

Slip Sliding Away...

Science Standard III

Objective 2

Connections

Standard III:

Students will understand the basic properties of rocks, the processes involved in the formation of soils, and the needs of plants provided by soil.

Objective 2:

Explain how the processes of weathering and erosion change and move materials that become soil.

Intended Learning Outcomes:

1. Use Science Process and Thinking Skills
2. Manifest Scientific Attitudes and Interests

Content Connections:

Background Information

How does erosion move and change the shape of Earth?

All along mountains and hillsides, weathering is breaking down rock into small pieces. These pieces can be sand, gravel, or small bits of clay. As this material is broken up, it is moved by erosion from place to place. The agents of erosion include gravity, moving water, ice, waves, and wind. Deposition is the process of laying the weathered material, called sediments, in a new location.

Running water is a major cause of erosion. Stones carried with a river's current scour and abrade the banks and beds. Ocean waves can erode banks and beaches, especially during storms. When an area receives more water than the ground can absorb, the excess flows to the lowest level, carrying loose soil with it. The world viewed the effects of erosion in December 2004—the tsunami in the Indian Ocean, landslides on rain-soaked California hills, and flash flooding in St. George that ravaged homes and property. These are graphic reminders of erosion that causes constant changes in land. In Utah we have many examples of erosion around us through our varied landscapes from northern to southern Utah.

Research Basis

Haury, D. L. (1993) *Teaching Science through Inquiry*. ERIC/CSMEE Digest. www.eric.ed.gov.

This article addresses the benefits of teaching science through inquiry. Inquiry based programs have generally been found to enhance students performance especially in laboratory skills, understanding graphing and interpreting data. Inquiry related teaching is also helpful in helping students understand the scientific process and build vocabulary knowledge.

Ryan, P., & Walking-Woman, L. (2000). Linking Writing to the Process of Scientific Inquiry: Strategies from Writing Teachers in the Disciplines. Paper presented at Annual Meeting of Conference on College Composition and Communication.

This paper encourages teachers to help students use writing as a tool of inquiry. In the disciplines of science, there is benefit for students when completing “hands-on” activities to use writing as a tool of thinking. Rather than just giving answers, students should use writing to show evidences, synthesize data and make conclusions. Writing, when associated with inquiry, can require students to find data and develop skills for dealing with methods of reporting.

Wolf, D. P. (1987). The Art of Questioning. *Academic Connections*, 1-7.

This article attends to the issue that teachers need to develop positive questioning strategies in the classroom. Teachers have the ability, through their range of questioning, to guide students to discover new information. Some of these methods of questioning include inference, (going beyond the available information), interpretation (filling in missing information), hypothesis (predictions & testing), and reflective (what do I know?). If teachers use questions to provoke an atmosphere of inquiry and personally process “when to ask,” “who to ask,” and “how to ask and respond,” then classrooms will provide students with more learning possibilities.

Assessment Suggestions

- Encourage students to draw a mountain that would have the least amount of erosion. Have them include the materials that would resist erosion longest.
- Students predict what would happen if the bottle used to simulate rain had one hole, 8 holes.
- Check Journal entries and *Canyon Building Model* for understanding.

Invitation to Learn

Put a box of sugar cubes on a tray, pouring warm water through the center of them. What will happen? What is that called? How is that different from weathering? Show a pile of sand with coins on the top. Gently drip water over the top of the sand and coins. What do you predict will happen? Do we have places in Utah that might have been formed this way? Show calendar pictures from various places in Utah and discuss what the forces of erosion are evidenced. Question if anyone has seen the effects of erosion on the news or in the newspapers this year in the world, the United States, or Utah.

Instructional Procedures

Materials

- Potting tray (without holes) 21" x 8"
- 3 20 oz. bottles of water
- 10 2-liter bottles
- Rocks
- Potting soil
- Gravel
- Sand
- Paper cups
- Small plastic toys
- Artificial turf (cut in 3" x 5" pieces)
- Toothpicks
- 5 plastic baggies
- Ruler
- String
- Measuring tapes
- Stop watch
- Paper towels

1. Students are placed in five groups. Explain to the class that their task will be to build a mountain that will withstand the effects of having water poured over it.
2. Each group will receive different materials.
Group 1: sand/gravel
Group 2: sand/rocks
Group 3: gravel/rocks
Group 4: soil/gravel
Group 5: soil/rocks
3. Students are instructed to observe their materials and record their observations on their plan sheets. Each group devises a building plan which they label and draw on their building sheet.
4. Have the students construct their mountain using only the materials they were given.
5. Tell the students they are going to observe erosion rates on their mountain with rain simulated from the 2-liter bottles. They must decide how they will measure the "run-off." Have rulers, string, and measuring tapes available. (Help guide them through what possible ways of measurement. Sometimes it is hard to measure some things because of their shape and size. How might you do it?) Have each student draw the mountain and label it's content materials in their journal. Then write a prediction about what will happen to the mountain when the water is poured over it.
6. Have one student in each group be the "Rainmaker," watering the mountain while standing next to the desk holding Bottle #1 (bottle with 3 holes) at arm's length.
7. One group member will time how long it took to empty the bottle.

8. When the bottle is empty, have the students decide how to measure the amount of eroded material coming out from the bottom of the mountain.
9. Have them measure and record the eroded material.
10. Going back to their journals, students predict what will happen to the mountain when water from Bottle #2 (bottle with 6 holes) rains.
11. Bottle #2 will be poured over the mountain by another member of the group. When the bottle is empty, a group member will note the time. Each group measures the amount of eroded material and adds that to their collected data. When finished, have the students go to their journals and answer:
 - I predicted _____
 - My prediction was _____
 - What surprised me _____
12. As a group, report the group findings. Use an overhead transparency to record each group's materials and rates of erosion. Have a group discussion: What materials eroded the most? Why? Whose materials did not erode? Why? What would you use to build a mountain that would erode the least? What is a sediment? Will sediments erode quickly?
13. Ask each group to rebuild their mountains and see if there are some things that might stop erosion. Hand them a plastic bag containing toothpicks, artificial turf, monopoly house, toy people, etc.
Ask students to answer these questions:
 - Do you think there will be change in water flow the way the hill is rebuilt?
 - Will there be as much erosion?
14. Refill Bottle #2 with water and "rain" on the mountain. What happens?
15. What did you see this time? Ask the students to share:
 - What ways did the mountain change? Why? What forces are working?
 - What ways did they stay the same? What was different?

16. Discuss with the students what factors affect erosion. Can these be changed? What is the difference between weathering and erosion? Have students write their own definition of erosion in their journal and draw an example.
17. Show the *Canyon Building Model* transparency and review erosion.

Curriculum Extensions/Adaptations/Integration

- Build a mountain at home. What would you build it of that would be different from the one at school?
- Identify areas in Utah that have erosion. Collect pictures of them and put them on a map of Utah.
- Make a coordinate grid map where weathering and erosion have occurred in Utah.
- Make a collage of weathering and erosion landforms throughout Utah.

Resources

Books

Mountain Dance, by Thomas Locker; ISBN 152026223

The Unfolding River, by Michael March; ISBN 1561381160

The Mountain that Loved a Bird, by Alice McLerran;
ISBN 0887080006

The Mud Family, by Betsy James; ISBN 0195124790

Web sites

Investigating earth systems: www.agiweb.org/ies

The National Park Service Site has good explanations of how the National Parks in Utah were formed by weathering and erosion. Click on individual Utah parks.

The Discovery Channel site: <http://school.discovery.com/lesson>

Ideas from Wondernet: <http://www.chemistry.org>

Dirtmeister's Science Reporters: Erosion:
<http://teacher.scholastic.com/dirtrep/erosion/index.htm>

Family Connections

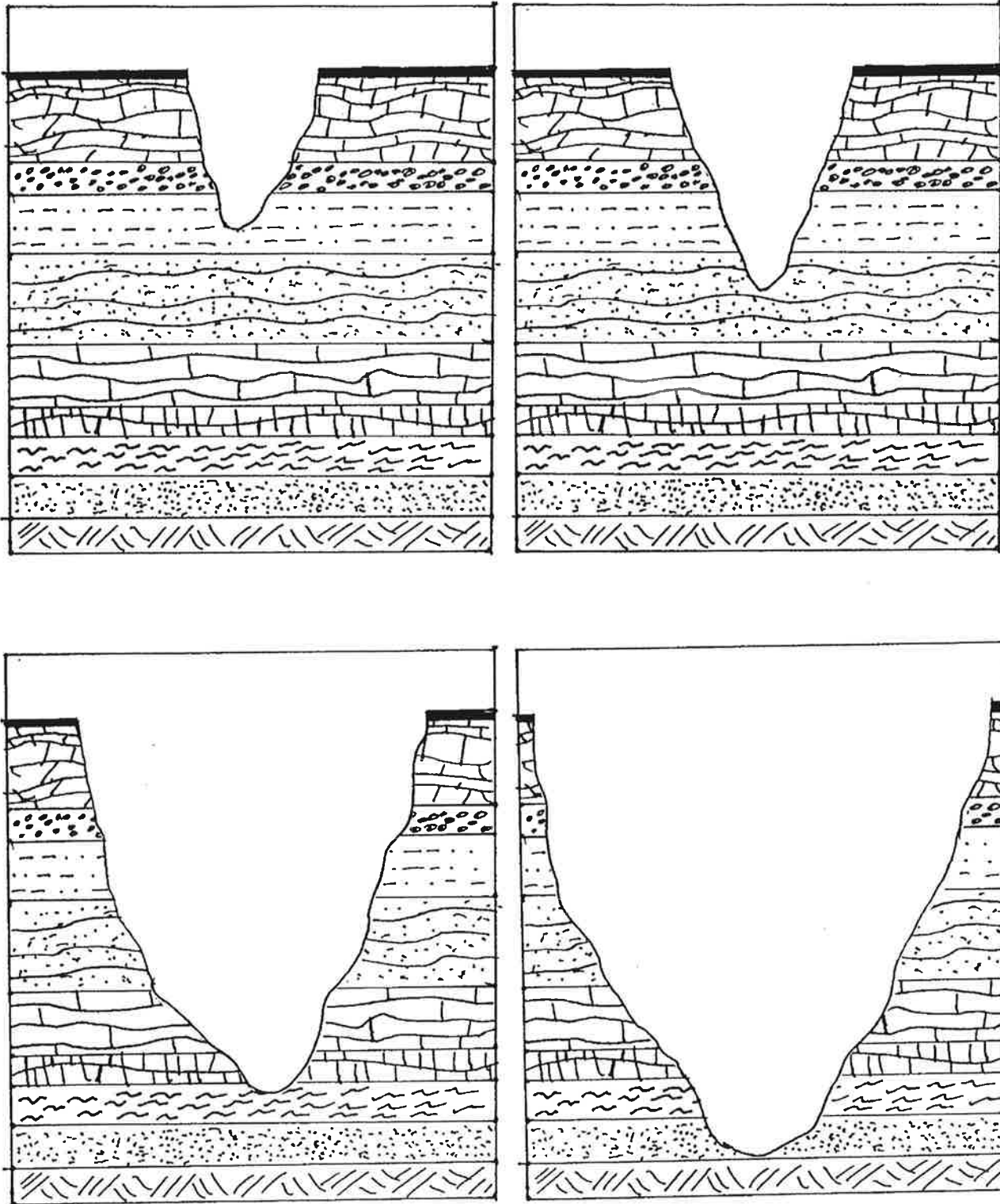
- Listen to the news to see where there are erosion disasters in the world.
- Ask your family if you have been on a trip where there has been erosion.

Name _____

Slip Sliding Away

Material	Number of Holes	Time to Empty	Depth of Erosion	What the Mountain Looks Like	
				Before	After
Rebuilt Mountain					

Canyon Building Model



Name _____

Landform Creation



Draw what the land looks like and explain what you think happened to make the land this way.
