Rocks

Earth & Space Science | Lesson Guide

3rd Grade

Photo Description

This photo shows a house with a beautiful rock garden and water feature made from stacked stones. The rocks are piled up in different shapes and sizes to create a waterfall or fountain. Plants are growing around the rocks, and you can see how water has changed the color and texture of some stones.

Scientific Phenomena

The anchoring phenomenon here is weathering and erosion in action. The stacked stones show how water moves over and through rock materials, gradually changing their appearance through physical and chemical weathering processes. Water flowing over these rocks carries away tiny particles, smooths rough edges, and creates the moss-covered, aged appearance we observe. This demonstrates how Earth's surface is constantly being shaped by the movement of water.

Core Science Concepts

1. Weathering: Water, wind, and living things slowly break down rocks into smaller pieces over time
2. Erosion: Moving water carries away small rock particles and soil from one place to another
3. Deposition: The carried materials eventually settle in new locations, creating new landforms
4. Water Cycle Connections: This garden feature mimics natural processes where water flows downhill due to gravity

Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing weathering concepts. Have students first think individually about how rocks might change over time, then discuss with a partner before sharing with the class. This builds confidence and allows processing time.

UDL Suggestions:

Provide multiple ways for students to demonstrate understanding: allow them to draw, act out, or build models of weathering processes rather than only using written responses. This supports diverse learners and makes abstract concepts more concrete.

Zoom In / Zoom Out

Zoom In: At the microscopic level, water molecules are breaking chemical bonds in the rock minerals and carrying away individual ions and tiny particles. Freeze-thaw cycles cause water to expand in rock cracks, creating physical pressure that splits rocks apart.

Zoom Out: This small garden feature connects to massive Earth systems - the same weathering and erosion processes shape entire mountain ranges, create river valleys, form beaches, and build deltas where rivers meet oceans. These processes have been reshaping Earth's surface for billions of years.

Discussion Questions

1. What evidence do you see that water has been flowing over these rocks for a long time? (Bloom's: Analyze | DOK: 2)

2. How do you think this rock garden might look different after 100 years of water flowing over it? (Bloom's: Evaluate | DOK: 3)

3. Where do you think the tiny rock pieces go when water washes them away from this garden? (Bloom's: Apply | DOK: 2)

4. What would happen to these rocks if no water ever flowed over them? (Bloom's: Synthesize | DOK: 3)

Potential Student Misconceptions

1. Misconception: "Rocks never change because they're so hard and strong."
   Reality: All rocks change over time through weathering, even the hardest ones, just very slowly.

2. Misconception: "Only big events like earthquakes change the land."
   Reality: Slow, everyday processes like flowing water cause most land changes over long periods of time.

3. Misconception: "Erosion only happens during storms or floods."
   Reality: Erosion happens continuously, even with gentle water flow, though it's faster during heavy rain.

Cross-Curricular Ideas

1. Math - Measurement & Data: Have students measure the height of the rock stack using non-standard units (blocks, pencils) or standard units (inches/centimeters). Create a bar graph showing measurements of different rocks in the garden. This connects to 3.MD.B.3 (represent and interpret data).

2. ELA - Descriptive Writing: Ask students to write a detailed description of how the rocks look, feel, and sound as water flows over them. Use sensory words (rough, smooth, wet, splashing) to make their writing vivid. This supports W.3.2 (write informative texts with descriptive details).

3. Social Studies - Community Helpers: Connect to local professionals who work with Earth materials - landscapers, construction workers, geologists, and environmental engineers. Invite a guest speaker or take a virtual field trip to see how professionals use knowledge of rocks and water in their work.

4. Art - Land Art & Sculpture: Have students create their own small rock arrangements or "stone sculptures" outdoors using natural materials. Photograph them and discuss how their creations are similar to and different from the water fountain feature. This connects art to environmental design and problem-solving.

STEM Career Connection

1. Geologist - A scientist who studies rocks, soil, and how Earth changes over time. Geologists examine rocks up close with special tools, take samples from the ground, and help us understand natural disasters like earthquakes and erosion. They might work in nature parks, universities, or for the government. Average Salary: $92,000/year

2. Landscape Designer - A professional who plans and creates beautiful outdoor spaces like gardens, parks, and water features. They use their knowledge of rocks, soil, plants, and water to design features like the rock fountain in this photo that are both beautiful and work with nature's processes. Average Salary: $65,000/year

3. Environmental Engineer - An engineer who solves problems related to water, soil, and natural resources. They might design systems to manage water flow, prevent erosion on hillsides, or clean up polluted areas. Environmental engineers help protect Earth while building things people need. Average Salary: $88,000/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 - Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe
- 4-ESS1.C - Local, regional, and global patterns of rock formations reveal changes over time due to Earth forces

Crosscutting Concepts:
- Patterns - Patterns in the natural world can be observed and used as evidence
- Scale, Proportion, and Quantity - Natural objects and observable phenomena exist from very small to very large scales

Science Vocabulary

* Weathering: The slow breaking down of rocks into smaller pieces by water, wind, or plants
* Erosion: When water, wind, or ice carries away small pieces of rock and soil
* Deposition: When flowing water slows down and drops the rock pieces it was carrying
* Sediment: Tiny pieces of rock, sand, and soil that have been worn away and moved by water
* Runoff: Water that flows over the ground surface, carrying materials with it

External Resources

Children's Books:
- The Magic School Bus Inside the Earth by Joanna Cole
- Rocks and Minerals by Steve Tomecek
- The Rock Factory: A Story About the Rock Cycle by Jacqui Bailey