Fountain

Physical Science | Lesson Guide

1st Grade

Photo Description

This picture shows a big fountain with water. The water goes up and then falls down in layers. The fountain looks frozen with white ice hanging from it like long teeth.

Scientific Phenomena

The Anchoring Phenomenon is the freezing of moving water in a fountain during cold weather. This occurs when the air temperature drops below 32°F (0°C), causing the liquid water to change states from liquid to solid (ice). The continuous flow of water creates layered ice formations as each drop freezes upon contact with the already-frozen surfaces, building up icicles and ice sheets over time.

Core Science Concepts

1. States of Matter - Water can be liquid (flowing) or solid (ice) depending on temperature
2. Temperature Effects - Cold air makes water freeze and turn into ice
3. Water Cycle in Action - Water moves from liquid to solid state when it gets very cold
4. Gravity - Water falls down from the fountain because gravity pulls it toward the ground

Pedagogical Tip:

Use concrete examples from students' daily lives, like ice cubes in drinks or puddles freezing outside, to help them connect to the concept of water changing from liquid to solid.

UDL Suggestions:

Provide multiple ways for students to explore states of matter through hands-on activities like ice melting experiments, drawing observations, and acting out water molecules moving differently in liquid vs. solid states.

Zoom In / Zoom Out

1. Zoom In: At the tiny level we can't see, water molecules slow down and stick together tightly when it gets cold, forming the solid structure we call ice.

2. Zoom Out: This frozen fountain is part of the larger water cycle where water changes between liquid, solid, and gas all around our planet - in clouds, rivers, lakes, and even in our own backyards.

Discussion Questions

1. What do you think made the water in the fountain turn into ice? (Bloom's: Analyze | DOK: 2)
2. Where else have you seen water turn into ice? (Bloom's: Remember | DOK: 1)
3. What do you predict will happen to this ice when the weather gets warm? (Bloom's: Apply | DOK: 2)
4. How is this frozen fountain the same as and different from an ice cube? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: "Ice is not water anymore"
   Clarification: Ice is still water, just in a different form - like how the same person can stand up or sit down but is still the same person.

2. Misconception: "Only big things like fountains can freeze"
   Clarification: Any water can freeze when it gets cold enough - drops, puddles, or even the water in a cup.

Cross-Curricular Ideas

1. Math - Counting & Patterns: Count the layers of ice on the fountain or the icicles hanging down. Create a simple bar graph showing "How many icicles did we count?" Students can also look for repeating patterns in how the ice forms in layers.

2. ELA - Descriptive Writing: Have students draw the frozen fountain and write or dictate words that describe what they see and feel (cold, white, sparkly, hard). Create a class book titled "Our Frozen Fountain" with student observations and illustrations.

3. Art - Ice Sculptures: Create paper or salt dough "ice sculptures" inspired by the frozen fountain. Students can paint them white and silver to look icy, then display them around the classroom. Discuss how artists use nature for inspiration.

4. Social Studies - Community Helpers: Talk about how maintenance workers, groundskeepers, and city planners care for public fountains during winter. Discuss why it's important to keep our community safe and beautiful in all seasons.

STEM Career Connection

1. Meteorologist (Weather Scientist) - A meteorologist studies weather and temperature. They predict when it will be cold enough for water to freeze and help people know when to expect ice and snow. They use special tools to measure how cold it is outside. Average Salary: $98,000 per year

2. Civil Engineer - Civil engineers design and take care of public spaces like parks and fountains in our communities. They think about how weather affects structures and make sure fountains and buildings stay safe during cold winters. Average Salary: $104,000 per year

3. Water Treatment Specialist - These scientists make sure the water in fountains and in our homes is clean and safe. They understand how water changes and moves, and they help manage water in our communities during all types of weather. Average Salary: $56,000 per year

NGSS Connections

- Performance Expectation: K-PS1-1 - Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- Disciplinary Core Idea: PS1.A - Structure and Properties of Matter

- Crosscutting Concept: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Freeze: When water gets so cold it turns hard like ice
* Liquid: Something that flows and takes the shape of its container, like water
* Solid: Something that keeps its shape and doesn't flow, like ice
* Temperature: How hot or cold something is
* Icicle: A long piece of ice that hangs down when dripping water freezes

External Resources

Children's Books:
- Water Is Water by Miranda Paul
- The Magic School Bus Wet All Over by Joanna Cole
- What Is the Water Cycle? by Robin Johnson