

Erosion and Landslides

Lesson Plan

Grade Level: 6-8

Curriculum Focus: Land and Water

Lesson Duration: 1-2 class periods

Student Objectives

- How to design an experiment and how to control different variables in an experiment.
- How different soil materials, amount of water, and slope can produce varying types of landslides.

Materials

- Video on *unitedstreaming: Erosion: Landslide*

Search for this video by using the video title (or a portion of it) as the keyword.

Selected clips that support this lesson plan:

- Bainbridge Island, WA: Victim of a Landslide
- Landslides: Products of Opposing Forces: Heat vs. Gravity
- The World's Largest Landslide Laboratory

- Stream table or a container to act as a stream table (milk carton with one side cut away)
- Materials to line stream table: sand, soil, pebbles, diatomaceous earth, clay, mixture of material
- Graduated cylinder
- Watering can
- Plastic sheeting or newspaper to cover lab tables or floor
- Scale or balance to measure amount of material in landslide (optional)

Procedures

1. Explain that not all landslides are alike. Some, like a debris flow, can happen very quickly and move rapidly. Others might be a slump of earth that moves slowly, even just a few centimeters a year. Discuss some of the different conditions that trigger landslides.
2. Ask the class to then brainstorm a list of the different variables that trigger landslides, such as slope, types of earth (like rocks or loose soil), and amount of water.
3. Tell students they will be designing their own lab to test how each of these variables affect a landslide.
4. As a class, design a lab to test how each of these variables affect a landslide. Begin by reviewing the materials they'll be using to simulate a small-scale landslide. Tell students they'll be working in small groups, so each group could test a different type of earth, such as sand, soil, clay, or pebbles. In addition, remind students that they should test only one variable at a time, and carefully record the variable each time (for example, the angle of the slope, the amount of each material added, or the exact amount of water added). They will need to repeat their experiment three times, and then average the results of each.
5. To construct their stream tables, students should begin by filling their container halfway with material (soil, rocks, etc.). To vary the angle of the slope, have students raise one end of their stream table with a book or two. (They may need to place another book at the opposite end of the stream table to keep it from sliding.) Students should measure this angle using a protractor or clinometer.
6. Next, have students slowly pour a measured amount of water on the higher end of the stream table until all the material is soaked. The water should be added gently, if possible with a sprinkling can. Have students observe and illustrate the patterns formed in the stream table.
7. Once the material has been soaked with water – without the material moving – students can create a “landslide” in their stream table. To do this, they need to slowly add a measured amount of water over a period of time. Students should be carefully measuring the total amount of water they add to the stream table – and observing the exact amount that has been added to instigate the landslide. Once the landslide has occurred, they should measure the amount of material involved in the slide by volume or weight.
8. Students should repeat their experiment two more times and average their results between the three trials. Encourage students to experiment with increased water amounts, materials, or slope angles.
9. Ask each student to create a lab report that clearly shows the outcome of each experiment. In addition, have them graph the results and write a conclusion based on the results.
10. Have each group share its results with the class and compare the findings. What materials (or types of earth) were most vulnerable to landslides?

Discussion Questions

1. Discuss possible causes of landslides. Provide some examples of areas that have experienced either recent or frequent landslides.
2. Debate whether landslide areas should be developed. What should be done for areas already developed that could help people survive a potential landslide?
3. Compare and contrast debris slides and rockslides. How should a community respond to each potential slide?
4. Explain how avalanches and volcanoes relate to landslides. Discuss which would be the most destructive.
5. Observe your community for evidence of landslides, rockslides, or debris slides. Is this a threat to your area? Are there other natural disasters that pose more of a threat?
6. Find the most recent news story about a landslide and explain its causes and effects. Debate whether the community responded well. How were citizens informed ahead of time?

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- 3 points: Students were active in class discussions; showed a strong understanding of landslides and the variables that trigger them; worked cooperatively in group; created a thorough and organized lab report that clearly shows the outcome of each experiment; graphs were accurate and neat; well-written conclusion based on lab results.
- 2 points: Students participated in class discussions; showed a satisfactory understanding of landslides and the variables that trigger them; worked well in group; created a complete lab report that clearly shows the outcome of each experiment; graphs were mostly accurate; adequate conclusion based on lab results.
- 1 point: Students did not participate in class discussions; showed a weak understanding of landslides and the variables that trigger them; did not work well in group; created an incomplete complete lab report that did not clearly show the outcome of each experiment; graphs were inaccurate or sloppy; vague or incomplete conclusion, loosely on lab results.

Vocabulary

avalanche

Definition: A fall or slide of a large mass of snow or rock down a mountainside.

Context: Snow-covered volcanoes or excessive snow accumulation can cause a landslide of snow commonly called an avalanche.

El Niño

Definition: The warming of the ocean surface every 4 to 12 years that affects weather over most of the Pacific region.



Context: The warming of the surface of the Pacific Ocean during El Niño created many heavy storms along the coast of California.

erosion

Definition: The process whereby the Earth's materials are carried away and redeposited by wind, water, ice, or gravity.

Context: Over many years, erosion changed the landscape of the beach community.

glacier

Definition: A huge, powerful mass of ice that moves slowly over a landmass, picking up large amounts of debris as it moves.

Context: Glaciers gradually melt over a long period of time.

gravity

Definition: The force of attraction exerted by a celestial body on objects at its surface; the force that pulls material on the Earth's surface toward the center of the Earth.

Context: Due to the force of gravity, material will always flow down a slope.

groundwater

Definition: Water beneath the Earth's surface, found between saturated soil and rock.

Context: After periods of heavy rain, groundwater can build up under sandy or loosely packed soil creating an unstable surface with a potential for a landslide.

tectonic plates

Definition: The pieces of the Earth's crust that float on the Earth's mantle.

Context: The Pacific and the North American tectonic plates continually move against each other. This plate movement can form uplifted mountains and earthquakes.

uplift

Definition: To raise or elevate.

Context: Some mountains are formed when pieces of the Earth's crust are uplifted against the force of gravity.

Academic Standards

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following national standards:

- Science – Earth Science: Understands Earth's composition and structure.



- Science – Nature of Science: Understands the nature of scientific inquiry.

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>

This lesson plan addresses the following national standards:

- Earth Science: Structure of the earth system
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>