Kinetic Energy

Physical Science | Lesson Guide

2nd Grade

Photo Description

A skateboarder is jumping into the air on a concrete skate park, balancing on their skateboard while their arms are spread wide for balance. The skateboard is below them, moving through the air. Other people are watching in the background, and you can see ramps and curved concrete features designed for skateboarding tricks.

Scientific Phenomena

Anchoring Phenomenon: A moving skateboard has energy that allows it to keep rolling, and a person's push-off creates motion.

Why This Happens: When the skateboarder pushes off with their feet, they transfer energy into the skateboard and themselves. This energy of motion is called kinetic energy. Objects that are moving have kinetic energy. The faster something moves, the more kinetic energy it has. Even while the skateboarder is in the air, both they and the skateboard are still moving because the energy they built up keeps them going until friction and gravity slow them down.

Core Science Concepts

* Motion and Speed: Things can move fast or slow. The skateboard and skateboarder are moving through space. We can describe how fast they're moving by observing how far they travel.

* Energy and Force: A push (force) from the skateboarder's legs creates motion. This push transfers energy to make things move. Moving objects have kinetic energy—the energy of motion.

* Gravity: Gravity pulls everything toward Earth. That's why the skateboarder comes back down after jumping. Gravity affects all moving objects.

* Friction: Friction is a force that slows things down. It happens when surfaces rub together. Friction between the skateboard wheels and the ground eventually stops the skateboard from rolling.

Pedagogical Tip:

When teaching kinetic energy to second graders, use the phrase "energy of motion" rather than the abstract term "kinetic energy" alone. Have students physically demonstrate the concept by running and stopping—they can feel the energy in their bodies and how it takes effort to slow down. This embodied learning makes the concept concrete and memorable.

UDL Suggestions:

To support diverse learners, provide multiple means of representation: show slow-motion videos of skateboarding, use visual diagrams with arrows showing movement direction, and allow students to physically act out motion concepts. For students with mobility differences, they can draw pictures of moving objects or use toys to demonstrate the same concepts. Offer choices in how students express their understanding—through movement, drawing, writing, or verbal explanation.

Discussion Questions

1. What made the skateboard start moving? (Bloom's: Remember | DOK: 1)

2. Why do you think the skateboarder comes back down to the ground after jumping? (Bloom's: Understand | DOK: 2)

3. If the skate park had sand instead of concrete on the ground, what would happen to the skateboard? Why? (Bloom's: Analyze | DOK: 2)

4. How could we make the skateboard go faster or slower? What would we need to do? (Bloom's: Apply | DOK: 2)

Extension Activities

1. Moving Objects Investigation: Give students toy cars, balls, and blocks on a smooth floor. Have them push each object and observe which ones move the farthest. Ask: "What made some objects move more than others? Did they all slow down? Why?" This connects to friction and kinetic energy transfer.

2. Ramp Race: Create simple ramps from cardboard and wood blocks. Have students roll different objects down the ramps and measure how far they travel using string or tape. Ask students to predict which object will go the farthest before slowing down. Discuss how the ramp's angle and height affect the object's speed and distance.

3. Freeze Dance Energy Game: Play music and have students dance and move (demonstrating kinetic energy). When the music stops, they must freeze quickly. Afterward, discuss: "When we were dancing, did we have energy of motion? What stopped our movement? How does friction help us stop?" This helps students feel kinetic energy in their own bodies.

NGSS Connections

Performance Expectation: 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Related Performance Expectation: K-PS2-1: Plan and conduct investigations to provide evidence that vibrations make sound and that vibrations can make objects move.

Disciplinary Core Ideas:
- 2-PS1.A—Different kinds of matter exist and can be described in different ways
- K-PS2.A—Objects can move in different ways, such as straight, zigzag, round, back-and-forth, and fast and slow

Crosscutting Concepts:
- Cause and Effect—Simple cause and effect relationships (push causes motion)
- Energy and Matter—Energy can be transferred in various ways

Science Vocabulary

* Kinetic Energy: The energy that something has when it is moving.

* Motion: The action of moving or changing position.

* Friction: A force that slows things down when two surfaces rub together.

* Gravity: An invisible force that pulls objects toward the ground.

* Force: A push or pull that makes something move or change direction.

* Speed: How fast something is moving.

External Resources

Children's Books:
- Push and Pull by Lola M. Schaefer (teaches forces and motion in accessible language)
- The Wheels on the Skateboard by Adria F. Klein (board sports and movement)
- Motion by Sian Smith (simple explanations of how things move)

YouTube Videos:
- "What is Kinetic Energy? Energy of Motion for Kids" — Explains moving objects and energy in simple terms with animated examples. https://www.youtube.com/results?search_query=kinetic+energy+for+kids+explanation
- "Skateboarding Physics for Kids" — Shows how skateboards use balance, gravity, and motion in easy-to-understand ways. https://www.youtube.com/results?search_query=skateboarding+physics+for+elementary+students

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Teacher Note: This lesson builds foundational understanding of motion and energy that will be expanded in later grades. Use real-world examples from students' lives (running, rolling toys, sliding on ice) to reinforce that kinetic energy is everywhere!