Rock

Earth & Space Science | Lesson Guide

Kindergarten

Photo Description

This image shows a large rock sitting on the ground surrounded by soil and grass. The rock has different colors—tan, brown, and reddish spots—and a rough, bumpy surface. You can see dark patches on the rock where moss or lichen is growing, and there is moss or lichen also growing on the soil around it.

Scientific Phenomena

Anchoring Phenomenon: Rocks breaking down and changing over time through weathering and biological colonization.

Why This Happens: Rocks are constantly exposed to natural forces that cause them to change. Water, wind, temperature changes, and living things like moss and lichen all work together to slowly break down rocks into smaller pieces. This process is called weathering. In this image, you can see evidence of both physical weathering (the cracked and bumpy surface) and biological weathering (the moss and lichen growing on the rock's surface). These organisms produce weak acids that slightly dissolve the rock, and their presence accelerates the breakdown process. Over many years, rocks become smaller pebbles, then sand, and eventually soil—which is essential for plant growth.

Core Science Concepts

* Rocks have observable properties: Rocks can be described by their color, size, texture (smooth or rough), and weight. Students can observe and compare these features.

* Rocks change slowly over time: Through weathering, rocks break into smaller pieces. Wind, water, and living things cause these changes, though the process takes a very long time.

* Living things can grow on and change rocks: Moss, lichen, and other organisms can live on rock surfaces and help break rocks apart through biological weathering.

* Rocks become part of soil: When rocks break down completely, they become soil, which plants need to grow.

Pedagogical Tip:

For Kindergarten, focus on observable, sensory experiences rather than abstract timescales. Let students touch rocks, compare textures, and observe moss or lichen with magnifying glasses. Avoid explaining deep geological time; instead, use language like "rocks change very, very slowly—slower than you can see happening."

UDL Suggestions:

Universal Design for Learning (UDL) Strategy: Provide multiple means of representation by offering both tactile rock samples AND photographs. Some students may benefit from holding actual rocks with different textures while discussing the photo. Use descriptive language paired with visual supports (color photos, labeled diagrams). Consider offering a "rock exploration station" where students can touch smooth and rough rocks, building vocabulary through sensory engagement.

Zoom In / Zoom Out

Zoom In (Microscopic/Unseen): At the microscopic level, the moss and lichen cells are slowly releasing acids that dissolve tiny pieces of the rock's mineral crystals. Water seeps into microscopic cracks in the rock, freezes and thaws, and creates pressure that widens those cracks even more. Over time, billions of these tiny changes add up to visible changes in the rock's shape and size.

Zoom Out (Larger System): In the larger landscape, this single rock is one of many rocks undergoing weathering in a hillside, forest, or field. All these rocks breaking down contribute to soil formation across an entire watershed or ecosystem. The soil created from weathered rock feeds plants, which feed animals, creating the entire food web of a forest or meadow. Rocks are part of a slow, continuous cycle that recycles Earth's materials over millions of years.

Discussion Questions

1. "What do you see growing on this rock? Why do you think it's growing there?" (Bloom's: Understand | DOK: 1–2)

2. "If you left this rock outside for one year, what might happen to it? What might happen after many years?" (Bloom's: Predict | DOK: 2)

3. "How do you think this rock helps make soil for plants to grow in?" (Bloom's: Analyze | DOK: 2)

4. "Compare this rock to a smooth pebble you might find in a river. How could a rough rock like this one become smooth like a river pebble?" (Bloom's: Analyze | DOK: 3)

Potential Student Misconceptions

* Misconception: "Rocks never change; they stay the same forever."
  - Clarification: Rocks DO change, but very, very slowly—over many years. You can see evidence of change by finding rocks with cracks, moss growing on them, or rocks that are different colors, showing that weathering has occurred.

* Misconception: "Only big, strong things like tools can break rocks."
  - Clarification: Tiny living things (like moss), water, and even sunshine can break rocks apart over a long time. Nature is very patient and powerful!

* Misconception: "Soil comes from nowhere; it's just 'dirt.'"
  - Clarification: Soil is made from broken-down rocks, dead plants, and animals. Rocks are one of the main ingredients that make soil!

Extension Activities

1. Rock Texture Hunt: Take students on a nature walk to find 3–4 different rocks with different textures (smooth, rough, bumpy, cracked). Have them place each rock in a bag or basket and create a "texture display" in the classroom. Discuss: "Which rocks look like they are changing? Which rocks have moss or lichen on them?" Students can draw or paint their favorite rock.

2. Moss and Lichen Observation Station: Bring in rocks with visible moss or lichen and set up a "discovery table" with hand lenses (magnifying glasses). Let students safely examine the moss/lichen up close and draw what they see. Read a simple picture book about rocks to reinforce concepts.

3. Soil Exploration Sensory Bin: Fill a bin with potting soil and hide small rocks and pebbles inside. Let students dig, sift, and discover. Ask: "Where did this soil come from? Can you see bits of rock in the soil?" This hands-on experience helps them understand that soil is made partly from broken-down rocks.

Cross-Curricular Ideas

* Math & Measurement: Sort rocks by size (small, medium, large) or color. Count how many rocks of each size. Graph results using a picture graph.

* ELA & Storytelling: Write a class "story of a rock" using a beginning-middle-end format. Example: "Once, this rock was huge. Wind and rain made it crack. Moss grew on it. Now it's becoming soil." Students can illustrate each part.

* Art & Nature: Create a "rock collage" using different colored rocks and pebbles glued onto paper. Discuss how rocks have many different colors. Paint or color rocks to show different weathering stages.

* Social Studies & Community: Take a walk around the school or neighborhood and observe rocks in different places (playground, garden, sidewalk cracks, building foundations). Discuss: "Which rocks look old and weathered? Which look newer? Where do we see rocks in our community?"

STEM Career Connection

* Geologist: A scientist who studies rocks and Earth materials. Geologists travel to different places, find cool rocks, and figure out how old they are and what they're made of. They help us understand how Earth changes over time. Average Salary: $93,000/year

* Soil Scientist (Pedologist): A scientist who studies soil and how it forms from rocks. They help farmers grow better crops and help protect Earth's land. Average Salary: $66,000/year

* Paleontologist: A scientist who finds fossils (old rocks with ancient plants and animals inside them) and learns about creatures that lived a long, long time ago. They use rocks to tell Earth's story! Average Salary: $65,000/year

NGSS Connections

Grade Band: Kindergarten (K-2, primarily K)

Relevant Performance Expectations:
- 2-ESS1-1: Plan and conduct investigations to provide evidence that rocks exist in many sizes and shapes (Kindergarten preparation standard)

Disciplinary Core Ideas:
- K-ESS3.A Earth Materials and Systems (rocks and soil as Earth materials)

Crosscutting Concepts:
- Patterns (rocks show patterns of change over time; weathering is a gradual pattern)
- Cause and Effect (water, organisms, and weather CAUSE rocks to break down and change)
- Stability and Change (rocks appear stable, but they slowly change through weathering)

Science Vocabulary

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

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

* Moss: A tiny green plant with no roots that grows on rocks, soil, and trees.

* Lichen: A living thing that is made of both fungus and algae; it grows on rocks and looks like fuzzy patches.

* Soil: The mix of broken-down rock, dead plants, and dead animals that plants need to grow in.

* Texture: How something feels when you touch it—smooth, rough, bumpy, or scratchy.

External Resources

Children's Books:
The Pebble* by Elwyth Thane (explores how a pebble changes through weathering)
Come Back, Salmon* by Molly Cone (includes discussion of rocks in riverbeds and their role in ecosystems)
Rocks and Fossils* by Jinny Johnson (simple, visually engaging introduction to rocks)

Summary: This rock image is an excellent anchor for helping Kindergarten students begin to recognize that Earth's materials (like rocks) are not static but change slowly through natural processes. By engaging their senses and curiosity, you're building foundational understanding for later NGSS standards about weathering, soil formation, and Earth systems.