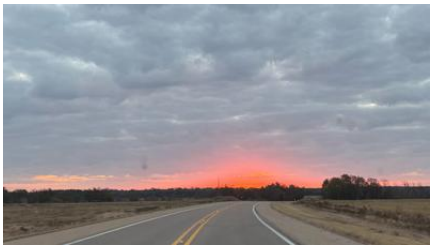
Sunrise

Earth & Space Science | Lesson Guide

4th Grade

Photo Description



This image shows a sunrise over a flat landscape with a straight road stretching toward the horizon. The sun is low on the eastern horizon, creating brilliant orange and pink colors in the sky that fade to blue higher up. The road, fields, and trees are still mostly dark because the sun hasn't fully risen yet, showing how light from the sun gradually brightens our world each morning.

Scientific Phenomena

Anchoring Phenomenon: Why does the sun appear to move across the sky and create a sunrise?

Scientific Explanation: The sun doesn't actually move—Earth does! Earth rotates (spins) on its axis like a spinning top, completing one full rotation every 24 hours. When your location on Earth rotates toward the sun, you experience sunrise. As the sun's light reaches Earth's atmosphere at a low angle during sunrise, it scatters off air particles, creating the distinctive red, orange, and pink colors we see. This is called the "scattering of light" and happens because shorter blue wavelengths scatter more easily than longer red and orange wavelengths when the sun is near the horizon.

Core Science Concepts

1. Earth's Rotation: Earth spins on an invisible axis (an imaginary line through the North and South Poles). This rotation causes the sun to appear to rise in the east and set in the west, though the sun isn't actually moving—we are!

2. Light and Atmosphere: Sunlight travels in straight lines through space, but when it enters Earth's atmosphere (especially at sunrise and sunset), it interacts with air molecules and particles. This causes the light to scatter, which is why we see brilliant colors instead of just a bright sun.

3. Day and Night: As Earth rotates, different parts of the planet face toward or away from the sun. The part facing the sun experiences day (sunlight), while the part facing away experiences night (darkness).

4. Patterns in the Sky: Sunrise occurs at predictable times and in predictable directions (east), allowing us to recognize patterns and use the sun's position to navigate and tell time.

Pedagogical Tip:

Help students understand that Earth's rotation is difficult to "feel" because we're moving smoothly at a constant speed. Use an analogy: When you're in a car moving at steady highway speed, you don't feel the movement—only changes in speed feel noticeable. Similarly, Earth's constant rotation is imperceptible to us, which is why ancient people thought the sun moved instead!

UDL Suggestions:

To support diverse learners: (1) Provide a physical model (globe with a flashlight) so kinesthetic and visual learners can see how rotation creates sunrise/sunset; (2) Use videos showing time-lapse sunrises so students can observe the phenomenon at different speeds; (3) Create a "sunrise observation journal" where students can draw and write about what they observe, supporting varied forms of expression beyond verbal participation.

Discussion Questions

1. "Why do you think we see an orange and red sunrise instead of a white or blue sunrise?" (Bloom's: Analyze | DOK: 2)

2. "If you traveled west on an airplane very, very fast, could you 'chase' the sunrise and make it stay in the sky longer? Why or why not?" (Bloom's: Evaluate | DOK: 3)

3. "What evidence from this photo tells you that Earth is rotating rather than the sun moving toward Earth?" (Bloom's: Evaluate | DOK: 3)

4. "Predict what the sky would look like 30 minutes after this photo was taken, and explain your thinking." (Bloom's: Create | DOK: 3)

Extension Activities

1. Sunrise Observation Journal (5-7 days): Have students observe and sketch the sunrise from the same location each morning before school or with a family member. Ask them to record the time, colors, cloud patterns, and any changes they notice. After one week, discuss patterns: Does the sunrise time change? Does the location on the horizon change slightly? This builds observation skills and reveals the patterns in Earth's rotation.

2. Day-Night Globe Demonstration: Using a globe and a flashlight in a darkened classroom, have students take turns rotating the globe while the flashlight represents the sun. Students can identify where it's sunrise, sunset, and night, and predict what will happen as they continue rotating. This kinesthetic activity makes the abstract concept of rotation concrete and memorable.

3. Sunrise Colors Investigation: Provide students with watercolor paints or colored pencils and have them create their own sunrise artwork. First, discuss why the colors change from red/orange near the horizon to yellow to blue higher up. Then, as they paint or draw, ask them to think about which colors represent which parts of the sky and why light scatters differently at different angles. Display artwork and have a gallery walk where students explain their color choices using scientific reasoning.

NGSS Connections

Performance Expectation:
4-ESS1-1: Identify evidence from patterns in local geological records that Earth has changed over time.

Disciplinary Core Ideas:
- 4-ESS1.A The Universe and Its Stars: Patterns of the sun, moon, and stars observed from Earth can be predicted and described; differences in these patterns are due to Earth's rotation and orbit.
- 4-ESS2.E Earth's Systems: Maps show where things are located; one can determine distances between places using maps.

Crosscutting Concepts:
- Patterns The predictable patterns of sunrise and sunset result from regular motion (Earth's rotation).
- Cause and Effect Earth's rotation causes the observed motion of celestial objects and creates day-night cycles.

Science Vocabulary

* Sunrise: The moment when the sun appears above the eastern horizon at the beginning of the day.

* Rotation: When Earth spins like a top on an imaginary line called an axis, completing one full spin every 24 hours.

* Atmosphere: The layer of air that surrounds Earth.

* Scatter (or Light Scattering): When light bounces off tiny particles in the air, spreading out in different directions and creating colors we see at sunrise and sunset.

* Horizon: The line where the sky meets the land (or water) in the distance.

* Axis: An imaginary line through Earth's center that runs from the North Pole to the South Pole, around which Earth rotates.

External Resources

Children's Books:
- The Sun: Our Nearest Star by Franklyn M. Branley, illustrated by Don Madden – A classic explanation of how the sun creates day and night through Earth's rotation.
- Me and My Amazing Body by Joan Sweeney – Includes sections on how our bodies respond to sunrise and the Earth's daily cycle.
- Sunrise by Barney Saltzberg – A picture book exploring what happens at sunrise with beautiful illustrations.

YouTube Videos:
- "Earth's Rotation and Day/Night Cycle" (Crash Course Kids) – A 4-minute animated explanation of how Earth's rotation creates day and night. https://www.youtube.com/watch?v=xA5pz4_6_0s
- "Why Is the Sky Different Colors at Sunrise and Sunset?" (National Geographic Kids) – A 3-minute video explaining light scattering and atmospheric optics in kid-friendly language. https://www.youtube.com/watch?v=Yd3V02j7kHU