

# Water Cycle

**Purpose:** This lesson allows students to see how water changes states as it moves through the water cycle. Also, students will get a visual representation of the earth's water supply.

**Time:** 60 min

**Level:** 4

## Materials:

- *Water Observation Sheet*
- Ice cubes
- Water
- Large, clear plastic bowl
- Clear drinking glass
- Masking tape
- Small container (size of a butter tub)
- Small weight (rock with a diameter of a quarter)
- Clear plastic wrap
- Large rubber band
- 1 gallon container (such as a plastic ice cream bucket)
- Eye dropper
- ½ cup measuring cup
- Small plate



## Minnesota Science Standards and Benchmarks

4.3.2.3.1 Identify where water collects on Earth, including atmosphere, ground and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation.

## Minnesota Math Standards and Benchmarks

4.1.2.4 Read and write decimals with words and symbols; use place value to describe decimals in terms of thousands, hundreds, tens, ones, tenths, hundredths, and thousandths.

## Background

One of the most important natural resources on earth is water. All living things depend on water for survival. As the world population continues to grow, more and more people, plants, animals and other living creatures need water to live. Water is a resource used over and over through evaporation, transpiration and precipitation. The water that is on earth now is the same water that has always been here. No “new” water is being made.

The movement of water in and around the earth is called the water cycle. Rain or snow falls on oceans and land as precipitation. The soil will soak up some of the water. Plants will take up some of this water through their roots and some water will move down through the soil and become groundwater. Some of the water from precipitation will run off the land into streams, marches, lakes and oceans. The water that remains on the earth's surface is called surface water. The surface water will return to the atmosphere through evaporation. Then water vapor may form clouds that cause precipitation to occur again. The precipitation will return to the surface of the earth and the cycle will continue.

Water is extremely important for crop and animal production because crops (plants) need water to grow and animals depend on the crops for food. Minnesota farmers rely on rainfall, irrigation systems and the ability of soil to hold water to grow crops and livestock each year.

## Procedure

Hand out a *Water Observation Sheet* to each student.

### Activity 1 – Changing States

1. Place one cup of water into a clear bowl. Place a piece of masking tape on the outside of the bowl at the top of the water line. Set the bowl on a sunny window sill. Check the bowl every half hour to see what happens. Instruct students to record their observations on the *Water Observation Worksheet*. The sun will warm the water and cause the water to evaporate. Evaporation is the process where water changes from a liquid to a gas (water vapor). As the students make observations, ask:
  - a. Where do you see evaporation in real life? (*boiling water; lake and river levels rise and fall with temperature due to evaporation*)

**Evaporation:** process by which water changes from a liquid to a gas or vapor

**Precipitation:** water released from clouds in the form of rain, freezing rain, sleet, snow, or hail

**Condensation:** process by which water vapor in the air is changed into liquid water

**Ground Water:** water that seeps down through the soil until it reaches rock material that is saturated with water. Water in the ground is stored in the spaces between rock particles (no, there are no underground rivers or lakes).

**Surface Water:** water in the nation's rivers, streams, creeks, lakes, and reservoirs

*Definitions from the USGS*

<http://ga.water.usgs.gov/edu/index.html>

- b. What happens during evaporation and what causes this?  
*(water changes from liquid to gas; sun's energy)*
2. Fill a glass  $\frac{3}{4}$  full with ice. Set the glass of ice where most students can watch it. Check the glass every 15-20 minutes to see what happens. Instruct students to record their observations on the *Water Observation Worksheet*. As students make observations ask: Where have you seen this in real life? (melting ice on sidewalks, lakes, etc.)

## Activity 2 – Water Cycle

1. Explain to the students that water changes forms naturally in the environment. Explain that you will be making a water cycle that functions similarly to how water changes forms in nature. Notice that after the system is set up that no new water is added - it only changes form.
3. Place the small container (butter tub) inside a large clear bowl. Pour water into the large bowl around the small container – do NOT get any water in the small container – until the water level reaches about  $\frac{3}{4}$  of the height of the small container.
4. Place a piece of clear plastic wrap over the large bowl. Put the rubber band around the top of the bowl to keep the plastic wrap in place. Take the weight (rock) and put it in the middle of the plastic wrap. Place the “water cycle” inside the classroom in a sunny spot. The sun will heat the water in the large bowl so the water will evaporate, just like in the experiment in activity 1. The evaporated water will rise and cool. The cooled water will condense on the plastic wrap. Condensation is the process of changing from a gas to a liquid. Finally, students will observe the condensed water droplets on the plastic wrap fall into the small container. This small container collects the water and the process begins again. Discuss with students:
  - a. How can you tell evaporation is taking place? *(water level changes, collection of droplets on the plastic wrap)*
  - b. How can you tell water vapor is changing back to a liquid? *(droplets form on the plastic wrap in the condensation process)*
  - c. Where does the precipitation collect? *(in the butter tub because the rock helps direct the droplets into this container)*
5. Show the attached picture, or have students think of an agricultural field they have been to. Even better, if you are able to walk or take a trip to an outdoor area, bring students to this location. Ask students:
  - a. How would precipitation affect this area? *(Water would soak into the soil. Plants will use this water and some water will also move through the soil to become ground water. Precipitation would add water to the stream. If a large amount of precipitation fell, it would run off the field and grassy area into the stream. Water in the stream is classified as surface water.)*
  - b. Where would evaporation happen? *(The water in the stream would heat up and evaporate into the atmosphere)*
  - c. Explain how condensation would occur? *(Water vapor from evaporation would eventually cool and fall as rain or snow.)*
6. Have students define the following words on their Water Observation sheet using their own words and drawings. Use the Glossary in the left column as a guide.
  - Evaporation
  - Precipitation

Condensation  
Ground water  
Surface water

### Activity 3 – The Earth’s Water Supply

1. Display the following chart on a poster or your board.

#### EARTH’S WATER SUPPLY

Oceans 97.3%

Ice 2.19%

Ground water 0.5%

Soil Moisture 0.005%

Atmosphere 0.001%

Lakes 0.018%

Rivers 0.000096%

- Have students practice saying and writing these numbers and decimals with a partner. Ask for volunteers to say and/or write for the class.
2. To demonstrate how much of the Earth’s water supply is actually used, ask students to help you with the next steps. (Make sure that the students understand this is just a demonstration and there is actually more water than this on earth.)
  3. Fill a one-gallon container, such as a plastic ice cream bucket, with water. This represents all the water on the earth.
  4. Take ½ cup of water out of the one-gallon container and pour into a clear bowl. The water in the bowl represents all of the fresh water on earth. Refer back to the chart with the EARTH’S WATER SUPPLY. The approximately 15 ½ cups left in the bucket represent the salt water found in oceans. The freshwater (1/2 cup now in the bowl) is found on earth in lakes, rivers, groundwater, ice and living things.
  5. With an eyedropper, drop one drop of water from the ½ cup onto a small plate. This one drop represents the freshwater that is available for our use. This water is found in rivers and lakes. The rest of the freshwater is unavailable because it is deep groundwater, tied up in the soil or is in our atmosphere.

### Additional Activities

- Give students a diagram of the water cycle or have them draw their own. Encourage students to draw and label groundwater, surface water, evaporation, condensation and precipitation.
- Invite a soil and water conservationist into your classroom to talk with your students and also to lead them in additional demonstrations and experiments.
- Invite a local farmer to visit your classroom and talk with your students about how he/she uses different conservation methods to protect the water supply.

### Resources

- The United States Geological Survey website has a wide variety of water educational resources. <http://ga.water.usgs.gov/edu/index.html>

*Adapted from Utah Agriculture in the Classroom*

*In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651/201-6000. TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider..*

# Water Observations

Name \_\_\_\_\_

## Bowl of Water

Time	Observations
30 min	
60 min	
90 min	
120 min	

What is happening to the water in the bowl?

Why is this happening?

Where have you seen this process happen in your life?

## Glass of Ice

Time	Observations
15 min	
30 min	
45 min	
60 min	

What is happening to the ice?

Why is this happening?

Where have you seen this process happen in your life?

## **Water Cycle**

Define these terms involved in the water cycle:

Evaporation

Precipitation

Condensation

Ground Water

Surface Water

## **Earth's Water Supply**

Explain in your own words why we need to take care of the water in our lakes, rivers and streams.

