Precipitation Snow

Earth & Space Science | Lesson Guide

5th Grade

Photo Description

This image shows snow falling on a brick building surrounded by ivy-covered trees and walls during winter weather. The white snowflakes are visible falling through the air, covering the rooftop and ground below. This scene demonstrates how water falls from clouds to Earth's surface during cold winter months.

Scientific Phenomena

Anchoring Phenomenon: Snowfall during winter weather conditions

Why It's Happening:

Snow forms when water vapor in clouds condenses into ice crystals instead of liquid water droplets. This happens when the air temperature is below 32°F (0°C). As these ice crystals grow heavier in the clouds, they eventually become too heavy to float and fall to the ground as snow. The cold temperatures near the ground keep the snow frozen as it falls, so it reaches Earth as solid precipitation rather than rain.

Core Science Concepts

* The Water Cycle: Water evaporates from oceans, lakes, and rivers; forms clouds; and returns to Earth as precipitation (rain or snow) before cycling again.

* States of Matter: Water exists in three states—solid (ice/snow), liquid (water), and gas (water vapor)—and changes between states depending on temperature.

* Weather Patterns and Seasons: Winter temperatures are cold enough for water to freeze, causing snow instead of rain; seasonal temperature changes affect what type of precipitation falls.

* Cloud Formation: Water vapor rises, cools in the atmosphere, and condenses around tiny particles to form visible clouds where precipitation develops.

Pedagogical Tip:

Avoid the common misconception that it must be "snowing" for snow to fall—clarify that snow forms in clouds where temperatures are below freezing, even if the ground is warmer. Use a thermometer to show students what 32°F actually feels like, making the concept more concrete.

UDL Suggestions:

Provide multiple means of representation by showing this image alongside a cross-section diagram of cloud formation and the water cycle. Allow students to express their learning through drawing, writing, or verbal explanations. Create a anchor chart with pictures and simple labels that remains visible throughout the unit for reference.

Zoom In / Zoom Out

Zoom In: Ice Crystal Formation (Microscopic Level)

If you could shrink down and float inside a cloud where snow forms, you would see something amazing happening at a scale too tiny for our eyes to see. Water vapor molecules (invisible gas) bump into a microscopic speck of dust or salt in the cloud. As the temperature drops below freezing, the water vapor doesn't turn into liquid droplets like it does when rain forms—instead, it freezes directly into solid ice crystals. These ice crystals have beautiful geometric (six-sided) shapes because of how water molecules naturally arrange themselves when they freeze. As more and more water vapor freezes onto these crystals, they grow heavier and heavier until gravity finally pulls them downward as the snowflakes we see in the photo.

Zoom Out: Global Weather Systems and Climate Patterns (Planetary Level)

This single snowstorm is actually part of a much larger planetary system. Cold air masses move across continents, pushed by wind patterns created by the sun's uneven heating of Earth. The snow falling on this brick building is connected to ocean temperatures thousands of miles away, to jet streams in the upper atmosphere, and to seasonal patterns that repeat every year. When we zoom out even further, we see that snowfall in winter is part of Earth's entire water cycle—the same water in this snow may have evaporated from the Atlantic Ocean weeks earlier, traveled across the continent in clouds, and will eventually melt, flow into rivers, and return to the ocean. This repeating cycle has been happening for billions of years and is essential for all life on Earth.

Discussion Questions

* What do you observe happening in this picture, and what questions does it make you wonder about? (Bloom's: Understand | DOK: 1)

* Why do you think snow falls in winter but rain falls in spring, even though both come from clouds? (Bloom's: Explain | DOK: 2)

* If you traced a snowflake backward through the water cycle, where would it have come from before it fell as snow? (Bloom's: Analyze | DOK: 2)

* How might this snowy landscape change over the next few days or weeks, and what causes those changes? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

Misconception 1: "It has to be cold on the ground for snow to fall."

Scientific Clarification: Snow forms where it's cold—high up in the clouds where temperatures are below 32°F (0°C). Even if the ground temperature is 40°F or warmer, snow can still fall from clouds above. However, the snow may melt as it falls through warmer air layers and turn into rain by the time it reaches the ground. Students should understand that snow formation happens in the cloud, not on the ground.

Misconception 2: "Snow and rain are different types of clouds, so some clouds make snow and others make rain."

Scientific Clarification: The same type of cloud can produce either snow or rain depending on temperature. A cumulonimbus cloud in winter produces snow because the air is cold; the same type of cloud in summer produces rain because the air is warm. It's the temperature of the air, not the type of cloud, that determines whether precipitation falls as snow or rain.

Misconception 3: "When snow melts, it disappears forever."

Scientific Clarification: When snow melts, it doesn't vanish—it becomes liquid water that flows into streams, rivers, and lakes, or soaks into the ground. That water will eventually evaporate again and rise back into the atmosphere to form new clouds and new precipitation. This is the water cycle, and no water is ever lost; it just keeps changing forms and moving around Earth.

Extension Activities

1. Snow Observation Journal: Have students look outside during or after snow and draw detailed sketches of snowflakes, frost patterns, or snow-covered objects. Ask them to write 3-5 observations about how snow looks, feels (without touching), or changes throughout the day. This develops observational skills and connects to scientific illustration.

2. Water Cycle in a Bag: Create a sealed plastic bag water cycle model by drawing the water cycle stages on a gallon-sized ziplock bag, filling it partially with water mixed with blue food coloring, sealing it completely, and taping it to a sunny window. Students predict and observe evaporation, condensation on the bag, and "precipitation" as water droplets form and "rain" down. This demonstrates the continuous cycle students saw in the snowy scene.

3. Temperature and State Change Experiment: Provide crushed ice, salt, thermometers, and water in cups. Students create a freezing mixture, measure temperature changes, and observe how adding salt lowers the freezing point. They compare this to how atmospheric conditions change states of water, connecting their model to real snow formation in clouds.

Cross-Curricular Ideas

Mathematics Connection: Measuring and Graphing Precipitation
Have students create a "Snow Data Collection Chart" where they measure snowfall depth each day (or hour) during a winter weather event using a ruler in a consistent location. Students can graph their measurements on a line graph, calculate the total accumulation, and compare it to precipitation amounts from previous years using class or school data. This connects to measurement, data representation, and making predictions based on patterns.

English Language Arts Connection: Weather Poetry and Descriptive Writing
Using the vivid imagery in the photo, have students write descriptive paragraphs or poems about snow using sensory words (white, silent, cold, glittering, soft). Students can read snow-themed books like Snow by Manya Stojic or Come On, Rain! and compare how different authors describe weather. They could create an illustrated "Snow Vocabulary" word wall that includes adjectives, verbs, and nouns related to winter precipitation.

Social Studies Connection: How Seasons Affect Human Life and Culture
Explore how winter snow affects people in different regions. Students can research how communities prepare for snowfall, how snow impacts transportation and daily activities, and how different cultures celebrate winter. Create a comparison chart showing "Winter in Our Community" versus "Winter in Another Location" (such as tropical regions that never see snow, or arctic regions with extreme snowfall). This builds geography skills and cultural awareness.

Art Connection: Nature's Symmetry and Snowflake Design
Students can study real snowflake photographs or use magnifying glasses to observe snow crystal patterns, noting their six-sided symmetrical shapes. They can create paper snowflakes using the folding-and-cutting method, design snowflake patterns using geometry and symmetry, or create winter landscape artwork inspired by the photo using watercolors, white paint on blue paper, or mixed media. This connects art, geometry, and observation skills while celebrating the beauty of natural patterns.

STEM Career Connection

Meteorologist (Weather Scientist) — Average Annual Salary: $98,000

Meteorologists study weather, clouds, and precipitation to understand and predict what the weather will be. A meteorologist looking at this snowy scene would use special instruments to measure temperature, wind, and humidity in the clouds. They help people prepare for snowstorms by forecasting when and where snow will fall, how much will accumulate, and whether it will be safe to drive or go to school. Some meteorologists also study climate change and how weather patterns are shifting over many years. If you love watching the weather and wondering "why" about storms and snow, this could be your career!

Hydrologist (Water Cycle Scientist) — Average Annual Salary: $85,000

Hydrologists study all forms of water on Earth—rain, snow, rivers, groundwater, and lakes. They trace where water comes from, where it goes, and how it moves through the environment. A hydrologist might measure how much snow falls in mountains, predict how much water will flow in rivers when that snow melts in spring, or study how snowmelt affects drinking water supplies for cities. They help communities prepare for floods, droughts, and water shortages. If you're curious about where water comes from and where it goes, this job is perfect for you!

Climate Scientist — Average Annual Salary: $104,000

Climate scientists study long-term weather patterns and how Earth's climate is changing over decades and centuries. They use data about snowfall, temperature, and precipitation to understand whether winters are getting warmer, colder, or different than they used to be. Climate scientists work with computers to create models that show what Earth's weather might be like in the future. They help governments and communities understand climate change and plan how to adapt. If you want to solve big problems about Earth's future, this career lets you do that!

NGSS Connections

Performance Expectation: 5-ESS2-1. Develop a model to describe that the atmosphere is made of a thin layer of gases surrounding the Earth, and that wind and water (including ice, snow, and rain) are pulled around the Earth by the sun's energy and the force of Earth's rotation.

Disciplinary Core Ideas:
- 5-ESS2.A Earth's Materials and Systems - The atmosphere is composed of a thin layer of gases and is made of many different gases.
- 5-ESS3.C Human Impacts on Earth Systems - Scientists study weather patterns to predict future conditions.

Crosscutting Concepts:
- Patterns - Weather patterns change seasonally and predictably; precipitation patterns vary by location and season.
- Energy and Matter - Water changes states as energy is added or removed from the system.

Science Vocabulary

* Precipitation: Water that falls from clouds to Earth's surface in the form of rain, snow, sleet, or hail.

* Condensation: The process where water vapor in the air cools down and turns into liquid water droplets, which form clouds.

* Evaporation: The process where liquid water from oceans, lakes, and rivers turns into invisible water vapor gas that rises into the atmosphere.

* Freezing: The process where liquid water turns into solid ice when the temperature drops below 32°F (0°C).

* Weather: The conditions in the atmosphere at a particular place and time, including temperature, precipitation, wind, and clouds.

* Season: One of four time periods in a year (spring, summer, fall, winter) that has typical weather patterns and temperature ranges.

External Resources

Children's Books:
- Snow by Manya Stojic (explores snow in different environments and ecosystems)
- The Snowflake: A Water Cycle Story by Ron Fridell and illustrated by Jeannie Winston Colbert (traces a snowflake through the water cycle)
- Come On, Rain! by Karen Hesse (poetic exploration of weather and precipitation)