

GOLD PANNING

Science Concept:

Rocks will form a graded bed (layered streambed) in water.

Objectives:

The student will:

- describe how mass affects the deposition rate of rocks in water;
- infer and make generalizations about rock deposition in water; and
- create a poster which illustrates and labels a graded bed.

GLEs Addressed:

Science

- [6] SD1.1 The student demonstrates an understanding of geochemical cycles by exploring the rock cycle and its relationship to igneous, metamorphic and sedimentary rocks.
- [6] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Writing

- [6] 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., step-by-step directions, descriptions, observations, or report writing).

Vocabulary:

deposition - the accumulation of material dropped because of a slackening movement of the transporting medium, e.g., water or wind. Also, the transition of a substance from the vapor phase directly to the solid phase, without passing through an intermediate liquid phase, also referred to as "sublimation"

elements - (1) (chemistry) any substance that cannot be separated into different substances by ordinary chemical methods. (2) (Historical) Any of four substances (earth, air, fire, and water) formerly regarded as a fundamental constituent of the universe. (3) (Meteorology) Weather conditions, especially violent or severe weather

graded bed - a sediment layer with a gradation of grain size from large grains to finer grains; gradation is a process or change that takes place through a series of stages, by degrees, or in a gradual manner

minerals - naturally occurring inorganic elements or chemical compounds or limited mixture of chemical compounds. Minerals generally form crystals and have specific physical and chemical properties, such as density and hardness, which can be used to identify them. Minerals are the fundamental units from which most rocks are made

sediment - loose, uncemented pieces of rock or minerals

slurry - n. a thin mixture of an insoluble substance, as cement, clay, or coal, with a liquid, as water or oil; v.t. to prepare a suspension of (a solid in a liquid)

tailing - gravel, aggregate, etc., that fails to pass through a given screen; the residue of any product, as in mining; leavings

Materials:

- River gravel (five pounds per group)
- Sand (five pounds per group)
- Pyrite (one pound per group)
- Gold pans or metal pie plates (one per group)
- Rectangular cake pans (one per group)
- Five-gallon buckets for the slurry (one per group)
- Water (two gallons per group)

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INSTRUCTIONS Grade 6



- Large plastic test tube (one per group)
- Measuring spoons (one set per group)
- Magnifying glass (one per group)
- Small scale
- Science Journals

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: observing, inferring, and communicating

1. Set the stage by telling your class about the price of gold and your get-rich-quick plans for next summer.
2. Prepare a gold pan with a mixture of river gravel, sand and pyrite. Add water and swirl the slurry to get a good mixture. As the finer rocks and debris are picked up by the water dump half of the water into the bucket.
3. Continue swirling the water, allowing the rocks with the greatest mass to settle at the bottom. Dump the water off until you are left with just the pyrite (fool's gold) in the bottom of your pan.
4. Ask students what they observed and what they can infer. Chart the responses of individual students on the board. Possible responses include: light rocks floated up and were dumped, the slurry (mixture) moved in the same direction as the pan was rotated, heavy rocks settled in the grooves or the bottom of the pan, the process can be messy, and/or gold panning looks like fun.

Explore

Process Skills: observing, inferring, and communicating

5. Divide students into groups. Explain groups will design various methods of separating rocks into a graded bed (layered streambed). Distribute gravel, sand, pyrite, gold pans, a test tube, measuring spoons, and a magnifying glass to each group. Make water and a small scale available to groups to share.
6. Instruct groups to explore ways to separate the gold and create a graded bed. Groups should discuss and record their observations.
7. After students have had ample time to explore, ask students what might happen if the gold has less mass. Discuss as a class. Ask how students might explore what a flood might do.

Generalize

Process Skills: observing, inferring, and communicating

8. Ask the following questions and discuss as a class:
 - a. What happened to the simulated riverbed?
 - b. Why do you think this happened?
 - c. How did the size, shape and mass of materials/debris affect the results?
 - d. How did the pyrite react to the swirling?
 - e. What would have happened if you used all similar-sized material?
 - f. What would happen if you did not add water to the materials/debris? Why do you think this is so?
 - g. What are some natural causes that create a graded bed?
 - h. What would happen in a flood?
 - i. What is the rock movement process that creates graded streambeds?

Apply

Process Skills: describing, inferring, communicating, and making generalizations

9. Instruct students to explain how the mass of the rock affects the layered deposition in a streambed in their science journal.

Assessment Task:

Create a poster that illustrates a graded bed. Describe at least two reasons why the mass of rocks affect deposition rate. Include at least one inference and one generalization on how the rock properties of size, shape, and mass allow rocks to deposit at different rates. The poster should include at least three labels, three captions with supporting details, and no more than two spelling errors.

Rubric:

Objectives	GLEs	Below Proficient	Proficient	Above Proficient
The student will describe how mass affects the deposition rate of rocks in water.	[6] SD1.1	The student may describe a reason why the mass of rocks affect deposition rate of rocks in water.	The student describes two reasons why the mass of rocks affects the deposition rate of rocks in water.	The student describes three or more reasons why the mass of rocks affects the deposition rate of rocks in water.
The student will infer and make generalizations about rock deposition in water.	[6] SA1.1	The student may make either an inference or a generalization about rock deposition, rate, and rock properties of size, shape, and mass.	The student makes an inference and a generalization about rock deposition, rate, and rock properties of size, shape, and mass.	The student makes multiple inferences and generalizations about rock deposition, rate, and rock properties of size, shape, and mass.
The student will create a poster that illustrates and labels a graded bed.	[6] W2.2.2	The student may create a poster that illustrates a graded bed. It has less than three labels, three captions with supporting details, and more than two spelling errors.	The student creates a poster that illustrates a graded bed. It has three labels, three captions with supporting details, and has no more than two spelling errors.	The student creates a poster that illustrates a graded bed. It has four or more labels, four or more captions with supporting details, and has no spelling errors.