

Photo Description



This image shows a concrete surface filled with many different colored rocks, pebbles, and small stones. The rocks come in various sizes, shapes, and colors including brown, red, yellow, black, and gray pieces all mixed together in a cement-like material.

Scientific Phenomena

This image represents the Anchoring Phenomenon of composite material formation and sedimentary processes. The concrete demonstrates how different materials (aggregate rocks, sand, and cement) can be combined to create a new material with different properties than its individual components. This mirrors natural geological processes where sediments of various sizes and compositions become cemented together over time to form sedimentary rocks like conglomerate.

Core Science Concepts

1. **Material Properties and Composition:** Different materials can be combined to create new substances with unique properties that may be stronger or more useful than the original components.
2. **Particle Size and Sorting:** The various sizes of rock fragments (from fine sand to larger pebbles) demonstrate how materials can be classified by their physical properties.
3. **Weathering and Erosion Evidence:** The smooth, rounded edges of many rock pieces show evidence of natural weathering processes that wore down sharp edges over time.
4. **Engineering Design:** Humans can mimic natural processes to create useful materials for construction and building.

Pedagogical Tip:

Have students collect and sort different sized rocks and pebbles from the playground, then discuss how engineers might choose specific sizes and types for different construction projects.

UDL Suggestions:

Provide tactile experiences by bringing in actual rock samples of different textures and sizes for students who learn better through hands-on exploration, and use color-coding or visual organizers to help students categorize different rock types and sizes.

Zoom In / Zoom Out

1. **Zoom In:** At the microscopic level, the cement paste creates chemical bonds between the rock particles through crystalline structures that form as the concrete cures, creating a strong matrix that holds everything together.

2. Zoom Out: This concrete surface is part of larger human infrastructure systems that require durable materials, and the rocks came from quarries and natural deposits formed over millions of years through Earth's geological processes.

Discussion Questions

1. "What properties would make some rocks better than others for making concrete?" (Bloom's: Evaluate | DOK: 3)
2. "How do you think these rocks became so smooth and rounded?" (Bloom's: Analyze | DOK: 2)
3. "What would happen if we made concrete using only large rocks or only sand?" (Bloom's: Apply | DOK: 2)
4. "Why might engineers choose different combinations of materials for sidewalks versus building foundations?" (Bloom's: Synthesize | DOK: 4)

Potential Student Misconceptions

1. Misconception: "All rocks are the same, just different colors."
Clarification: Rocks have different compositions, hardness levels, and formed through different geological processes, which affects their properties and uses.
2. Misconception: "Concrete and cement are the same thing."
Clarification: Cement is just one ingredient in concrete; concrete is a mixture of cement, water, sand, and aggregate (rocks and gravel).
3. Misconception: "The rocks were always smooth and round."
Clarification: The rounded edges formed over time through weathering, erosion, and transportation processes that gradually wore away sharp corners.

Cross-Curricular Ideas

1. Mathematics - Measurement & Data: Have students measure and sort rock samples by size using rulers or calipers, then create bar graphs or histograms showing the distribution of different rock sizes found in a concrete sample. Students can calculate averages, compare data sets, and practice estimation skills.
2. English Language Arts - Descriptive Writing: Ask students to write detailed descriptive paragraphs about rocks they observe, using sensory language (rough, smooth, warm, heavy) and color words. They could also research and write informational texts about how different materials are quarried and used in construction projects.
3. Social Studies - Engineering & Community: Connect to local infrastructure by having students research concrete structures in their community (sidewalks, buildings, bridges) and investigate the materials sourced from nearby quarries. Students can explore how construction materials impact their neighborhoods and learn about civil engineers' roles in community development.
4. Art - Mixed Media & Texture: Students can create mixed media artwork by collecting and arranging different colored rocks, pebbles, and sand on paper or canvas to explore texture, pattern, and composition—mirroring the natural patterns seen in concrete and learning about how artists use materials creatively.

STEM Career Connection

1. **Materials Engineer:** Materials engineers design and test new materials like concrete and plastics to make them stronger, safer, and longer-lasting. They experiment with different combinations of ingredients to find the best mixtures for buildings, roads, and bridges. Average Salary: \$98,000 USD/year
2. **Geologist or Earth Scientist:** Geologists study rocks, minerals, and Earth processes to understand how rocks form and change over time. They also help locate quarries where valuable rocks and minerals can be extracted for use in construction and manufacturing. Average Salary: \$92,000 USD/year
3. **Civil Engineer:** Civil engineers design and oversee the construction of infrastructure like roads, bridges, buildings, and dams. They decide what materials to use and how to build structures that are strong, safe, and will last for many years. Average Salary: \$109,000 USD/year

NGSS Connections

- Performance Expectation: 5-PS1-3 Make observations and measurements to identify materials based on their properties
- Disciplinary Core Ideas: 5-PS1.A (Structure and Properties of Matter), 2-ESS1.C (The History of Planet Earth)
- Crosscutting Concepts: Patterns, Structure and Function, Scale, Proportion, and Quantity

Science Vocabulary

- * **Aggregate:** Small pieces of rock, gravel, or sand mixed into concrete to make it stronger.
- * **Composite:** A material made by combining two or more different materials together.
- * **Weathering:** The process where rocks are broken down by wind, water, and temperature changes.
- * **Properties:** The characteristics of a material that help us identify and describe it.
- * **Sediment:** Small pieces of rock, sand, and other materials that settle in layers.

External Resources

Children's Books:

- Let's Rock! by Jess French
- Rocks and Minerals by Chris Pellant
- The Magic School Bus Inside the Earth by Joanna Cole