Dawn

Earth & Space Science | Lesson Guide

2nd Grade

Photo Description

The picture shows a foggy morning over a green field. The sun is rising and makes the sky look pink and orange. White fog floats low over the plants and ground.

Scientific Phenomena

This image captures the anchoring phenomenon of morning fog formation. Fog occurs when water vapor in the air condenses into tiny water droplets that remain suspended near the ground. This happens when warm, moist air meets cooler surfaces (like the ground that has cooled overnight), causing the air temperature to drop to its dew point. The fog appears most prominently over the field because plants release water vapor through transpiration, and the flat, open area allows for efficient radiational cooling during the night.

Core Science Concepts

1. Water Cycle in Action: Fog demonstrates evaporation, condensation, and the movement of water through different states of matter.

2. Temperature Changes: The ground cools faster than the air at night, creating temperature differences that lead to fog formation.

3. Weather Patterns: Morning fog is a common weather phenomenon that shows how air, water, and temperature work together.

4. Plant Processes: Plants release water vapor into the air, which contributes to fog formation over fields and forests.

Pedagogical Tip:

Use a clear jar with hot water and ice on top to demonstrate condensation in the classroom. This concrete demonstration helps second graders visualize how water vapor becomes water droplets.

UDL Suggestions:

Provide multiple ways for students to express their understanding: drawing the water cycle, acting out water molecules changing states, or using hand gestures to show evaporation and condensation processes.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, individual water molecules are slowing down and clustering together to form tiny droplets as the temperature decreases. These droplets are so small they float in the air instead of falling like rain.

2. Zoom Out: This local fog is part of the larger global water cycle, where water continuously moves between oceans, atmosphere, and land. The fog will eventually evaporate as the sun warms the air, returning the water vapor to the atmosphere to continue the cycle.

Discussion Questions

1. What do you think will happen to the fog when the sun gets higher in the sky? (Bloom's: Predict | DOK: 2)
2. How is fog similar to and different from clouds? (Bloom's: Compare | DOK: 2)
3. Why do you think the fog is thicker over the green plants than over the bare ground? (Bloom's: Analyze | DOK: 3)
4. What other times have you seen water droplets form in the air or on surfaces? (Bloom's: Remember | DOK: 1)

Potential Student Misconceptions

1. Misconception: "Fog is smoke or pollution coming from the ground."
   Clarification: Fog is made of tiny water droplets, just like clouds, not smoke or dirt particles.
2. Misconception: "Plants don't do anything to create fog."
   Clarification: Plants release water vapor through their leaves, which adds moisture to the air and helps create fog.
3. Misconception: "Fog only happens when it's cold outside."
   Clarification: Fog can form in different temperatures when warm, moist air meets cooler surfaces.

Cross-Curricular Ideas

1. Math - Measurement & Graphing: Have students observe and record the temperature at different times during the morning (when fog is thick, when it starts to disappear, when it's completely gone). Create a simple line graph showing how temperature changes throughout the morning and connects to fog disappearance.

2. ELA - Descriptive Writing & Poetry: Ask students to write sensory descriptions of the foggy morning using words like "misty," "cool," "wet," and "quiet." They could also create simple poems or acrostics using the word "FOG" to describe what they see, hear, and feel in a foggy morning.

3. Art - Watercolor Painting & Observational Drawing: Have students create watercolor paintings of the foggy landscape, layering light colors to show how fog makes things look blurry and soft. This connects to understanding how fog changes what we see and helps students practice blending colors to show mist and atmosphere.

4. Social Studies - Community & Agriculture: Discuss how farmers depend on understanding weather patterns like fog. Students can learn that farmers use fog and morning dew to help their crops grow, connecting the science of fog to how people work with nature and use weather knowledge in their daily lives.

STEM Career Connection

1. Meteorologist (Weather Scientist): A meteorologist studies weather, including fog, rain, snow, and wind. They watch clouds and temperatures, and tell people what the weather will be like tomorrow. Meteorologists help farmers know when to plant crops and help keep people safe during dangerous weather. Average Annual Salary: $97,000 USD

2. Agricultural Scientist: An agricultural scientist helps farmers grow healthy plants and crops. They study how weather like fog and moisture affects plants, and teach farmers the best ways to care for their fields. They work outside and in laboratories to make sure plants have everything they need to grow strong. Average Annual Salary: $68,000 USD

3. Water Systems Engineer: A water systems engineer studies how water moves through the air, soil, and rivers. They work to protect water quality and understand how fog, rain, and groundwater connect to help communities and nature. They design systems to manage water safely for drinking, farming, and the environment. Average Annual Salary: $82,000 USD

NGSS Connections

- Performance Expectation: 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly
- Disciplinary Core Ideas: 2-ESS1.C - The roles of water in Earth's surface processes
- Crosscutting Concepts: Patterns - Patterns in the natural world can be observed and used as evidence

Science Vocabulary

* Fog: A cloud that forms close to the ground made of tiny water droplets floating in the air.
* Water vapor: Water that has changed from liquid to gas and is invisible in the air.
* Condensation: When water vapor cools down and changes back into liquid water droplets.
* Evaporation: When liquid water changes into water vapor and rises into the air.
* Temperature: How hot or cold something is.

External Resources

Children's Books:
- Fog by Arthur Geisert
- Water Is Water by Miranda Paul
- The Magic School Bus Wet All Over by Joanna Cole