

CLASSROOM ACTIVITY

Water Waste Awareness Apps

OBJECTIVES

Students will be able to:

- **Discover** where we are using water and that we are using more water in our daily lives than we would expect.
- **Calculate** the estimated daily water usage for personal, class, school, community, and national use.
- **Create** a prototype of an app that could be used by students to track water use, encourage water conservation, and connect students to the idea that water conservation is important for everyone.

OVERVIEW

In this teacher-led activity, the driving question for students is “how could data, design, and technology help to monitor and improve water use and conservation by individuals and communities?” Students will begin by taking a survey about their water use throughout a typical day in their life and estimate the amount of water that is used by their actions and habits. (For example, they will be given information from the EPA that one toilet flush uses 1.6 gallons of water on average.) They will then work together and use population data to calculate and estimate the amount of water used in their class, school, community, and state in a single day. Using this information, students will be asked to work in pairs or small groups to create a prototype of an app that people could download onto their phone to record and monitor the water that they use, give tips on how to reduce water consumption, and track and reward them for improved conservation and decreases in water waste.

NATIONAL STANDARDS

Science

[Next Generation Science Standards](#)

- **MS-ETS1-3 Engineering Design**
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS-ETS1-4 Engineering Design**
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

BACKGROUND INFO

Water is essential to life, and without water, there is no life. Water is used in countless ways, not just to drink, cook, shower, or wash our clothes. Water is used in areas you may not even think of, such as

manufacturing, agriculture, and even producing electricity. Yet, with all this water use, only 1% of the water on earth is available for human use! We don't often think about all the ways we are using water, but it is important for our local and global community to understand that conservation of water is essential for a sustainable future. Simple things like taking shorter showers, fixing leaky faucets, and collecting rainwater can make a big difference when a whole community participates in conservation. While this may seem like a faraway problem, cities in the U.S. are now facing record breaking droughts and water shortages and are mandated to limit the water they use to water their plants and use in their homes. Without action now, the water crisis will only become greater, but with many small actions, a major increase in water conservation can be achieved.

MATERIALS

- White boards (1 per pair of students)
- Dry erase markers (1 per pair of students)
- Student Water Use Calculations Student Sheet (1 per student)
- Calculator or access to an online calculator
- Water Conservation App Planning and Prototyping Student Sheet
- Devices with internet access (student laptops or iPads)
- Markers and colored pencils

PROCEDURE

1. The teacher should introduce the lesson by asking students to think about how and where they use water on an average day. Ask students to pair up with a student sitting next to them and give each pair a whiteboard and a dry erase marker. (If whiteboards are not available, students may use a blank piece of paper and a marker.)
2. Ask students to draw a large circle in the middle of the paper. Next, ask students to take five minutes to discuss their daily water use and create a pie chart that categorizes how or where they use water daily and draw each piece of the pie to represent the percent (out of 100) that category is of their total water use daily.
3. When students are finished, give pairs a chance to share their pie chart with the class. Students may give feedback on how they agree or disagree with each chart. Next, display the pie chart from "How Much Water Do We Use?" (from the EPA's [How We Use Water](#)) on the overhead screen for students to view. Ask students to compare their charts with the chart on the screen and discuss their reactions with the whole group.
4. Next, explain to students that they will look more closely at the amount of water they use each day from these categories in the pie chart by taking a survey. Ask students to go to the "How Much Water Do We Use at Home?" survey on their devices. Show the following website <https://water.usgs.gov/edu/activity-percapita.html> and give students time to take the survey individually.
5. When students have finished, divide them into groups of 3–4. Give each student a copy of the Student Water Use Calculations Sheet. (Students will need calculators for this activity, which the instructor can provide, or students can use calculator apps and websites on their devices.) Ask groups to work

together to complete the calculations for the average daily student water use all the way to the national student daily water use.

6. When all groups have finished, ask groups to share out their final numbers for the state and national estimated number of gallons of water used per day. Ask students to share their reactions to these numbers. Students will likely be surprised at this amount. Remind students that this estimated amount only accounts for the gallons used by student-aged people, and only this age group from the United States, not globally. Share with students that the U.S. averages a water footprint more than double the average from around the world.
7. Next, ask students to think about why water use is something that we should be conscious of and why water conservation is important. Pose the question—is water an unlimited resource? Will we ever run out of water to use for our everyday life?
8. Show the video [“How Much Water Do We Really Use Everyday?”](#) on the overhead screen for students. Ask students to share their reactions to the video. Note that at the end of the video, it was predicted that there will be water shortages in 36 states by 2023. Display the digital article [“As the climate dries the American west faces power and water shortages, experts warn”](#) from August of 2022 on the overhead screen next. Read through or summarize the article for students.
9. Tell students that now that they have learned more about how water is used in the U.S. and the importance of water conservation, they will work with a partner to create a prototype app that could be used by students to learn about, track, and reward their own water use and conservation.
10. Give each pair a copy of the “Water Conservation App Planning and Prototyping Sheet.”
11. Explain that students should use their devices to research ways that students can conserve water in their daily lives. (Taking shorter showers, turning off the water when they brush their teeth, using a reusable bottle instead of plastic ones, etc.)
12. As they research, students should work together to complete the sections in the planning and prototyping sheet, including sketching the way their app will look and devising ways students can be rewarded for logging ways that they conserved water that day through a social network of users or gaining points to buy digital prizes.
13. Students should use markers or colored pencils to finalize and polish the app screen designs in their prototype and complete the reflection at the end of the sheet.

EXTENSION

As an extension of this lesson, students can use their paper storyboard and create a promotional marketing campaign for their app. This could include slideshows, videos, or presentations that will introduce the app user to the app’s mission, how the app will be used, and why the user should download the app and interact with it. Student pairs can then present their app marketing campaigns to the class for feedback and additional ideas.

Directions: After you have taken the “How Much Water Do You Use At Home?” survey online, record your estimated water use in the table below. Link to the “How Much Water Do You Use At Home?” survey: <https://water.usgs.gov/edu/activity-percapita.html>

TABLE 1: AVERAGE DAILY WATER USE—Per Student

Group Member	Estimated # of gallons of water use per day
<i>Add the estimated # of gallons for the group and divide by the number of group members</i>	
Average:	

TABLE 2: TOTAL DAILY WATER USE—Per Student

Group	Average # of gallons of water use per day
1	
2	
3	
4	
5	
6	
7	
8	
Total Amount of Water used in one day by this class:	

TABLE 3: TOTAL DAILY WATER USE—Per School

Estimated number of students in your school	Average # of gallons of water use per day per student
<i>Multiply to find the number of gallons used by your school population each day.</i>	
Total gallons used by the school population per day:	

Next, we will look at the water usage by students in your town/city, state, and in the U.S.!

Go to the U.S Census Bureau website’s quickfacts webpage: <https://www.census.gov/quickfacts/>

- Type in your town or city name and click search.
- Find the most recent population estimate for your city/town.
- Next, find the percent of the population that is 18 and under. (This represents people that are of student-age, 5–17 years old.)
- Take the TOWN/CITY POPULATION TOTAL multiplied by the PERCENT (write it as a decimal). This will give you the population ages 5–17.
- Enter this number into TABLE 4 below:

TABLE 4: DAILY WATER USE by Students in My Town or City.

City/town student population (ages 5–17)	Average # of gallons of water use per day per student (from Table 1)
<i>Multiply to find the number of gallons used by students in your city/town each day.</i>	
Total gallons used by students in my city per day:	

NEXT, on the U.S Census Bureau website’s quick facts webpage, type in your state and click search.

- Find the most recent population estimate for your state.
- Next, find the percent of the population in your state that is 18 and under. (This represents people that are of student-age, 5–17 years old.)
- Take the STATE POPULATION TOTAL multiplied by the PERCENT (write it as a decimal). This will give you the population ages 5–17.
- Enter this number into TABLE 5 below:

TABLE 5: DAILY WATER USE by students in my state

State student population (ages 5–17)	Average # of gallons of water use per day per student (from Table 1)
<i>Multiply to find the number of gallons used by students in your state each day</i>	
Total gallons used by students in my state per day:	

FINALLY, type in the United States and click search.

- Find the most recent population estimate for the U.S.
- Next, find the percent of the population that is 18 and under.
- Take the U.S. POPULATION TOTAL multiplied by the PERCENT (write it as a decimal). This will give you the population ages 5–17.
- Enter this number into TABLE 6 below:

TABLE 6: DAILY WATER USE by students in the U.S.

State student population (ages 5–17)	Average # of gallons of water use per day per student (from Table 1)
<i>Multiply to find the number of gallons used by students in the U.S. each day.</i>	
Total gallons used by students in my state per day:	

Who would you like to use and connect with your app? What is the age group and demographic of your intended user?

Brainstorm 2–3 ideas of the type of app that would be interesting or enjoyed by people in your demographic. You may use existing apps as a model. Your app should have both information and links, a way to report data, and a way to connect with other users.

Narrow down your ideas from your brainstorming to just one. Which is your favorite?

State the goal or mission of your app in 2–3 sentences.

What exactly will the app do?

How will users get information about water conservation?

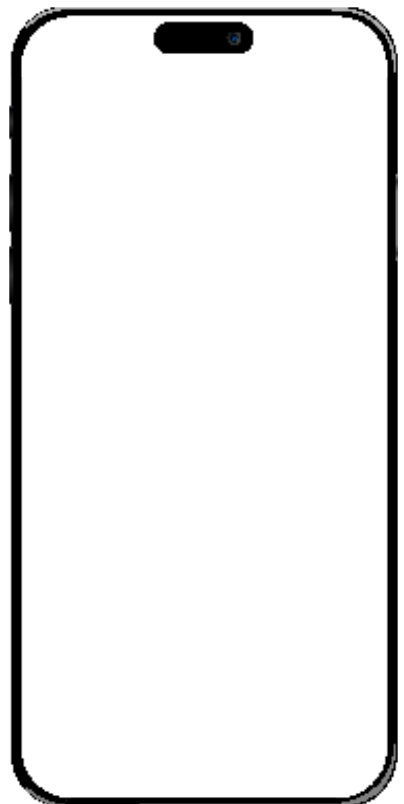
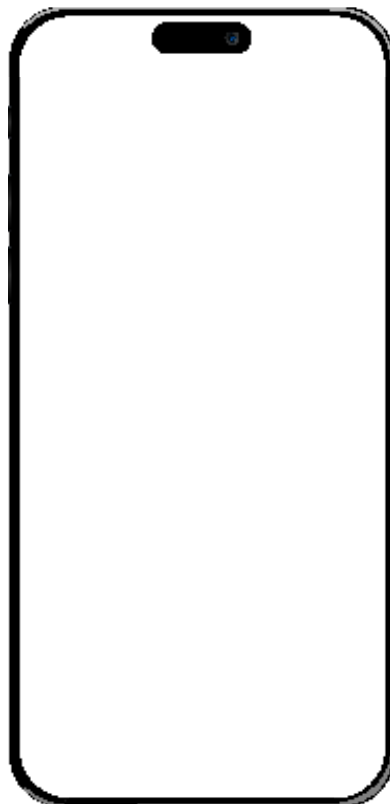
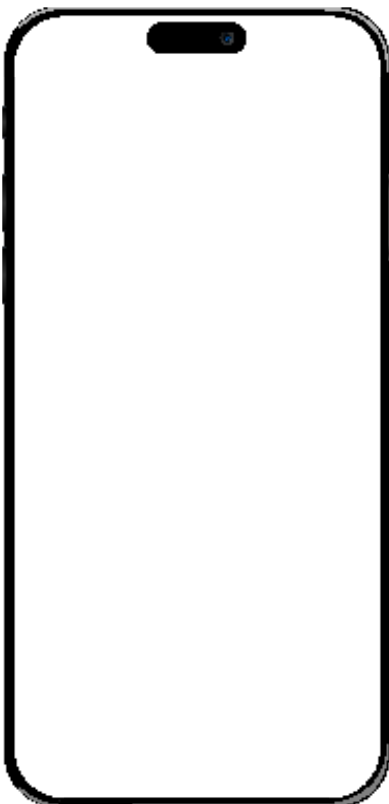
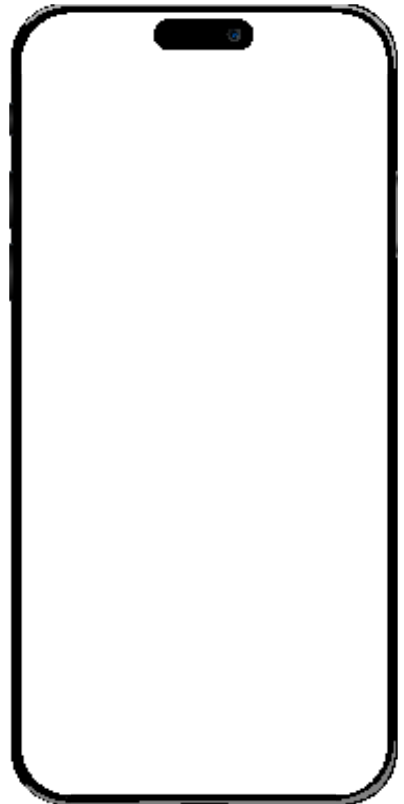
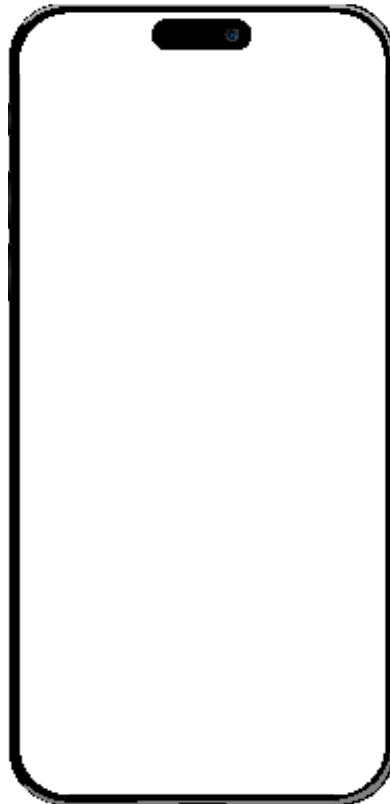
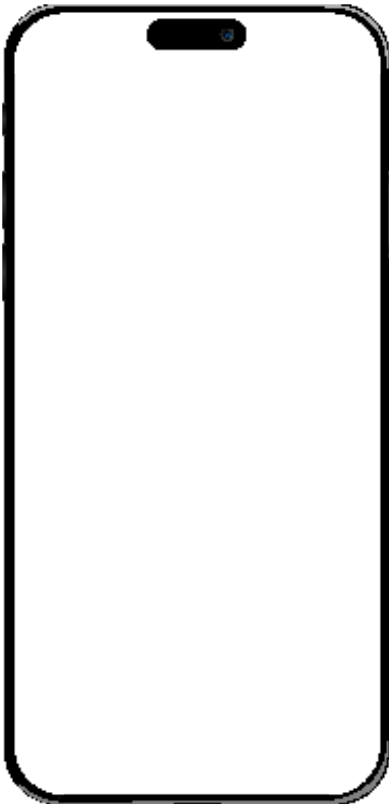
How will users input data and get rewarded for conserving water?

How will users connect with other users of the app?

CREATE A STORYBOARD FOR YOUR APP

First give it a name and a logo on the home screen below.

Next, use the screens below to create a storyboard for the app. Include arrows from buttons to screens to show how someone would navigate through the app.



Reflect on your app:

How will this app help students to conserve water on a daily basis?

How will the app help to contribute to water conservation in a student's home, school, and community?