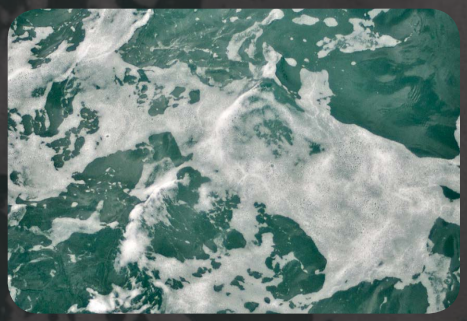

Journey of a Water Drop

Grade: 3

Subject Areas: Life Science, Earth Science, Physical Science

Skills: identifying, observing, modeling, predicting, writing

Duration: 1 hour

Connections: physics, physical education, art, social studies

Vocabulary

hydrology
water cycle
evaporation
heat energy
condensation
transpiration
temporary
spring
precipitation
watershed
mouth
reservoir
aqueduct

Objective:

Students will understand connections to the water cycle by following the journey of a water drop.

Materials

- poster or quilt of the water cycle
- dice (one for each student)
- pencils
- 9 large paper signs
- bell or a whistle
- index card or notebook to mark the various stations the students visit
- digital cameras
- colored printers
- journal paper

Standards

Strands: Excellence in Environmental Education Guidelines
Strand 1 —Questioning and Analysis: F) Work with models and simulations: Learners understand that relationships, patterns, and processes can be represented by models.
Strand 2 —Environmental Process and Systems:
2.1 The Earth as a Physical System: A) Processes that shape the Earth: Learners are able to identify changes and differences in the physical environment. B) Systems changes in matter: Learners are able to identify basic characteristics of and changes in matter.
Strand 2.2 — The Living Environment: C) Systems and connections: Learners understand basic ways in which organisms are related to their environments and to other organisms.
Strand 2.4 — Environment and Society: C) Resources: Learners understand the basic concepts of resource and resource distribution.

California State Educational Standards:
Physical Science 1e: Students know matter has three forms: solid, liquid, and gas. **1f:** Students know evaporation and melting are changes that occur when the objects are heated.
Life Sciences 3c: Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial.
Earth Sciences: 4e: Students know the position of the Sun in the sky changes during the course of the day and from season to season.

Background

The Water Cycle

Water is one of earth's most precious resources. All life as we know it depends on water for survival. Water is used for manufacturing, food production, cleaning, and recreation. Most life on Earth lives in water because the Earth is covered mostly by water; this is why Earth appears blue from space.

Hydrology is the study of fresh water in all of its complexity. The hydrological cycle is the continual exchange of fresh water through its many forms and locations. Approximately 97% of all water is in the oceans at any given time. Of the remaining 3%, most of the water is locked up as glaciers and ice caps. This means only 1% of all water on Earth is available as fresh water and most of it is underground. Fresh water is recycled over and over during the water cycle.

The path fresh water takes as it flows through the water cycle is variable. As water changes physical form, it usually changes location too. For instance, as water evaporates off the surface of the ocean, it rises into the sky during evaporation. Evaporation is when a liquid is changed to a gas. This happens usually through radiant energy or the energy from the sun. When there is an increase in heat energy, water will change to a form with a higher energy state. Solids turn to liquids and liquids turn to gas as energy is added. Sometimes a solid can change directly to a gas during a process called sublimation

Water in a gaseous state is called water vapor. It will eventually accumulate into clouds or be pulled back down to earth by gravity as it condenses. Condensation is when a gas changes to a liquid. This happens as things cool or reach a lower energy state.

Raindrop to Ocean

There is no true starting point for a water droplet. Water is constantly in motion and the amount of water on Earth is relatively fixed. Where one chooses to discuss the flow of water is arbitrary. Atmospheric circulatory patterns can carry water that is in the sky thousands of miles away from where it evaporated. Likewise, water moves along the surface in rivers and streams. Plants pull liquid water up through their roots during growth. During daylight hours, they loose water vapor from their leaves during a process called transpiration. Animals move water too. Water vapor is exhaled out our mouth and nose; and as we drink water, it moves through our bodies.

The water you see in the landscape or the water you use in your home is in a temporary state; meaning it is not in a fixed place. The most visible form in which water moves is the liquid state. The water from your faucet probably came from a well or a spring. A spring is a place where ground water is exposed at the surface. Water released from the sky is precipitation. Forms of precipitation include rain, hail, snow and sleet. If the precipitation

Local Connection

Humboldt County can get wet. As a matter of fact, 30% of all runoff in the state comes from the watersheds of Humboldt County. Even though loads of rain gets dumped here in the winter time, this is not the period for peak demand. Many rivers get very low in the summer months and water conservation measures are warranted. Our rural area has many different water districts. Here is a list of some of them:

Alderpoint: Alderpoint County Water District
Water comes from the Middle Fork of the Eel River.
Briceland: Briceland Community Service District
Water comes from a spring on private property.
Garberville: Garberville Sanitary District
Water is pumped from the South Fork of the Eel River.
Redway: Redway Community Service
Water is pumped from the South Fork of the Eel River and an unnamed spring.
Miranda: Miranda Community Services District
Water is provided by district wells with good water quality (low in pH).
Myers Flat: Myer's Flat Mutual Water Company
Water comes from Pete's Creek and a private well.
Shelter Cove: Resort Improvement District 1
Water is provided by surface water sources on Ricks Spring and Telegraph Creek.
Weott: Weott Community Services District
A new well of poor quality has been developed. Water has come from Mill, Corner and Deck Creeks.

doesn't runoff, it can infiltrate and accumulate in the ground. Underground water can move through the pores in soil providing water for wells, springs or rivers.

Water in the local landscape belongs to a particular watershed. A **watershed** is an area of land where all of the water that flows goes into a particular catchment area. The shape and size will be based on the topography of an area. Gravity pulls water downwards. As water travels to lower and lower elevations it accumulates in the lowest places becoming rivers and streams. Eventually, rivers and streams will carry water to the ocean unless people divert it elsewhere. In the King National Conservation Area (NCA) many rivers and streams exist, the largest being the Mattole River. The Mattole River flows into the ocean southwest of the small isolated town of Petrolia. The place where a river meets the ocean is called the **mouth** of a river. If river water is allowed to mix with seawater, an estuary results.

People divert water for a variety of reasons. Sometimes water is temporarily held behind a dam in a reservoir or man-made lake. **Reservoirs** can be used for agriculture, hydroelectricity, municipal water supplies, and many industrial uses. Other times water is channeled down **aqueducts** to distant locations such as in the central valley of California. Water is transported from northern regions of the state to southern regions where more people live and work. Much of this water is used to grow crops. Simpler forms of diversion happen when someone uses water at home to water a garden, take a shower or water their car.

Water Crisis

As world population grows, a water crisis is emerging. Many people around the world don't have adequate water for their basic needs. The sources of water in the King Range NCA are mostly clean and plentiful, although summer droughts can occur and adequate storage for summer use can be problematic. As people use water they take it from the landscape. The more water people use the less there is for natural processes and wildlife. Finding ways to reduce our water consumption is important for a healthy planet.

Aside from the garden, most water in a home is used for laundry, dishes and in the bathroom. Here are some statistics for typical household usage: flushing a toilet uses 1.5-4 gallons of water; brushing your teeth takes 2-5 gallons of water; taking a bath or a shower uses 15-25 gallons of water; running a dishwasher uses 8-15 gallons of water; and running a washing machine uses 35-50 gallons of water per load.

By being water conscious, people can lower their consumption of water. Installing low pressure shower valves and low-flush toilets, turning the faucet off when you aren't using it, and installing drip lines or timers out in the garden are easy ways to conserve this precious resource. The more people are aware of the ever growing water crisis, the happier our world will be.

Activity 1: Modeling the Journey of a Water Droplet

Preparation

Ideally, before students perform this activity, they have already had some exposure to the nature of water. If not, you may want to spend more time reviewing the water cycle.

Materials

- poster or quilt of the water cycle
- dice (one for each student)
- pencils
- 9 large paper signs
- bell or a whistle
- index card or notebook to mark the various stations each student visits

Procedure

1. Begin by reviewing the water cycle. Before you show the students a picture of the water cycle, ask them questions about water and where it goes. As they give correct answers, write the locations or stations on large pieces of paper. These will be the labels used during the following activity. The nine stations are: clouds, plants, animals, Mattole or Eel rivers, Pacific Ocean, Ruth Lake, ground water, soil and glaciers. Feel free to add a tenth if it is appropriate to the area.

- *What kind of places can we find water?*
- *What kinds of things need water?*
- *Where is most of the water on Earth?*
- *What forms can water come in?*
- *How does water travel through your body?*
- *How does a plant use water?*
- *During what time of year, do we experience more rain? Why do we get more rain then?*
- *Where does water go once it rains?*
- *What form does water take as it moves to a cloud?*
- *What form does water take as is leaves a cloud?*

2. During the initial discussion on water, show poster or quilt of the water cycle. Explain how water is constantly moving and changing form during the water cycle. Review the three forms water takes (solid, liquid, gas) and write key points on the board. Instead of looking at the water cycle in two dimensions, this activity will have the students physically move through the water cycle.

3. As they move from station to station, where they move to is determined by the roll of a die. For some stations, "stay" is an option. If they roll "stay" they go to the back of the line at that station.

4. Ideally, students leave a plant as water vapor and enter as liquid water. When students become water vapor, for instance if they move to a cloud, they do so alone. This is because the water molecules in water vapor are far apart. However, when students move as a liquid or sit as a solid, they do so in pairs. This is because the water molecules in a liquid and a solid are close together. Because most of the water on Earth is in the ocean, four sides to the ocean die should be labeled "stay".

5. The cloud and plant stations are the most complex because the students either enter alone or leave alone. At the cloud station, students arrive alone (as vapor), but leave as a liquid. Have them line up single file at this station and then grab a partner (the next person in line) as they leave. The partner should not roll the die. Because they enter the cloud station alone, this station can begin with an odd number of students. The plant station is the reverse of a cloud. Because

Activity 1 continued...

all other stations begin as a liquid or a solid, all stations should start with an even number of students. The students will spread out and line up at each station to begin.

6. Lastly, you may want to have the students review where they have travelled. They can write this in a journal or write their journey in a story. To mark where they have been, they can write it on the index card or notebook each time, however, it may be easier for them to place a personalized sticker at each particular site.

7. Before students begin the journey, you may want to have a few students model a few examples. This is a good job for older students. Tell the students they will be prompted to begin and stop with the sound of a whistle or a bell. After the journey is complete, give them time to review how many stations they visited and which ones.

Activity 2: Photographic Water Journal

Preparation
This activity will take at least one week to complete.

Procedure
After reviewing the water cycle, have the students photograph where they use water at home. Pictures should include them performing daily activities like brushing their teeth and cooking food. As they should briefly describe each picture. All pictures and text will be put together into a photographic water journal.

Materials
- digital cameras
- colored printers
- journal paper

Extensions

- Make a class photo book of where students find water at home and how it is used.
- Record the daily weather: temperature, cloud condition of the sky, and rainfall.
- Investigate ways of conserving water.
- Locate water ways and water sources on maps.
- Form a water blog. Exchange ideas and places concerning water.

References

California Water Awarness Campaign, http://www.wateraware.org/, 2010.

How much water does it take to…. http:www. watereducation. org/, Water Education Foundation, 2010.

Lesson modified from: The Incredible Journey, Project Wet, Water Education for Teachers International, The Watercourse and Council for Environmental Education (CEE), pg. 161-165, 1995.