Take a Tumble

Summary

A hands-on activity helps students identify the visual characteristics of rocks such as color, texture, shape and distinguishing marks.

Group Size

Large Groups

Materials

- *Photo Mat*
  Rock tumbler
  Silicone Carbide Grit
  Rocks
  Calipers
  Scale or balance
  Graduated cylinders
  Camera
  Photo mat
  Student journals
  Colander
  Dish pan

Additional Resources
Books
How to Tumble Polish Gemstone, by Jerom Wexler; ISBN 0-9351-8237-3
Geology Crafts For Kids: 50 Nifty Projects to Explore the Marvels of Plane Earth, by Alan Anderson, Gwen Diehn, & Terry Krautwurst; ISBN 0-8069-8157-1
Exploring Earth's Treasures (Eyes on Adventure), by Donald Olson; ISBN 1-5615-6481-8
Media
Earth Science Collection. Weathering & Erosion. by 100% Education Videos, Inc. (1-800- 483-3383)
UEN eMedia
After logging in, search by title.
Organizations
American Federation of Mineralogical Societies, AFMS Cental Office, P.O. Box 302, Glyndon, MD 21071-0302, (410) 833-7926, http://www.amfed.org
Rocky Mountain Federation of Mineralogical Societies, http://www.amfed.org/rocky.htm

Background for Teachers

Have you ever seen those bright, polished rocks in tourist shops? Have you wondered how they were made? Rock hounds use rock tumblers or rock polishers to make rough rocks smooth and shiny. By placing rocks in small barrels with grit and water and letting them tumble--much like clothes in your dryer at home--you can have them rub and grind against grit and each other to smooth their surfaces and knock off edges. It has been calculated that every 24 hours a rock is worked in a tumbler is equivalent to traveling 4.3 kilometers (2.7 miles) in a stream. With this in mind, rock tumblers are a great way to simulate mechanical or physical weathering in your own classroom.
At the most basic level, weathering is the process by which rock is broken down into smaller pieces, and erosion is how those smaller pieces (e.g., the tiny bits of rock and minerals that make up soil) are moved or carried away. Weathering can be divided into two types: mechanical or (physical)

weathering, in which the chemical makeup of the rock is unchanged during the breakdown; and chemical weathering, in which a change occurs in the chemical makeup of the rock that then causes it to break down.
Start by providing rocks for the students that are of the same relative hardness on the Mohs scale of mineral hardness. Limestone, shale, or marble are good choices for our simulation because these rocks are made of particles that are well cemented but still soft enough to show weathering over a few days of tumbling. Harder rocks like jasper, agate, or tiger eye are typically tumbled, but take 3 to 4 weeks to polish and smooth--much longer than you may have with your students. Students really take ownership for their rocks, and if a softer rock is placed in with hard rocks, it could tumble completely away.
Size of rocks also matters. Provide rocks that are slightly larger than a toy marble. A double barrel tumbler with 3 lb barrels (the weight the barrel can hold) will be sufficient for use with a class of students. Label the barrels and have half of your students place their rock in one barrel and the rest in the other. Have the students record in which barrel they placed their rock. In this way they will need to distinguish their rock from only the other rocks in their barrel rather than from the whole collection of rocks.
The students will also be asked to measure different characteristics of their rocks. They could measure their rock with a ruler but they may not be able to do so accurately enough to distinguish change in their rock's size. Calipers are used to measure three-dimensional objects and can be used by students to more accurately measure the width and thickness of their rock.
Measuring the volume of their rock could also be new for them. Placing their rock in a graduated cylinder with a specific amount of water and then calculating the amount of water that is displaced will provide students with the volume of their rock.

Intended Learning Outcomes

1. Make simple predictions and inferences based upon observations.
2. Compare things and events.
3. Use instruments to measure length, temperature, volume, and weight using appropriate units.
4. Conduct a simple investigation when given directions.

Instructional Procedures

Invitation to Learn

Give each student a rock and tell them that they are going to play an identification game with their rocks. Each of them will need to describe their rock in detail in their journal so that they can identify it when it is put with the rocks from the other members of the class. Ask what type of characteristics they could use to identify their rocks.
Have them identify the visual characteristics such as color, texture, shape and distinguishing marks. After they have done this have them use the calipers to measure the length and width of the rocks. Use a scale to measure the mass of the rock. And then have them measure the volume of their rock using a graduated cylinder with a specific amount of water inside.
After they have identified their rock, have them team up with three other students to take a picture of their rocks placed on the Photo Mat (see blackline masters.). Four students will place rocks on the 4 sections of one photo mat. One picture will be taken of the photo mat; after it is printed the picture will be cut four ways.
Have the students place their rocks into the rock tumbler with 4 tablespoons of grit and enough water to fill the barrel two-thirds to three-fourths of the way. Seal the containers and begin the tumbling process.
When disposing of the used grit, do not pour it down a sink drain. The grit is heavy and will clog the sink and make it difficult to unclog.

Instructional Procedures

Make Rock Journal Entries

Have students compile their data in a journal entry. (See suggested format in sketch.)

Have the students write a prediction of how their rock will change. Go so far as to guess the mass, volume and length measurements.

After a week's period of time, open the rock tumbler, dump it into a colander and separate the rocks from the grit and water. Save the grit and water. Without adding more water to the gritty water, rinse and dry the rocks.

Have the students select their rock using their journal entry. There may be some disputation regarding true ownership of a rock. This would be a good time to have a discussion on the importance specific and accurate scientific explanations.

Have the students describe the changes that have taken place in their rock.

Have the students again describe the visual characteristics, length, mass, and volume measurements for their rock.

If there hasn't been substantial change, place the grit and dirty water back into the rock tumbler and return the rocks to the tumbler.

Repeat the rock tumbling again for another week and repeat steps 1-6 above. Remember to not dispose of the grit by rinsing it down a sink drain.

It is import to discuss the observations that the students make. Here are some questions that could be used as part of the discussion:

How has your rock changed? Is this what your predicted?

Did something happen that surprised you?

Why do you think the tumbler water changed color?

Extensions

Curriculum Extensions/Adaptations/ Integration

Tumble a batch of rocks (all of the same relative hardness) and compare how different rocks resist weathering.

Tumble a batch of jasper or agate through the entire polishing process (usually 4-6 weeks) using different grades of grit and polish.

Make a line graph representing the data for the weathering of the rock.

Assessment Plan

Teacher observation of activity and discussion.

Journal Entry using a rubric you and your students have made or the one supplied.

Bibliography

Chesbro, R., (2006). Using Interactive Science Notebooks for Inquiry-Based Science. *Science Scope* . 29(3) 30-34.

The interactive science notebook is an opportunity for students to create and use a notebook that represents their science learning throughout the year. Interactive science notebooks enhance learning by encouraging students to write across the curriculum and promote personal connections to learning.

Klentschy, M., (2005). Science Notebook Essentials. *Science & Children*.

This article focuses on the effective components of student science notebooks and their use as an effective teaching tool to assist students in developing a deeper understanding of science content.

Authors

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