

SATURATION OF ARCTIC TUNDRA

Prep Time: 15 minutes

Teaching Time: 60 minutes for lab/discussion, time for field trip/PowerPoint varies

INSTRUCTIONS
Grade 4



Science Concept:

Earth's surface can be changed by water eroding rock and soil.

Objectives:

The student will:

- describe how water can affect Earth's surface;
- communicate results of data collection; and
- construct a bar graph.

GLEs Addressed:

Science

[4] SD2.1 The student demonstrates an understanding of the forces that shape Earth by observing models of how waves, wind, water, and ice shape and reshape the Earth's surface by eroding rock and soil.

[4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate.

Math

[4] S&P-1 The student demonstrates an ability to classify and organize data by designing an investigation and collecting, organizing or displaying, using appropriate scale, data in real-world problems (e.g., social studies, friends, or school), using bar graphs, tables, charts, or diagrams with whole numbers up to 25.

Vocabulary:

data - facts and statistics collected together for reference or analysis

erosion - removal of material by water, wind, or ice; as soon as some flowing agent such as air, water or ice causes a rock particle to move (through weathering), erosion has occurred

evaporation - turn from liquid into vapor

filter - a porous device for removing impurities or solid particles from a liquid or gas passed through it

graph - a diagram that illustrates the relationship between two variables

groundwater - water held underground in the soil or in pores and crevices in rock

saturation - the state of a substance holding all the water it can hold; the action of filling a substance with all the water it can hold

volume - amount of space taken up by a body

water table - the level below which the ground is saturated with water

watershed - an area or ridge of land that separates waters flowing to different rivers, basins, or seas

Materials:

- Pie pan or other container (one per pair of students)
- Large sponges (four per pair of students)
- Gallon water pitchers (one per pair of students)
- Water
- Clay
- Rulers (one per pair of students)
- Graph paper
- Stopwatches (one per pair of students)
- Plastic syringes, 2-ounce preferred (one per pair of students)
- Camera (optional)

Activity Procedure:

Please review the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: observing, recording, investigating, describing, and communicating

1. Create a K-W-L chart. Ask students what they know about water runoff, saturation, and erosion. Ask students how erosion, runoff, and saturation affect the Arctic environment and the communities in that environment. Ask what they want to learn about runoff, saturation and erosion.
2. Explain that students will be constructing a model of the arctic tundra. Divide students into pairs. Distribute a large sponge, pie pan, gallon pitcher of water, syringe, and stopwatch to each pair. Instruct students to place the sponge in their pie pan, then use the syringe to transfer water onto the sponge. Students should record how much water is added to the sponge before water begins to runoff into the pan (saturation point).

Explore

Process Skills: observing, collecting data, and communicating

3. Ask the class what will happen when snow melts in the community. Ask the class how they might create a model to demonstrate break-up.
4. Ask pairs to construct a simulation of spring break-up for the local community. Distribute three dry sponges, and a piece of clay to each pair. Guide pairs through the following steps to create their model:
 - a. Place a large dry sponge on a equally-sized solid piece of clay.
 - b. Place the sponge and clay in one corner of the pan.
 - c. Fill a gallon pitcher with water.
 - d. Use the plastic syringe to add water to the sponge until water escapes into the pan. Record the amount of water used.
 - e. Using a stopwatch, record the time it takes for the water to runoff.
 - f. Empty the pie pan and repeat the above steps three times.
 - g. Create a bar graph that shows the time and amount of water needed for the sponge to saturate. Graph each trial and the average of all three trials.
 - h. Share bar graph and results with another pair of students.

Generalize

Process Skills: inferring, describing, and communicating

5. As a class, discuss the following questions:
 - a. How much time did it take for water saturation and runoff to occur in each of the three trials?
 - b. What conclusions did you form from the data?
 - c. How might saturation from a sponge compare to saturation of other materials such as fabric, balsa wood, etc?
 - d. Discuss any problems that occurred with your water saturation simulation.
 - e. Discuss the successes you had in your water saturation simulation.
 - f. How could you apply the information acquired during this simulation to look for evidence of erosion in the local community?
 - g. Complete L part of the KWL chart (what I learned).

Apply

Process Skills: predicting, inferring, and communicating

6. Take a field trip to the area surrounding the school. Bring a camera, if possible. Ask students to observe and record information associated with ground water saturation and erosion around the community.
7. Instruct pairs to create a PowerPoint presentation based on the classroom activities and field trip, explaining the project and the evidence they found on their field trip.



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RUBRIC

Assessment Task

Imagine that the arctic is experiencing spring break-up after a cold winter. The snow is melting from the mountains, tundra, and taiga forests of the northwest Arctic. The geese are beginning to show up in the region and snow machines are being put away by residents of the Arctic. The snow quickly turns to water and has been soaked up and released by the exposed arctic tundra in the small northwestern community of Kiana located on a plateau above the Kobuk River. The saturation and release of the melting snow has made the roads of the community muddy and hard to travel. Erosion from spring break-up is evident as water makes its way from higher elevations to the Kobuk River located below the community at sea level. Using the knowledge acquired from observation and investigation, describe how water can affect Earth's surface. Give at least one example of how water has eroded the local area.

Rubric

| Objective | GLE | Below Proficient | Proficient | Above Proficient |
|---|------------------------|---|--|--|
| The student describes how water can affect Earth's surface. | [4] SD2.1 | The student cannot describe how water can affect Earth's surface. | The student describes how water can affect Earth's surface and provides one example. | The student describes how water can affect Earth's surface and provides two examples. |
| The student communicates results of data collection. | [4] SA 1.2 | The student does not explain results with peers. | The student explains results with peers. | The student explains the results with peers and answers resulting questions. |
| The student constructs a bar graph. | [4] S&P-1 [4] S&P-2 | The student does not create a graph, or his or her graph does not include appropriate scale, data, or labels. | The student creates a bar graph and includes appropriate scale, data, and labels. | The student creates a bar graph and includes appropriate scale, data, and labels. He or she shares results with peers. |