

Terrariums

Students have the opportunity to see the water cycle happen right before their eyes. The students construct their own terrarium, plant seeds, and learn about the water cycle in the process.

Grade Level : 5th grade

Objectives:

- Students will be able to name the different parts of the water cycle.
- Students will be able to make a connection between their terrarium and the water cycle.

Materials:

- 20 oz. or 2 L. soda bottles (1/ student)
- 1 Bag soil
- Activated carbon/charcoal (found in aquarium sections of stores- enough for 3 tbs. per student)
- Pebbles
- Seeds
- Tap water (2 L. total for class)
- Clear packing tape (1 roll)
- Permanent marker
- 3 oz. Plastic cups (approx. 10)
- Whiteboard/chalkboard
- Dry erase markers/chalk
- Scissors
- 2 - 1 tablespoon measurers

Time Considerations

Preparations: 15 minutes

Activity 1- Water Cycle: 25 min.

Activity 2- Terrariums: 25 min.

Related Activities:

Medicinal Plants, Pollination, Photosynthesis



Nevada Department of Education Standards

- **Scientific Inquiry (Nature of Science Unifying Concept A)-** Scientific inquiry is the process by which humans systematically examine the natural world. Scientific inquiry is a human endeavor and involves observation, reasoning, insight, energy, skill, and creativity. Scientific inquiry is used to formulate and test explanations of nature through observation, experiments, and theoretical or mathematical models. Scientific explanations and evidence are constantly reviewed and examined by others. Questioning, response to criticism and open communication are integral to the process of science.
- **N.5.A. Students understand that science involves asking and answering questions and comparing the answers to what scientists know about the world.**

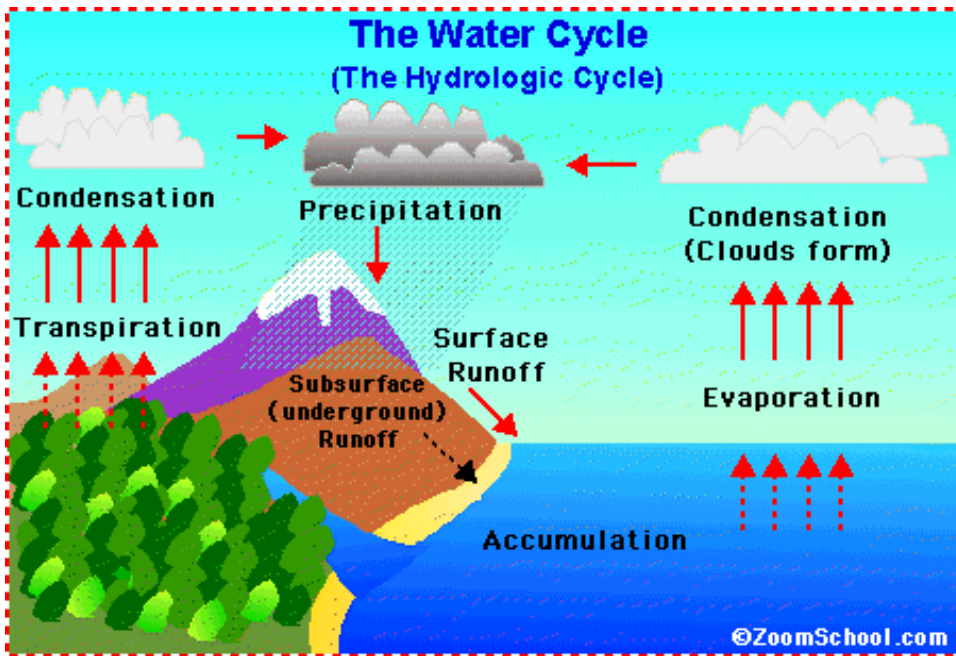
Excellence in Environmental Education Guidelines

- **Strand 1-Questioning, Analysis and Interpretation Skills (A, B, C, G):** Learners are able to develop questions that help them learn about the environment, design simple investigations, locate and collect information about the environment and environmental topics and develop simple explanations that address their questions about the environment.
- **Strand 2.1-The Earth as a Physical System (A, B):** Learners are able to identify changes and differences in the physical environment and in matter.

Background

Terrariums are clear glass or plastic containers that are closed systems used for growing plants. Terrariums are good representations of the water cycle on a smaller scale. Terrariums are a good way for students to visualize the equally important parts of the water cycle. The water cycle is the continuous movement of water on, above, and below the earth's surface. The diagram on page 2 is a helpful visual for un-

derstanding the process. For the entire process to take place, the sun is needed to warm the earth. Without the sun the water cycle would not happen. The sun warms the earth and causes water to evaporate from areas of accumulation (lakes, oceans, puddles, etc.). Water also evaporates off of plants through a process known as transpiration. The evaporated water in the air rises and cools until it condenses. The point at which the water condenses is called the dew point.



Doing the Activity

Activity 1—Water Cycle

Draw a basic diagram of the water cycle on the board. Have the students label the processes and discuss them as each one is being labeled. Explain how water has been on earth for such a long time. Water molecules come and go easily from one state to another (gas, liquid, solid), but they don't normally disappear all together. Explain to students about average residence time and give them a few examples. Oceans for example, have an average residence time of 3,200 years. This means that the water cycle does not always occur as fast as we might think. Leave the drawing on the board and erase the answers (will be used to re-view after Activity 2).

Activity 2—Terrariums

Describe to the students what a terrarium is. Ask them "What does a terrarium have to do with the water cycle?" A terrarium is a closed system, just like earth. The terrarium is a model of the water cycle. Earth has the atmosphere that traps the water in and the sun heats the water on the earth, making it cycle. The bottle has just a set amount of water in it that constantly cycles through (similar to earth). They will be able to see evidence of condensation on the top and sides of the bottle. Draw a bottle on the board and show them the basic set up of the terrarium. Use page 4 as an example what to draw on the board. Have the students find the middle of their bottles. They will need to cut along the middle of their bottle so it is in two separate pieces. Have the students take the cap off of their bottle to make the cutting easier (but remind them not to lose it!) Explain to the students to take 1 cupful of pebbles, and put them in the bottom

This is the point where it is possible for clouds to form. When the clouds are saturated to the point where they cannot hold any more water, the water falls in various forms of precipitation. The different forms of precipitation are: rain, snow, sleet, hail, etc. The precipitation hits the surface and is pulled down because of gravity (runoff). The water can travel on land (streams, rivers) or underground (flows into water table). At some point, all of the water that hits the ground ends up back in an accumulation zone. From this point the process starts over again. The water cycle is constantly in motion, with no set beginning or end. The water that is in the accumulation zone is also called a reservoir.

Water will stay in these reservoirs for an average amount of time. This period of time is called "residence time". See the chart below for average residence times for different places on earth. Water on earth has been around nearly as long as the earth itself. That means that the water that was in the apple you ate today could have been around millions of years ago when a dinosaur was giving her baby a bath.

Preparations

Collect bottles for the terrariums. Have the students bring in their own or check out the local recycling center for a few free bottles.

For 20 oz. bottles, choose bottles with little design on the plastic (ex. Pepsi bottles as compared to Coke bottles). The straighter the sides of the bottle the easier it is to put their terrarium back together. Gather the other supplies together.

Reservoir	Average residence time
Oceans	3,200 years
Glaciers	20 to 100 years
Seasonal snow cover	2 to 6 months
Soil moisture	1 to 2 months
Groundwater: shallow	100 to 200 years
Groundwater: deep	10,000 years
Lakes	50 to 100 years
Rivers	2 to 6 months
Atmosphere	9 days

Average Residence times in different types of reservoirs



half of their terrarium.

Then have them take 3 tablespoons of carbon and sprinkle it over the pebbles. If using smaller bottles, the students will not need as much carbon (just enough to cover the pebbles). The carbon acts as a filter for the water in the bottle. The carbon keeps the water from becoming stagnant. On top of the carbon, the students should put 3 to 4 scoops of soil. The amount of soil that will fit depends on where the students cut the bottle and how much of the carbon and pebbles they put in it. The proportions put in their bottles should be similar to those on the diagram on page 4. The next thing to put in their terrariums is seeds. Any plant seed can be used, although hearty vegetables seem to work well with very little care. The seed should then be covered with a small amount of soil (depth depends on the type of seed). After their seed is planted, they should put the bottle back together. One half will have to be bent a little to fit inside the other end. After they are fit together, use packing tape to seal up the bottle (around where it was cut). The students will need to use a permanent marker to write their names on the terrariums (won't smear if wet). Once everyone's terrariums are together they should all put 3 to 4 capfuls (less if smaller bottles) of water in their bottle. Water may leak out of the area where it was taped together, which is normal. It is possible to need to add more water if too much leaked out when they first watered it. Before trying to water it again, wait a day or two and then check the soil for moistness. If the students added too much water, have them leave the cap off for one day, then check it again. Ask the students how often they should have to water their plants after the initial watering (never!). Since it is a closed sys-

tem, the water will just cycle through the bottle, always with the same amount of water in the bottle that the students initially put in. Remind the students that their plants may get too large for their terrariums and might need to be replanted into a larger pot or garden.

Evaluations—

Use the drawing that was created on the board in Activity 1. Have the students label the different parts of the water cycle on the board. Also have them repeat to you the definitions of each of the words.



Extension Activities—

- The terrarium was first discovered by Nathaniel Ward, on accident! Have your students read up on the history of the terrarium after they build their own.
- Have the students experiment with their terrariums and light. Have some students put their terrariums in dark places (closet/cupboard), some in the window, and some in the open away from windows. Watch how the plants grow differently in each area. Have the students record their observations on a daily basis. The students will notice that the amount of light plants need is just as important as the water that they have in their terrariums.

Sources—

Wikipedia. Retrieved on 23 June 2008. Page last updated on 22 June 2008. http://en.wikipedia.org/wiki/Water_cycle.

Vocabulary

Accumulation: The act of collecting, growth by continuous additions.

Atmosphere: The mixture of gases that surrounds a planet, the air.

Condensation: (Meteorology) Water changing from vapor to liquid to form clouds, or a solid to form precipitation.

Dew point: Temperature where water vapor condenses.

Evaporation: When a liquid changes into a vapor or gas.

Liquid: A wet substance that you can pour.

Model: Small or miniature version.

Precipitation: The falling of water from the sky in the form of rain, sleet, hail, or snow.

Reservoir: A natural or artificial place where water is stored (ex. lakes and oceans).

Residence time: The length of time water stays in a given reservoir.

Runoff: Way in which water moves across and under the ground.

Solid: Hard or firm; not a liquid or gas.

Terrarium: A glass or plastic container for growing small plants or raising small land animals.

Transpiration: The movement of water through a plant and into the atmosphere.

Water Cycle: constant movement of earth's water. Plants give off moisture, and water from rivers and oceans evaporates, making water vapor. This vapor rises, forms clouds, and then falls as rain, hail, or snow.

Water Vapor: gas produced when water evaporates.

Bottle Terrarium

