

Photo Description



This picture shows concrete with many small rocks and pebbles mixed inside. The rocks are different colors like brown, red, yellow, and black. You can see both big and tiny pieces stuck together in the hard concrete.

Scientific Phenomena

The anchoring phenomenon shown here is composite material formation - specifically concrete as a human-made mixture. Concrete is created when cement powder, water, sand, and aggregate (rocks/gravel) are combined and undergo a chemical reaction called hydration. The cement acts as a binding agent that hardens around the various-sized particles, creating a strong, durable material. This demonstrates how humans can engineer materials by combining different substances with varying properties to create something entirely new with enhanced characteristics.

Core Science Concepts

1. Mixtures and Materials: Concrete is a mixture where you can still see the individual parts (rocks, sand, cement) even though they're stuck together permanently.
2. Properties of Materials: Different materials have different properties - some rocks are hard, cement is sticky when wet, and together they make something very strong.
3. Human Engineering: People combine natural materials (rocks, sand) with manufactured materials (cement) to solve problems like building strong structures.
4. Observable Characteristics: Scientists and engineers can identify materials by looking at their color, size, texture, and other features we can see and touch.

Pedagogical Tip:

Use actual concrete samples or photos of concrete being mixed to help students understand that this "recipe" creates predictable results every time, just like following a recipe in cooking.

UDL Suggestions:

Provide tactile experiences by letting students feel different aggregate samples (smooth river rocks, rough gravel, fine sand) and create their own "concrete" using playdough as cement to accommodate different learning styles and sensory needs.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, cement crystals grow around each grain of sand and piece of rock, creating tiny chemical bonds that lock everything together like millions of invisible hands holding tight.
2. Zoom Out: This concrete is part of larger human-built structures like sidewalks, buildings, and bridges that connect our communities and help people travel safely from place to place across entire cities and countries.

Discussion Questions

1. What different materials can you identify in this concrete, and how are they different from each other? (Bloom's: Analyze | DOK: 2)
2. Why do you think people mix rocks of different sizes together when making concrete? (Bloom's: Evaluate | DOK: 3)
3. How is concrete similar to and different from a mixture like trail mix? (Bloom's: Compare | DOK: 2)
4. What would happen if someone tried to make concrete using only big rocks or only tiny sand? (Bloom's: Predict | DOK: 2)

Potential Student Misconceptions

1. Misconception: "The rocks were always stuck in there naturally."
Clarification: Concrete is made by people who mix rocks, sand, cement, and water together on purpose to build things.
2. Misconception: "All rocks in concrete are the same."
Clarification: Engineers choose different sizes and types of rocks to make concrete stronger, just like using different ingredients makes different kinds of cookies.
3. Misconception: "You can easily pull the rocks out of concrete."
Clarification: Once concrete hardens, the cement creates very strong bonds that hold everything together permanently.

Cross-Curricular Ideas

1. Math - Sorting and Classifying: Have students sort concrete aggregate samples (or pictures) by size, color, or shape. Create bar graphs showing how many rocks of each color appear in the concrete sample. This connects to 2.MD.D.10 (drawing and interpreting picture graphs and bar graphs).
2. ELA - Descriptive Writing: Ask students to write or dictate sentences describing what they see in the concrete photo using sensory words (rough, hard, colorful, speckled). Create a class "Concrete Poem" where each line describes a different part of the material, supporting 2.W.2 (writing informative texts).
3. Social Studies - Community Builders: Discuss how concrete is used in students' neighborhoods (sidewalks, playgrounds, buildings, parking lots). Take a neighborhood walk to identify concrete structures and discuss how they help the community. This connects to understanding human-made environments and community helpers like construction workers and engineers.
4. Art - Mixed Media Collage: Have students create their own "concrete" artwork by gluing various materials (small stones, sand, foam pieces, colored paper scraps) onto paper or cardboard to mimic the texture and appearance of real concrete. This explores how artists combine materials just like engineers do.

STEM Career Connection

1. Civil Engineer: Civil engineers design and build structures like roads, bridges, and buildings using materials like concrete. They decide what materials to mix together and how thick to make concrete so it stays strong and safe for people to use. Average Annual Salary: \$88,000 USD

2. Construction Worker: Construction workers use concrete and other materials to build the structures that civil engineers design. They mix concrete, pour it into molds, and make sure it hardens correctly so buildings and sidewalks are strong and level. Average Annual Salary: \$56,000 USD

3. Materials Scientist: Materials scientists study different substances and mixtures to create new materials that are stronger, lighter, or work better for different jobs. They might experiment with concrete to make it last longer or work better in cold climates. Average Annual Salary: \$68,000 USD

NGSS Connections

Performance Expectation: 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Disciplinary Core Ideas:

- 2-PS1.A Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature
- K-2-ETS1.A A situation that people want to change or create can be approached as a problem to be solved through engineering

Crosscutting Concepts:

- Patterns Patterns in the natural and human designed world can be observed and used as evidence
- Structure and Function The shape and stability of structures of natural and designed objects are related to their function

Science Vocabulary

- * Mixture: When two or more different materials are combined together but keep their own properties.
- * Concrete: A strong building material made by mixing cement, water, sand, and rocks together.
- * Properties: The ways we can describe materials, like their color, size, shape, or how they feel.
- * Aggregate: The rocks and sand pieces that are mixed into concrete to make it stronger.
- * Material: Any substance that things are made from, like wood, metal, plastic, or rock.

External Resources

Children's Books:

- "What Is the World Made Of? All About Solids, Liquids, and Gases" by Kathleen Weidner Zoehfeld
- "Materials" by Anna Claybourne
- "Building Things" by David Dreier