Static Electricity

Physical Science | Lesson Guide

3rd Grade

Photo Description

A blue balloon floats above a dark surface covered with colorful paper confetti pieces. Small water droplets hang from the bottom of the balloon. The confetti pieces are scattered in many bright colors like red, yellow, green, and blue.

Scientific Phenomena

This image demonstrates static electricity as the anchoring phenomenon. The balloon has been rubbed against another material (likely hair or fabric), which transferred electrons and gave the balloon a negative electric charge. This charged balloon can now attract small, lightweight objects like the paper confetti through electrostatic force. The water droplets on the balloon's surface may have formed due to condensation or been attracted due to water's polar nature, which responds to electric fields.

Core Science Concepts

1. Static Electricity Generation: When two materials rub together, electrons transfer from one to the other, creating an electric charge
2. Electrostatic Attraction: Charged objects can attract neutral objects or objects with opposite charges
3. Properties of Materials: Different materials respond differently to electric charges - lightweight paper moves easily while heavier objects do not
4. Force and Motion: Electric forces can cause objects to move without direct contact (non-contact force)

Pedagogical Tip:

Have students make predictions before demonstrating with the balloon and confetti. This engages their prior knowledge and makes the learning more meaningful when they observe the results.

UDL Suggestions:

Provide multiple ways for students to experience static electricity - visual (balloon and confetti), tactile (feeling hair stand up), and auditory (crackling sounds when separating socks from the dryer). This supports different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: At the atomic level, electrons are moving from one material to another when objects are rubbed together. These tiny particles carry negative electric charge and create an invisible electric field around the charged object.

2. Zoom Out: Static electricity is part of the larger electromagnetic force that governs much of our world - from lightning in thunderstorms to how our electronic devices work to the forces that help hold atoms together.

Discussion Questions

1. What do you think would happen if we used heavier objects instead of paper confetti? (Bloom's: Predict | DOK: 2)
2. Why do you think some of the confetti pieces move toward the balloon while others don't? (Bloom's: Analyze | DOK: 2)
3. How could we test whether the balloon's power gets weaker over time? (Bloom's: Create | DOK: 3)
4. What other materials in our classroom might be attracted to a charged balloon? (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

1. Misconception: "The balloon is magnetic like a magnet."
   Clarification: The balloon creates electric charges, not magnetic forces. Electric and magnetic forces are different types of forces.

2. Misconception: "Only some balloons can do this trick."
   Clarification: Any balloon can build up static charge when rubbed properly - it's about the rubbing action, not a special type of balloon.

3. Misconception: "The confetti sticks because it's sticky."
   Clarification: The paper moves because of invisible electric forces pulling on it, not because anything is sticky or wet.

Cross-Curricular Ideas

1. Mathematics - Graphing and Data: Have students conduct a static electricity experiment and record how many confetti pieces stick to the balloon each time. Create a bar graph or pictograph showing the results. Students can compare results across different materials (balloon rubbed on hair vs. wool vs. cotton) and discuss which material works best.

2. English Language Arts - Descriptive Writing: Ask students to write or draw a sequence of steps explaining how to make a balloon attract confetti. They can use transition words like "first," "next," "then," and "finally" to organize their explanation. This reinforces procedural writing while deepening understanding of the science concept.

3. Art - Color and Light Exploration: Have students create artwork inspired by the colorful confetti in the photo. They can explore color mixing, patterns, and composition while discussing why the photographer chose bright colors against a dark background to make the image more interesting and visible.

4. Social Studies - Safety and Community: Discuss when static electricity is helpful (removing dust) and when it can be problematic (near flammable materials or in hospitals). Connect this to community helpers like electricians and scientists who work with electricity safely.

STEM Career Connection

1. Electrician: Electricians install and fix electrical systems in homes, buildings, and power plants. They work with electricity every day to keep lights, appliances, and devices working safely. They need to understand how electricity moves through wires and what happens when things go wrong. Average Annual Salary: $56,000 USD

2. Research Scientist: Research scientists do experiments to discover new things about how the world works, including studying electricity and forces. They ask questions like "What happens when we rub different materials together?" and design careful tests to find answers. Average Annual Salary: $69,000 USD

3. Engineer: Engineers use science to design and build things that help people, like batteries, computers, and electric vehicles. They need to understand static electricity and other forces so they can create products that work well and safely. Average Annual Salary: $80,000 USD

NGSS Connections

- Performance Expectation: 3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other
- Disciplinary Core Ideas: PS2.B - Types of Interactions
- Crosscutting Concepts: Cause and Effect and Patterns

Science Vocabulary

* Static electricity: Electric charges that build up on objects when they rub together
* Attract: To pull toward something using an invisible force
* Electric charge: A property of matter that creates electric forces
* Electrons: Tiny particles that carry electric charge and can move between objects
* Force: A push or pull that can make objects move
* Non-contact force: A force that works without objects touching each other

External Resources

Children's Books:
- Sparks Fly High: The Legend of Dancing Point by C.S. Kitchens
- The Magic School Bus and the Electric Field Trip by Joanna Cole
- Static Electricity by David Dreier