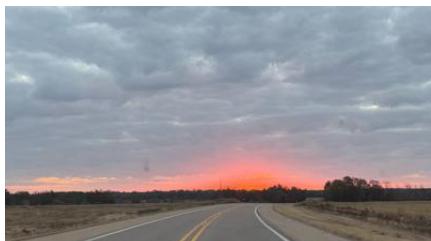


## Photo Description



This photograph shows a beautiful sunrise over a flat landscape with a straight road stretching toward the horizon. The sun is just beginning to rise above the treeline on the horizon, painting the sky with brilliant shades of orange, pink, and yellow. Above the sunrise, the sky gradually transitions to gray and blue as it gets higher, and fluffy clouds are scattered throughout the sky.

## Scientific Phenomena

Anchoring Phenomenon: Why does the sun appear to rise and set every day?

The sun doesn't actually move across the sky—rather, Earth rotates on its axis. Earth spins like a top, completing one full rotation every 24 hours. As your location on Earth rotates away from the sun in the evening, you experience sunset. As your location rotates back toward the sun in the morning, you experience sunrise. The colors we see during sunrise (oranges, pinks, and reds) occur because sunlight travels through more atmosphere at this angle, and shorter blue wavelengths scatter away while longer red and orange wavelengths reach our eyes.

## Core Science Concepts

- \* Earth's Rotation: Earth spins on an imaginary line called its axis, tilted at about 23.5 degrees. One complete rotation takes 24 hours and creates day and night.
- \* Light and Atmosphere: During sunrise, sunlight travels at a low angle through a thicker portion of Earth's atmosphere. This causes blue light to scatter (a process called Rayleigh scattering), leaving the red, orange, and yellow wavelengths visible to our eyes.
- \* Apparent Motion: Objects in the sky appear to move across our sky because Earth rotates beneath them. This is called apparent motion—it looks like the sun moves, but we are actually moving.
- \* Time Zones: Because Earth rotates continuously, the sun rises and sets at different times in different locations around the world. This is why we have time zones.

### Pedagogical Tip:

Before diving into the abstract concept of Earth's rotation, have students physically experience it. Have one student stand in the center representing the sun, while other students stand in a circle representing different locations on Earth. Have them slowly rotate counterclockwise while facing the "sun." This kinesthetic experience makes the abstract concept concrete and memorable.

### UDL Suggestions:

Multiple Means of Representation: Provide both a physical globe and a digital animation showing Earth's rotation to accommodate visual and kinesthetic learners. Some students may benefit from a tactile globe they can physically rotate themselves.

Multiple Means of Engagement: Connect the sunrise phenomenon to students' personal experiences. Ask them to share observations from their own morning commutes or when they've watched the sunrise. This increases relevance and motivation.

Multiple Means of Expression: Allow students to demonstrate understanding through drawings, written explanations, dramatic reenactments, or digital presentations rather than traditional written tests.

## Discussion Questions

1. If the sun doesn't actually move across the sky, what IS moving to make the sun appear to rise and set? (Bloom's: Understand | DOK: 2)
2. Why do you think the colors at sunrise look different from the colors at noon when the sun is high in the sky? (Bloom's: Analyze | DOK: 2)
3. If you could travel west very quickly following the sunset, what would happen? How could you stay in daylight longer? (Bloom's: Analyze | DOK: 3)
4. At the same moment this sunrise was happening, it was nighttime on the opposite side of Earth. How is this possible? (Bloom's: Evaluate | DOK: 3)

## Extension Activities

1. Sunrise Observation Journal: Over a week or two, have students observe and sketch a sunrise (or look at photos from the same location) at the same time each day. Have them record the time, colors, cloud formations, and temperatures. They should notice that the time of sunrise changes slightly each day and that the colors vary based on weather and atmospheric conditions. This reinforces the pattern of Earth's rotation and introduces the concept of seasonal changes.
2. Build a Model Day/Night System: Provide students with a globe, a flashlight, and a dark room. Have them simulate Earth's rotation by slowly rotating the globe while shining the flashlight (sun) on it from a fixed position. Students should observe how different parts of the globe experience day and night simultaneously, and how the angles of light create different colors at the "horizon." This hands-on model makes abstract rotation concepts visible and testable.
3. Global Sunrise Time Investigation: Provide students with a world map and a list of major cities with their current sunrise times. Have them investigate and graph when the sun rises in different cities. Students should discover the pattern that the sun rises later moving from east to west around the world at any given moment. This introduces time zones and reinforces Earth's rotation and spherical shape.

## NGSS Connections

Performance Expectation: 5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their different distances from Earth.

Relevant Disciplinary Core Ideas:

- 5-ESS1.A The sun, Earth, and moon system
- 5-ESS1.B Earth and the solar system

Crosscutting Concepts:

- Patterns (daily patterns of sunrise and sunset)
- Systems and System Models (Earth as part of the sun-Earth system)

## Science Vocabulary

- \* Sunrise: The time in the morning when the sun appears above the horizon as Earth rotates toward the sun.
- \* Rotation: When Earth spins on its axis like a spinning top, completing one full turn every 24 hours.

- \* Axis: An imaginary line that runs through Earth's center from the North Pole to the South Pole; Earth rotates around this line.
- \* Horizon: The line where the sky appears to meet the land or water in the distance.
- \* Atmosphere: The layer of air that surrounds Earth; sunlight passes through it at different angles during sunrise and sunset.
- \* Apparent Motion: When something appears to move across the sky, but it's actually Earth moving while we stand on it.

### External Resources

Children's Books:

- The Sun Is a Star by Neil F. Comins (explores sun and solar system concepts)
- Earth's Rotation by Rebecca E. Hirsch (specifically focuses on rotation and day/night)
- Up in the Sky: Watching Birds, Planes, and Insects Fly by Patricia Lauber (includes observations about apparent motion)

YouTube Videos:

- "Why We Have Day and Night" by National Geographic Kids — Explains Earth's rotation and the day/night cycle with clear animations. <https://www.youtube.com/watch?v=Xc5DqcEKc8U>
- "Earth's Rotation Explained" by Crash Course Kids — Demonstrates rotation using a globe and clear visuals, approximately 4 minutes long. <https://www.youtube.com/watch?v=IlgObh7-A6I>

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Teacher Notes: This lesson connects to students' direct observations and lived experience, making abstract planetary motion more concrete. Consider pairing this image-based discussion with an outdoor observation activity to strengthen understanding and create lasting engagement with Earth science concepts.