Moss on Rock

Earth & Space Science | Lesson Guide

5th Grade

Photo Description

This image shows bright green moss growing on weathered rock surfaces. The moss forms thick, cushion-like patches that cover different colored layers of rock, including reddish and grayish sections. The rock appears to have cracks and worn surfaces where the moss has found places to attach and grow.

Scientific Phenomena

The anchoring phenomenon here is biological weathering - the process where living organisms break down rocks over time. The moss is both responding to and creating changes in its rocky environment. Moss releases weak acids that slowly dissolve minerals in the rock, creating tiny cracks and spaces. As the moss grows, its root-like structures (rhizoids) physically push into these spaces, gradually breaking the rock apart. This process happens very slowly over many years, demonstrating how life and non-living materials interact to shape Earth's surface.

Core Science Concepts

1. Weathering and Erosion: Living things like moss can break down rocks through chemical and physical processes, contributing to the rock cycle.

2. Organism-Environment Interactions: Moss has adapted to survive on rocks by absorbing water and nutrients from the air and rain, while simultaneously changing its rocky habitat.

3. Succession and Ecosystem Development: Moss acts as a pioneer species, creating soil and conditions that allow other plants to eventually grow in rocky areas.

4. Structure and Function: Moss has specialized structures (rhizoids) that help it anchor to rocks and absorb water, demonstrating how form follows function in nature.

Pedagogical Tip:

Use hand lenses or magnifying glasses to help students observe the detailed structures of moss. This close observation builds scientific inquiry skills and helps students notice patterns they might miss with naked eyes.

UDL Suggestions:

Provide multiple ways for students to document observations: drawing, photography, verbal descriptions, or digital tools. Some students express scientific thinking better through visual representations than written words.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, moss releases carbonic acid and other weak acids that chemically react with rock minerals, dissolving them ion by ion. The moss's rhizoids are single-celled structures that can squeeze into tiny rock crevices.

2. Zoom Out: This biological weathering is part of the global rock cycle, where mountains are slowly broken down into sediments that form new rocks. The soil created by moss and rock weathering supports larger ecosystems and helps regulate Earth's water cycle by creating surfaces that can absorb and hold moisture.

Discussion Questions

1. "What evidence do you see that the moss is changing the rock over time?" (Bloom's: Analyze | DOK: 2)

2. "How might this rocky area look different in 100 years if the moss continues growing?" (Bloom's: Evaluate | DOK: 3)

3. "What do you think would happen to the moss if this rock was moved to a desert environment?" (Bloom's: Apply | DOK: 2)

4. "Why do you think moss grows better in the cracks of rocks rather than on smooth surfaces?" (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: "Plants can't grow without soil." Reality: Moss doesn't need soil and can absorb water and nutrients directly from air and precipitation through its leaves.

2. Misconception: "Only weather like wind and rain can break rocks." Reality: Living things like moss, lichens, and tree roots are powerful forces that can break apart even hard rocks over time.

3. Misconception: "Moss hurts or damages rocks." Reality: While moss does break down rocks, this is a natural process that creates soil and habitats for other living things - it's part of how ecosystems develop.

Cross-Curricular Ideas

1. Math - Measurement and Scale: Have students measure the moss growth on rocks over several weeks or months. Create a graph showing how much the moss coverage increases over time. Students can calculate percentages (e.g., "The moss covered 20% of the rock last month and 35% this month"). This connects to data analysis and represents real-world scientific measurement.

2. ELA - Descriptive Writing and Research: Students write detailed descriptions of the moss and rocks using sensory language ("soft," "bumpy," "emerald green"). They can also research and write informational paragraphs about moss, lichens, or weathering processes. This builds vocabulary and expository writing skills while reinforcing science concepts.

3. Social Studies - Human Impact on Geology: Explore how humans interact with weathering and erosion. Discuss topics like construction on rocky terrain, preservation of historical stone structures, or how cities manage erosion. Students can investigate why some old buildings need repair due to weathering caused by moss and lichens.

4. Art - Nature Observation and Color Mixing: Students create detailed sketches or paintings of mossy rocks, focusing on the different colors and textures they observe. They practice mixing greens, grays, and browns to match the natural palette. This develops fine motor skills and deepens observational learning through artistic expression.

STEM Career Connection

1. Geologist - Geologists study rocks, minerals, and how Earth changes over time. A geologist might investigate how weathering affects mountains, study soil formation from moss and rocks, or predict erosion problems. They help us understand Earth's history and plan construction projects. Average Salary: $92,000/year

2. Botanist (Plant Scientist) - Botanists study plants, including moss and how they grow in different environments. They research why moss thrives on rocks and how plants adapt to harsh conditions. Botanists help us understand ecosystems and discover new ways plants can be useful. Average Salary: $65,000/year

3. Environmental Engineer - Environmental engineers solve problems related to soil erosion, water management, and land restoration. They might use moss and plants to stabilize hillsides or prevent erosion on construction sites. They protect Earth's natural systems while helping humans build and live safely. Average Salary: $88,000/year

NGSS Connections

- Performance Expectation: 5-ESS1-1 - Develop a model using an example to describe ways the geosphere interacts with other Earth systems.
- Disciplinary Core Ideas:
  - 5-ESS2.A - Earth's major systems interact through physical and chemical processes
  - 5-LS2.A - Organisms interact with the living and nonliving environment
- Crosscutting Concepts:
  - Systems and System Models
  - Cause and Effect

Science Vocabulary

* Weathering: The breaking down of rocks into smaller pieces by natural forces.
* Rhizoids: Tiny root-like structures that help moss attach to surfaces and absorb water.
* Pioneer species: The first living things to grow in a new or harsh environment.
* Biological weathering: The breakdown of rocks caused by living organisms like plants and bacteria.
* Ecosystem: A community of living and non-living things that interact with each other.

External Resources

Children's Books:
- The Magic School Bus Meets the Rot Squad by Joanna Cole
- Rocks and Minerals by Steve Tomecek
- Mosses, Liverworts, and Hornworts by Elizabeth Lawson