Matter

Physical Science | Lesson Guide

Kindergarten

Photo Description

Long, white ice sticks hang down from a roof. The ice is thick and pointy. Some ice pieces are short and some are very long.

Scientific Phenomena

This image shows icicle formation as an anchoring phenomenon. Icicles form when snow or ice on a roof melts due to heat from the building or sun, creating water that drips down. As the water drips in freezing air temperatures, it refreezes layer by layer, building downward to create the characteristic pointed ice formations. This demonstrates the water cycle in action during winter conditions, specifically the freezing and melting processes.

Core Science Concepts

1. States of Matter: Water exists as solid (ice), liquid (dripping water), and can change between these states based on temperature
2. Temperature Effects: Heat causes ice to melt into liquid water; cold causes liquid water to freeze into solid ice
3. Gravity: Water drips downward due to gravity, creating the downward-pointing shape of icicles
4. Patterns in Nature: Icicles form in predictable patterns based on where water drips and refreezes

Pedagogical Tip:

Use concrete, hands-on experiences with ice cubes melting and refreezing to help kindergarteners understand state changes before introducing the icicle formation concept.

UDL Suggestions:

Provide multiple ways for students to explore this concept: tactile experiences with ice, visual observations of melting, and kinesthetic activities like acting out water molecules moving faster when heated and slower when cooled.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules move faster when heated (melting) and slower when cooled (freezing). The crystal structure of ice forms as molecules arrange in organized patterns during freezing.

2. Zoom Out: Icicle formation is part of the larger water cycle system. Water evaporates, forms clouds, falls as precipitation (snow), melts on roofs, and refreezes, demonstrating how water continuously moves through different states in our environment.

Discussion Questions

1. "What do you think makes icicles grow longer or shorter?" (Bloom's: Analyze | DOK: 2)
2. "How are icicles similar to and different from ice cubes?" (Bloom's: Compare | DOK: 2)
3. "What would happen to these icicles on a warm, sunny day?" (Bloom's: Predict | DOK: 2)
4. "Where else have you seen ice forming in nature?" (Bloom's: Remember | DOK: 1)

Potential Student Misconceptions

1. Misconception: "Icicles grow upward like plants"
   Clarification: Icicles grow downward as gravity pulls the dripping water down, and each drop freezes onto the bottom of the forming icicle.

2. Misconception: "Ice is always the same temperature"
   Clarification: Ice can be at different temperatures, and ice near its melting point (32°F) can melt more easily than very cold ice.

3. Misconception: "Icicles form when it's snowing"
   Clarification: Icicles typically form when temperatures are near freezing with cycles of melting and refreezing, not necessarily during active snowfall.

Cross-Curricular Ideas

1. Math - Measurement & Comparison: Students can compare the lengths of different icicles using non-standard measurement tools (yarn, blocks, or their own hand spans). Create a simple chart showing "long," "medium," and "short" icicles to practice sorting and classification skills.

2. ELA - Descriptive Language & Poetry: Read winter-themed books like The Snowy Day and have students use sensory words to describe icicles (cold, pointy, shiny, smooth). Create simple rhyming poems or use repetitive language patterns: "Icicles hang, hang, hanging down / Long and sharp all through the town."

3. Art - Nature Collage & Color Mixing: Students can create icicles using white paint, glue, and materials like yarn or paper strips. Explore how white and light blue look similar and discuss how ice reflects light. Make winter scenes combining icicles with painted backgrounds of buildings and trees.

4. Social Studies - Seasonal Changes & Community: Discuss how winter weather affects people in the community (homes need heat, people wear warm clothes, ice can be dangerous). Take a virtual or real neighborhood walk to spot icicles and other winter signs, then create a class "Winter in Our Community" poster.

STEM Career Connection

1. Meteorologist (Weather Scientist): A meteorologist studies weather and helps predict when it will be cold, warm, snowy, or icy. They watch the sky and temperature to understand patterns like when icicles form. These scientists help keep people safe by warning them about dangerous ice and winter storms. Average Annual Salary: $97,000

2. Physicist (Scientist Who Studies How Things Work): Physicists study why things happen in nature, like how water freezes into ice and why icicles form in specific shapes. They ask questions about temperature, gravity, and how materials change. Average Annual Salary: $129,000

3. Building Inspector/Home Safety Expert: These professionals check buildings and roofs to make sure they're safe during winter. They look at icicles and ice buildup to protect people and property from falling ice. They also help design roofs and buildings that handle winter weather better. Average Annual Salary: $64,000

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 Ideas: K-PS1.A - Objects can be described in terms of the materials they are made of and their physical properties
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Icicle: A pointed piece of ice that hangs down from a roof or other surface
* Freeze: When liquid water becomes solid ice because it gets very cold
* Melt: When solid ice becomes liquid water because it gets warm
* Drip: When small drops of water fall down one at a time
* Temperature: How hot or cold something is

External Resources

Children's Books:
- The Snowy Day by Ezra Jack Keats
- Water is Water by Miranda Paul
- Ice is Nice by Leon Read