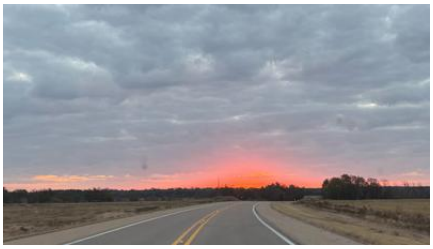
Sunrise

Earth & Space Science | Lesson Guide

3rd Grade

Photo Description



This image shows a beautiful sunrise over a long, straight road stretching toward the horizon. The sky displays a dramatic gradient of colors—deep oranges and reds near the horizon gradually shifting to pink, purple, and gray clouds above. The sun is just beginning to peek over the treeline in the distance, casting warm light across the flat landscape and illuminating the road's yellow center line.

Scientific Phenomena

Anchoring Phenomenon: Why does the sky change colors during sunrise, and why does the sun appear to move across the sky?

Scientific Explanation: The sun doesn't actually move—Earth is rotating on its axis. As our location on Earth turns to face the sun, we experience sunrise. The colorful sky happens because sunlight enters Earth's atmosphere at a low angle during early morning. The shorter blue and violet wavelengths scatter when passing through more atmosphere, while longer red and orange wavelengths pass through more directly, creating the warm colors we see. This is called Rayleigh scattering. The sun appears to move across the sky because of Earth's rotation, not because the sun is moving.

Core Science Concepts

* Earth's Rotation: Earth spins like a top on an imaginary axis. This spinning causes day and night. It takes 24 hours for Earth to complete one full rotation.

* The Sun as an Energy Source: The sun provides light and heat energy that reaches Earth. This energy travels through space in the form of light and warms our planet.

* Light and Atmosphere: Light from the sun travels through Earth's atmosphere (the blanket of air around our planet). Different colors of light behave differently in the atmosphere—some scatter more than others, which is why we see different colors at sunrise and sunset.

* Observable Patterns in the Sky: The sun rises in the east and sets in the west every day. This is a pattern we can observe and predict.

Pedagogical Tip:

Students at this age are concrete thinkers who benefit from direct observation and kinesthetic experiences. Rather than only explaining Earth's rotation verbally, have students physically demonstrate it by standing and slowly spinning. This embodied learning helps them internalize the concept that Earth rotates, not that the sun moves around us.

UDL Suggestions:

To support diverse learners, provide multiple means of representation: (1) Show the image alongside a simple animated diagram of Earth rotating toward the sun; (2) Offer a tactile globe that students can rotate themselves; (3) Use color-coded vocabulary cards (sun = yellow, atmosphere = blue, light = white) to support visual learners and English Language Learners. Additionally, allow students to express their understanding through drawing, movement, or verbal explanation rather than requiring only written responses.

Zoom In / Zoom Out

Zoom In: Atoms and Light Waves
When we zoom in very close—smaller than we can see even with a regular microscope—we discover that light is made of tiny waves of energy. At sunrise, billions and billions of these light waves travel from the sun through space and into Earth's atmosphere. Blue and violet light waves are very short and bouncy, so they bump into air molecules and scatter in all directions (like a tennis ball bouncing off a wall). Red and orange light waves are longer and straighter, so they pass through the air more easily. This is why we see warm colors at sunrise! Scientists called this discovery Rayleigh scattering, and it happens at a scale so tiny that we cannot see individual light waves—only the beautiful colors they create together.

Zoom Out: Earth's Place in the Solar System
If we zoom way out into space, we can see that Earth is one of eight planets orbiting around the sun. The sun is at the center of our solar system, and Earth constantly moves around it while also spinning like a top. Earth's rotation (spinning) happens every 24 hours and creates sunrise and sunset. But Earth is also orbiting the sun, which takes 365 days and creates our yearly seasons. This means that the exact time and location of sunrise changes slightly each day throughout the year! In summer, the sun rises earlier and higher in the sky. In winter, it rises later and lower. All of these motions—Earth's spinning and Earth's orbiting—work together in a cosmic dance that has repeated for billions of years and will continue for billions more.

Discussion Questions

1. What do you think causes the sun to appear in different places in the sky throughout the day? (Bloom's: Understand | DOK: 1)

2. Why do you think the sky is red and orange at sunrise instead of blue like it is during the middle of the day? (Bloom's: Analyze | DOK: 2)

3. If Earth is always spinning, why does it feel like we are standing still? (Bloom's: Analyze | DOK: 2)

4. Where do you predict the sun will be in the sky two hours from now, and what evidence helps you make this prediction? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

Misconception 1: "The sun moves across the sky during the day."
Clarification: The sun stays in almost the same place in space. It is Earth that is moving! Earth spins like a top, and as your part of Earth rotates toward the sun, the sun appears to rise. As your part of Earth rotates away from the sun, the sun appears to set. The sun's motion is just an illusion caused by Earth's rotation. A helpful analogy: If you sit in a spinning chair and spin around, it looks like the room is moving, but actually you are moving!

Misconception 2: "The sun is closest to Earth at sunrise, which is why the sky is red and orange."
Clarification: The sun is not closer to Earth at sunrise or sunset. The reason the sky is red and orange is because of how light travels through the atmosphere. At sunrise, the sun's light has to travel through much more atmosphere to reach your eyes because the sun is low on the horizon. This extra-thick layer of air scatters the blue light away, leaving the red and orange light to reach your eyes. It's like looking through a thick fog—you can still see things, but they look more orange or red.

Misconception 3: "Daytime happens everywhere on Earth at the same time."

Clarification: Because Earth is spinning and the sun can only light up one side of Earth at a time, different places on Earth experience day and night at different times. When it is sunrise where you are, it is sunset on the opposite side of Earth, and it is noon somewhere else. This is why we have different time zones around the world!

Extension Activities

1. Sunrise Observation Journal: Have students observe and sketch the sunrise or a simulated sunrise (using images or video) for several days. Ask them to record the time, colors they see, and where the sun appears on the horizon. This builds observational skills and reinforces the predictable pattern of sunrise. (Supports 3-ESS1-1)

2. Rotating Earth Model: Provide students with a globe, flashlight, and darkened classroom. One student holds the flashlight (representing the sun) while another slowly rotates the globe. Students observe how different parts of Earth experience "day" and "night" as the globe rotates. This kinesthetic activity makes abstract rotation concrete. (Supports understanding of 3-ESS1.A)

3. Color-Mixing Sky Experiment: Using watercolors or colored tissue paper, have students blend colors from orange and red through pink to purple and blue, mimicking the colors they see in the sunrise photo. Discuss why the colors blend and fade, connecting this to light scattering through the atmosphere. Display finished artwork alongside the original photo for comparison. (Supports Patterns through artistic representation of natural phenomena)

Cross-Curricular Ideas

Math Connection: Time and Patterns
Have students track sunrise times over several weeks using a calendar or graph. Create a simple bar graph showing whether the sunrise time is getting earlier or later as the seasons change. Ask: "If the sun rose at 6:30 AM today and 6:15 AM last week, how many minutes earlier is it rising?" This combines observational science with data collection and mathematical reasoning. Students can also predict future sunrise times based on the pattern they observe.

ELA Connection: Descriptive Writing and Poetry
Ask students to write descriptive sentences or a short poem about the sunrise in the photo, using sensory words (colors they see, warmth they feel, sounds they might hear). Provide a word bank with vocabulary like "glowing," "brilliant," "peaceful," "awakening," and "golden." Students can then share their writing aloud, comparing how different people describe the same natural event. This builds vocabulary and helps students connect emotions to scientific observations.

Social Studies Connection: Time Zones and Cultures
Introduce the concept that sunrise happens at different times in different places around the world because of Earth's rotation and time zones. Show students a world map and explain: "When the sun is rising in your city, what is happening in Japan or Australia?" Have students research what time the sun rises in different countries and discuss how this affects people's daily schedules, meals, and activities. This builds global awareness and shows how Earth science influences human life.

Art Connection: Color Mixing and Atmospheric Effects
Have students create a large collaborative sunrise mural using markers, watercolors, or cut paper. Challenge them to accurately blend colors from deep orange near the horizon through pink, purple, and gray in the upper sky, mirroring the photo. Display the mural next to the original photo and discuss: "How did we mix colors to match nature? Why does the sky have these different layers of color?" This reinforces the concept of light scattering through the atmosphere while allowing creative expression.

STEM Career Connection

Astronomer
An astronomer is a scientist who studies the sun, moon, stars, and planets in space. Astronomers use telescopes and special instruments to observe the sky and learn about how Earth, the sun, and other stars work. Some astronomers study the sun and how it affects our planet. Others discover new planets or study distant galaxies. To be an astronomer, you need to be curious about space, enjoy solving puzzles, and like using tools to observe things. Average Annual Salary: $120,000 USD

Meteorologist
A meteorologist is a scientist who studies weather and the atmosphere—the air that surrounds Earth. Meteorologists observe clouds, wind, temperature, and other things in the sky to predict whether it will rain, snow, or be sunny. They also study how the sun's energy affects our weather and climate. Meteorologists help keep people safe by warning them about dangerous storms. If you like watching the weather and want to understand why the sky looks different each day, meteorology might be for you! Average Annual Salary: $95,000 USD

Photographer or Videographer
A photographer captures beautiful images of nature, including sunrises like the one in this photo. Some photographers work for news companies, magazines, or nature documentaries to show people the amazing sights on our planet. Photographers need to understand light, color, and timing to get the perfect shot. They work early in the morning to catch sunrises or stay up late for sunsets. If you love taking pictures and want to share the beauty of Earth with others, photography could be a great career! Average Annual Salary: $65,000 USD

NGSS Connections

Relevant Performance Expectation:
- 3-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Disciplinary Core Ideas:
- 3-ESS1.A—The sun, Earth, and moon and the regular and predictable motion of the earth in relation to the sun and moon
- 3-ESS2.D—Weather and climate are influenced by, among other things, the position of Earth relative to the sun

Crosscutting Concepts:
- Patterns—Students identify and describe the predictable pattern of sunrise in the eastern sky
- Cause and Effect—Earth's rotation causes the sun to appear to move across the sky

Science Vocabulary

* Sunrise: The time of day when the sun first appears above the horizon in the eastern sky, bringing daylight.

* Atmosphere: The layer of air that surrounds Earth and protects it from the sun's harmful rays.

* Rotation: The spinning motion of Earth on its axis, which causes day and night.

* Horizon: The line where the sky appears to meet the land or water in the distance.

* Light: Energy from the sun that allows us to see and warms Earth.

* Pattern: Something that happens again and again in the same way, like the sun rising every morning.

External Resources

Children's Books:

- Sun Up, Sun Down by Gail Gibbons (explores Earth's rotation and daily light patterns with clear illustrations)
- The Sun by Dayle Ann Dodds (introduces the sun as a star and its importance to Earth)
- Day Light, Night Light by Franklyn M. Branley (explains how Earth's rotation causes day and night)