Erosion and Its Effects on Earth's Surface

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Science

Standard II: Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

Objective 2: Describe how weather and erosion change Earth's surface.

Indicators a: Identify the objects, process, or forces that weather and erode Earth's surface (e.g. ice, plants, animals, abrasion, gravity, water, wind).

Science Intended Learning Outcomes

1- Use science process and thinking skills—d, f, h, i

4- Communicate effectively using science language and reasoning—a, b, c

Background Information:

Erosion on Earth's surface is happening all around us all the time. Sometimes it happens so slowly or subtly that we don't know it is happening. Other times it can happen quickly right before our eyes. It is important for students to know what erosion is and how it is different from weathering. The definition of erosion is movement of sediments and rocks from one place to another. The forces water, snow, wind, and gravity cause erosion. There are many different types of erosion. The ones that will be shown in these lessons are caused by water run-off, wind carrying sediments, waves crashing against cliffs, and glaciers moving down mountains.

Erosion

Definition: The physical movement of sediments and rocks from one place to another by forces of nature.

Different Types of Erosion

When students are learning about science the best thing the students can do is write down these ideas in a journal. Have them draw pictures of what is happening and then label the important parts. Have them write captions under the drawings describing what is happening.

I. Water run-off

- When it rains or snow is melting, the water will collect together while going downhill in the form of a stream. The stream will carry with it a lot of sediments and even rocks if the stream is moving fast enough. Where the streams drop the sediments are called deltas.

Experiments/Observations:

- **Make a mountain out of sand in a large plastic tub.**
- **Get a soup can or two and punch holes in the bottom with a nail and hammer.**
- **Pour water in the cans while the cans are over the sand mountain. You will observe that the water will gather and carry sediments with it making small canyons.**

II. Wind carrying sediments

- If the wind blows strong enough it pick up the sediments and carry off to some other place. Where the wind has blown the sand is called sand dunes.

  Experiments/Observations:

  - **Get some sand and smooth it out in a tub.**
  - **With your hand acting as wind, show how the wind can pick up the sand and place it somewhere else.**
  - **From the direction the wind is coming from, the sand will gradually slope up. At the top will be an abrupt fall.**

III. Waves crashing against cliffs

- On the coasts of oceans, waves crash up against the cliffs and break down the rocks and disturb the soil. The small sediments and small rocks that fall into the ocean are then carried off by the undercurrents and taken somewhere else. The place where these sediments are taken by the undercurrent are crating a new beach or adding to an old one.

  Experiments/Observations:

  - **Make a cliff out of sand in a tub that stretches out about six inches.**
  - **Put water on the other side of the tub so that it looks like the ocean in the tub.**
  - **Make waves with your hand to crash the water up against the cliff.**
  - **The water will be tearing down the cliff and distributing the sand to make a beach.**

IV. Glaciers

- On the high slopes of some mountains after snow has fallen on the mountain peaks, during the summer, the slopes facing the sun will melt. Since the northern facing peaks are so high up, the air doesn't melt the snow. Year after year the snow will

accumulate on the north side and form many feet of snow. At a certain point when the snow is heavy enough, gravity will begin to pull on the snow. At this point it is a glacier. The glacier gradually moves down a mountain. As the glacier is going down the mountain, it will cut deep into the mountainside taking large amounts of sediments with it. Getting from the top to the bottom could take as long as 50 years. When the snow gets to the bottom of the mountainside, it will melt. The sediments left will form a hill called a moraine.

Experiments/Observations:

- **Make a mountain out of sand in a large plastic tub.**
- **Get some crushed ice and put it on the mountainsides simulating snow.**
- **Get a hair dryer and dry the south side of the mountain like the sun does. Don't do anything to the north side.**
- **Continue with this process until the north side of the slope is really covered with ice.**
- **With your hand (your hand is simulating the pull of gravity) push the snow down the side of the mountain.**
- **With a hand dryer (or just have it naturally melt) melt the snow at the bottom of the mountain.**
- **A hill will be left.**

V. Gravity

- As rocks break off high cliffs by ice in cracks or temperature change, they fall great distances. This falling is erosion because the rocks are moving from a high place to a low place by gravity. The place where they fall is a pile of rocks.

  Experiments/Observations:

  - **Get about 6 big rocks.**
  - **Put them in a large bowl.**
  - **Pick up the bowl as though they were part of a huge cliff.**
  - **Drop each one separately making a pile at the bottom.**
  - **Gravity has made them fall to find a new home at the base of the cliff.**

Assessment

- Look in the students' journals to make sure they are writing about the different experiments. They should be making predictions, making observations, and writing conclusions. Check for misconceptions and accuracy
- Ask questions after the experiments to make sure the students are grabbing onto the concepts being taught.
- Have the students write in their journals about each topic what they learned about each experiment.
- Have the students answer the worksheet questions about the experiments. Check for content, accuracy, and depth.
- Have the students write a summary paper of what erosion is using the ideas of the experiments that were done in class.

Subject Area

Writing

Standard VIII:

Students will write daily to communicate effectively for a variety of purposes and audiences.

Objective 6:

Write in different forms and genres.

Indicators b: Produce traditional and imaginative stories, narrative and formula poetry.

d: Produce writing to persuade (e.g., essays, editorials, speeches, TV scripts, responses to various media.

Science Connection

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Objective 2: Describe how weather and erosion change Earth's surface.

i. Write a poem using Haiku, Cinquain, Diamante, or any form of your choice that describes one of the ways erosion takes place. Describe it as well as you can that will put pictures in the minds of the reading of the actual process of the type of erosion you have chosen.

ii. Write a short humorous story about a hillside that is being eroded away by one of the processes of erosion. Bring the hillside to life giving it human qualities and characteristics. What does the hillside do to deter its demise? Be sure to have a beginning, middle, and end; main idea; details; setting; problem; and plot.

iii. Would if we could purchase one of the erosion forces to wash away a hillside? Write a TV commercial that you are selling one of the erosion forces to take away a hillside in your area. Be sure it tells truthful facts about the type of erosion forces you are promoting

iv. Write a newspaper article for the "Erosion Gazette" that tells about a tragedy of a hillside that was attacked by the erosion force of your choice. Tell when it happened, where the erosion force came from, what it did, and how it happened. Be very descriptive so the reader can picture the story in their minds.

v. Write a journal entry of the day and the life of a hillside. Write about what a hillside's day would be like. Tell some challenges, dangers, happy times, sad times, and/or humorous events it would face daily.

Subject Area

Visual Arts

Standard IV:

The students will interpret and apply visual arts in relation to cultures, history, and all learning.

Objective 3:

Recognize the connection of visual arts to all learning.

Indicator d: Any works of art with which the teacher is familiar and appropriately teaches the standards and objectives of this grade level.

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With a piece of large white drawing paper or white bulletin board paper, draw a few mountains and valleys and a flat foreground. Draw in places that the seven types of weathering we talked about would take place. When you are done drawing it, label the places of weathering.

Subject Area

Theatre

Standard I:

The students will plan and improvise plays based on personal experiences and heritage, imagination, literature, and history of informal and formal theatre.

Objective 3: Describe and explain plot structure in terms of conflict.

Indicator b: Create and improvise an original scene in which the major conflict comes from the environment.

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In groups of twos or threes, have each group select a erosion process. Have the students create and improvise crisis scenes based of hillsides. Have the students act out the type of erosion that is happening to the hillside. There can be some dialogue but mostly action that show what is happening in the erosion process.

Questions about Erosion

1. Tell of two sources where running water could come from to cause erosion on a hill.

2. Explain how running water causes erosion on a hill.

3. Explain how wind causes erosion.

4. Explain how waves cause erosion.

5. Explain how glaciers cause erosion.