Rainbow Refraction

Physical Science | Lesson Guide

Kindergarten

Photo Description

This photo shows a beautiful rainbow stretching across the sky on a rainy day. The rainbow has many colors—red, orange, yellow, green, blue, and purple—in a curved arc from the clouds to the ground. You can see green grass, trees, and a road below the rainbow.

Scientific Phenomena

Anchoring Phenomenon: A rainbow forms when sunlight passes through water droplets in the air and bends, creating a beautiful spectrum of colors.

Why This Happens: When rain falls and the sun shines at the same time, sunlight enters millions of tiny water droplets. The light bends (refracts) as it enters each droplet, bounces off the back, and bends again as it exits. Different colors of light bend at slightly different angles, so they separate into the rainbow colors we see. This is called light refraction, and it happens because light travels at different speeds through water than through air.

Core Science Concepts

* Light and Color: Sunlight appears white, but it is actually made of many colors mixed together. When light bends through water, the colors separate so we can see them.

* Properties of Water: Water droplets act like tiny mirrors and lenses. They can bend light and change its direction.

* Conditions for Rainbows: Rainbows only appear when three things happen at the same time: rain (water droplets), sunshine, and the observer positioned correctly between the sun and the rain.

* Light Refraction: Light changes direction when it moves from one material (like air) into another (like water). This bending of light is called refraction.

Pedagogical Tip:

For Kindergarteners, focus on the observable, colorful outcome rather than the physics of refraction. Use simple language: "Light bounces and bends in the raindrops, and that makes the colors separate so we can see them." Connect to their experience: "Have you ever seen a rainbow after it rains?" This builds engagement before introducing vocabulary.

UDL Suggestions:

Representation: Provide a color chart showing the rainbow colors in order (ROYGBIV) for students to reference. Use picture cards showing "sun + rain + rainbow" together. Action & Expression: Allow kinesthetic learners to create rainbows by moving their body in an arc, or by arranging colored strips in rainbow order. Engagement: Celebrate rainbow sightings! Create a "rainbow journal" where students draw or write about rainbows they see, making the concept personally meaningful.

Discussion Questions

* What colors do you see in the rainbow? Can you name them in order? (Bloom's: Remember | DOK: 1)

* Why do you think we see a rainbow when it rains and the sun is shining at the same time? (Bloom's: Analyze | DOK: 2)

* What do you think would happen if there were no raindrops in the air? Would we still see a rainbow? (Bloom's: Evaluate | DOK: 3)

* Have you ever seen a rainbow? Where were you, and what was happening with the weather? (Bloom's: Understand | DOK: 1)

Extension Activities

* Rainbow in a Jar: Fill a clear jar with water and shine a flashlight or sunlight through it. Angle it to catch the light and create a mini-rainbow on the wall or paper. Students can observe how light bends through water and discover rainbows indoors.

* Rainbow Color Sorting: Provide students with colored objects (blocks, beads, buttons, ribbons) and have them sort items by color and arrange them in rainbow order (ROYGBIV). This reinforces color recognition and the sequence of colors in a rainbow.

* Rainbow Sensory Walk: After rain, take students outside to look for rainbows or "rainbow hunters." Have them collect natural items in each color (red leaf, yellow flower, blue rock, etc.) and arrange them in rainbow order on the ground.

NGSS Connections

Performance Expectation (Kindergarten):
K-PS4-1: Plan and conduct investigations to provide evidence that vibrations make sound and that vibrations can make materials move. (Note: While this PE addresses vibrations, K.PS4 addresses light and sound properties more broadly.)

Disciplinary Core Ideas:
* K-PS4.A Waves and their applications in technologies for information transfer: Light can be produced, seen, and affects how we see objects.

Crosscutting Concepts:
* Patterns - The rainbow shows a clear pattern of colors that appears each time conditions are right.
* Cause and Effect - The presence of sun + rain + correct position causes a rainbow to appear.

Science Vocabulary

* Rainbow: A colorful arc in the sky made when sunlight shines through raindrops.

* Light: Brightness that helps us see things; it travels very fast and comes from the sun.

* Refraction: The bending of light when it passes through water or other materials.

* Water droplets: Tiny drops of water floating in the air, like during rain.

* Colors: Different shades of light that we see—red, orange, yellow, green, blue, and purple.

* Spectrum: All the different colors of light arranged in order.

External Resources

Children's Books:
The Rainbow* by Maria Rius (simple, colorful introduction)
Rain* by Sam Usher (includes rainbow observation in a beautiful story)
A Rainbow of My Own* by Don Freeman (engaging fiction about a child and a rainbow)

YouTube Videos:
* "How Rainbows Are Made" by National Geographic Kids — A 3-minute animated explanation of rainbows with simple, kid-friendly language. https://www.youtube.com/watch?v=YYaWpY-4FEo

* "Rainbow Science Experiment for Kids" by Kids Learning Videos — Shows how to create a rainbow using a glass of water and sunlight. https://www.youtube.com/watch?v=VNpDCdgpFvQ