Matter

Physical Science | Lesson Guide

1st Grade

Photo Description

Old rusty nails and screws are stuck in wood. The metal pieces are brown and orange because they are rusty. Some nails are round and some are long and thin.

Scientific Phenomena

The Anchoring Phenomenon is metal corrosion, specifically rusting of iron-containing materials. This occurs when iron in the nails and screws combines with oxygen from the air and water (moisture) to form iron oxide (rust). The chemical reaction happens slowly over time, changing the metal's properties and appearance from shiny silver to reddish-brown. This weathering process demonstrates how materials can change when exposed to environmental conditions.

Core Science Concepts

1. Material Properties Change Over Time - The metal nails started shiny and silver but became brown and flaky through rusting
2. Objects Are Made of Different Materials - Wood and metal have different properties and react differently to weather
3. Environmental Effects on Materials - Air, water, and time can change how objects look and feel
4. Observable Changes - Students can see, touch, and describe how the rusty metal is different from new metal

Pedagogical Tip:

Use real rusty and new nails side-by-side for students to observe differences. Let them use magnifying glasses to see texture changes and encourage them to use descriptive words like "rough," "flaky," and "bumpy" versus "smooth" and "shiny."

UDL Suggestions:

Provide multiple ways for students to explore: visual observation with magnifying glasses, tactile exploration of different metal textures (safely), and verbal descriptions. Create a sensory word bank with pictures to help all learners express their observations.

Zoom In / Zoom Out

1. Zoom In: At the tiny level we cannot see, iron atoms are combining with oxygen atoms from air and water to make new molecules called iron oxide. These new molecules take up more space and are weaker than the original metal.

2. Zoom Out: This rusting process happens to metal objects everywhere - playground equipment, cars, bridges, and tools. People paint metal or use special coatings to protect it from rusting and keep structures safe and strong.

Discussion Questions

1. "What do you notice is different about these nails compared to new nails?" (Bloom's: Analyze | DOK: 2)

2. "Why do you think some nails are more rusty than others?" (Bloom's: Evaluate | DOK: 3)

3. "What might happen if we put a new nail outside in the rain for a long time?" (Bloom's: Apply | DOK: 2)

4. "How could we protect metal from getting rusty?" (Bloom's: Create | DOK: 3)

Potential Student Misconceptions

1. Misconception: "The rust came from somewhere else and got on the metal"
   Clarification: Rust forms when the iron in the metal changes by combining with air and water

2. Misconception: "Only old things get rusty"
   Clarification: New metal can rust quickly if it gets wet and is exposed to air

3. Misconception: "Rust is just dirt on metal"
   Clarification: Rust is actually the metal itself changing into a different material

Cross-Curricular Ideas

1. Math - Sorting and Counting: Students can sort rusty and non-rusty nails by size, count them, and create simple bar graphs showing "rusty" versus "not rusty." This connects to 1.MD.C.4 (organizing, representing, and interpreting data).

2. ELA - Descriptive Writing: Students can draw rusty nails and write or dictate descriptive sentences using sensory words like "rough," "bumpy," "orange," and "flaky." Create a class book titled "Our Rusty Nails" with student observations and illustrations.

3. Social Studies - Community Helpers: Discuss how construction workers, plumbers, and maintenance workers use metal tools and must protect them from rust. Visit or invite a local tradesperson to show students their tools and explain how they care for them.

4. Art - Texture Exploration: Students can make rubbings of rusty nails and textured surfaces using paper and crayons to explore texture. They can also create mixed-media art by gluing actual small nails and screws onto paper to show different materials and textures.

STEM Career Connection

1. Materials Engineer/Scientist - These scientists study what things are made of and figure out how to make materials stronger and longer-lasting. A materials engineer might work on making metal that doesn't rust easily or finding new coatings to protect tools and buildings. Average Salary: $100,000 USD

2. Maintenance Worker/Facilities Manager - These workers take care of buildings, playgrounds, and equipment by fixing rusty parts, painting metal to prevent rust, and replacing old tools. They use their knowledge of materials to keep our community safe and looking nice. Average Salary: $38,000 USD

3. Structural/Civil Engineer - These engineers design and maintain big structures like bridges, buildings, and roads. They must understand how rust affects metal structures and plan ways to protect them so people stay safe. Average Salary: $88,000 USD

NGSS Connections

- Performance Expectation: 1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate
- Disciplinary Core Ideas: 2-PS1.A Different kinds of matter exist and many of them can be either solid or liquid
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Rust: The brown, flaky stuff that forms on iron when it gets wet and stays in the air
* Metal: A hard, shiny material that can be shaped into tools and objects
* Material: What something is made of, like wood, plastic, or metal
* Change: When something becomes different than it was before
* Property: How something looks, feels, or acts

External Resources

Children's Books:
- What Is the World Made Of? by Kathleen Weidner Zoehfeld
- Materials by Karen Bryant-Mole