Mixture

Physical Science | Lesson Guide

Kindergarten

Photo Description

This picture shows concrete with lots of colorful rocks and pebbles stuck inside it. The rocks are different sizes, shapes, and colors like brown, red, yellow, and black. Some rocks are big and some are tiny, all mixed together in the gray concrete.

Scientific Phenomena

The anchoring phenomenon here is composite material formation - specifically, concrete as a human-made mixture of different materials. This concrete demonstrates how combining different materials (cement, water, sand, and aggregate stones) creates a new material with different properties than any individual component. The varied rock sizes and types show natural geological diversity, while their incorporation into concrete illustrates how humans use natural materials to engineer solutions for construction needs.

Core Science Concepts

1. Materials and Their Properties: Different rocks have different colors, sizes, and textures, showing that materials can be sorted and described by their observable properties.

2. Mixtures: Concrete is a mixture where we can still see the individual parts (rocks, sand, cement) even though they are combined together.

3. Natural vs. Human-Made Materials: The rocks are natural materials from the Earth, but concrete is a human-made material that uses natural materials.

4. Sorting and Classifying: The various rocks can be grouped by color, size, or shape, introducing basic classification skills.

Pedagogical Tip:

Use actual concrete samples or create "concrete" using playdough and small rocks so students can feel the texture differences and see how individual materials combine to make something new.

UDL Suggestions:

Provide multiple ways for students to explore materials - visual sorting cards, tactile rock samples, and verbal descriptions to accommodate different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, the cement paste fills tiny spaces between sand grains and rock pieces, creating chemical bonds that harden over time through a process called hydration.

2. Zoom Out: This concrete is part of larger human infrastructure systems like sidewalks, buildings, and roads that connect communities and provide safe spaces for people to live and travel.

Discussion Questions

1. What different colors and sizes of rocks can you see in this concrete? (Bloom's: Remember | DOK: 1)

2. How do you think the rocks got stuck in the concrete and why don't they fall out? (Bloom's: Analyze | DOK: 2)

3. What would happen if we made concrete with only big rocks or only tiny rocks? (Bloom's: Evaluate | DOK: 3)

4. Where else have you seen concrete being used, and why do you think people choose to use it there? (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

1. Misconception: "All rocks are the same"
   Clarification: Rocks come in many different colors, sizes, and textures because they form in different ways and contain different materials.

2. Misconception: "Concrete is just one material"
   Clarification: Concrete is made by mixing several different materials together - cement, water, sand, and rocks.

3. Misconception: "The rocks will fall out of the concrete"
   Clarification: The cement acts like a strong glue that holds all the pieces together permanently.

Cross-Curricular Ideas

1. Math - Sorting and Counting: Have students sort rocks by color or size and count how many they find in each group. This builds classification skills and number sense while exploring the concrete's composition.

2. ELA - Descriptive Language: Read books about rocks and concrete, then have students use sensory words (rough, smooth, hard, colorful) to describe what they see and feel. Create a class "rock words" chart together.

3. Social Studies - Community Builders: Discuss how concrete helps build communities by creating sidewalks, playgrounds, and buildings where people live and play. Take a neighborhood walk to spot concrete and talk about how it helps people.

4. Art - Texture Collage: Create a mixed-media art project using actual small rocks, sand, and paint to mimic the concrete's appearance. Students can arrange materials on paper and explore how different textures look and feel when combined together.

STEM Career Connection

1. Concrete Worker/Construction Worker: These workers mix concrete and use it to build sidewalks, playgrounds, and buildings. They work with their hands to make sure the concrete is smooth and strong so people can safely walk and play on it. They need to understand how materials work together to create safe spaces for communities.
   - Average Annual Salary: $45,000 - $55,000

2. Materials Scientist: These scientists study what things are made of and how different materials work. They might figure out how to make concrete stronger, longer-lasting, or more colorful. They ask questions about why materials behave the way they do and test new ideas.
   - Average Annual Salary: $65,000 - $75,000

3. Civil Engineer: These engineers design and plan the roads, sidewalks, and buildings that communities need. They decide what materials to use, including concrete, and make sure structures are safe and strong for people to use every day.
   - Average Annual Salary: $70,000 - $85,000

NGSS Connections

- Performance Expectation: K-2-ETS1-1 - Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- Disciplinary Core Ideas: 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.

Science Vocabulary

* Concrete: A strong building material made by mixing cement, water, sand, and rocks together
* Mixture: When two or more different things are combined together but you can still see the separate parts
* Properties: The special things about a material like its color, size, or how it feels
* Natural: Something that comes from nature and is not made by people
* Human-made: Something that people create or build using materials

External Resources

Children's Books:
- "From Sand to Glass" by Robin Nelson
- "What Is It Made Of?" by Victoria Parker
- "Rocks and Minerals" by Chris Oxlade