

STEPS FOR *EROSION RATES*

1. **Warm-up Activity:** Provide students with a small amount of sand, a small tray, safety goggles, and cup of water. Challenge them to move the sand from one end of the tray to the other using as many different methods as they can. Students should record their methods and then share with the class. One method might be blowing the sand and it is important students wear safety goggles while investigating.

Ask students to identify the processes they are demonstrating. At this point, students are likely to give very general/common descriptions of the processes. They might use terms such as blowing, pushing, and rolling. Students should be prompted to use the term erosion by clarifying erosion is process in which water, ice, or wind move pieces of rock and soil.

2. Guide students to define the terms erosion, sediment and gravity. Use the Frayer Model with students to map out the definitions of each term. Students will write the definition in the middle oval and fill out the four sections. These terms will be used frequently throughout the lesson.
3. Explain to students that there are four stations around the room that investigate systems that impact Earth's surface. They will be observing that all stations demonstrate a different agent of erosion and its effect on Earth's surface.

Station #1 Waves

Materials-aluminum baking pan, sand, water, metric ruler, and piece of cardboard

Students will build a small hill on one side of a tray with sand. On the other end, they will pour a cup of water. Students will create different sized waves using the piece of cardboard. Ask students to observe how the sand moves. Students will observe the sand being carried into the water and back onto the sand pile.

Station #2 Wind

Materials-aluminum baking pan, cornmeal or sand, and drinking straw

Students cover the pan with a layer of sand or cornmeal 1-2 centimeters thick. They will use a straw to gently blow over the layer of sediment. Ask students to observe how the sand moves. Students will observe the sand or sediment being carried by their breath of air and being dropped down after they stop blowing. Students might use the term gravity to explain how the sediment dropped.

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Station #3 Glaciers

Materials- ice cube, modeling clay, sand, cardboard

Students slide an ice cube over the clay and sand. They then leave the ice cube to melt at the end of the path. Ask students to observe how the sand moves. Students will observe the ice picking up particles of sand and that they are making a path. Where the ice melts they will observe the sand making a small pile.

Station #4 Water

Materials- Petri dish, soil, water, pipette, meter stick

Students will fill a petri dish with 1 centimeter of soil. They will place the dish on a paper and fill a dropper with water. Students will squeeze a large water drop from a height of 1 meter onto the surface of the soil. They will measure the distance the soil splashed from the dish. They will repeat these steps at a height of 2 meters. Ask students to observe how the dirt moves. Students will observe that the greater height the soil splashed further. The splash caused the sediment to move from one place to another.

4. Have students discuss and debate a ranking of most efficient agent of erosion to least efficient based on their observations. Ask students to consider the amount of sediment that was moved from one place to another. More sediment moved is evidence of a more efficient method.
5. **Wrap-up:** Share with students that human activities can also affect Earth's surface. Ask students to consider how erosion is impacted when you plant trees on Earth's surface. Deforestation is the process of removing all the trees and vegetation. How could this process impact erosion?

Students will identify that by planting trees you can stop sediment from moving. Trees slow down water as it runs and the roots can use the water. If trees are removed sediment can continue to move freely.

Extension Activity

After a rainstorm, take a walking tour with your class around the school. Look for evidence of erosion. Try to find areas where there is loose soil, sand, gravel, rocks, or bare ground with grass.

Sources

http://www.mnh.si.edu/earth/main_frames.html

<http://education.usgs.gov/lessons/schoolyard/glacialstriations.html>

Waves

Wind

Glaciers

Water

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Name:

Date:

Waves

Ocean waves carry sand and other materials. As waves move over land, they drop off the materials they carry. As ocean waves hit the shore, they break down rocks and other materials into small pieces. Erosion is the movement of pieces from one place to another.

Do large waves erode more than small waves?

- Build a small sand hill on one side of the pan.
 - Add water and make waves with the small piece of cardboard.
 - Make small waves and then large waves.
 - What relationship did you observe about wave size and erosion?
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Wind

Wind shapes the land in places where there are few plants to hold the soil in place. Wind carries sand that can grind down other rock. Wind carries sand and drops it creating hills, like sand dunes.

How does moving air affect sediment?

- Cover the bottom of a pan with a flayer layer of cornmeal or sand (1-2 centimeters deep)
 - Gently blow over the layer of sediment using a straw to direct your breath. Observe what happens.
 - What changes did the wind you created make in the flat layer of sediment?
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Glaciers

Glaciers can form only in an area where more snow falls than melts. The movement of a glacier changes the land beneath it. They move slowly and can pick up rocks and dirt as they move. These sediments can scrape against the land as it flows with the glacier. When a glacier melts it will drop the sediments creating new landforms.

How do glaciers affect sediment?

- There is a modeled landscape made out of clay with sand at your station, sprinkle with extra sand if needed.
 - Slide an ice cube over the clay and sand.
 - Leave the ice cube to melt at the end of the path.
 - Write a description of how the sand moved.
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Water Erosion

Water in all forms can cause erosion. Raindrops splash moving particles of soil. In streams water moves picking up and dropping sediment.

How does the force of falling raindrops affect soil?

- Fill a Petri dish with fine textured soil to a depth of about 1 cm. Make sure the soil is flat but not packed in.
- Place the dish on paper.
- Fill a dropper with water. Squeeze a large water drop from a height of 1m onto the surface of the soil. Repeat 4 times.
- Use a meter stick to measure the distance the soil splashed from the dish.
- Repeat steps 1 through 4, this time from a height of 2 m. Which traveled further, the splash from 1 m or the splash from 2 m?
- Which test produced the greater amount of erosion? Why?

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Frayer Model

Definition	Examples
Characteristics/Notes:	Illustration

