Force

Physical Science | Lesson Guide

2nd Grade

Photo Description

A tall building has a big clock on its stone wall. The American flag waves in the wind above the clock. The clock shows the time with black hands pointing to different numbers.

Scientific Phenomena

The Anchoring Phenomenon is the motion of objects caused by forces. The flag is moving because wind (moving air) pushes against it, creating a force that makes the fabric wave and flutter. The clock hands move in a circular pattern because of mechanical forces inside the clock that push the hands around the clock face at regular time intervals.

Core Science Concepts

1. Forces cause motion - Wind is a force that pushes the flag, making it move and wave
2. Objects can move in different ways - The flag moves back and forth while clock hands move in circles
3. Some motions repeat in patterns - Clock hands move around the same path over and over
4. Wind is moving air - Air that moves fast enough can push lightweight objects like flags

> **Pedagogical Tip:**
>
> Have students wave scarves or ribbons to feel how their arm motion creates "wind" that makes the fabric move, connecting their actions to the force concept.

> **UDL Suggestions:**
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> Provide kinesthetic learners with hands-on experiences using pinwheels, streamers, or fans to observe how air movement creates forces that cause motion.

Zoom In / Zoom Out

1. Zoom In: Inside the clock, tiny gears and springs work together like a machine. The gears have teeth that push against each other to move the hands at just the right speed.

2. Zoom Out: This clock is part of a larger weather system where air moves across the city, state, and country. The same wind moving this flag might travel hundreds of miles and move flags in other places too.

Discussion Questions

1. What do you think would happen to the flag if there was no wind? (Bloom's: Predict | DOK: 2)
2. How are the flag's movement and the clock hands' movement different? (Bloom's: Compare | DOK: 2)
3. What other things have you seen move because of wind? (Bloom's: Remember | DOK: 1)

4. Why do you think the clock hands keep moving even when the wind stops? (Bloom's: Analyze | DOK: 3)

Potential Student Misconceptions

1. Misconception: The flag moves by itself
   Scientific Clarification: Flags need wind (moving air) to push them and make them move

2. Misconception: All things move the same way
   Scientific Clarification: Different objects move in different patterns - flags wave back and forth, clock hands move in circles

3. Misconception: You can't see forces
   Scientific Clarification: While we can't see wind directly, we can see what it does when it pushes objects like flags

Cross-Curricular Ideas

1. Math - Time and Patterns: Have students practice telling time using a large clock face while discussing how clock hands move in predictable patterns. Connect to skip counting by 5s as the minute hand moves around the clock.

2. ELA - Descriptive Writing: Read "The Wind Blew" by Pat Hutchins and have students write or draw about what the wind blew away in their own neighborhood. Students can create sentences using action words like "wave," "flutter," "spin," and "blow."

3. Social Studies - Symbols and Citizenship: Discuss what the American flag represents and why it's displayed on important buildings. Students can learn that the flag is a symbol of our country and explore other symbols they see in their community.

4. Art - Movement and Expression: Have students create windsocks or paper streamers and decorate them with colors and patterns. They can display these and observe how they move in the classroom fan or open window, then draw pictures showing the movement.

STEM Career Connection

1. Meteorologist (Weather Scientist): A meteorologist studies wind, weather, and air movement. They use special tools to measure how fast the wind is blowing and predict whether it will be windy, rainy, or sunny. This helps people know what to wear and plan outdoor activities. Average Annual Salary: $95,000

2. Clockmaker/Horologist: A clockmaker builds and fixes clocks and watches. They understand how tiny gears and springs work together to make clock hands move at exactly the right speed so the clock shows the correct time. It requires patience and careful work with very small parts. Average Annual Salary: $42,000

3. Mechanical Engineer: A mechanical engineer designs machines and objects that move, like clocks, wind turbines, and robotic arms. They use science and math to figure out how forces and motion work together to create things that help people. Average Annual Salary: $88,000

NGSS Connections

- Performance Expectation: K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
- Disciplinary Core Ideas: K-PS2.A Forces and Motion
- Crosscutting Concepts: Cause and Effect

Science Vocabulary

* Force: A push or pull that can make things move
* Motion: When something changes position or moves from one place to another
* Wind: Moving air that can push against objects
* Pattern: Something that repeats the same way over and over
* Circular: Moving in a round path like a circle

External Resources

Children's Books:
- Forces Make Things Move by Kimberly Bradley
- The Wind Blew by Pat Hutchins
- Clocks and More Clocks by Pat Hutchins