Rock

Earth & Space Science | Lesson Guide

2nd Grade

Photo Description

This image shows a large rock sitting on the ground surrounded by moss, lichen, and small plants. The rock's surface has cracks, rough spots, and different colors—some tan, some reddish-brown, and some darker areas. You can see that the rock is breaking apart slowly and that living things are growing on and around it.

Scientific Phenomena

Anchoring Phenomenon: This rock is being broken down by weathering and erosion—natural processes that gradually wear away rocks over time.

Why is this happening?
Rocks are slowly broken apart by several natural forces:
- Physical weathering: Water gets into cracks, freezes and expands, pushing the rock apart. Wind and rain also wear away the surface.
- Biological weathering: Plant roots, moss, and lichen grow on and around the rock, creating acids and pushing into cracks, which weakens the rock.
- Chemical weathering: Water and air react with the minerals in the rock, causing it to break down and change color.

This process takes a very long time (years or even centuries) but is constantly happening to all rocks on Earth.

Core Science Concepts

1. Rocks change over time: Rocks are not permanent; they are constantly being worn down and broken apart by natural processes in our environment.

2. Living things affect rocks: Plants, mosses, and lichens can grow on rocks and actually help break them down by creating acids and pushing into cracks.

3. Weather breaks down rocks: Rain, wind, ice, and temperature changes all work together to wear away rock surfaces and create cracks.

4. Weathering products become soil: As rocks break apart into smaller pieces, they eventually become part of the soil that plants need to grow.

> **Pedagogical Tip:**
> For Second Grade, keep the focus on observable changes rather than deep geological timescales. Help students see that rocks change in ways they can observe directly: cracks forming, color changes, and the presence of plants. Use the phrase "rocks are always changing, but very, very slowly" to help students understand this happens over long periods of time.

UDL Suggestions:

Multiple Means of Representation: Provide close-up photos of rocks at different weathering stages so students can see the progression visually. Use tactile rock samples in the classroom so students can feel smooth vs. rough textures.

Multiple Means of Action and Expression: Allow students to demonstrate understanding through drawing rocks before and after weathering, building a "rock timeline" with pictures, or creating a physical model using clay and water.

Multiple Means of Engagement: Connect to students' lives by finding weathered rocks on the school grounds and comparing them to new rocks. This makes the concept relevant and observable.

Zoom In / Zoom Out

Zoom In: The Microscopic Level

At a very tiny scale you cannot see without a microscope, the minerals inside the rock are being attacked by water and acids from plants. The crystals and atoms that make up the rock are being broken apart and rearranged into new substances. Bacteria and fungi in the moss and lichen also release chemicals that slowly eat away at the rock's surface.

Zoom Out: The Earth System Connection

This single weathered rock is part of a much larger rock cycle on Earth. Over millions of years, rocks break down into sediment, which gets compacted into new rocks, which then gets pushed deep underground where heat and pressure transform it again. Weathering is also the first step in soil formation—as rocks break into tiny pieces, they mix with dead plants and animals to create the fertile soil that supports all land ecosystems. This process connects mountains, rivers, soil, plants, and the entire landscape.

Discussion Questions

1. "Why do you think this rock has cracks in it? What might have caused those cracks to form?"
   - Bloom's: Analyze | DOK: 2

2. "If you could visit this same rock again in 100 years, how do you think it would look different? What would change it?"
   - Bloom's: Evaluate | DOK: 3

3. "The moss and lichen growing on this rock are actually helping to break it apart. Why do you think that is? What are they doing?"
   - Bloom's: Explain | DOK: 2

4. "How is this rock connected to the soil in your garden or at a park? How did rocks help make that soil?"
   - Bloom's: Synthesize | DOK: 3

Potential Student Misconceptions

1. Misconception: "Rocks are hard and never change."
   - Clarification: Rocks ARE hard, but they change very slowly over time. Even though we don't see it happen day-to-day, rocks are constantly breaking down. The cracks, moss, and color changes we see in this photo are evidence that rocks ARE changing.

2. Misconception: "Only big storms or earthquakes break rocks."
   - Clarification: While earthquakes and storms can break rocks, the most common way rocks break down is through slow, steady processes like rain seeping into cracks, freezing and expanding, plant roots pushing, and wind blowing. These happen every day, all around us.

3. Misconception: "Plants grow ON rocks, but don't affect them."
- Clarification: Plants actually HELP break down rocks! The acids plants make, combined with their roots pushing into cracks, gradually weaken and break apart the rock. It's a slow partnership between living things and rocks.

Extension Activities

1. Rock Detective Hunt: Take students outside to find rocks at different stages of weathering (smooth rocks, cracked rocks, rocks with moss). Bring them back to class and arrange them on a poster from "newest looking" to "oldest looking." Discuss what they observe about each rock's condition.

2. Make Your Own Weathering: Provide students with clay or salt dough rocks. Have them use tools like toothpicks, water droppers, and small plant seeds to simulate weathering. Over several days, have them observe and draw how the "rocks" change. This helps them see weathering in action (even if sped up).

3. Soil Investigation: Collect soil and weathered rock pieces from the school grounds. Separate the components (small rocks, sand, plant matter, etc.) and discuss how weathered rocks become part of soil. Plant seeds in this soil and in sandy material alone to show how soil (which contains weathered rock) helps plants grow better.

Cross-Curricular Ideas

1. Mathematics: Measure and compare the sizes of rocks before and after weathering. Create a graph showing "how many cracks" different rocks have. Use length and mass to track changes over time.

2. English Language Arts: Write or draw a "story of a rock"—following one rock from being part of a mountain, to weathering, to becoming soil. Create a sequence or timeline narrative using picture cards with captions.

3. Social Studies: Discuss how weathering shapes the land where we live. Look at local geological features (cliffs, canyons, sandy beaches) and talk about how weathering created them. Connect to how Native peoples and early settlers used the landscape shaped by these natural processes.

4. Art: Create a mixed-media collage showing rocks at different weathering stages using real rock samples, paint, clay, and photos. Students can paint backgrounds showing rain, wind, plants, and ice to illustrate what causes weathering.

STEM Career Connection

1. Geologist: A scientist who studies rocks and soil. Geologists examine rocks like the one in this photo to understand how Earth changes over time and to find useful materials like metals and fossil fuels. They help us predict earthquakes, find water underground, and understand Earth's history.
- Average Salary: $92,000/year

2. Environmental Scientist: A scientist who studies how nature works and how living things interact with rocks, soil, and water. They help protect forests, clean up polluted areas, and understand erosion to prevent landslides.
- Average Salary: $73,000/year

3. Park Ranger/Naturalist: A professional who takes care of parks and natural areas, learning about weathering and erosion to maintain hiking trails, protect landscapes, and teach visitors about Earth science.
- Average Salary: $38,000/year

NGSS Connections

Performance Expectation:
2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Disciplinary Core Ideas:
- 2-ESS1.C Natural processes can happen at different speeds (weathering happens slowly; earthquakes happen quickly).

Crosscutting Concepts:
- Cause and Effect – Weathering (cause) changes the appearance and structure of rocks (effect).
- Stability and Change – Rocks appear stable but actually change slowly over time through natural processes.
- Scale, Proportion, and Quantity – Weathering happens over very long periods that are hard for students to imagine, but we can see evidence of it.

Science Vocabulary

* Weathering: The slow breaking down of rocks by wind, water, ice, and living things over a long time.

* Erosion: The movement of broken rock pieces and soil from one place to another by wind or water.

* Lichen: A living thing (not quite a plant, not quite an animal) that grows on rocks and can slowly break them down.

* Crack: A narrow line or break in the surface of a rock.

* Mineral: The natural materials that make up rocks (like quartz, feldspar, and mica).

External Resources

Children's Books:
- Rocks and Soil by Mary Cerullo (explores what rocks are made of and how they change)
- The Rock Cycle by Rebecca Olien (explains how rocks change forms over time)
- Cracks in the Sidewalk by Alicia Kennedy (a narrative about how small natural forces break down concrete and pavement)