Force And Motion

Physical Science | Lesson Guide

Kindergarten

Photo Description

A child in a red shirt jumps high into the air over an orange cone, with their legs bent and arms outstretched for balance. In the background, other children and adults watch the activity take place in an outdoor school setting. This image shows how our bodies can move through space when we apply force to push off the ground.

Scientific Phenomena

Anchoring Phenomenon: A person jumping over an obstacle and landing safely

This happens because the child pushes down hard against the ground with their legs (applying force), which makes their body move upward into the air. Gravity then pulls them back down toward Earth. The child's muscles create the force needed to overcome gravity temporarily. The jumping motion demonstrates how force causes changes in motion—the child goes from standing still to moving upward very quickly, then slows down and comes back down. This is a perfect example of Newton's First Law: objects in motion stay in motion (and objects at rest stay at rest) unless a force acts on them.

Core Science Concepts

* Force: A push or pull that makes things move, stop, or change direction. In this photo, the child's leg muscles push down on the ground, creating an upward force.

* Motion: A change in position or location. The child moves from the ground upward into the air and then back down again.

* Gravity: An invisible force that pulls objects toward Earth. It's what brings the jumping child back down to the ground.

* Balance and Control: Using body awareness to stay steady while moving. The child's outstretched arms help maintain balance in the air.

Pedagogical Tip:

Kindergarteners learn best through direct, physical experience. Rather than only showing this image, have children actually jump, hop, and skip themselves. Let them feel the force they create with their own legs and experience gravity pulling them back down. This embodied learning is far more powerful than passive observation for this age group.

UDL Suggestions:

Multiple Means of Representation: Some children may benefit from slow-motion video of jumping to see the motion more clearly. Use visual supports like picture cards showing the sequence: "push legs down !' jump up !' come back down." Multiple Means of Action/Expression: Allow children to demonstrate their understanding through movement (jumping, hopping) rather than requiring verbal or written responses. Children with mobility challenges can participate by predicting motions or directing others' movements.

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Zoom In / Zoom Out

Zoom In: Inside the Muscles
When the child pushes down with their legs to jump, tiny parts inside their muscles called fibers are working very hard! These muscle fibers are made of even tinier cells that shorten and pull, kind of like springs getting tighter and then letting go. Millions of these tiny muscle cells work together at the same time to create enough force to lift the child's whole body off the ground. This happens so fast that we can't see it—it's like magic happening inside our bodies!

Zoom Out: Earth's Gravity Everywhere
The force that pulls the jumping child back down to Earth is the same force that keeps us all on the ground every single day. Gravity is a huge invisible force that the entire Earth creates. It pulls on everything—the child, the orange cone, the trees in the background, even the clouds in the sky! Gravity keeps our Moon circling around Earth, and it keeps Earth circling around the Sun. Without gravity, nothing could stay on the ground, and we'd all float away into space!

Discussion Questions

1. What made the child's body go up into the air? (Bloom's: Understand | DOK: 1)
2. Why did the child come back down to the ground after jumping? (Bloom's: Explain | DOK: 2)
3. If the child pushed down harder with their legs, what do you think would happen to their jump? (Bloom's: Predict | DOK: 2)
4. What forces are working on the child's body right now—the push from the legs and the pull from Earth? (Bloom's: Analyze | DOK: 3)

Potential Student Misconceptions

Misconception 1: "The child jumped because they were strong."
Clarification: While strength helps, jumping happens because muscles create a downward push on the ground. The ground pushes back equally hard on the child's legs (this is called an action-reaction pair), and that push sends the child upward. It's not just about being strong—it's about the push and the push-back!

Misconception 2: "Gravity only works when you're falling down."
Clarification: Gravity is always pulling on us, even when we're standing still or sitting down! Gravity pulls the child down during the jump, but it also pulls on us all the time. It's what keeps us from floating up into the air right now. Gravity never stops working—it's always there, pulling everything toward Earth.

Misconception 3: "If you jump higher, gravity won't catch you."
Clarification: Gravity always catches everything! No matter how high or how far someone jumps, gravity will always pull them back down toward Earth. The higher you jump, the longer it takes to come back down, but gravity never stops working. It's impossible to escape gravity by jumping.

Extension Activities

1. Jumping Contest: Set up a safe indoor or outdoor space with low obstacles (foam blocks, tape lines, or cones). Have children practice jumping over obstacles at different heights. Encourage them to notice how they feel their leg muscles pushing and how gravity brings them back down. Discuss: "What helped you jump higher?"

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2. Force and Motion Exploration Station: Create stations where children can push and pull different objects (balls, blocks, toy cars). Have them observe which pushes and pulls make things move far, fast, or slow. Connect this to their jumping experience: "Your legs pushed to make your body move, just like you push to move these toys!"

3. Jump Like Animals: Have children imitate how different animals jump or move (bunnies hop, frogs leap, kangaroos bound, birds fly up). Discuss the different forces and motions each animal uses. This builds vocabulary and deepens understanding of force and motion through imaginative play.

Cross-Curricular Ideas

Math Connection: Measuring Jumps
Have children jump and measure how far or high they jumped using non-standard units (blocks, hand spans, footprints). Create a simple bar graph showing "My Jump Distance" compared to classmates' jumps. This integrates measurement, comparison, and data representation while reinforcing the concept of motion and force.

ELA Connection: Action Words and Sequencing
Read or create simple stories about jumping using action verbs (jump, hop, leap, skip, bounce). Have children sequence picture cards showing the stages of a jump: "First we bend our legs. Next we push down hard. Then we go up in the air. Finally we come back down." This builds vocabulary and narrative understanding while reinforcing the sequence of forces and motion.

Art Connection: Movement in Drawing
Have children create artwork showing a jumping person using lines and shapes to show motion. They can draw curved lines to show the path of the jump, or create a "motion series" showing the same figure in three positions (ready to jump, in the air, landing). This helps children visualize and represent force and motion in a creative way.

Social Studies Connection: Games and Sports Around the World
Explore how children in different cultures play jumping games (hopscotch, jump rope, traditional folk games). Look at pictures or videos of children jumping in other countries. Discuss how people everywhere use jumping for play, exercise, and sports, connecting movement to human culture and community.

STEM Career Connection

Physical Therapist
A physical therapist is a helper who works with people who have trouble moving their bodies. They teach people exercises—like jumping, stretching, and walking—to help them get stronger and move better. When someone gets hurt or is having trouble running or jumping like the child in the picture, a physical therapist creates special movements to help them heal. They use their knowledge of how bodies move and what forces make movement possible.
Average Annual Salary: $92,000 USD

Sports Coach or PE Teacher
A sports coach teaches children and grown-ups how to play sports safely and have fun moving their bodies. They know all about how our muscles make us jump, run, and throw. Coaches help people understand how to use force with their legs to jump higher, how to balance in the air, and how to land safely. They use science to help people become better athletes!
Average Annual Salary: $48,000 USD

Biomechanist or Exercise Scientist

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A biomechanist is a scientist who studies how bodies move! They watch people jumping, running, and playing—just like in this photo—and use cameras and computers to understand exactly which muscles create force, how gravity affects our movement, and how to help athletes jump higher or run faster. They work with sports teams, doctors, and people creating new shoes or equipment to help us move better.
Average Annual Salary: $68,000 USD

NGSS Connections

Performance Expectation (K-PS2-1): Plan and conduct an investigation to provide evidence that vibrations make sound and that various materials can be used to change the volume of sound.

Disciplinary Core Ideas:
- K-PS2.A Objects can move in many different ways, such as straight, zigzag, round and round, back and forth, and fast and slow.
- K-PS2.B Things push or pull on other things when they come into contact. Pushes and pulls can make things move.

Crosscutting Concepts:
- Cause and Effect Pushes or pulls can change how objects move or whether they are moving.

Science Vocabulary

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

* Jump: To push your body up into the air with your legs.

* Gravity: An invisible force that pulls things down toward Earth.

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

* Balance: Keeping your body steady so you don't fall over.

External Resources

Children's Books:
- Jump, Kangaroo, Jump! by Stuart J. Murphy (explores jumping and motion through story)
- Move! by Robin Page & Steve Jenkins (introduces basic concepts of motion and force)
- The Reason for a Flower by Ruth Heller (includes gentle exploration of how living things move)

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