Matter

Physical Science | Lesson Guide

Kindergarten

Photo Description

This picture shows old rusty nails and screws on a wooden board. The metal pieces are brown and orange colored because they have rust on them. Some nails are straight and some are bent.

Scientific Phenomena

The anchoring phenomenon here is corrosion/rusting - the chemical process where iron and steel react with oxygen and water in the air to form iron oxide (rust). This occurs when metal objects are exposed to moisture and air over time, causing the metal to slowly change from its original silver color to reddish-brown. The wooden surface provides a perfect backdrop to observe how different metals weather and change when left outdoors.

Core Science Concepts

1. Materials and Their Properties: Different materials (metal vs. wood) behave differently when exposed to weather and time
2. Observable Changes: Objects can change color, texture, and appearance over time due to environmental factors
3. Cause and Effect: Water and air cause metal to rust and change appearance
4. Material Durability: Some materials last longer than others in different conditions

Pedagogical Tip:

Use real rusty objects (safely handled) alongside shiny new nails to help students make direct comparisons. This concrete, hands-on approach helps kindergarteners understand abstract concepts like "change over time."

UDL Suggestions:

Provide multiple ways for students to explore this concept: visual comparison charts, texture exploration (with safe materials), and simple before/after drawings to accommodate different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: At the tiny level we cannot see, oxygen molecules in the air are sticking to iron atoms in the metal, creating new rust molecules that are a different color than the original metal.

2. Zoom Out: This same rusting process happens to metal objects everywhere - playground equipment, cars, bridges, and tools - showing us how all materials interact with their environment over time.

Discussion Questions

1. What do you notice is different about these nails compared to new nails? (Bloom's: Analyze | DOK: 2)
2. What do you think caused these changes to happen? (Bloom's: Evaluate | DOK: 3)
3. How do you think we could protect metal from rusting? (Bloom's: Create | DOK: 3)
4. What other metal things have you seen that look rusty like this? (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

1. Misconception: "The rust came from dirt getting on the metal"
   Clarification: Rust forms when metal reacts with air and water, not from dirt sticking to it

2. Misconception: "All metals turn the same color when they get old"
   Clarification: Different metals change in different ways - some turn green, some turn black, and iron turns reddish-brown

3. Misconception: "Rust happens very quickly"
   Clarification: Rusting is a slow process that takes weeks, months, or years to become visible

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: 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 reddish-brown coating that forms on iron when it mixes with air and water
* Metal: A hard, shiny material that can be shaped and is often used to make tools
* Change: When something becomes different from how it was before
* Material: What something is made of, like wood, metal, or plastic
* Property: How something looks, feels, or acts

External Resources

Children's Books:
- Materials by Karen Bryant-Mole
- What Is It Made Of? by Robin Nelson
- From Metal to Bicycle by Robin Nelson

YouTube Videos:
- "Rust Experiment for Kids" - Simple demonstration showing how rust forms on steel wool: https://www.youtube.com/watch?v=8K-NYkQzNNM
- "Materials Song for Kids" - Educational song about different materials and their properties: https://www.youtube.com/watch?v=uOeNNLlVPuM