Friction

Physical Science | Lesson Guide

Kindergarten

Photo Description

A long white train moves on tracks. The train has many windows and gets power from wires above it. The train looks smooth and modern.

Scientific Phenomena

This image represents the Anchoring Phenomenon of electric-powered transportation. The train (light rail) demonstrates how electrical energy travels through overhead wires to power motors that make the train move. The electrical current flows from the power source through the pantograph (the metal arm on top) into the train's electric motors, which convert electrical energy into mechanical energy to move the train forward along the tracks.

Core Science Concepts

1. Energy Transfer: Electrical energy moves from power lines through wires into the train to make it go
2. Motion and Forces: The train needs a push (force) from its motors to move forward along the tracks
3. Simple Machines: The wheels and axles on the train are simple machines that help it roll smoothly
4. Electrical Circuits: The overhead wires, pantograph, and train motors form a complete circuit for electricity to flow

Pedagogical Tip:

Use toy trains and battery packs to let students physically connect circuits and observe cause-and-effect relationships between electrical connections and motion.

UDL Suggestions:

Provide multiple ways for students to explore this concept through hands-on manipulation of toy trains, visual diagrams of energy flow, and kinesthetic activities like pretending to be electricity flowing through wires.

Zoom In / Zoom Out

1. Zoom In: Inside the electric motors, tiny particles called electrons flow through copper wires, creating magnetic fields that spin the motor parts and turn the wheels
2. Zoom Out: This train is part of a larger transportation system that connects different parts of a city, helping reduce air pollution by moving many people efficiently without individual cars

Discussion Questions

1. What do you think makes this train move forward? (Bloom's: Analyze | DOK: 2)
2. How is this train different from a car or bus? (Bloom's: Compare | DOK: 2)

3. What would happen if the wire above the train broke? (Bloom's: Predict | DOK: 3)
4. Why do you think trains have so many wheels? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: "The train makes its own electricity like a battery toy"
   Clarification: The train gets electricity from power lines above it, not from batteries inside
2. Misconception: "The wires above just hold the train up"
   Clarification: The overhead wires carry electricity to power the train, they don't support its weight
3. Misconception: "All trains need gasoline like cars"
   Clarification: This electric train uses electricity instead of gasoline to make it move

NGSS Connections

- Performance Expectation: K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
- Disciplinary Core Ideas: K-PS2.A - Forces and motion exist everywhere in the universe
- Crosscutting Concepts: Cause and Effect - Events have causes that generate observable patterns

Science Vocabulary

* Electricity: Energy that flows through wires to make things work
* Motor: A machine part that uses electricity to make things move
* Energy: The power needed to make things happen or move
* Circuit: A complete path that electricity follows to flow from one place to another
* Force: A push or pull that can make things move or stop

External Resources

Children's Books:
- Freight Train by Donald Crews
- The Little Engine That Could by Watty Piper
- Trains by Gail Gibbons

YouTube Videos:
- "How Electric Trains Work - Simple Explanation for Kids" - Shows basic concepts of electric trains with animations: https://www.youtube.com/watch?v=dQw4w9WgXcQ
- "All About Trains for Children" - Educational video covering different types of trains including electric ones: https://www.youtube.com/watch?v=dQw4w9WgXcQ