Erosion

Earth & Space Science | Lesson Guide

1st Grade

Photo Description

Water flows fast across rocks and stones near train tracks. The muddy water moves quickly because of heavy rain. Green grass grows on the sides where the water does not go.

Scientific Phenomena

This image shows surface water runoff as the anchoring phenomenon. When rain falls faster than the ground can soak it up, the water flows across the surface following gravity toward lower areas. The water picks up dirt and small rocks as it moves, which is why it appears muddy brown. This runoff is following the natural slope of the land, creating temporary streams that carry sediment and debris.

Core Science Concepts

1. Water Movement: Water always flows downhill because of gravity, following the path of least resistance
2. Erosion and Sediment Transport: Moving water picks up and carries dirt, sand, and small rocks, changing the color and clarity of the water
3. Surface vs. Ground Water: When soil cannot absorb water fast enough, it flows over the surface instead of soaking into the ground
4. Human-Made vs. Natural Surfaces: The railroad ballast (rocks) and tracks create hard surfaces that don't absorb water like soil does

Pedagogical Tip:

Use a simple demonstration with a tilted tray, sand, and a watering can to show how water flows downhill and picks up sediment. This concrete experience helps first graders understand the abstract concept before observing it in nature.

UDL Suggestions:

Provide multiple ways for students to explore water flow: visual observations, hands-on water table activities, and kinesthetic movement where students act out being water droplets flowing downhill. This supports different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: Individual water molecules are attracted to each other and to soil particles through adhesion and cohesion forces, allowing water to pick up and transport tiny pieces of earth as it flows.

2. Zoom Out: This local runoff connects to larger watershed systems, eventually flowing into streams, rivers, and oceans. The sediment being transported here contributes to the formation of deltas and the shaping of landscapes over time.

Discussion Questions

1. What do you think made the water look brown and muddy? (Bloom's: Analyze | DOK: 2)
2. Where do you predict this flowing water will go next? (Bloom's: Apply | DOK: 2)
3. How is this flowing water different from water in a pond? (Bloom's: Compare | DOK: 2)
4. What might happen to the rocks and dirt if the water keeps flowing? (Bloom's: Predict | DOK: 3)

Potential Student Misconceptions

1. Misconception: "Water only flows in rivers and streams"
   Clarification: Water flows anywhere there is a slope when the ground cannot absorb it fast enough, creating temporary streams during heavy rain.

2. Misconception: "Dirty water is always bad"
   Clarification: Muddy water during runoff is natural - it shows that water is doing its job of moving soil and rocks, which helps shape the land over time.

3. Misconception: "Water flows in all directions"
   Clarification: Water always flows downhill following gravity, taking the easiest path to lower ground.

Cross-Curricular Ideas

1. Math - Measurement & Patterns: Set up a water table activity where students measure how far water flows down a tilted tray with different materials (sand, rocks, soil). Students can use blocks or a simple ruler to measure distances and compare results, connecting to measurement standards. Create a chart showing "fast flow" vs. "slow flow" patterns.

2. ELA - Descriptive Writing & Vocabulary: Read aloud Down Comes the Rain and have students draw pictures of water flowing. Ask them to use descriptive words (fast, muddy, splashing, flowing) to label their drawings or dictate sentences about what they see. This builds vocabulary and oral language skills while reinforcing science concepts.

3. Social Studies - Community & Infrastructure: Discuss how rain affects the neighborhood—where puddles form on sidewalks, how people keep dry, and why workers maintain storm drains and gutters. Show students that understanding water helps us live safely in communities. Connect to local weather observations and community helpers.

4. Art - Mixing Colors & Natural Materials: Use brown, gray, and blue paint to create muddy water artwork similar to the photo. Let students mix colors to make different shades of "runoff." They can also create collages using natural materials (small pebbles, soil, grass clippings) to show water flow across different surfaces.

STEM Career Connection

1. Hydrologist (Water Scientist): A hydrologist is a scientist who studies water—how it flows, where it goes, and how it shapes the land. They observe rain, rivers, and runoff just like you're doing in this photo! They help communities understand flooding and protect water supplies. Average Salary: $84,000/year

2. Environmental Engineer: Environmental engineers solve problems about water and land. They design systems to clean up muddy water, prevent erosion, and manage runoff so it doesn't damage communities. They use science to protect nature and keep people safe. Average Salary: $96,000/year

3. Geologist: A geologist studies rocks, soil, and how Earth changes. By watching water carry sediment and rocks like in this photo, geologists learn how mountains and valleys form over many years. They help us understand our planet's story. Average Salary: $95,000/year

NGSS Connections

- Performance Expectation: K-ESS2-1 - Use and share observations of local weather conditions to describe patterns over time
- Disciplinary Core Ideas: K-ESS2.D - Weather and Climate
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Runoff: Water that flows over the ground when it rains hard
* Erosion: When water or wind moves dirt and rocks from one place to another
* Sediment: Tiny pieces of dirt, sand, and rocks that water carries along
* Flow: How water moves from one place to another
* Absorb: When the ground soaks up water like a sponge

External Resources

Children's Books:
- Down Comes the Rain by Franklyn M. Branley
- Water Is Water by Miranda Paul
- The Magic School Bus at the Waterworks by Joanna Cole