



Science Unit: *The Earth Around Us: Air, Water & Soil*

Lesson 3: *Erosion*

School year: 2007/2008

Developed for: Carnarvon Elementary School, Vancouver School District

Developed by: Linda Hanson (scientist), Moira Corrigan and Tania Pearse (teachers)

Grade level: Presented to Grade 2; appropriate for grades 1 – 7 with age appropriate modifications.

Duration of lesson: 1 hour and 15 minutes

Notes: Sheets of Styrofoam insulation can be bought from any large home improvement store and cut into 12" squares using a serrated knife or hand saw.

We conducted the lesson in a sandbox however if each group was given a large tray (with sides) the lesson could be modified to take place indoors.

A related lesson focusing on the importance of trees in preventing erosion is available from the Scientist in Residence Program website <http://www.scientistinresidence.ca>, see , Lesson 6 Trees and Erosion in the Temperate Forest science unit, Life Science curriculum area.

Objectives

1. Learn about the process of erosion and discover which factors are important in determining the extent of erosion.
2. Relate erosion to the water cycle.

Background Information

Erosion is the transport of rocks or particles by natural agents. Forces of erosion include wind, water (streams, waves, rain, groundwater), snow and ice (glacial action, avalanches) and gravity (rockslides, landslides, debris flows). It is important not to confuse erosion (the transport of materials) with weathering (the breaking down of materials into smaller pieces) as the two processes often occur simultaneously.

Vocabulary

Erosion: The movement of rocks or rock particles due to natural forces (wind, water, gravity).

Materials

- 12" by 12" by ½" thick styrofoam foam tile
- Mixture of small rocks of various sizes (1 cup per group)
- Toothpicks (50-100 per group)
- Sand (or sandbox)
- Spray bottle (1 per group)
- Buckets of water or a hose



In the Classroom

Introductory Discussion

1. Review last week's experiment on weathering.
 - Review vocabulary (physical weathering versus chemical weathering)
2. Last week we learned how rocks are broken down into smaller particles. Today we are going to learn what can happen to those particles. (Record ideas from discussion on the board)
 - What happens to your tap water after a big rainstorm? (gets muddy, murky etc.)
 - Where does that mud come from? (record ideas)
 - Come to the consensus that particles of mud, sand and rock can be carried away or moved by rain and other natural processes. Introduce vocabulary: EROSION
 - What causes erosion? (brainstorm) [Water (rain, rivers, waves, snow, glaciers); wind; gravity (rockslides, debris flows, landslides)].
 - Focus in on where erosion occurs in the water cycle.
3. Briefly describe science experiment/activity.
 - Students will use the foam tile as a hillside and examine the various factors that effect erosion on their hillside.
 - Students will work in groups.
4. Students will focus on observing the process of erosion and after the activity on recording their observations.
5. Briefly describe safety guidelines.
 - Do not spray water or throw sand at or near any other students.
 - Remain in the sandbox area at all times (do not wander off to the playground)

Science Activity

Activity Title: Exploring Erosion

Purpose of Activity: to observe the process of erosion and discover which factors effect the erosion of hillsides.

Methods and Instructions:

Set-up prior to experiment: cut enough Styrofoam tiles for each group, count out toothpicks for each group. Draw lines with a felt marker to divide each tile into quarters.

Students will work in teacher assigned groups of 3-4 students. They will cover the tiles (i.e. hillsides) with a variety of materials and then spray water on the hillsides of simulate rain. They will observe the resulting erosion.

1. Have the students create a base for their hillside out of sand (the tiles should rest at 30-40° angle).
2. Discuss the variables that students should control for (have students make suggestions).
3. The activity consists of 3 different comparisons.



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4. Have the students cover the top half of the tile with an even layer of sand.
5. Have them spray $\frac{1}{4}$ of the tile with the spray bottle on "mist" setting to simulate light rain. Adjust the spray bottle to the "spray/stream setting. Have students spray the second quarter with the spray bottle on the new setting to simulate heavy rain.
6. Discuss the differences between the two treatments.
7. If students are working outdoors they will record all observations at the conclusion of the activity. If they are working indoors they can record observations as the activity progresses.
8. Clean off the tile.
9. Cover the top half the tile with a mixture of sand and small rocks. The rocks should be a variety of sizes.
10. Spray the tile to simulate rain. Have the students start with light rain and progress to heavy rain.
11. Discuss the results.
12. Clean the tiles.
13. Cover $\frac{1}{4}$ of the tile with toothpicks (50-100 per group). Have the students ensure the toothpicks are firmly embedded in the foam.
14. Cover the top half of the tile (including the $\frac{1}{4}$ with toothpicks) with a layer of sand.
15. Have the students spray the tile to simulate rain (light or heavy, as long as the class is consistent).
16. Discuss the results.

Closure Discussion

1. In the first activity what happened when your hills received heavy rain?
2. Which particles (from the sand rock mixture) moved down the hill the farthest?
3. Why are trees important on hillsides?
4. Discuss the concepts of particles size, energy required for erosion in the context of streams (freshet, transport distance of different particle sizes downstream) in the context of streams and beaches (beach erosion, sea walls etc.).
5. Discuss the importance of trees and vegetation for slope stability.

References

1. Christopherson, Robert W. 2002. Geosystems: an introduction to physical geography. Prentice, Hall

Scientist: _____

Date: _____

Exploring Erosion

Draw what happens to your hills after it rains:

Sandy hill with light rain



Sandy hill with heavy rain



On which hill did the sand move the most?

Rocky hill



Which particles moved the farthest down the hill?

Sandy hill (no trees)



Sandy hill with toothpick trees



On which hill did the sand move the most?

Why are trees important on hills? What would happen if all of the trees on a hill were cut down?

The process by which particles of rock and sand are carried away is called _____.

Brainstorm some things that might cause erosion

EROSION