WHERE DOES OUR WATER GO?

INSTRUCTIONS

(MODIFIED FOR ADEED)

Overview:

Students develop understanding of the water cycle through two separate activities. First, students take part in a simulation of water moving through the water cycle through various paths, visiting eight stations around the classroom. They record and reflect on their journey and then build simple water cycle models using ziplock bags or jars. Second, students learn about water pollution and wastewater treatment through a visit from a local "expert," and make posters or presentations to share and clarify their understanding.

Targeted Alaska Standards:

Science

[2] SB2 Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one places or system to another, may be unavailable for use, and is ultimately conserved.

[2] SD1 Students develop an understanding of Earth's geochemical cycles.

Targeted Alaska Grade Level Expectations:

Science

[3] SB3.1 The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by recognizing that temperature changes cause changes in phases of substances (e.g., ice changing to liquid, water changing to water vapor, and vice versa.

[3] SD1.2 The student demonstrates an understanding of geochemical cycles by describing the water cycle to show that water circulates through the crust, oceans, and atmosphere of Earth.

[3] SD2.1 The student demonstrates an understanding of the forces that shape Earth by identifying and comparing a variety of Earth's land features (i.e., rivers, deltas, lakes, glaciers, mountains, valleys, and islands

[3] SE1.1 The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by identifying local problems and discussing solutions (L).

[3] SG4.1 The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by: asking questions about the natural world.

[4] SB3.1 The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by explaining that temperature changes cause changes in phases of substances (e.g., ice changing to liquid water and liquid water to water vapor).

Materials:

- Science notebooks
- Reading: A Water cycle story
- Station signs (http://seagrant.uaf.edu/marine-ed/curriculum/grade-3/investigation-2.html#labels)
- Station cubes (http://seagrant.uaf.edu/marine-ed/curriculum/grade-3/investigation-2.html#cubes)
- Nine different colored beads—enough for 10-12 beads per child
- A piece of wire for each student to thread the beads onto.
- Two large glass jars OR a ziplock bag per student
- Tape
- Warm sunny window, heat lamp, or other heat source
- Ice (optional)

Activity Preparation

1. Read through all of the instructions for the activity. Choose a suitable water cycle story for your students. Print and prepare the cubes and signs for the game. Locate large level location to play the game. Practice making a water cycle model with jars or ziplock bags.

2. Review the following vocabulary words used in this lesson: condense, convection, estuary, evaporate, glacier, infiltration, precipitation, river, runoff, soil, transpiration and water cycle.

Activity Procedure:

Engagement: (15 minutes)

1. Ask students to sit quietly with eyes closed as you read a story.

   Online Stories:
   - Water drop story: Follow a drop through the water cycle (http://ga.water.usgs.gov/edu/followadrip.html)
   - A Drop of Water: Gulf of Maine Aquarium. c. 2000 (http://www.gma.org/Tidings/drop/moving.html)
   - The Water Cycle: Online animations/videos (http://www.epa.gov/safewater/kids/flash/flash_watercycle.html)
   - EPA Water Cycle Informational Animation: Very good and simple explanation. (http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html)

   Print Resources:
   - *Dream Journey*, Alaska Wetlands and Wildlife, 2007, p. 105.
   - *The Magic School Bus Wet All Over: A Book about the Water Cycle* by Pat Relf.
   - *The Snowflake*: A Water Cycle Story by Neil Waldman.
   - *A Drop Around the World* by Barbara McKinney.
   - *Water Dance* by Thomas Locker.
   - *Listen to the rain*. Bill Martin, Jr. and John Archambault.

2. Students can share thoughts and impressions after the story. They can work alone or with a partner to draw or write in their science notebook what it felt like to be a water particle, and share aloud with each other.
3. After reading or telling a story about the water cycle, have the class act out the journey of a water molecule. Begin with having them be water vapor- the molecules are very EXCITED. They are bouncing around the room, but leaving plenty of space between themselves. Then, they lose some energy, and begin to cool down. They huddle together (Condensation). Now that they have come together, they are too heavy for the air to hold them, so, on the teacher's signal, they fall to the ground. (Precipitation) They are lying in a puddle, and the sun comes out to warm them. They get energized, and start to rise up and spread out. (Evaporation). Repeat. (Thanks to Kathy Holmes for this idea).

Exploration: (1 class period for Exploration and Explanation)

1. With the roll of a dice, students will role play a game where they act like water particles, rotating through nine stations designed to simulate the many paths of water through the water cycle: clouds, lakes, rivers, glacier, groundwater, soil, ocean, plants, and animals. At each location, students will collect a different colored bead that represents that station.
2. Divide the students into nine approximately equal groups, and give each student a piece of wire, bent into a loop on one end, to be used for stringing beads they pick up.
3. Each group will begin at one station. Ask students to write down the name of each station they visit and how they got there in their science notebooks. Optional: Talk with the students about how a water particle might move in different situations and have them practice acting out some different motions to use as they move. Snow and rain particles stick together. Vapor particles move alone. Colder particles move more slowly, warmer ones move faster. Will the water particle fall? Float? Flow?
4. At each station, each student should pick up a bead and string it on the wire, roll the cube and read the instructions on the side that faces up. Every time the signal "Cycle" is given, students will follow the instructions they just read. They will pick up an additional bead each time they are instructed to stay at the station. Continue to move through the stations until the class has "cycled" about 10 times. (Cubes

and station signs used with permission from the NOAA Office of Response and Restoration's Student and Teacher publication, "The Water Cycle Game").

Explanation: (1 class period for Exploration and Explanation)

1. Using their "bracelets" and notebooks to help them remember where they went during the game, ask students to reflect on their journey through the water cycle and describe it in their science notebooks.
2. On the board, write the names of the nine stations and, going through one station at a time, ask students to share the different ways that they got there. (For example, for "river" — they melted from a glacier, they fell from a cloud, they flowed downward through the water table). Write each student response on the board with an arrow to the station name.
3. You migh ask students to make a class tally chart showing how often they visited each individual station. They can make inferences about how water moves through the cycle. For instance "Clouds" and "Ocean" would have many more tally marks than "Animals" and "Plants". This information could also be recorded in a bar graph. (Thanks to Judith Phillips for this idea).

Elaboration: (20 minutes + daily observation)

1. Make a simple model of the water cycle that will allow students to see evaporation and condensation in action.
2. Use a large glass jar with one or two inches of water in the bottom, to represent the ocean. Invert another jar on top of it and seal the two together with tape. Set the model in a hot location for a few days. If you don't have a warm, sunny window, use a heat lamp.
3. Ask students to use their science notebooks to make predictions, and to observe and record what they see happening. Optional: Enhance your model with food coloring or a rock to represent land sticking up out of the ocean. Try putting large gravel in the bottom and use a small dish of water inside the jar to represent a lake, so that you can observe water becoming groundwater after it evaporates and condenses.
4. An alternate way to make a model, if you have a warm, sunny window, is to give each student or group a large ziplock bag with about a cup of water in it. Tape the bag to the window and make observations. How does it change what happens if you move it to a cooler place? What happens if you hold ice next to the bag?

Essential Questions:

1. How are we connected to wetlands, rivers and the sea?
2. What is the salmon's life journey through the wetlands, rivers and the sea?
3. Where does our local water come from and where does it go?

Enduring Understandings:

1. Watersheds, rivers, wetland and the one big ocean of the world are an interconnected system.
2. Salmon depend on the rivers and the ocean during parts of their life cycle.
3. Science is a way to help us study the many connections in our world.

Tips from Teachers:

1. The "Water Cycle" song (http://www.aces.edu/dept/fisheries/education/ras/Updates/water_cycle_song.pdf) is a good way to begin the lesson.
2. Before reading the initial story, brainstorm on chart paper ideas of what it would be like to be a water particle.
3. Use pipe cleaners instead of wire for stringing beads.
4. Color code the beads according to what they represent. For example: place white beads in a paper cup labeled "clouds" and make a sign with laminated white construction paper for students to see at a glance.
5. Before transitioning to the next station with the cue "Cycle", make sure all students have written in their journals.
6. Ask students to use their bracelets to write a 1-2 paragraph story with a beginning, middle and end to recount their journey through the water cycle as a tiny water molecule.

7. Poems or music that lend themselves to visualizing what happens to water are useful. Consider using a water poem as a cue for transitioning between activities…for example (from Listen to the Rain): "the tiptoe pitter-patter…the roaring pouring rain… the quietude of rain". Language makes science come alive.

Evaluation:

Using their student notebooks, students describe or draw the water cycle. Ask them to answer the following questions:

- How does water get into our streams and faucets?
- Why don't we run out of water?

The teacher might guide statements to make connections to home water inquiry. Teacher assesses student notebooks.

Lesson Credit:

Alaska Seas and Rivers curriculum, published by Alaska Sea Grant College Program, University of Alaska Fairbanks. ©2007 Alaska Sea Grant. Reproduced with permission from Kurt Byers, Education Services Manager, NOAA Alaska Sea Grant College Program, University of Alaska Fairbanks.

The Alaska Sea Grant College Program at the University of Alaska Fairbanks helps ensure the vitality of Alaska's marine resources and communities through research, education and extension. In addition to the complete Alaska Seas and Rivers curriculum, Alaska Sea Grant has many books, brochures, posters, and videos about Alaska's seas and coasts that teachers, students, and parents can enjoy. Visit the Alaska Sea Grant online bookstore at www.alaskaseagrant.org.