An Experiment with Landslides and Avalanches
Lesson Plan

Grade Level: 6-8 | **Curriculum Focus:** Weather | **Lesson Duration:** Two class periods

Student Objectives

- Friction between snow or rocks and the underlying ground holds the snow or rocks in place on a slope, preventing avalanches and landslides.
- In order for an avalanche or landslide to occur, friction must be overcome.
- Lubricants, like water, ice, and sand, can overcome friction and cause avalanches and landslides.

Materials

- Discovery School video on *unitedstreaming*: *Raging Planet: Avalanche*
  Search for this video by using the video title (or a portion of it) as the keyword.

  Selected clips that support this lesson plan:
  - Avalanche Ammunition: Complex Material in Nature
  - Understanding Conditions of an Avalanche: Forecasters Predict Danger
  - Avalanche without Snow: Erupting Volcano, Earthquake Slides, Mountain Side Collapse

For each group:

- Old textbook
- Plastic bag
- Half-meter piece of wood about 30 centimeters wide
- Meter stick
- Newspaper
- Tape
- Talcum powder
- Sand
- Pebbles

- Marbles

Procedures

1. Ask your students to define the terms *avalanche* and *landslide*. In an avalanche, deep snow that has been lying on a slope breaks free from the underlying surface and crashes down the slope. A landslide is a similar phenomenon, involving rocks instead of snow. Students should know that both are potentially destructive and dangerous.
2. Ask students to think about the possible causes of an avalanche or landslide. Start them off by asking them to imagine a steep mountainside covered with snow. For weeks, the snow remains on the mountainside without moving. Then, one day, an avalanche occurs. Something must have changed, since things that are stationary do not begin to move for no reason at all. What changes could have caused the avalanche?
3. Tell your students that they are going to perform an experiment that might help them answer the question or confirm the answers that they have formulated. Then divide the class into groups to carry out the experiment.
4. Distribute materials to each group.
5. Have students clear an area on the floor to work, spread out the newspaper, and tape it to the floor. (The newspaper will catch debris that falls later in the experiment.)
6. Instruct students to place the piece of wood flat on the floor on top of the paper. At one end of the board, have them stand the meterstick on its end, with the 0 end down.
7. Next, students should place the book on the end of the board near the meterstick.
8. One student should then slowly lift the end of the board, causing the board to slope, until the book begins to slip.
9. Another student in the group should record the height of the board at the moment the book began slipping down the slope.
10. Have students repeat the experiment after putting different substances on the board underneath the book: talcum powder, sand, pebbles, and marbles. (Make sure they wipe off the substance between experiments.) Each time they try a new substance, have them record the height of the board when the book begins to slip.
11. Discuss with the class the results of the experiment. Can students explain why the book began to slip sooner when talcum or other substances were added?
12. Explain that *friction* between the board and the book held the book in place. In the same way, friction between snow or rocks and the underlying ground holds the snow or rocks in place on a slope, preventing avalanches and landslides. In order for an avalanche or landslide to occur, friction must be overcome.
13. Next, explain that the added substances in their experiment acted as *lubricants*, reducing the friction. Ask students what lubricants in nature might overcome friction and cause avalanches and landslides? (*water, ice, and sand*) Explain that these lubricants make the underlying surface slippery and provide a cushion for snow or rocks to move over.

14. Have each student write a paragraph speculating as to what each lubricant used in the experiment may represent in nature. What if the lubricant were water or ice? How would water accumulate under a thick layer of snow on a mountain? They should conclude their paragraphs by telling what they think could have caused the avalanche they imagined before performing the experiment.

Discussion Questions

1. Create a convincing argument for building at least one type of avalanche safeguard for your town. Assume the simplest plan will cost the town one million dollars and there is no money set aside for a project of this magnitude.
2. Develop a plan for how the town will fund construction of the safeguard and share it with the group.
3. Decide who will pay for safeguards around homes outside the central district.
4. After careful discussion, formulate a master plan that seems fair and benefits the majority of the residents.
5. Compare the three types of snow avalanches.
6. Brainstorm and share possible ways people could protect themselves from rock avalanches and pyroclastic flows.

Assessment

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

- 3 points: Student's report reflects carefully thought out reasoning; paragraph well organized and error-free.
- 2 points: Student's report reflects adequate reasoning; paragraph lacking in organization with some errors.
- 1 point: Student report reflects careless reasoning; paragraph lacking in organization with numerous errors.

Vocabulary

cornice

Definition: An overhanging mass of snow, ice, or rock usually on a ridge.

Context: Wind can also blow snow into a huge, dense drift or cornice on the crest of a ridge.

powder avalanche

Definition: A mass of loosely packed snow that begins with a piece of falling rock or ice.

Context: The largest and most destructive avalache is a powder avalanche. A piece of falling ice or rock starts a mass of loose snow sliding down the mountain.