2008

Just Passing Through! The Water Cycle! Post-Visit Lesson (Grade 4)

Discover Mojave: Forever Earth

GRADE 4

Just Passing Through! The Water Cycle!

POST-VISIT LESSON

Going Full Cycle!

Just Passing Through! The Water Cycle!

POST-VISIT OVERVIEW

Water use is such an automatic and habitual daily activity that students often do not understand the consequences of its use. Seldom do they connect the water that comes out of the faucet to its sources in the natural world. Lake Mead on the Colorado River is one of the most intensely used reservoirs in the western United States, providing recreational activities and domestic drinking, industrial, and irrigation water for millions of users. The quality of this water must be maintained to guarantee a reliable and safe resource for its many uses. Inflow into Lake Mead primarily is from the Colorado River; however, about three percent of the inflow is from tributaries on the northern side of the Lake and from Las Vegas Wash on the northwest side of the Lake.

In "Just Passing Through! The Water Cycle!," students use the Forever Earth vessel to begin exploring the importance of Lake Mead by making and recording observations of how water is being used in different ways by plants, animals, and people. Then students view an animated PowerPoint presentation that follows one drop of water through Lake Mead's water use cycle and then re-create the cycle on a magnet board. Working as scientists, students determine if water is the same in all parts of the lake by comparing water samples from the middle of the lake and from Las Vegas Bay. By examining a number of scenarios, students use scientific reasoning to deduce the major reasons for the current lower lake level. In a culminating activity, students brainstorm ideas for personal actions that they can take to conserve or protect Lake Mead's water.

The following post-visit activities are designed to synthesize and expand the knowledge students have gained in their Forever Earth experience. Students apply their knowledge by building a model of the water cycle, recording observations of changes through time, and designing experiments to examine additional questions.

THEME

Lake Mead not only plays a huge role in supporting life in our desert but also provides a scientific laboratory for understanding how the water cycle works.

KEY QUESTIONS

Where does all the water in Lake Mead come from? Is the water the same in all parts of the lake? What happens to the water?

GOALS

Students will demonstrate an understanding of the processes of condensation and evaporation and the factors that affect these processes.

OBJECTIVES

Students will:

- Demonstrate how condensation occurs when water vapor touches a cool surface and changes into liquid;
- Understand how evaporation and condensation contribute to the movement of water through the water cycle;
- Describe evaporation as the process by which liquid water changes into water vapor, a gas;
- Explain how temperature affects the rate of evaporation; and
- Explain how surface area of a volume of water affects the rate of evaporation.

NEVADA STATE STANDARDS CORRELATION

N.5.A.1. Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method.

E.5.A.2. Students know water on Earth can be a liquid (rain) or a solid (snow and ice) and can go back and forth from one form to the other.

CLARK COUNTY SCHOOL DISTRICT CURRICULUM ESSENTIALS FRAMEWORK (CEF) CORRELATIONS

Students will:

(4)1.1. Generate investigable questions based on observations and interactions with objects, organisms, and phenomena.

(4)1.2. Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

(4)1.3 Create and use labeled illustrations, graphs (number lines, pictographs, bar graphs, frequency tables), and charts to convey ideas, record observations, and make predictions.

(4)1.4 Conduct safe investigations with a partner and with a small group.

(4)1.5 Identify, gather, and safely use tools (magnet, thermometer, lens) and materials needed in investigations.

(4)1.10 Cooperate and contribute ideas within a group.

(4)3.1 Investigate and describe the properties of water.

(4)3.2 Investigate and describe the water cycle, including the role of the sun.

(4)3.3 Investigate and describe the factors that affect the processes of evaporation and condensation.

(4)3.4 Investigate and explain that water can be a liquid, a gas, or a solid and can go back and forth from one form to another.

(4)3.5 Investigate and describe how the earth is nearly spherical and covered with more water than land.

PREREQUISITE EXPERIENCE

Pre-visit classroom lessons

Forever Earth field trip

VOCABULARY

collection	liquid	water
condensation	precipitation	water conservation
condense	rain	water cycle
evaporation	surface area	water vapor
gas	thermometer	

POST-VISIT LESSON: GOING FULL CYCLE!

Part 1 ▸ Introduction

TIME 10 minutes

MATERIALS

Divided circle map from pre-visit lesson

The teacher begins by posting the divided circle map constructed during the pre-visit activity and asks students what they can add or change on the diagram from what they learned about water from their field trip. Students may talk with a partner and then suggest additions which the teacher adds in a different color to the diagram. The teacher encourages students to use vocabulary introduced during the pre-visit activities and practiced during the field trip activities: precipitation, liquid, water vapor, gas, evaporation, condensation, water cycle.

Part 2 ▸ Concept Development

TIME 60 minutes

MATERIALS

Post-it note

Re-sealable plastic bag

Graduated pipette or syringe

Small plastic cup

The teacher will ask teams of students to assemble a model of the water cycle that they can use to observe and investigate in the classroom. (The teacher should post the directions and model these procedures for the class first.)

- Write your team names on a post-it note and put it in your bag.
- Using the graduated pipette or syringe, measure 50 m. of water into your small cup.
- Carefully place the cup of water into your plastic bag. BE CAREFUL NOT TO SPILL ANY WATER INTO THE BAG!
- Seal the top of the bag tightly.
- Tape your bag to a sunny window.

Students should leave their models in the sunlight while they draw and label the set up of the investigation in their notebooks. They should

Science notebooks

also take some time to discuss with their team members and record in their notebooks some predictions about what they think will happen in their models.

After some time (30 minutes – several hours, depending on the weather), students should observe their models again and record any changes in their notebooks. The teacher should use probing questions to help students reflect on what they observe.

How well did you predict what would happen to the water?

Where do you see any water in your model? How do you think it got there?

How is this model like what happens at Lake Mead (and other bodies of water on Earth)? (The water evaporates into the air and rises with the heat of the sun. As the warm water vapor hits the cooler bag, it condenses into small droplets – similar to the way clouds form. When the droplets become too heavy, they fall to the bottom of the bag. This is like what happens to clouds as they collect moisture and become cool enough to drop water to the earth as rain.)

Part 3 ▸ Linkage and Closure

TIME 20 minutes

MATERIALS

Teams should share their ideas with the rest of the class. The teacher should assess student learning as the groups present their ideas. As they present, other class members should ask questions about their work and the teacher should use observation and questioning to assess student learning and guide any naïve conceptions about science content or process that were formed by students in the process of their inquiry.

- How do students explain the water in the bag? How well do their explanations reflect understanding of the processes of the water cycle? (With the heat of the sun, the water evaporates from the cup and condenses on the inside of the bag eventually dripping down to the bottom of the bag.)
- Do they use appropriate vocabulary (evaporation, condensation, water vapor, etc.) to describe the processes of the water cycle?

The teacher should ask teams to meet and generate questions for further investigation, using their water cycle models. These questions could be recorded and posted for future use (see extension activities).

EXTENSION

Students are encouraged to develop other questions that could be investigated using the mini-water cycle.

- Some people are worried about the effects of pollution on the Earth's polar ice caps. If particles in the air make the white ice caps darken, the ice caps might melt. How do you think discoloration would affect your water cycle? Would dark-colored water evaporate more quickly or more slowly than plain water? How could you find out?
- Is air temperature or water temperature more important to evaporation? How could you test this? Would you need more than one mini-water cycle? What tools would you need to measure the results of your investigation?
- How does direct sunlight affect evaporation? Try placing one water cycle system in the sun and one in the shade. What do you discover?

RESOURCES

Full Option Science System (FOSS) Environments module materials

Water Science for Schools

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

http://www.epa.gov/safewater/kids/kids_k-3.html

ADAPTATIONS FOR DIVERSE LEARNERS

Create language-supportive collaborative learning groups to allow students to work together to answer questions.

Use a think-pair-share to encourage thought sharing and discussion and allow for language processing time.

Record observations with words and/or pictures.

Create illustrated word bank, thinking maps, and charts.

ASSESSMENT

Students are assessed in the large group discussions on presentation of their observations and reasoning, on participation in discussion, and on clarifying questions posed.

The teacher may also ask students to self-evaluate their work as a scientist during this investigation. Students should reflect about the level of their work in the following areas:

- Was I on-task as I worked with my partner to investigate?
- Did I write and draw things in my science notebook that I could use for evidence for the presentation of our findings?
- Did I ask questions of other groups? Did my questions help me and other students better understand what the presentations were trying to say?
- What did I learn about the water cycle?