Sunrise

Earth & Space Science | Lesson Guide

2nd Grade

Photo Description

This image shows a beautiful sunrise over a flat, open landscape with a straight road stretching toward the horizon. The sky is filled with colorful clouds—orange, pink, and red near the horizon, changing to gray and blue higher up. Trees line the distant horizon, and the sun is just beginning to rise, creating a warm glow across the sky.

Scientific Phenomena

Anchoring Phenomenon: Why does the sky change colors at sunrise?

When the sun rises, its light travels through Earth's atmosphere at a low angle. The sunlight passes through more air and dust particles than it does at midday. These particles scatter the shorter blue wavelengths of light away, allowing the longer red and orange wavelengths to reach our eyes. This is called Rayleigh scattering. Additionally, the sun itself appears larger and more orange near the horizon due to an optical illusion caused by our perception of distance and the contrast with objects on the landscape. The changing colors we observe demonstrate how light, atmosphere, and Earth's rotation work together to create predictable daily patterns.

Core Science Concepts

* Earth's Rotation: Earth rotates on its axis, which causes the sun to appear to move across the sky from east to west. This rotation creates day and night and the predictable pattern of sunrise and sunset.

* Light and Atmosphere: Sunlight scatters differently through Earth's atmosphere depending on the angle and the particles in the air. At sunrise and sunset, light travels through more atmosphere, scattering away blue light and revealing reds, oranges, and yellows.

* Weather and Sky Conditions: Clouds and atmospheric conditions affect what we see during sunrise. The clouds in this image reflect and scatter the colored light, creating the beautiful gradient effect visible in the photo.

* Patterns and Predictions: Sunrises happen every day in a predictable pattern. By observing the sky, we can learn to predict when sunrise will occur and what colors we might see based on weather conditions.

Pedagogical Tip:

Second graders are natural observers! Rather than explaining all the science at once, start with what they can SEE: "What colors do you notice?" and "What's different about the sky now compared to midday?" This grounds the lesson in direct observation before introducing vocabulary or deeper concepts. Build from their observations toward explanations.

UDL Suggestions:

Multiple Means of Representation: Provide images of sunrises in different weather conditions (clear vs. cloudy) so students can compare. Some students may benefit from a simple diagram showing the sun's position at sunrise, midday, and sunset. Multiple Means of Expression: Allow students to document their observations through drawing, painting, or photography rather than only writing or verbal discussion. Multiple Means of Engagement: Connect to student interests by asking, "What's happening in your home when the sun rises?" or "Do animals wake up with the sunrise?"

Zoom In / Zoom Out

Zoom In: Light Particles and the Atmosphere
If we could shrink down to the size of a speck of dust floating in the air, we would see something amazing! Sunlight is made of tiny waves of energy traveling from the sun. When these light waves hit dust, water droplets, and air molecules in the atmosphere, they bounce around like a ball bouncing off a wall. The smaller blue light waves bounce away more easily than the larger red and orange waves. This bouncing around (scattering) happens billions of times, and that's why we see orange and red near the horizon at sunrise!

Zoom Out: Earth's Day-Night Cycle and Our Planet's Place
If we could float high above Earth in space and look down, we would see that Earth is constantly spinning like a top. At any moment, half of Earth is lit up by the sun (daytime) and half is in darkness (nighttime). As Earth rotates, different places move in and out of the sunlight. When your part of Earth rotates toward the sun, you experience sunrise and a new day begins. This same process happens everywhere on Earth—sunrise in your town, sunrise in Japan, sunrise in Australia—all because of one giant planet slowly spinning in space.

Discussion Questions

1. Why do you think the sky looks different colors at sunrise than it does in the middle of the day? (Bloom's: Analyze | DOK: 2)

2. If you observe the sunrise tomorrow morning, what colors do you predict you will see, and why? (Bloom's: Predict | DOK: 3)

3. How is a sunrise different from a sunset? Do you think the same science explains both? (Bloom's: Evaluate | DOK: 3)

4. What would happen if Earth did not rotate? Would we still have sunrises? (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

Misconception 1: "The sun moves across the sky."
Student thinking: Many second graders believe the sun actually travels from east to west across the sky each day.
Scientific clarification: The sun doesn't move—it's Earth that moves! Earth spins like a top, and as it spins, the sun appears to move across our sky. It's the same as when you spin in a chair and the room seems to spin around you, even though you're the one moving.

Misconception 2: "The sky is blue because of the ocean."
Student thinking: Students may think the sky's color comes from reflection of the ocean or water below.
Scientific clarification: The sky gets its color from how sunlight scatters in the atmosphere (the air around Earth). The sky is blue at midday because blue light scatters a lot. At sunrise, the sky is orange and red because we're looking through much more air, and the blue light scatters away before reaching our eyes.

Misconception 3: "Sunrises look different because the sun is a different color in the morning."
Student thinking: Students may think the sun itself changes color at sunrise.
Scientific clarification: The sun is always the same color—it's yellow-white! What changes is the air the sunlight travels through. In the morning, sunlight travels through more atmosphere at a low angle, which makes it look orange and red to us. At noon, sunlight travels straight down through less air, so it looks yellow and bright.

Extension Activities

1. Sunrise Observation Journal: Over one or two weeks, have students observe and sketch the sunrise (or ask families to help them observe at home). Students can record the colors they see, the weather, and the time. Create a class chart to look for patterns in their observations. This connects to Patterns and builds data literacy.

2. Color Mixing Experiment: Provide watercolors or food coloring in water and have students mix colors to recreate the colors they see in a sunrise. As they mix, discuss how the colors blend and change—a hands-on way to explore light and color without needing to understand Rayleigh scattering deeply.

3. Shadow Tracking: On a sunny day, have students place a stick upright in the ground and trace its shadow at sunrise (or early morning), midday, and afternoon. Students can observe how the shadow's length and direction change as the sun moves across the sky, providing evidence of Earth's rotation and the sun's apparent movement.

Cross-Curricular Ideas

Math: Sunrise Time Patterns and Graphing
Have students collect sunrise times for two weeks (from a calendar, weather app, or family observations). Create a class bar graph or line graph showing how sunrise times change. Discuss: Does sunrise happen at the same time every day? Why or why not? This builds graphing skills while reinforcing the pattern concept from science.

ELA: Poetry and Descriptive Writing
After observing or discussing sunrises, have students write poems or short descriptive paragraphs about the colors, feelings, and changes they notice. Provide a word bank with descriptive words like glowing, orange, peaceful, bright, and stretching. Students can illustrate their writing, creating a sunrise poetry collection for the classroom.

Social Studies: Daily Routines Around Sunrise
Discuss what people do when the sun rises in different parts of the world. Create a simple chart: "What are people doing at sunrise?" Include farmers waking up animals, families getting ready for school, bakeries opening, mail carriers starting their routes, etc. Connect to the idea that sunrise is a signal for activity and that routines depend on the sun's movement.

Art: Sunrise Color Mixing and Landscape Painting
Provide watercolors, pastels, or tempera paints and have students create their own sunrise artwork. As they paint, encourage observation and discussion: "What colors do you see near the horizon? How do they change as you move up the sky?" Students can paint the landscape from the photo with a horizon line, trees, road, and layered sky colors. Display the artwork and compare how each student interpreted the sunrise differently.

STEM Career Connection

Meteorologist (Weather Scientist)
Meteorologists are scientists who study weather and the atmosphere. They observe clouds, rain, wind, and changes in the sky—just like you did with the sunrise! A meteorologist might wake up early to observe sunrise and use that information to predict what the weather will be like that day. They help people know when to bring an umbrella or wear a coat. Average salary: $97,000/year

Astronomer (Space Scientist)
Astronomers study the sun, stars, moon, and planets. They use telescopes and cameras to observe how Earth moves and how the sun and moon affect our planet. An astronomer might study why sunrises and sunsets look different at different times of year, or how the sun's light and heat affect life on Earth. Average salary: $119,000/year

Photographer or Cinematographer
Photographers and cinematographers capture beautiful images and videos of nature, including sunrises and sunsets. They understand how light works, how the sky changes colors, and how to use cameras to show people the beauty of Earth. They might photograph sunrises for magazines, websites, or nature documentaries that teach others about our planet. Average salary: $67,000/year

NGSS Connections

Performance Expectation:
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Relevant Disciplinary Core Ideas:
- 2-ESS1.A Earth's place in the universe (daily patterns of sunlight and shadows)
- 2-ESS1.B Earth and the solar system (patterns of the sun, moon, and stars)

Crosscutting Concepts:
- Patterns The sun's movement creates predictable patterns we observe as sunrise and sunset
- Systems and System Models The sun, atmosphere, and Earth work together to create the colors we see

Science Vocabulary

* Sunrise: The moment when the sun appears above the horizon in the morning and the sky begins to get bright.

* Horizon: The line far away where the sky seems to meet the land or ocean.

* Atmosphere: The blanket of air that surrounds Earth.

* Scatter: When light bounces off particles in the air and spreads out in different directions, instead of traveling straight.

* Rotate: To spin or turn, like how Earth spins on its axis.

* Pattern: Something that happens in the same way over and over again in a regular order.

External Resources

Children's Books:
- Sun by Sam Usher (explores how the sun affects our daily lives with beautiful illustrations)
- Come Sun, Go Sun by Jean McElroy (celebrates sunrise and sunset through rhythmic text)
- Earth's Place in Space by Nuria Roca (part of the "My First Discovery" series; includes day/night concepts)