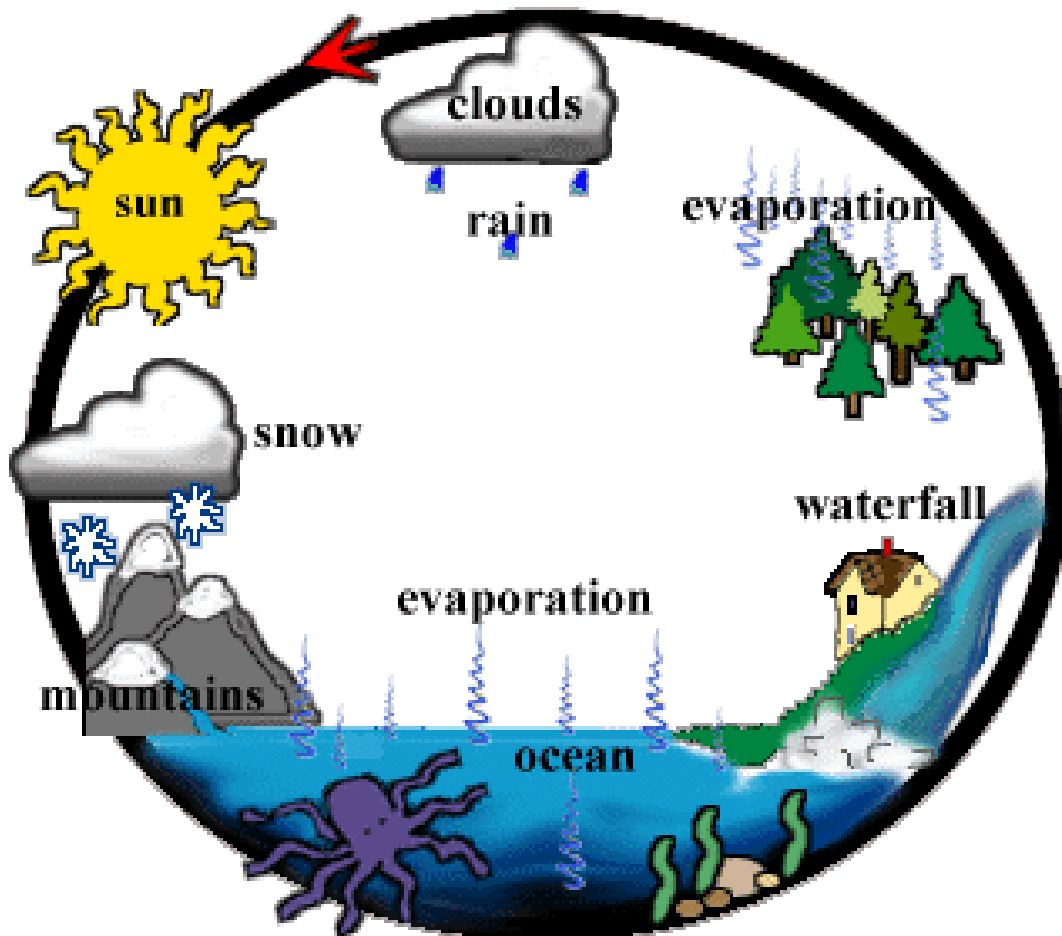


Evaporation



Unit Written By:

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Science Methods
EDUC 342
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Introduction to Evaporation

Abstract: During the introductory lesson the students will begin to learn about the water cycle and the different processes involved, specifically evaporation. Most of their learning will come through hands-on experimentation of the phenomena of evaporation. This lesson is also focused on making predictions and observations.

Target Audience: 4th Grade

Time:

- Instructional time of 60 minutes
- Requires hourly observations

Core Connections:

- Standard 1:* Students will understand that water changes state as it moves through the water cycle.
 - Objective 1b:* Identify the sun as the source of energy that evaporates water from the surface of the Earth.
 - Objective 2a:* Locate examples of evaporation and condensation in the water cycles (e.g., water evaporates when heated and clouds or dew forms when vapor is cooled).

Intended Learning Outcomes:

1. Students will explore the processes of evaporation through hands-on collaborative activities.
2. Students will be able to relate learning to life through experimentation with evaporation.

Materials:

- Styrofoam or Plastic Plates (enough for partners)
- One purple, one orange, and one black crayon for each group
- Water

Background:

The earth has a limited amount of water. The water keeps going around and around and around in what we call the Water Cycle. It is important for students to learn about this cycle because it provides all of the water we use to survive. On top of it being a vital cycle to our lives it is part of the Fourth Grade Utah State Science Core and a Science Benchmark.

The Water Cycle is made up of a few main parts:

- Evaporation
- Condensation
- Precipitation

Terminology:

Evaporation:

Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river or lake or ocean and goes into the air, where it becomes a cloud.

Condensation:

Condensation--the process of water vapor in the air turning into liquid water. Water drops on the outside of a cold glass of water are condensed water.

Precipitation:

Precipitation occurs when so much water has condensed that the air cannot hold anymore. The clouds get heavy and water falls back to earth in the forms of rain, snow, hail, sleet, dew, and frost.

These definitions can be found at: <http://ga.water.usgs.gov/edu/dictionary.html>

Anticipatory Set: (Assessing Prior Knowledge)

- Teacher wipes a damp sponge across the chalkboard. The class will watch and make observations about what happens. They should notice the streak slowly disappear. Ask the following questions:
 - Where does the water on the board go?
 - What happens to puddles after it rains?
 - Where does the water go?
 - Have you ever seen clothes hung out on a line to dry in the sun and wind?
 - Where does the water from the wet clothes go?
- Based on the answers that the students give the teacher, the terms of evaporation, condensation, and precipitation will be discussed. If the answers from the previous activity are primitive than the explanations will be more general, but if the answers are knowledgeable than the explanations will be more specific and detail oriented.

Procedures:

1. (Lesson needs to be done on a dry day, not a rainy or foggy day). Divide the class into partners. Each pair needs a plate and three different colored crayons.
2. Each pair should make a shallow puddle of water on their plate. Then they are to draw a circle around the puddle using the purple crayon.

3. Have each pair choose different places in the room to place their plate (i.e. in the sun, in the shade, near a heat register, etc.)
4. Let the plates sit for about an hour.
5. During that time make some predictions about what will happen to the puddles of water. Questions to ask: If we leave our puddles of water in the spots we chose around the room, what do you think the puddles will look like in one hour? What will happen to the water? Will the puddle be the same size? Will it be larger or smaller?
6. After one hour has passed, have each pair check their puddles. Each pair should make an orange circle around their puddles if the puddles have changes any. (The puddles should shrink.)
7. Have the different groups compare puddles.
8. Then have them leave their plates and puddles for another hour.
9. During this time compare the predictions the children made about what they thought would have happened to what actually happened. Also discuss what the students think will happen to their puddles in the next hour. Ask: What will your puddles look like in one hour? What will have happened to the water? Where does the water go? Do you think there will even be a puddle left? Why?
10. After one hour, recheck the puddles. Each group should now draw a black circle around the new puddle. The groups can compare the puddles again.
11. Have a discussion about what happened to the water. Possible questions are: If there are differences in how fast puddles in different parts of the room evaporated, why is that? Whose puddle shrunk, or evaporated faster? Why? (Relate this to the locations in the room.) What happened to your puddles? Where did the water go? What types of places help evaporation to happen faster? Here you can direct the students into the idea of the process of evaporation.

Conclusion:

-Have the students leave their plates where they are. Have them predict what their puddles will look like tomorrow morning. Explain that they will check out their puddles tomorrow morning when they come in.

Assessment:

-To check the students understanding, the students will write a creative short story about what happened to their water. (ex. The air got thirsty and drank up all the water...). Please see attached rubric for criteria.

-Continuous listening to student comments throughout the lesson

RESOURCES:

-http://faldo.atmos.uiuc.edu/w_unit/LESSONS/evaporation.html

-www.usgs.org

Story Writing: **Water Cycle**

Teacher name: Ms. Throndsen and Ms. Ericson

Student Name _____

CATEGORY	Excellent	Good	Satisfactory	Needs Improvement
Focus on Assigned Topic	The entire story is related to the assigned topic and allows the reader to understand much more about the topic. Key terms such as evaporation, condensation, and precipitation can be found.	Most of the story is related to the assigned topic. The story wanders off at one point, but the reader can still learn something about the topic. Some key terms can be found.	Some of the story is related to the assigned topic, but a reader does not learn much about the topic. One key term can be found.	No attempt has been made to relate the story to the assigned topic. No key terms can be found.
Creativity	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.
Accuracy of Facts	All facts presented in the story are accurate.	Almost all facts presented in the story are accurate.	Most facts presented in the story are accurate (at least 70%).	There are several factual errors in the story.
Action	Several action verbs (active voice) are used to describe what is happening in the story. The story seems exciting!	Several action verbs are used to describe what is happening in the story, but the word choice doesn't make the story as exciting as it could be.	A variety of verbs (passive voice) are used and describe the action accurately but not in a very exciting way.	Little variety seen in the verbs that are used. The story seems a little boring.

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Ideas for Prior Learning Connections

Before the lessons on evaporation, students should explore the many elements pertaining to weather, such as how weather can be observed, measured and recorded. Students could celebrate different forecasts and spend each day in a different weather condition. In addition, a Weather station could be constructed in our classroom and students reported the weather conditions to the entire school prior to each recess.

Students could focus on similarities and differences of environment from the Great Salt Lake and another ecosystem. Experts could be assigned to specific inquiries, for example: animal life, plant life, rocks, soil and water. After discovering and becoming familiar with the environments, two aquariums from the resources of the two habitats could be created. Experts could fill the aquarium with rocks, soil, water, plants and the animal experts could draw pictures and paste them on the rear of the aquarium.

The Water Cycle lesson will provide an opportunity for the students to become familiar with the elements of the water cycle.

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Evaporation: Great Salt Lake vs. Fresh water

Abstract: Students will accurately measure water and observe process of evaporation. In addition, students will make predictions concerning the speed of evaporation between fresh as well as salt water.

Grade Level: 4th Grade

Core Connections:

- Standard 1: Students will be able to understand that water changes state as it moves through the water cycle.
 - Objective 1a: Identify relative amount and kind of water in various locations on Earth.
 - Objective 1d: Investigate and record temperature data to show the effects of heat energy on changing states of water.

Intended learning outcomes:

- Students will predict the outcomes of evaporation of fresh and salt water.
- Students will make observations about the water cycle as they observe first hand the changes that occur as water evaporates.
- Students will be able to connect prior knowledge and learning to their current experiment.
- Students will be able to accurately explore the process of experimentation and observation.

Materials:

- Habitat aquariums of fresh and salt water from the Great Salt Lake
- Cups of equal size for holding water
- Measuring devises (1 cup). In order to have 10% salinity (about that of GSL), put 3.5 tsp. of salt into one cup of water.
- Marker
- Labels
- Observation logs

Background:

Lake Bonneville was a large, ancient lake that existed 32 to 14 thousand years ago. It filled the depression of the eastern Great Basin, and at its largest covered western Utah and smaller portions of eastern Nevada and southern Idaho. It contained many islands that are the present-day mountain ranges of western Utah. Its relatively fresh water was derived from direct precipitation, rivers, streams, and water from melting glaciers.

During the time of Lake Bonneville, the climate was somewhat wetter and colder than it is now.

After a while Lake Bonneville began to flood, the Great Basin gradually became warmer and drier. Lake Bonneville began to shrink due to increased evaporation. Today, the Great Salt Lake is a large remnant of Lake Bonneville, and occupies the lowest depression in the Great Basin. The size, shape, and location of this depression have been controlled by Basin. Other relics of Lake Bonneville are Utah Lake, Sevier Lake, and the Great Salt Lake Desert containing the famous Bonneville Salt Flats.

Much of the salt now contained in the Great Salt Lake was originally in the water of Lake Bonneville. Even though Lake Bonneville was fairly fresh, it contained salt that concentrated as its water evaporated. A small amount of dissolved salts, leached from the soil and rocks, is deposited in Great Salt Lake every year by rivers that flow into the lake. The Great Salt Lake is a terminal lake because it has no surface outlet (rivers flowing from it). Water is lost from the lake mostly through evaporation.

Water moves from place to place in a process called the water cycle. The sun provides the energy to make the cycle work. Heat from the sun evaporates water from the earth's surface, condenses in clouds and falls back to the earth as precipitation. Almost all the water on the earth has passed through the water cycle countless times. The water in our experiment came from rivers and these rivers were used by rain and snow. The water has been on earth for a long time. The water cycle is the process by which water is recycled through the environment, making this all possible.

Terminology:

Evaporation: The process by which water on earth is heated by the sun and changes from liquid to vapor. The vapor then rises into the air.

Water Cycle: The process by which water is naturally recycled on earth through evaporation and condensation.

Assessment of Prior Knowledge: Students will use their prior knowledge concerning water evaporation from the previous lesson to predict the outcomes of the experiment. Students will describe the process of evaporation and reflect upon its overall impact on different types of water. Have students create a diagram of the processes of evaporation.

Procedures:

1. Students will first be divided into learning groups and collaborate on a prediction as to the effect salt has on the evaporation process.
2. Predictions will be made and recorded in experimental journals.
3. Students will collect the necessary materials (cups, labels, and water) for the experiment. First students will label the cups one being fresh water and the other salt water.
4. Students will place one cup of water into the designated cup.
5. Students will mark the water level and place their cups in the window sill and wait for further observations.

6. Students will record their first observation in their journal and include their collaborated hypothesis.
7. Students will continue to observe the water level and debris not evaporated then continue to record daily for the period of two weeks.

Discussion Questions:

- What effect did salt have on the evaporation process?
- Why did the water evaporate and not the salt?
- What does this tell us about evaporation in solids and liquids?
- Do you think this might be a reason why the Great Salt Lake is so salty?
- Were your predictions correct?

Assessment Strategies:

- Did the students write a hypothesis with their prediction and explanation?
- Did the students record their observations?
- Did the students create a detailed diagram of the water cycle concluding the events of the experiment?
- Did the students enjoy their exploration and experimentation?

Follow-Up Activities:

- Once all the water has evaporated from the salt water sample students will use the microscope to observe the appearance of the salt crystals. They will draw a diagram of the salt crystals and show how they appeared under the microscope.
- Students will find the task card “The Water Cycle” found under Jennifer Throndsen on www.uen.org. Here they will answer the questions for each site and watch a video on the water cycle.