Plop! Plop! Fizz! Fizz!

Summary

Students will learn about physical and chemical weathering.

Materials

For each group:

- 10 graduated cylinders (small)
- 5 plastic petri dishes with lids
- 10 balloons
- Water
- Vinegar
- Chalk
- Limestone chips
- Marble chips
- Sandstone chips
- Granite
- Paper towels
- Pocket hand lenses
- Tweezers
- Group Observation worksheet

For each student:

- *Plop! Plop! Fizz! Fizz!* worksheet

Additional Resources

Books

- *Grand Canyon, A Trail Through Time*, by Linda Vierira; ISBN 0802775691
- *Everybody Needs a Rock*, by Byrd Baylor; ISBN 0689710518
- *Earth, All About Earthquakes, Volcanoes, Glaciers, Oceans and More*, by Carol Allen; ISBN 1895688061
- *Earth*, by Science Photo Library; ISBN 0671686291
- *Mountains*, by Seymour Simon; ISBN 0688154778

Background for Teachers

Earth's surface is constantly changing. Over time, rocks can be broken down and moved by the processes of weathering and erosion. Weathering breaks rocks into smaller and smaller pieces. There are two types of weathering— *physical* and *chemical*.

Physical weathering is the process that breaks rocks into smaller pieces that have the same composition as the rock they came from. Rocks can be affected by changing temperature. During the day the sun's energy heats Earth, and during the night the rock surface cools. This process can go on, causing the rock surface to peel or flake. Rocks can be affected by water through frost, freezing, and thawing. Water can find its way into a small crack or hole in the rock. When the water freezes, it expands and then, as it melts, it may move deeper into the rock and refreeze. Eventually the rock may break into pieces. Utah has wide temperature swings during seasons, so there is evidence of this physical weathering not only on rocks, but also on our highways. Tree and plant roots may push

into a rock and, as roots grow bigger, rock material is pried loose. Gravity can also pull rocks down a hillside where they collide and break into pieces. Abrasion wears away rocks by solid particles carried by wind or water. All of these forms of physical weathering can be seen in Utah.
Chemical weathering may also alter the size of the rock, but it changes the mineral composition or chemical makeup of the rock as well. This can occur through the dissolving action of water. Water mixes with carbon dioxide to form carbonic acid, which can dissolve some minerals over time. Limestone is especially susceptible to rain/carbonic acid. Oxygen can also mix with iron to form rust, which can change the internal composition of some rock. Mosses and lichens produce acids that weaken the surface of rocks. By altering the minerals of rocks, they break over time. Chemical and physical weathering work together to break rocks apart.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
2. Manifest Scientific Attitudes and Interests
3. Understand Science Concepts and Principles

Instructional Procedures

Invitation to Learn

Give everyone a lifesaver and ask them to put it in their mouth.
Take a small clear container with a lid. Open the container and put about 8-10 sugar cubes in the container. Begin to shake the container.
What do you think will happen? Over what length of time will you see change? What kind of weathering is this? Open your mouth—what size do you think the lifesaver is in your mouth? If this was like weathering, what might we call it?

Instructional Procedures

Divide students into small learning groups (four to five students) and distribute the materials.
Give each group 10 small graduated cylinders. Each group member is responsible for observing chalk, limestone, sandstone, granite, or marble. Students may work with partners if necessary.
Students use the *Plop, plop, Fizz! Fizz!* worksheet and draw their rock. Write a prediction for what will happen if dropped in water and in vinegar.
When predictions are finished, have the students measure 35 milliliters of water in one cylinder, and 35 milliliters of vinegar in another. Place their rocks in each container. Cover the lip of the cylinder with a balloon and shake the cylinder 10 times.
Wait five minutes and observe the reaction in the cylinder with a hand lens and draw it.
When finished, students shake the cylinders again 10 times and watch the reaction.
After 10 minutes, have the students observe with a hand lens—drawing the reaction in the cylinder on their *Plop! Plop! Fizz! Fizz!* worksheet.
Students take each cylinder and shake it 50 times, then 75 times, waiting as indicated on the worksheet.
Students write a description of the experiment they conducted in their journal. Answer the questions, “What did I predict? What did I observe? Was I right? How did the rock change? Why did the rock stay the same? Was there a difference between the rocks in the vinegar and the rocks in the water? What were the bubbles in the water? Was there change in the rock? What surprised you?”
Slip off the balloons and take pieces of rock out of the cylinders with tweezers. Place them in the lid of the Petri dish to see what changes have taken place. Fill in the “After” comments and draw the rock on the worksheet.
Students share in their group the reactions and changes that their rocks made. Have them fill in the Group Observation worksheet.

Discuss as a class what was observed. Which reaction was chemical weathering and which was physical weathering? Why were there differences? What do you think could happen over time with water? With acid? Where might we see this type of weathering in Utah?
Students write their reactions and observations of all the rocks in their group in their journals. Describe what kind of weathering they observed and draw a picture of the rocks with the largest reactions. Which rocks did not react?
Complete a graphic organizer about weathering.

Extensions

Leave the balloons that have filled with gas on the graduated cylinders and watch to see how long before the balloon returns to flaccid state.
Make a Venn Diagram of two different areas of Utah, e.g., Bryce Canyon and Wasatch Mountains. What is the same, what is different? How would what we did relate to these areas in terms of weathering.
Have students research the Internet Sites on State/National Parks in Utah to determine what kinds of weathering caused the landforms in the area.
Ask students if they have been to a cemetery. What happens to the headstones?
Have students create a K-W-L chart to show what they know and list what else they would like to learn about weathering.

Family Connections

Take your family to a cemetery and talk about the weathering of headstones.
Do the class experiment at home with a family member.

Assessment Plan

- *Plop, Plop, Fizz! Fizz!* worksheet
Depth of journal entries.
Check student's ability to explain his/her understanding on the *Group Observation* worksheet.
Group presentation to the class about five new things they learned about weathering.

Bibliography

Research Basis

The Institute for the Advancement of Research in Education. (2003). *Graphic Organizers: A Review of Scientifically Based Research*. URL: http://research@inspiration.com
This compilation of 29 research studies about the use and effectiveness of graphic organizers. In using graphic organizers, researchers found that students improved critical thinking skills, retained learning, and had higher test scores when taught to use graphic organizers. These studies were carefully selected by meeting the institute's criteria for scientifically based research as defined by the *No Child Left Behind Act*.
Gibson, Helen L. (1998) Cases Studies of an Inquiry-Based Science Programs Impact on Students' Attitude towards Science and Interest in Science Careers. Paper presented at Annual Meeting of the National Association for Research in Science Teaching. (San Diego, CA)
This presentation explores the relationship between inquiry-based science programs on students' attitudes toward science. The article states that inquiry teaching approach in science helps students to connect classroom activities with personal experiences. Inquiry requires students to work with others while asking questions, searching for and selecting information to answer their own questions. The importance of connecting a problem to a student's own background can empower students to become independent learners.

Lee, O., & Fradd, S.H. (1998). Science for All, Including Students from Non-English- Language Backgrounds. *Educational Researcher*, 27(4), 12-21.
This article addresses the issue of second-language students needing to have ways of making academic content accessible, meaningful, and relevant. Science learning process through inquiry can benefit secondlanguage students learning through the language of science, such as describing, hypothesizing, reasoning, explaining, predicting, and reflecting. It helps preliterate students understanding through hands-on experiences to provide a foundation for academic learning. Second language students can manipulate materials, make observations, and connect evidences to help them acquire science vocabulary.

Authors

Utah LessonPlans