Hill

Earth & Space Science | Lesson Guide

4th Grade

Photo Description

This picture shows a large house with a red tile roof sitting on a hill covered with green trees. In the distance, you can see a city skyline through hazy air. The thick forest of trees stretches between the house and the city buildings far away.

Scientific Phenomena

The Anchoring Phenomenon this image represents is air pollution and atmospheric haze affecting visibility. The hazy appearance of the distant city skyline occurs because tiny particles (particulates) and gases in the air scatter and absorb light as it travels from the city to our eyes. This happens when pollutants from cars, factories, and other sources mix with water vapor and natural particles in the atmosphere, creating a visible layer that reduces how clearly we can see distant objects.

Core Science Concepts

1. Air Quality and Pollution: The atmosphere contains a mixture of gases, water vapor, and tiny particles that can affect how clearly we see distant objects and impact human health.

2. Light Scattering: When light travels through air containing particles, it gets scattered in different directions, making distant objects appear hazy or less clear.

3. Urban vs. Natural Environments: Cities produce more air pollution than forested areas, which is why the vegetation in the foreground appears clearer than the urban skyline in the distance.

4. Environmental Impact: Human activities in cities create pollution that can travel through the air and affect areas far from where it was produced.

Pedagogical Tip:

Use the "See-Think-Wonder" thinking routine with this image. Have students first observe what they see, then think about why the city looks hazy, and finally wonder about questions they have. This builds scientific inquiry skills.

UDL Suggestions:

Provide multiple ways for students to engage with this concept by offering binoculars for outdoor observations, air quality apps to check local conditions, and drawing activities to compare clear vs. hazy visibility.

Zoom In / Zoom Out

1. Zoom In: At the microscopic level, air pollution consists of tiny particles smaller than the width of a human hair, including dust, pollen, soot from burning, and droplets of chemicals that float in the air we breathe.

2. Zoom Out: This local air quality connects to the global atmosphere system, where air currents can carry pollution hundreds of miles away, affecting weather patterns, climate, and air quality in distant locations around the world.

Discussion Questions

1. What do you think is causing the city in the distance to look hazy compared to the trees in the front? (Bloom's: Analyze | DOK: 2)

2. How might the air quality in this picture affect the plants, animals, and people living in both areas? (Bloom's: Evaluate | DOK: 3)

3. What solutions could help reduce the haze we see over the city? (Bloom's: Create | DOK: 3)

4. If you were standing in the city looking back toward this house, what do you think you would see and why? (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

1. Misconception: "The hazy air is just fog or clouds."
Clarification: While fog and clouds are made of water droplets, the haze in this image is primarily caused by air pollution mixed with some water vapor.

2. Misconception: "Air pollution only affects the area right around where it's made."
Clarification: Air pollution can travel many miles through wind currents, affecting air quality far from its original source.

3. Misconception: "You can't see air pollution, so it's not really there."
Clarification: Air pollution is often invisible, but when it builds up enough, it creates visible haze like we see in this image.

NGSS Connections

- Performance Expectation: 5-ESS2-1 - Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Disciplinary Core Ideas: 5-ESS2.A - Earth's major systems interact through physical and chemical processes
- Disciplinary Core Ideas: 3-5-ETS1.A - Possible solutions to problems can be compared by how well they meet criteria
- Crosscutting Concepts: Systems and System Models - A system can be described by its components and their interactions
- Crosscutting Concepts: Cause and Effect - Events have causes that generate observable patterns

Science Vocabulary

* Air pollution: Harmful substances in the air that can make it dirty and unsafe to breathe.
* Atmosphere: The layer of gases that surrounds Earth and contains the air we breathe.
* Particulates: Tiny pieces of solid or liquid matter floating in the air.
* Visibility: How clearly and how far you can see through the air.
* Haze: A thin layer of particles in the air that makes distant objects look unclear or fuzzy.

External Resources

Children's Books:
- The Magic School Bus: In the Air by Joanna Cole
- The Air Around You by Franklyn Branley

- Pollution by Rebecca Hirsch

YouTube Videos:
- "What is Air Pollution? | Environment for Kids" - Simple explanation of air pollution sources and effects suitable for elementary students: https://www.youtube.com/watch?v=e6rglsLy1Ys
- "How Air Pollution Affects Our Health" by Crash Course Kids - Kid-friendly explanation of air quality and health impacts: https://www.youtube.com/watch?v=GVBeY1jSG9Y