

Fruit Belt Lesson Plans for Elementary (K-5)

GRADES 3-5: SCIENCE LESSON: SOIL EROSION

- **Lesson Objectives:** Erosion represents a significant force in the creation of natural landscapes. Learning about erosion will help students identify factors that shape the local landscape and also help them to create strategies to preserve our natural environment. Erosion causes great personal and monetary damage in this region each year due to overflowing rivers, acid rain and extreme temperature changes. After the lesson, students will benefit from knowledge of erosion in their earth science and chemistry classes. This knowledge is applicable to geography, geology, climatology, biology and history. Upon completion, students should be able to:
 - a. Predict the outcomes of various means of erosion
 - b. Identify different types of erosion
 - c. Identify effects of chemicals on the land
 - d. Identify effects of wind on the land
 - e. Identify effects of ice on the land
 - f. Identify effects of water on the land
 - g. Identify effects of temperatures on the land
 - h. Compare effects from different types of erosion
 - i. Distinguish variables that influence rates of change
 - j. Work cooperatively to build a plan
 - k. Recognize examples of erosion in nature

- **Concepts:** Erosion; the continuous process of wearing away the earth's surface
Weathering; Gradual physical and chemical wearing away of rocks

- **Relevant Standards:** Science / Strand 1 / Content Standard 1 / Elementary: All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings; and reconstruct previously learned knowledge.
 - Benchmark 1: Generate reasonable questions about the world based on observation.
 - Benchmark 2: Develop solutions to problems through reasoning, observation, and investigation.
 - Benchmark 5: Develop strategies and skills for information gathering and problem solving.
 - Benchmark 6: Construct charts and graphs and prepare summaries of observations.
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- **Related Resources:**
 - Friedl, Alfred E. (1997) Teaching Science to Children: An Inquiry Approach. New York: McGraw-Hill Companies. Pages 206-207
 - "T.E.A.C.H. Great Lakes" offers many mini-lessons on the Great Lakes Environment and History at <http://www.great-lakes.net/teach/>

- The Great Lakes Commission has a downloadable color brochure on the various types of erosion and sediment that occur in the Great Lakes Basin entitled, "Where the Land Meets the Water: Soil Erosion and Sedimentation in the Great Lakes Basin" <http://www.glc.org/basin/pubs/wlmw.html>
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- **Activity #1 Chemical Erosion**

- ♣ **Materials Needed:** Limestone, glass tray, plastic tray, eye dropper, diluted hydrochloric acid, vinegar, chalk, science journals (prediction sheet, planning sheet, result sheet, etc.)

1. Place a piece of flat limestone into a glass tray. Get students to guess what they think will happen when you add a few drops of an unknown liquid (diluted hydrochloric acid) to the limestone.
2. Add drops from time to time for several minutes and ask students to describe what they observe (fizzing, discovering that a hole is slowly forming).
3. Ask students to form a hypothesis as to why they think such a reaction occurred.
4. Students will repeat the experiment on their own, who will use vinegar dribbled on chalk instead. They will predict what will happen when the vinegar is added and they will again hypothesize why such a reaction occurred.
5. Distribute the following assignments to group members:
 - I. Principal Investigator: This person conducts the experiment and answers questions.

Questions:

1. What do you think the unknown liquid might be?
 2. Why do you think the acid ate a hole in the limestone?
 3. What happened when you dropped the vinegar on the chalk? Why?
 4. What materials do you think would react the same way as the chalk and limestone?
 5. What type of reaction occurred in these experiments?
- II. Materials Manager: Collects and puts away whatever safety equipment (gloves, glasses, etc)
 - III. Recorder: Records group data
 - IV. Reporter: This person reports group findings to the rest of the class.
6. Give the following directions:
 - I. Place chalk in plastic container
 - II. Slowly add drops of vinegar with an eye dropper
 - III. Record observations
 - IV. As a group, discuss why such a reaction occurred

7. Discuss the results and ask students for explanations why their hypothesis might be correct. Explain what a chemical reaction is and give them appropriate reading material to understand this process. Introduce the terms "erosion" and "weathering" by asking students to list examples of each. Give them a few pictorial examples of chemical erosion if possible. (Mammoth Cave in Kentucky, Carlsbad Cavers in New Mexico, the results of acid rain)
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- **Activity #2 Water Erosion**

- ✦ **Materials Needed:** Non-oily clay, tray or pan, outdoor water hose, pebbles, coins, plastic chips, paper, excerpts from science journals

1. Form a mound of clay into a level mass about 5-10 centimeters across and place it into a tray or large pan.
2. Pebbles, coins and plastic chips will be pressed into the top surface of the clay.
3. Lightly spray the clay from above.
4. Students should note how the spray washes away the clay while the pebbles, coins and plastic chips cause pinnacles to form. They should conclude that harder substances are more durable in the face of water erosion and be able to use this to explain certain natural features in the local geography.
5. Have students answer the following questions.

- Questions**

1. What caused the clay to run off?
 2. Why did the pinnacles form?
 3. What other materials might have protected the clay?
 4. What examples of these pinnacle formations are found in nature? Local landscape?
 5. What other examples of water erosion can you think of?
 6. How does this type of erosion effect agriculture?
 7. If possible, show pictures of formations such as the Grand Canyon. Get students to consider water erosion in the form of rivers moving soil form one area to another. A discussion of deforestation would go well here.
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- **Activity #3 Wind Erosion**

- ♣ **Materials Needed:** Cardboard box with top and one side removed, sand, paper, water, plastic chips, pebbles, coins, articles from science and agricultural journals.
 1. Each group has a box with a pile of sand in the middle.
 2. Students will blow lightly over the sand from the open side of the box.
 3. Record results
 4. Students will reform their sand piles and will be given a choice of materials to choose from (water, plastic chips, pebbles, coins) and prevent the sand from moving.
 5. Students will again blow and record their observations and answer the following questions.

Questions

1. What happened to the sand as you blew?
2. Could you make the whole pile move if you blew long enough?
3. What materials did you choose to add to your reformed piles and why did you choose these materials?
4. What was the effect after you added these materials and blew?
5. Think of examples of wind erosion in nature, specifically Southwest Michigan.
6. Follow-up: Bring in pictures of sand dunes from the coast of Lake Michigan. Draw student attention to the fact that many areas in the Fruit Belt have protection from wind erosion while others do not. Perhaps bring-up the 1930s Dust Bowl, a human-caused environmental disaster.

- **Activity #4 Glacial Erosion**

- ♣ **Materials Needed:** Modeling clay, ice cubes, sand, timer.

1. Students will press an ice cube against the flat surface of modeling clay and move it back and forth several times and record observations.
2. Students should then place a small pile of sand on the clay. The ice cube should be placed on top of the sand and left for one minute.
3. Pick-up ice cube and observe the surface of the cube that was touching the sand and again record observations.
4. The same side of the ice cube should then be placed on the sandy part of the clay and moved back and forth several times.

5. The cube should be removed, the sand wiped away from the clay and the clay's surface texture should be recorded. Answer the following questions.

Questions

1. What happened to the clay the first time you rubbed the cube against it?
 2. What happened to the ice cube after it sat on the sand?
 3. What did the surface of the clay look like after you rubbed the cube against it the second time?
 4. Does glacial erosion still occur today or was it just an ice age phenomena?
 5. How many examples can you give of glacial erosion?
6. Follow-up: Bring in pictures that illustrate the most extreme examples of glacially induced geographic anomalies occurring in Southwest Michigan. Discuss how glaciers still exist in every mountain chain in the world. A brief presentation of how a glacier is formed should also be given. Articles from science journals could be great help in facilitating discussion.
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