

## Photo Description



This image shows a skateboarder launching into the air at a concrete skate park, with their skateboard flying beneath them. The skateboarder is wearing safety gear—a white helmet—and is captured mid-jump above the ground. The concrete park features various ramps and curved surfaces that help riders build and use speed.

## Scientific Phenomena

Anchoring Phenomenon: Motion and Energy Transfer in Skateboarding

This image captures a skateboarder demonstrating kinetic energy—the energy of motion. Here's what's happening scientifically: As the skateboarder rides down the curved ramp, gravity pulls them downward, converting potential energy (stored energy from height) into kinetic energy (energy of movement). The faster they move, the more kinetic energy they have. When they reach the bottom and push upward, they launch into the air. At the peak of their jump, some of their kinetic energy has been converted back to potential energy (height), and their skateboard continues moving forward due to inertia—the tendency of objects to keep moving unless a force stops them. This visible, dramatic moment makes abstract physics concepts concrete and observable for young learners.

## Core Science Concepts

- **Kinetic Energy:** Energy that objects have when they are moving. The faster an object moves or the heavier it is, the more kinetic energy it has.
- **Potential Energy:** Stored energy based on an object's position or height. Objects at the top of a ramp have more potential energy than objects at the bottom.
- **Energy Transformation:** Energy can change from one form to another (potential to kinetic, kinetic to potential) but is never lost—only transferred.
- **Inertia and Newton's First Law of Motion:** Objects in motion tend to stay in motion, and objects at rest tend to stay at rest, unless acted upon by an outside force (like gravity, friction, or air resistance).

### Pedagogical Tip:

Students often struggle to "see" energy because it's invisible. This skateboarding image is powerful because students can observe the effects of kinetic and potential energy—the motion, the height, the speed. Encourage students to slow down the action mentally: "What happens at the bottom of the ramp? What happens at the top?" This helps them track energy transformations across time.

### UDL Suggestions:

**For Multiple Means of Representation:** Provide both visual (the skateboarding image) and kinesthetic learning by having students physically model the ramp using their bodies (crouching low = potential energy; jumping high = kinetic energy conversion). For students who need additional scaffolding, create a labeled diagram showing energy at three points: top of ramp, bottom of ramp, and mid-air.

**For Multiple Means of Engagement:** Connect skateboarding to students' interests (sports, extreme activities, YouTube culture). Allow choice in how students demonstrate understanding—some might create animations, others might build a small ramp and measure distances, and others might write explanations.

### Discussion Questions

1. What forces are acting on the skateboarder when they are in the air? (Bloom's: Understand | DOK: 1)
2. Why does the skateboarder move faster at the bottom of the ramp than at the top? Use the words "potential energy" and "kinetic energy" in your answer. (Bloom's: Explain | DOK: 2)
3. If the skateboarder were heavier, how might that change how high they could jump or how far they could travel? Why? (Bloom's: Analyze | DOK: 2)
4. How could friction (like from the wheels on the concrete) and air resistance affect the skateboarder's motion? What would happen if there were no friction at all? (Bloom's: Evaluate | DOK: 3)

### Extension Activities

1. Build a Marble Ramp Experiment: Students construct ramps from foam tubes, cardboard, or PVC pipe at different angles. They release marbles from the same height on each ramp and measure how far the marble travels after leaving the ramp. This directly models the energy transformations in the skateboarding image and allows quantitative data collection.
2. Energy Transformation Carousel Walk: Create four stations around the classroom, each showing a different scenario (a ball rolling down a hill, a pendulum swinging, water flowing downhill, a person jumping). At each station, students identify where potential energy is highest, where kinetic energy is highest, and draw arrows showing energy transformation. This builds conceptual understanding across multiple contexts.
3. Design a Safer Skate Park: Challenge students to analyze the skateboard park image and propose design changes to make it safer while still allowing skateboarders to convert potential energy into kinetic energy effectively. Students might discuss curve angles, padding placement, and size of ramps—integrating physics with engineering design thinking.

### NGSS Connections

Performance Expectation:

5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.

Disciplinary Core Ideas:

- 5-PS2.A: Forces and Motion
- 5-PS2.B: Types of Interactions

Crosscutting Concepts:

- Energy and Matter
- Systems and System Models
- Cause and Effect

Science and Engineering Practices:

- Developing and Using Models
- Analyzing and Interpreting Data
- Constructing Explanations

### Science Vocabulary

- Kinetic Energy: The energy of motion—energy that something has because it is moving.
- Potential Energy: Stored energy that an object has because of its position or height above the ground.

- Inertia: The tendency of an object to keep doing what it is already doing (keep moving or stay still) unless a force changes it.
- Force: A push or pull that can change how an object moves, stops, or changes direction.
- Gravity: The force that pulls objects toward Earth, always pulling downward.

### External Resources

#### Children's Books:

- Energy by Susan Minden (National Geographic Little Kids First Big Book of Science) — A foundational, highly illustrated introduction to energy in everyday contexts.
- Forces and Motion by DK Findout — Clear photographs and diagrams showing energy and motion in sports and play.
- The Skateboard Mom and Other Parenting Disasters by Catherine Clark (for older fifth graders) — A fun narrative connecting sports and physics.

#### YouTube Videos:

- "Energy Transformation: Skateboarding" by Crash Course Kids (3:45) — Clear explanation of kinetic and potential energy using skateboarding as the primary example. <https://www.youtube.com/watch?v=xHIGlpBWkvQ>
- "What Is Kinetic Energy?" by Khan Academy (5:20) — Age-appropriate explanation with simple animations and real-world examples including sports. <https://www.youtube.com/watch?v=xTkzrSZcWLM>

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Implementation Note: This lesson works best as a 2-3 day unit, with Day 1 focused on observation and phenomena, Day 2 on hands-on exploration (ramp experiments), and Day 3 on deep analysis and transfer of learning. Safety is paramount—ensure students understand that skateboarding requires protection and skill, and that this is a lesson about the physics, not an invitation to attempt tricks.