



Science Concept:

Smaller rocks come from larger rocks that have been broken.

Objectives:

The student will:

- describe that smaller rocks come from broken larger rocks;
- observe, measure (tally), classify, predict, communicate, and collect data on the number of features that help break down rocks at the coast; and
- write a descriptive paragraph about the breaking of rocks.

GLEs Addressed:

Science

[4] SD1.1 The student demonstrates an understanding of geochemical cycles by describing that most smaller rocks come from the breaking and weathering of larger rocks as part of the rock cycle.

[4] SA1.2 The student demonstrates an understanding of the process of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate.

Writing

[4] W2.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms using appropriate information and structure (i.e. personal letters, recounts, descriptions, or observations).

Vocabulary:

debris - accumulated material; any material, including floating or submerged trash, suspended sediment, or bed load, moved by a flowing stream

deposits - any accumulation of sediment

erode - the process of removing material by water, wind, or ice. As soon as a rock particle (loosened by weathering) moves, by some flowing agent such as air, water or ice, it is eroded

erosion - removal of material by water, wind, or ice. As soon as a rock particle (loosened by weathering) moves, by some flowing agent such as air, water or ice, it is erosion

fragmentation - the act or process of collapsing or breaking into pieces or fragments; to divide or cause to disintegrate

sediment - the word geologists use for loose, uncemented pieces of minerals and rock that come in all sizes and go by common names like sand, boulders, clay, silt, pebbles, and cobbles

weathering - (1) the physical disintegration or chemical decomposition of rock due to wind, rain, heat, freezing, thawing, etc. (2) The response of materials that were once in equilibrium within Earth's crust to new conditions at or near contact with water, air, or living matter. The breakdown of rock through a combination of chemical, physical, geological, and biological processes. The ultimate outcome is the generation of soil

Materials:

- Marshmallow treats (two per group)
- A jar with a screw on lid, such as a mayonnaise jar (two per group)
- Warm water
- Hot glue gun and glue sticks
- Timer or clock
- Small cloth bags
- Rocks (several per group)

WAVING GOODBYE TO ROCKS

INSTRUCTIONS



- Safety goggles (one per student)
- Hammers (one per group)
- Scale
- Science journal
- STUDENT WORKSHEET: "Measurements"

Activity Preparation:

For each group, hot glue a marshmallow treat to the inside lid of three jar lids. Fill each jar one-third full with warm water.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up

Process Skills: predicting, communicating, and inferring

1. Hold up a large rock. Ask students where it came from. Hold up a smaller rock and repeat the question. Ask students what is a mountain made from. Ask students what sand is made of and where sand comes from. Write responses on the board, while students write the same in their journals.
2. Divide students into pairs or small groups and hand out rocks to each group. Ask them what they are made of and where they come from. Ask students whether or not we could make sand from the rocks in front of them. If yes, how?
3. Review safety procedures. Hand out safety goggles, cloth bags, and hammers. Instruct groups to place a rock in the bag, close the bag, and place it on the scale. Students should document the weight in their journals. Ask students to break the rocks by hammering. Once the rock is broken into many pieces, ask students to weigh them again and record the weight.
4. Discuss as a class and review previous comments recorded on board.



Explore

Process Skills: observing, communicating, measuring, and investigating

5. Distribute the STUDENT WORKSHEET: "Measurements" and a jar and lid with treat to each group. Instruct groups to measure the marshmallow treat and lid, then screw the lid on the jar.
6. Ask students to rock their jars *slowly* for two minutes. Then, instruct them to unscrew the lid and measure the mass and record the measurement.
7. Ask students to put the lid back on the jar and rock *quickly* for two minutes. Then, instruct them to unscrew the lid and measure the mass and record the measurement.
8. Students should document their observations, measurements, and inferences in their science journals. Ask students to discuss the force of wave action as a process of weathering in their groups.
9. Give groups a new lid with treat and jar. Have students explore on their own, changing variables, (e.g., water temperature, time, amount of water, saltwater or other liquid), record results in their journal, and discuss.

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INSTRUCTIONS



Generalize

Process Skills: observing, communicating, inferring, and investigating

10. Ask the following questions and discuss as a class:
 - a. How does the jar activity relate to breaking rocks with a hammer?
 - b. Where do we see evidence of water breaking down rocks?
 - c. Which part of the treat represents sand?
 - d. What caused the marshmallow treats to weather?
 - e. Where can we see the effects of weathering outside?
 - f. What did you notice about the different rate of wave movement and how weathering occurred?
 - g. How does this relate to a coastline?
 - h. What else along a coast could break rock into smaller rocks?
 - i. What are other ways rocks could be broken down?

Apply

Process Skills: inferring and communicating

11. Explain how frozen water can break larger rock into smaller rocks. Ask students to use their knowledge of how waves affect rocks to explain how frozen water could break up rocks.

WAVING GOODBYE TO ROCKS

RUBRIC

Assessment Task:

If a beach is accessible, go to a beach and have students observe, tally, and classify the number of rocks that have been broken from larger rocks. Ask students to write at least a three-sentence paragraph describing at least two ways rocks break into smaller rocks. The paragraph should have no more than four grammar and/or spelling errors.

Rubric:

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student describes that smaller rocks come from the breaking of larger rocks.	[4] SD1.1	The student does not describe or describes one way small rocks come from the breaking of larger rocks.	The student describes two ways that small rocks come from the breaking of larger rocks.	The student describes three or more ways that small rocks come from the breaking of larger rocks.
The student observes, measures (tallies), classifies, predicts, communicates and collects data on the number of rocks that have been broken from larger rocks.	[4] SA1.2	The student records zero to one of each; observation, tally, data for prediction, and does not share about rocks that have been broken from larger rocks.	The student records two of each; observation, tally, data for prediction, and shares with a partner about rocks that have been broken from larger rocks.	The student records more than two of each; observation, tally, data for prediction, and shares with two or more classmates about rocks that have been broken from larger rocks.
The student writes a descriptive paragraph about the breaking of rocks.	[4] W2.2.2	The student may write two sentences with grammar and spelling errors about how rocks break.	The student writes a three-sentence paragraph that has no more than four grammar and/or spelling errors about how rocks break.	The student writes at least one four-sentence paragraph or two or more three-sentence paragraphs with correct grammar and spelling about how rocks break.



NAME: _____

MEASUREMENTS

Directions: Enter your measurements in the chart below, and then complete the math to determine how much of your "rock" broke down.

	Time	Before	-	After	=	
Slow	2 minutes					
Fast	30 seconds					