

The Water Cycle

Teacher Background

The continuous movement of water in the hydrosphere (water on the surface of Earth) is known as the “water cycle” or “hydrologic cycle.” The hydrosphere includes oceans, lakes, rivers, streams and ground water.

The Sun is the force behind the water cycle. It provides the energy needed to evaporate water from the Earth's surface, forming water vapor in the air. Most of this water comes from the oceans, but water also evaporates from soil, from plants during transpiration, and from plants and animals during respiration. Evaporation and transpiration are often combined and referred to as “evapotranspiration.”

As the water vapor rises some of it condenses forming clouds and returns to Earth in the form of precipitation—rain, snow, sleet or hail. This precipitation can return directly to the ocean or from rivers and streams as runoff. Some of the precipitation seeps into the ground and becomes groundwater.

Objectives

- Students will make a model of the water cycle (hydrologic cycle) and compare their model to Earth's water cycle
- Students will be able to observe a system, identify the different components of the system and describe how each of the components interacts with each of the other components in the system.

Vocabulary

atmosphere, condensation, cycle, evapotranspiration, groundwater, hydrologic cycle, hydrosphere, precipitation, respiration, transpiration, troposphere, water vapor

Engage

Ask students to define a system. Discuss how all of the parts of the system work together for the benefit of the entire system. (If you like living dangerously you might use “school” as a system, and show how teachers, students, administration and parents all work together in perfect harmony.)

How is the water cycle (hydrologic cycle) like a system? The water cycle is often explained as the continuous process of evaporation, condensation and precipitation. Is that description accurate? (Although the water cycle is basically evaporation, condensation and precipitation, it is not as simple as that. Transpiration and respiration are part of evaporation. Precipitation does not fall to be immediately evaporated again. Some of it seeps into ground water where it can be returned to the atmosphere through transpiration of plants or travel to creeks, streams and rivers.)

Materials

- clear plastic shoe box
- water
- soil (potting soil can be used)
- small plant or three or four leaves from a plant
- sandwich bag

Explain/Explore

Procedure

Have students place the soil in one half of the shoe box. Next, carefully pour the water into the other half of the shoe box. The water only needs to be about 1/2 cm in depth. They should try to disturb the soil as little as possible. Place the small plant or leaves in the soil. Cover the plant carefully with the sandwich bag. Tape the bag to the plant so that there are no openings and the plant is completely enclosed above the soil. (This will allow students to prove that the water has gone through the plant into the bag.) Cover the shoe box and place it on a windowsill. Observe what happens over the next few days. (Evaporation will begin and condensation will appear on the top of the box representing clouds. Students should observe condensation inside the sandwich bag which represents water being returned to the atmosphere through transpiration. The drops on the top of the box will grow in size and eventually a few dry spots will appear. There should also be droplets running down the sides of the box at times.) Have students record your observations in their journals.

Expand/Adapt/Connect

Draw a picture of the water cycle. "Make sure you include runoff, transpiration and ground water. Trace the different paths a droplet of water could take as it goes through the water cycle."

Note: this Activity can be implemented in class as a Teacher Demonstration. You might offer students the chance to set up their own water cycles at home for extra credit, keeping observations in their journals, summarizing results with charts, graphs, illustrations, etc. Students who cannot undertake the Activity at home could come in before or after school in order to run their cycle.

Suggested URLs

[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/hyd/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hyd/home.rxml)

The Hydrologic Cycle: how groundwater, transpiration, condensation, evaporation, transport, precipitation and runoff all play a role in the water cycle.

<http://www.learner.org/exhibits/weather/watercycle.html>

The Annenberg/CPB Project: discover how 40 trillion gallons of water above your head moves through the water cycle each day.

<http://observe.arc.nasa.gov/nasa/earth/hydrocycle/hydro1.html>

NASA's Observatorium explains how condensation, precipitation, infiltration, runoff and evapotranspiration work together to form Earth's Hydrologic Cycle.

<http://www.windows.ucar.edu/>

Windows to the Universe provides a good explanation of the water cycle in their "Our Planet" section.