Force

Physical Science | Lesson Guide

Kindergarten

Photo Description

Big waves crash into dark rocks by the ocean. The water splashes high into the air. Sand covers the ground near the rocks.

Scientific Phenomena

This image shows the Anchoring Phenomenon of wave erosion and weathering. Ocean waves carry tremendous energy that constantly pounds against rocky coastlines. The force of moving water breaks off small pieces of rock over time, gradually wearing them down and changing their shape. The splashing action also moves sand and smaller rock pieces around the beach, demonstrating how water can transport materials from one place to another.

Core Science Concepts

1. Forces and Motion: Moving water creates a pushing force that can move rocks and sand
2. Weathering: Water breaks down rocks into smaller pieces over long periods of time
3. Energy Transfer: Waves carry energy from the ocean and release it when they hit the shore
4. Material Properties: Some materials (like rocks) are harder to move than others (like sand)

Pedagogical Tip:

Use sensory experiences to help kindergarteners understand forces. Have students push against a wall to feel how they create force, then connect this to how waves push against rocks.

UDL Suggestions:

Provide multiple ways to represent wave motion through body movements, sound effects, and visual demonstrations. Let students act out being waves crashing into "rock" students to engage kinesthetic learners.

Zoom In / Zoom Out

1. Zoom In: At the tiny level, water molecules are constantly bumping into the rock surface, loosening microscopic pieces and carrying them away grain by grain.

2. Zoom Out: This beach is part of a massive ocean system where waves travel thousands of miles, carrying energy from storms and wind patterns across entire continents before reaching this shore.

Discussion Questions

1. What do you think happens to the rocks when waves hit them every day? (Bloom's: Analyze | DOK: 2)
2. How might the beach look different after many years of waves? (Bloom's: Evaluate | DOK: 3)
3. What other things in nature can change rocks? (Bloom's: Apply | DOK: 2)
4. Why do you think some rocks are smooth and others are rough? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: "Rocks never change because they are hard."
   Clarification: Even hard rocks change over time when water hits them again and again.

2. Misconception: "Waves only move water."
   Clarification: Waves can move sand, shells, and small rocks too because they are very strong.

3. Misconception: "The ocean stays in one place."
   Clarification: Ocean water is always moving and can carry things from far away places.

Cross-Curricular Ideas

1. Math - Patterns & Counting: Have students count rocks of different sizes on the beach and create patterns with them (big, small, big, small). Graph which rocks are smooth vs. rough to practice data collection and comparison.

2. ELA - Descriptive Language & Storytelling: Read books about ocean animals and create class stories about "the life of a rock." Students can dictate or draw what happens to a rock as waves crash on it, developing sequencing and cause-and-effect language skills.

3. Art - Texture Exploration & Collage: Students create textured artwork by rubbing crayons over rough rocks and smooth rocks (rock rubbings), then glue collected sand and small pebbles onto paper to make beach scenes, exploring different surface textures.

4. Social Studies - Community Helpers: Discuss people who work at beaches and oceans (lifeguards, marine biologists, beach cleanup workers). Take a virtual or real beach walk to observe how community members care for our natural spaces.

STEM Career Connection

1. Marine Biologist: A scientist who studies ocean animals and plants. They visit beaches and go in boats to learn about fish, crabs, whales, and other creatures that live in the water. They help keep the ocean healthy for all living things. Average Salary: $65,000 USD

2. Geologist: A scientist who studies rocks, soil, and how the Earth changes over time. They look at rocks on beaches to understand how waves and weather shape our planet. They help us learn about Earth's past and predict changes in the future. Average Salary: $95,000 USD

3. Ocean Engineer: A person who designs and builds things that work in the ocean, like boats, docks, and tools to protect beaches from big waves. They use science and math to solve problems and keep people safe near the water. Average Salary: $108,000 USD

NGSS Connections

- Performance Expectation: K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change
- Disciplinary Core Ideas: K-2-ETS1.A (Asking Questions and Defining Problems)
- Crosscutting Concepts: Cause and Effect, Patterns

Science Vocabulary

* Wave: Moving water that goes up and down in the ocean
* Force: A push or pull that can move things
* Erosion: When water or wind wears away rocks and soil
* Weathering: When rocks break into smaller pieces over time
* Energy: The power to make things move or change

External Resources

Children's Books:
- Waves by Suzy Lee
- The Magic School Bus on the Ocean Floor by Joanna Cole
- A House for Hermit Crab by Eric Carle