

FLUVIAL EROSION (MODIFIED FOR ADEED)

INSTRUCTIONS



Science Concept:

Water is a force that changes the surface features of Earth through erosion.

Objectives:

The student will:

- describe and explain surface features that indicate water (fluvial) erosion;
- record observations and inferences; and
- write a letter.

GLEs Addressed:

Science

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

[4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.

Writing

[4] W2.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms using appropriate information and structure (i.e., personal letters, recounts, descriptions or observations.)

Vocabulary:

erosion - removal of water or material by water, wind, or ice; as soon as a rock particle (loosened by weathering) moves, by some flowing agent (such as air, water, or ice) it has eroded

fluvial - produced by the action of a river or stream

landform - a physical feature of Earth's surface, such as a mountain or a valley

substrate - a substratum, or something that underlies or serves as a basis or foundation

Materials:

- Container for water (1 per group)
- Water source
- Plastic or rubber tubing (one 24 - 36" length per group)
- Plastic sled (one per group)
- Large container for collection of the runoff water (one per group)
- Assorted rocks (six to ten per group)
- Gravel (at least five pounds)
- Sand (at least five pounds)
- Potting soil (at least five pounds)
- Paper cups with holes poked in bottom [representing rain] (one per group)
- Paper towels [representing vegetation cover]
- Lunch trays (one per group)
- Rulers (one per group)

Activity Procedure:

Please refer to 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 Skill: observing and communicating

1. Divide students into groups, and ask them to build a mountain they believe will stay intact when a container full of water is poured over it. Provide access to soil, sand, gravel, and rocks. Distribute a lunch tray to each group, and provide ten minutes for groups to build their mountains on the lunch trays.
2. Ask each group to measure the height of their mountain. Empty a container of water over each group's mountain. Ask groups to measure their mountain's height again and calculate the difference. Discuss the results. Ask students to explain why such an outcome occurred. Ask groups to suggest improvements to their structures. Ask them to explain why they believe such improvements would be beneficial.

Explore

Process Skills: observing, communicating, measuring, collecting data, predicting, developing models, and investigating

3. Distribute a plastic sled to each group. Instruct each group to cover the entire surface of the sled with any of the substrates provided (sand, soil, gravel, rocks, and paper towels to simulate vegetation cover) and pat into place. Assist groups in positioning the sled such that water can drain from it into a bucket.
4. Choose one group with which to demonstrate the following procedure: Fill a container with water. Fill a length of tubing with water by submerging it in the container of water. Ask a student to cover one end of the tube with his or her finger while the tube is submerged. Hold the open end of the tube in the container of water, and ask the student to pull the other end of the tubing out of the container while keeping the end plugged. Ask another student to elevate the container above the sled and hold it firmly in place. Ask the student holding the tubing to place the end of the tubing against the soil, then release the end. Allow the water to siphon through the tube and flow steadily through the soil, simulating a river or stream. Observe and discuss the resulting landforms.
5. Allow each group time to perform the activity and to explore by changing the sled's angle of incline, trying different substrates (gravel, sand, soil), using the "grass layer" (paper towels), and by placing small or large rocks at spots in the soil that will impede the flow of water. Groups may also try adding water with the "raincup" (cup with holes) instead of the stream tube by pouring water into the raincup while another student holds the cup over the sled. Make sure one student in each group monitors the level of water in their drain bucket and empties it as necessary. Ask students to record observations and make at least one inference about the investigation.

Generalize

Process Skill: questioning, communicating, inferring, describing, and generalizing

6. Ask the following questions and discuss as a class.
 - a. Where did the water flow?
 - b. What patterns did the water make?
 - c. Were the patterns different when different materials are used?
 - d. Were the patterns different with rain and with a stream?
 - e. How did the rocks change the path of the water?
7. Ask students to brainstorm about ways this investigation simulates rainwater falling and the flow of rivers and streams.

Apply

Process Skills: communicating, inferring, describing, and generalizing

8. Take students outside, and as a class, point out evidence of erosion on the school grounds. Good examples can often be found near drains, drainpipes, and at the edges of concrete.
 - a. Divide students into pairs, and ask them to examine the area to look for other signs of erosion.
 - b. Instruct students to document examples of erosion they found by writing a description and drawing and labeling a sketch.

FLUVIAL EROSION

INSTRUCTIONS



- c. Return to the classroom. Ask pairs to share what they have written about the effects of erosion on the playground and school property.
- d. Ask the class if anyone noticed the placement of trees and/or shrubs. Ask if students think the trees and/or shrubs may have been placed in particular areas to help stop the effects of erosion.

FLUVIAL EROSION

RUBRIC

Assessment Task

1. Explain Mars is sometimes referred to as the Red Planet. Except for Earth, Mars has the most varied terrain of any of the terrestrial planets. The southern hemisphere of Mars is mostly cratered highlands, similar to the Moon. In contrast, most of its northern hemisphere consists of plains that are much younger than the highlands. There is clear evidence of erosion in many places on Mars. At some time in the past there may have been large lakes or even oceans on Mars' surface. Early in its history, Mars was much more like Earth. What evidence could indicate liquid water existed on Mars in the past?
2. Instruct students to imagine they are scientists who believe Mars once had liquid water on its surface. Ask students to write a letter to the Director of NASA justifying their theories. Students may draw the surface features that support their theories. They must identify at least two examples of surface features that are evidence of fluvial erosion on Mars.

Rubric

| Objective | GLE | Below Proficient | Proficient | Above Proficient |
|--|------------|--|--|---|
| The student describes and explains surface features that indicate water (fluvial) erosion. | [4] SD2.1 | The student does not identify any examples of surface features that are evidence of water (fluvial) erosion on Mars. | The student identifies at least two examples of surface features that are evidence of water (fluvial) erosion. on Mars. | The student identifies and explains at least three surface features that are evidence of water (fluvial) erosion on Mars. |
| The student records observations and inferences. | [4] SA1.1 | The student creates a model but is unable to describe or make inferences about the erosion processes that are occurring. | The student observes, describes, and makes at least one inference about his or her model created during the investigation. | The student observes, describes, and makes more than one inference about his or her model created during the investigation. |
| The student writes a letter. | [4] W2.2.2 | The student writes a letter to the NASA director that uses either a style that is appropriate for the purpose and audience or correct letter format, but not both. | The student writes a letter to the NASA director that uses a style that is appropriate for the purpose and audience and that uses correct letter format. | The student writes a letter to the NASA director that uses a style that is appropriate for the purpose and audience and that uses correct letter format. A drawing is included with the letter. |

