Have students complete the google form on the changes made in their home (INSERT URL to LINK).

4. Post the pledge cards in your classroom or school.

5. Report to stakeholders on the impact of this project.

ADVANCED LEARNING OPPORTUNITIES

Math extension: Have students create graphs and charts of the class data to see where the greatest water use and potential for savings is in their community. Charts and graphs will automatically populate once the data is entered from the individual tabs in the Conservation Calculator. Populate the individual tabs, then click on the "Charts and Graphs" tab.

Social Studies: Complete the Stakeholders in the Water System lesson found at the Cascade Water Alliance website under Classroom Resources.

Science extension: Use the Advanced Tab in the Conservation Calculator for a more in depth look at potential water and energy savings.

Global extension: Have students post pictures on the "We Need Water Because" Water Wall located at http://weneedwaterbecause.org/ Students could post an editorial or pictures of them fulfilling their pledge such as changing out a showerhead or faucet aerator.

TEACHER RESOURCES

Videos:

1. "The Source: A Story about Seattle's Tap Water."

https://vimeo.com/102183292
A 29 minute video on the background of Seattle's drinking water, including history, engineering, and chemistry.

2. Water Symposium Videos

http://www.sustainabilityambassadors.org/apps/videos/channels/show/4243207-water-systems
"Empower youth to catalyze community sustainability"
A series of success stories studied and prepared by young, talented, and focus driven sustainability ambassadors.

Websites:

1. Cascade Water Alliance
http://cascadewater.org
Cascade's mission is to provide water supply to meet current and future needs of our members in a cost-effective and environmentally responsible manner through partnerships, conservations, acquiring, constructing, and managing water supply infrastructure and fostering regional water planning.

2. We Need Water Because…
http://weneedwaterbecause.org/
How would *you* complete that sentence? Join this unique conversational project about how we all value our region's water. Share. Post. Tag.

3. EPA Water Sense Program
http://www3.epa.gov/watersense/about_us/index.html
Background information on EPA's Water Sense Program. WaterSense helps people save water with a product label and tips for saving water indoors and out.

4. EPA Water Sense Fix a Leak Week (March)
http://www3.epa.gov/watersense/our_water/fix_a_leak.html
Are you ready to chase down leaks? Household leaks can waste more than 1 trillion gallons of water annually nationwide, so each year we hunt down the drips during Fix a Leak Week.

5. EPA WaterSense – About Our Water
http://www3.epa.gov/watersense/our_water/tomorrow_beyond.html
Background information about what use in the United States.

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APPLICABLE LEARNING STANDARDS

High School NGSS Standards:

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HW-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Middle School NGSS Standards:

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.