Matter

Physical Science | Lesson Guide

3rd Grade

Photo Description

Long, white icicles hang down from the edge of a roof like frozen spears. The icicles are different sizes and shapes, with some being thick and others thin. They formed when water dripped and froze over and over again during cold weather.

Scientific Phenomena

This image represents the Anchoring Phenomenon of ice formation and the water cycle in action. The icicles form through a repeating process: snow or ice on the roof melts due to heat (from the sun or building), the liquid water drips down, and then freezes again when it meets the cold air. This cycle continues, building up layers of ice that create the long, pointed icicles we see. This demonstrates matter changing states from solid to liquid and back to solid again.

Core Science Concepts

1. States of Matter: Water exists in three forms - solid (ice), liquid (water), and gas (water vapor). The icicles show the transition between solid and liquid states.

2. Temperature and Heat Transfer: Heat from the sun or building warms the ice/snow above, causing it to melt. When the liquid water meets cold air, it loses heat and freezes again.

3. Gravity: The liquid water drips downward due to gravitational force, creating the downward-pointing shape of icicles.

4. Patterns in Nature: Icicles form in predictable ways based on temperature, water flow, and time, showing how natural processes create observable patterns.

Pedagogical Tip:

Use the "Think-Pair-Share" strategy when introducing icicles. Have students first think individually about what they notice, then discuss with a partner, and finally share with the class. This builds confidence and allows all learners to participate.

UDL Suggestions:

Provide multiple ways for students to represent their understanding: drawing the icicle formation process, acting out water molecules changing states, or creating a digital presentation. This supports different learning preferences and abilities.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules are moving faster when heated (liquid state) and slower when cooled (solid state). The molecules arrange themselves in organized patterns when they freeze, creating the crystal structure of ice.

2. Zoom Out: This icicle formation is part of the larger water cycle that moves water around Earth. The same water that forms these icicles will eventually melt, flow into streams and rivers, evaporate into clouds, and potentially fall as precipitation elsewhere.

Discussion Questions

1. What do you think would happen to these icicles on a warm, sunny day? (Bloom's: Predict | DOK: 2)
2. How are icicles similar to and different from ice cubes in your freezer? (Bloom's: Compare | DOK: 2)
3. Why do you think some icicles are longer than others? (Bloom's: Analyze | DOK: 3)
4. What evidence do you see that tells you water was involved in making these icicles? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

1. Misconception: "Icicles form because it's cold outside."
   Clarification: Icicles need both warming (to melt ice/snow) AND cold temperatures (to refreeze). Just cold weather alone won't create icicles.

2. Misconception: "Ice is not the same thing as water."
   Clarification: Ice IS water, just in a different state. The same H ,O molecules are present whether water is liquid or frozen solid.

3. Misconception: "Icicles grow from the bottom up."
   Clarification: Icicles grow from the top down as new water drips and freezes onto the existing ice formation.

NGSS Connections

- Performance Expectation: 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- Disciplinary Core Ideas: 2-PS1.A - Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Icicle: A hanging piece of ice formed by dripping water that freezes
* Freeze: When liquid water becomes solid ice due to cold temperatures
* Melt: When solid ice becomes liquid water due to warm temperatures
* State of matter: The form that matter takes, such as solid, liquid, or gas
* Temperature: How hot or cold something is
* Drip: Small drops of liquid falling one at a time

External Resources

Children's Books:
- The Magic School Bus: Wet All Over by Joanna Cole
- National Geographic Readers: Weather by Kristin Baird Rattini
- Ice Boy by David Ezra Stein

YouTube Videos:
- "States of Matter for Kids" - Simple explanation of solids, liquids, and gases with examples: https://www.youtube.com/watch?v=ZkwXoFaEaEY
- "How Do Icicles Form?" by SciShow Kids - Kid-friendly explanation of icicle formation: https://www.youtube.com/watch?v=qBjLW5_dGAM