Force And Motion

Physical Science | Lesson Guide

4th Grade

Photo Description

A student in a red shirt is jumping over an orange cone on a grassy field, demonstrating how forces act on their body to make it move. The athlete's legs are bent and lifted high, showing the upward push needed to leave the ground. Other students and spectators watch in the background, indicating this is a school athletic activity or field day event.

Scientific Phenomena

Anchoring Phenomenon: Why can a person jump into the air and then come back down?

This image captures the fundamental interaction between forces and motion. When the student pushes their legs down against the ground with force, the ground pushes back with an equal and opposite force (Newton's Third Law). This upward force is greater than the student's weight, causing them to accelerate upward into the air. Once airborne, gravity pulls the student downward, bringing them back to the ground. The student's muscles generated the initial force, demonstrating how living things use energy to create motion.

Core Science Concepts

* Force: A push or pull that can change how something moves. In jumping, the student's leg muscles push down on the ground.

* Motion: A change in position or place. The student moves upward through the air and then downward back to the ground.

* Gravity: An invisible force that pulls objects toward Earth. Gravity is what brings the student back down after jumping.

* Newton's Third Law of Motion: For every action, there is an equal and opposite reaction. The student pushes down on the ground; the ground pushes up on the student with equal force.

Pedagogical Tip:

When teaching force and motion with this image, have students first feel forces on their own bodies before explaining them abstractly. Ask students to push against a wall and feel the wall push back, or jump and feel gravity pull them down. Concrete, kinesthetic experiences help Fourth Graders internalize these invisible concepts.

UDL Suggestions:

Representation: Use slow-motion video of jumping to help students see the stages of motion more clearly. Provide labeled diagrams showing forces as arrows (push down, push up, gravity pulling down) so visual learners can see force directions.

Action & Expression: Allow students to demonstrate their understanding by creating their own jumping sequences, drawing force diagrams, or building simple lever systems rather than relying only on written responses.

Engagement: Connect jumping to real-world contexts students care about—sports, dance, playground games—to make the concept personally relevant.

Discussion Questions

1. What forces are acting on the student while they are in the air? (Bloom's: Understand | DOK: 1)

2. Why does the student come back down to the ground instead of staying in the air? (Bloom's: Explain | DOK: 2)

3. If the student jumped on the Moon instead of Earth, how would the jump be different, and why? (Bloom's: Analyze | DOK: 3)

4. How could the student jump even higher, and what force would need to change? (Bloom's: Apply | DOK: 2)

Extension Activities

1. Jump Height Challenge: Have students jump while you measure how high they jump using a meter stick or tape on a wall. Then ask them to predict how their jump height would change if they bent their knees more before jumping, jumped with one leg, or swung their arms. Test predictions and measure again. This connects to force (more bend = more push force) and motion (different forces = different heights).

2. Force Detective Walk: Take the class on a "force walk" around the school playground. Students identify and sketch examples of forces in action—pushing on swings, friction on the slide, gravity pulling the ball down. Have them label each force as a push, pull, or gravity, and explain how it changes motion.

3. Design a Better Jump: Provide students with simple materials (foam blocks, boxes, ramps) and ask them to design a landing zone that would help them jump safely over obstacles. Challenge them to explain how their design works using force and motion vocabulary. This connects physics to engineering and safety.

NGSS Connections

Performance Expectation:
4-PS3-3: Ask questions and predict outcomes about the changes in energy when objects collide, objects are pushed or pulled over a distance, and/or objects are dropped to make work easier. (Forces and Motion)

Disciplinary Core Ideas:
4-PS2.A Forces and Motion* – Objects are pushed or pulled by forces, and forces can change the direction or speed of an object's motion.
4-PS2.B Types of Interactions* – Electric and magnetic forces between a two objects act even when the objects are not in contact; contact forces, such as frictional force, act only when objects are touching.

Crosscutting Concepts:
* Cause and Effect – The student's leg muscles (cause) produce a push force that creates upward motion (effect).
* Energy and Matter – The student's chemical energy from food is converted into mechanical energy (motion) during the jump.

Science Vocabulary

* Force: A push or pull that can make something start moving, stop moving, or change direction.

* Gravity: An invisible force that pulls things toward Earth and keeps us from floating away.

* Motion: The act of moving from one place to another.

* Push: A force that moves something away from you.

* Newton's Third Law: The rule that says when one thing pushes on another, the other thing pushes back just as hard.

External Resources

Children's Books:
Push and Pull* by Lola M. Schaefer (Pebble Books) – Simple, illustrated exploration of pushes and pulls in everyday life.
Forces Make Things Move* by Kimberly Brubaker Bradley (HarperCollins) – Engaging narrative that explains forces through relatable examples.
What Makes Things Move?* by Jennifer Boothroyd (Lerner Publishing) – Accessible text with photos of real-world force and motion examples.

YouTube Videos:
"Newton's Laws of Motion for Kids" by National Geographic Kids – Clear, age-appropriate explanation with visual demonstrations. Note: Verify current URL as YouTube links may change, but search this exact title.*
* "Gravity Explained for Kids" by TED-Ed – Animated explanation of gravity and why objects fall, featuring diverse student-friendly examples.

Coaching Note: This jumping activity is an excellent, safe starting point for Fourth Grade force and motion study. It uses students' own bodies and experiences, making abstract concepts concrete. Consider filming student jumps and analyzing the motion frame-by-frame during future lessons to deepen conceptual understanding of speed, distance, and force.