Mountains "Fold, Fault, Erupt, and Erode"

Summary

Four forms of mountain formation are demonstrated and/or discussed.

Time Frame

1 class periods of 30 minutes each

Group Size

Individual

Materials

For the Teacher:

- A variety of pictures of mountains
- A strong paper plate
- 2 or more small rocks (about 1 inch in diameter)
- 1 cup of sand
- A container of water (a squirt bottle, such as one used for dish-washing detergent, would work well.)
- A place on the playground where mountains are visible (If this view is not available, begin with step 3.)
- A relief map of Utah (if available.)
- Newspaper

For each student:

- 1/2 inch x 11 inches
- Paper clip
- Hardbound book
- Broom straw (not plastic) or dry spaghetti noodle

Background for Teachers

Flat land becomes mountains and valleys when portions of the land are uplifted. Varying forces within the earth's crust can cause this uplift. Forces pushing toward each other can make the rock fold or fault (break and move). The Rocky Mountains are predominantly folded mountains, but in some areas there are faults.

Pushing can also cause rock within the crust to break and move forming fault block mountains such as those in Utah's Great Basin: the Wasatch, Oquirrh, and Stansbury Mountains.

Volcanic action can also form mountains. Molten rock (magma) that erupts at the earth's surface as flowing lava, cinders, or ash forms volcanic mountains. Such mountains in Utah include the Tushan Mountains and Black Rock Volcano.

Melted rock that pushes up the layered rock but does not erupt cools into igneous rock beneath the surface forming dome-shaped mountains. In Utah, dome-shaped mountains include the LaSal, Henry, and Abajo Mountains, and Navajo Mountain.

All mountains undergo the natural wearing down process of erosion. If mountain building forces are not active, mountains will again become flat land.

Intended Learning Outcomes

- Compare processes and events.
- Know and explain science information.

Describe and explain observations.

Instructional Procedures

Attach the rocks to the plate with a hot glue gun. This will prevent shifting during the demonstration.
Cover the rocks with enough sand so they are nearly or completely covered.
Place this plate on a desk at the front of the room, temporarily out of view of the students.
Have the students look out of the window or go outside to observe details about their surroundings, return to the classroom and list some of the details. Encourage students to include natural things both close and farther away.
If not offered voluntarily, ask probing questions to encourage students to list "mountains." If "mountains" were not listed early on the list, or if it was necessary to ask a probing question to get this response, ask students to discuss the reason for this omission. Many students have lived near mountains for much or all of their lives and may not "notice" them.
Tell students that you will be doing an activity that focuses on mountains.
Display the pictures that contain mountains. Ask students to identify what the pictures have in common.
Discuss the role the mountains play in the picture. If any of the pictures are only landscape pictures, have the students close their eyes and try to visualize the picture without the mountains.
If time permits, set aside a time where students are allowed to sketch one of the pictures leaving out the mountains. Compare the two pictures and discuss.
Have students place the hardbound book on their desk and attach the paper clip to the center of the front edge of the book cover.
Place the half-inch strip of paper under the paper clip so that approximately half of the paper is on either side of the paper clip. The students should be able to comfortably place one hand on each end of the paper strip.
Instruct the students to slowly slide their hands toward each other and observe what happens to the paper (pushing forces) .The paper will fold up in ripples.
Encourage the students to find hills and valleys in the paper.
Experiment with how many hills can be produced, or with how high the hills/mountains can get.
This demonstration shows a form of mountain building caused by a "folding" or rippling of the rock. The product may be referred to as a folded mountain. Most folded mountains are formed in chains.
Using a relief map of Utah, have students try and identify some folded mountain chains. Refer to the background for the specific names of these ranges.
Have the students predict what might happen if the rock was more rigid than the paper and the pressure continued.
Demonstrate this by using a broom straw or other reed-like strand. Repeat the demonstration and allow students to observe the snapping or breaking of the folds.
This demonstration may give students an idea of a fault block mountain (fault block) .Remind the students that even though the rock may break, it does not break open in a way that would "swallow" or leave a gaping hole. They should be able to show this point to themselves by making careful observations of the broom straw.
Discuss the similarities and differences of these two mountain building processes.
Find the Wasatch Mountains on the map. Discuss the formation of the Wasatch Mountains. How do these mountains look different from folded mountains?
Demonstrate the effect erosion has on a mountain with the paper plate, rocks, and sand.
Have the students gather around the paper plate that has been set up earlier.

Place newspaper on the desk below the demonstration to catch potential spills.
Holding the paper plate with one hand under the rock area and the other on the rim, apply enough pressure to the underside of the plate to raise the rocks into view (igneous rock).
Tilt the plate slightly and add water to the plate in simulating a stream or river.
Observe the sand being eroded and displaced to the edge of the plate (erosion) .
Discuss the process of the crust (rock) being uplifted and then how the forces of erosion continue to shape the mountain. The Blue Mountains in Australia are a good example of this process.
The formation of volcanic mountains is due to magma, lava, and other materials. The Hawaiian Islands have many volcanic mountains that may be found on the map. The belt of volcanoes around the Pacific Ocean is often called the Ring of Fire. More than half of the world's active volcanoes occur in this region.
Encourage the students to identify and find examples of mountains formed by volcanoes within Utah.
Explain that liquid rock forms mountains in two ways; through eruptions and by creating a dome. (See background material). The igneous dome is exposed by erosion.
Have the students review the four types of processes that can form mountains (folding, fault block, igneous eruptions and igneous domes) and the force that breaks mountains down (erosion).
Display the pictures of mountains used earlier in this lesson and have students predict the process that they believe may have formed these mountains. It is not necessary that you know how the mountains were formed. What is more important is that students use the knowledge they have gained in this lesson, make a prediction of the mountain formation process, and justify their answers.
Have students describe what the surface of the Earth would look like if there were no mountain uplift, no volcanic activity, no weathering, and no erosion.

Assessment Plan

Instruct students to write a paragraph describing four ways that mountains are formed. Use the rubric below to evaluate their writing.

Rubrics

Science Writing Rubric

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