Rock

Earth & Space Science | Lesson Guide

1st Grade

Photo Description

This image shows a large rock sitting on the ground surrounded by soil and plants. The rock has different colors—tan, gray, and reddish-brown—and you can see cracks and rough spots on its surface. Moss and lichen (tiny green and gray plants) are growing on parts of the rock, and small plants are sprouting in the dirt nearby.

Scientific Phenomena

Anchoring Phenomenon: Why does a big, hard rock change and break apart over time?

This image illustrates weathering—the slow process where rocks break down into smaller pieces due to wind, water, freezing, thawing, and living things. You can observe evidence of physical weathering (cracks forming) and biological weathering (moss and plants growing on the rock surface, which slowly breaks the rock apart as roots push into cracks). Water gets into small cracks in the rock; when it freezes, it expands and pushes the rock apart, kind of like how a balloon expands when you blow air into it. Over many, many years, big rocks become smaller rocks, then sand, then soil.

Core Science Concepts

* Rocks change slowly over time: Rocks are hard and seem permanent, but weathering gradually breaks them into smaller pieces through natural processes.

* Living things and non-living things interact: Plants and moss grow on rocks; their roots push into cracks and help break the rock apart. This shows how living organisms affect non-living materials.

* Evidence of change: The cracks, color variations, and rough texture are all visible signs that this rock has been weathered and changed.

* Soil comes from rocks: As rocks weather and break down, they become part of the soil that plants need to grow.

Pedagogical Tip:

Teaching Tip: First graders understand things break intuitively (toys, crackers!). Connect weathering to their everyday experience: "Just like when you drop a rock and it might crack, nature's rocks crack too—but it takes a VERY long time. Let's find rocks in our playground and look for cracks!"

UDL Suggestions:

UDL Strategy - Multiple Means of Engagement: Bring in real rocks of different sizes and let students hold, touch, and examine them with hand lenses. Pair visual observation with tactile exploration so kinesthetic learners can feel the rough textures and cracks. Provide a simplified "rock weathering" chart with pictures showing rocks breaking into smaller pieces over time.

Zoom In / Zoom Out

Zoom In: Microscopic Level
At a scale too small to see without a microscope, weathering happens because water molecules seep into tiny cracks in the rock's mineral structure. When water freezes, it expands and puts pressure on the rock from the inside, like squeezing a sponge. Over thousands of years, this repeated freezing and thawing creates bigger cracks. Additionally, acids produced by moss and lichen slowly dissolve certain minerals in the rock, weakening its structure at the molecular level.

Zoom Out: Ecosystem & Landscape Level
This single weathering rock is part of a larger rock cycle and landscape system. As rocks weather into smaller fragments and soil, they create the foundation for an entire ecosystem. The soil supports plant growth (you can see plants around this rock), which feeds animals, which affects the whole food web. Over geological time scales (thousands of years), weathering reshapes mountains, creates canyons, and builds new soil. Weathering is also connected to water cycles—rain carries minerals from weathered rocks into streams, rivers, and eventually oceans.

Discussion Questions

* "Why do you think there are cracks in this rock?" (Bloom's: Analyze | DOK: 2)
  - Encourages students to think about causes of weathering they can observe.

* "If we left this rock here for 100 years, what might happen to it?" (Bloom's: Synthesize | DOK: 3)
  - Develops understanding of slow change over long time periods and promotes predictive thinking.

* "How do you think the moss and plants on this rock might help break it into smaller pieces?" (Bloom's: Analyze | DOK: 2)
  - Connects living and non-living systems; encourages observation of cause-and-effect relationships.

* "Where do you think the soil in your garden or playground comes from?" (Bloom's: Evaluate | DOK: 3)
  - Connects weathering to students' everyday environment and promotes systems thinking.

Potential Student Misconceptions

* Misconception: "Rocks never change—they're hard forever."
  - Clarification: Rocks DO change, but it happens very, very slowly—over years and years. We can see signs of change like cracks and moss growing on them. Weathering is real, just slow!

* Misconception: "Only big, dramatic events (like being hit with a hammer) break rocks."
  - Clarification: Nature breaks rocks slowly without any dramatic event. Rain, freezing and thawing, plant roots, and wind all work together over a long time to break rocks apart.

* Misconception: "Moss and plants just sit on rocks; they don't affect them."
  - Clarification: Living things actually help break rocks down! Plant roots grow into cracks and push them wider. Moss produces acid that weakens the rock. Living and non-living things work together to weather rocks.

Extension Activities

* Rock Weathering Hunt: Take students on a playground or outdoor walk to find rocks with cracks, moss, or other signs of weathering. Have them sketch or photograph examples and create a simple chart: "What signs of weathering do we see?" This builds observational skills and reinforces the concept that weathering is happening all around them.

* Simulating Ice Weathering: Fill a small plastic bag with water, seal it, and place it in a freezer. When it freezes (and expands), students can see how the bag gets pushed outward—just like ice pushes on rocks! Show pictures of real rocks with frost cracks and connect the experience to how rocks weather over many freeze-thaw cycles.

* Plant Growth in Broken Rock: Give each student a small piece of porous rock (like pumice or terracotta), add soil, and plant a fast-growing seed (like beans or grass). Over 2-3 weeks, students observe how the plant's roots crack and break the rock while growing. Document with photos weekly. This demonstrates both biological weathering and the connection between rocks, soil, and plant growth.

Cross-Curricular Ideas

* Math - Measurement & Sequencing: Collect rocks of different sizes and sort them from largest to smallest. Measure rock widths with non-standard units (like paper clips). Create a simple bar graph showing "How many rocks of each size did we find?" This connects weathering (large rocks break into small rocks) to data representation.

* ELA - Descriptive Writing & Vocabulary: Have students describe a rock using sensory words: "bumpy," "rough," "smooth," "hard," "cold." Write collaborative class poems using phrases like "The old rock is cracked and cold, / With moss growing green and bold." This builds descriptive language while reinforcing weathering vocabulary.

* Social Studies - Community & Time: Discuss "old things in our community"—old buildings, sidewalks, statues, tombstones. Ask: "Do YOU notice cracks or weathering?" Create a class "Time Passes" bulletin board showing pictures of weathered objects in the school or neighborhood, emphasizing that change happens slowly over time.

* Art - Texture Rubbings & Rock Art: Make crayon rubbings of rocks with visible weathering patterns, cracks, and moss. Display these as a gallery. Students could also paint rocks with nature scenes or patterns, connecting geological science to creative expression while building fine motor skills.

STEM Career Connection

Geologist: A scientist who studies rocks and how they change over time. Geologists explore mountains, caves, and riverbeds to learn about Earth's history and how weathering shapes our planet. They help us understand natural disasters, find useful minerals, and protect the environment. Average Salary: $95,000/year*

Paleontologist: A scientist who finds and studies fossils (preserved rocks that contain remains of ancient plants and animals). Paleontologists dig carefully for fossils and piece together stories of life from long ago. Weathering sometimes reveals fossils buried deep in rocks! Average Salary: $70,000/year*

Landscape Architect/Environmental Designer: A professional who plans outdoor spaces (parks, gardens, playgrounds) by understanding how rocks, soil, water, and plants interact. They use knowledge of weathering and erosion to design landscapes that last a long time and support nature. Average Salary: $85,000/year*

NGSS Connections

Disciplinary Core Ideas:
- K-ESS3.A (Earth materials and systems): Rocks are made of minerals and can be broken down by weathering processes.
- K-LS1.C (Organization for matter and energy flow in organisms): Plants need soil (made from weathered rock) to grow.

Crosscutting Concepts:
- Cause and Effect: Wind, water, ice, and living things cause rocks to weather and break apart.
- Stability and Change: Rocks seem stable and unchanging, but over long time periods, they change due to weathering.

- Scale, Proportion, and Quantity: Weathering happens slowly over long time periods—it's not visible day-to-day but becomes obvious over years and years.

Performance Expectation (Undefined Level - appropriate for K-2):
- Students who demonstrate understanding can describe how water, ice, wind, and organisms change rocks and land over time.

Science Vocabulary

* Rock: A hard, solid material made of minerals that comes from the Earth.

* Weathering: The slow breaking down of rocks into smaller pieces by water, ice, wind, and living things.

* Moss: A tiny green plant that grows on rocks, soil, and trees in damp places.

* Crack: A thin break or split in something hard like a rock.

* Soil: Dark material made of broken-down rocks, minerals, and dead plants and animals that plants grow in.

* Mineral: A solid, natural material that makes up rocks (like quartz or feldspar).

External Resources

Children's Books:

* "Let's Look at Rocks" by Loretta Holland – A simple, photo-rich introduction to different types of rocks and how they form and change.

* "Rocks" by Adrienne Mason – An easy-to-read picture book exploring rocks in nature and how they are used by people, with accessible explanations of rock formation and weathering.

* "The Rock Cycle" by Rebecca Olien – A beginner-friendly book that explains how rocks change over time through weathering, erosion, and other natural processes, with colorful illustrations.

Ready to teach? This lesson anchors abstract concepts of slow change and weathering to concrete observations students can make outdoors. Start with the rock in the photo, move to rocks they find themselves, and let their curiosity about "why rocks crack" drive deeper exploration!