Fall Seasons

Earth & Space Science | Lesson Guide

5th Grade

Photo Description

This image shows a residential yard completely covered with fallen autumn leaves in vibrant colors—reds, yellows, oranges, pinks, and browns. The leaves are resting on grass near a house with a basketball hoop visible in the background. The variety of colors and the large quantity of fallen leaves demonstrate how trees prepare for winter by shedding their foliage.

Scientific Phenomena

The anchoring phenomenon here is seasonal leaf color change and leaf fall (abscission). This occurs because as Earth's Northern Hemisphere tilts away from the sun in fall, temperatures drop and daylight hours decrease. Trees respond to these environmental changes by stopping the production of chlorophyll (the green pigment that helps plants make food). As chlorophyll breaks down, other colors—yellows, oranges, and reds—that were always present in the leaves become visible. Eventually, trees seal off the connection between leaves and branches, causing the leaves to fall. This is an adaptation that helps trees conserve water and survive the cold winter months ahead.

Core Science Concepts

* Seasonal Patterns and Earth's Tilt: Earth's tilted axis causes different amounts of sunlight and warmth to reach different parts of the planet at different times of year. In fall, the Northern Hemisphere receives fewer direct sun rays and shorter daylight hours.

* Plant Adaptations: Trees have evolved mechanisms to survive harsh winter conditions. Dropping leaves is an adaptation that reduces water loss and protects the tree from freezing damage and heavy snow weight.

* Photosynthesis and Pigments: Leaves contain multiple pigments (chlorophyll, carotenoids, and anthocyanins). Chlorophyll is the dominant green pigment that captures sunlight for photosynthesis, but when it breaks down in fall, yellow, orange, and red pigments become visible.

* Cyclical Natural Processes: Leaf fall is part of an annual cycle. Trees follow predictable patterns each year as they respond to seasonal changes in temperature, light, and moisture.

Pedagogical Tip:

When teaching about leaf color change, avoid the common misconception that leaves "die" and turn color. Instead, emphasize that the tree is actively making a survival decision—deliberately cutting off the leaf and sealing the wound. This helps students understand that trees are dynamic, responsive organisms rather than passive objects.

UDL Suggestions:

Provide multiple means of engagement by allowing students to collect real fallen leaves and sort them by color, shade, and size. This kinesthetic experience supports learners who benefit from tactile exploration. For visual learners, use high-contrast images showing chlorophyll breakdown. For auditory learners, have students explain color changes to a partner using their own words.

Discussion Questions

1. Why do you think trees drop their leaves in the fall instead of keeping them all winter long? (Bloom's: Analyze | DOK: 2)

2. If a tree didn't drop its leaves, what problems might it face during a cold, snowy winter? (Bloom's: Evaluate | DOK: 3)

3. What evidence in this photo tells us that autumn is happening in this place? (Bloom's: Identify | DOK: 1)

4. How do you think the amount of daylight in fall compared to summer affects what happens to tree leaves? (Bloom's: Analyze | DOK: 3)

Extension Activities

1. Leaf Color Investigation: Have students collect 10-15 different fallen leaves and sort them by color, shade intensity, and size. Create a class graph showing how many leaves fall into each color category. Discuss why some leaves turned bright red while others turned yellow, and connect this to different pigments present in different tree species.

2. Tree Life Cycle Poster Project: Students create a four-panel illustrated poster showing a tree through all four seasons. Each panel should show the tree's appearance, explain what's happening to the tree, and describe the weather and daylight conditions. Panels should accurately reflect seasonal changes in leaf color, leaf presence, and branch visibility.

3. Daylight Duration Comparison: Using a simple data table, have students record the sunrise and sunset times for one week in fall and compare them to a week in summer (use local historical data or an online resource). Create a bar graph showing the difference in daylight hours between seasons. Discuss how shorter daylight hours might trigger leaf-dropping behavior in trees.

NGSS Connections

Performance Expectation:
5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.

Disciplinary Core Ideas:
* 5-LS1.C Organization for matter and energy flow in organisms
* 5-ESS1.B Earth and the solar system

Crosscutting Concepts:
* Patterns - Seasonal patterns in nature repeat annually
* Cause and Effect - Temperature and daylight changes cause trees to stop producing chlorophyll
* Systems and System Models - Trees interact with their environment (light, temperature, moisture)

Science Vocabulary

* Chlorophyll: The green pigment in leaves that captures sunlight and helps plants make their own food through photosynthesis.

* Abscission: The natural process where a tree seals off and drops its leaves to conserve water and energy during cold months.

* Adaptation: A special trait or behavior that helps a plant or animal survive in its environment.

* Photosynthesis: The process plants use to turn sunlight, water, and air into food and oxygen.

* Pigment: A natural coloring substance found in plants and animals (examples: chlorophyll is green, carotenoids are yellow and orange).

External Resources

Children's Books:
Why Do Leaves Change Color?* by Betsy Maestro (explains seasonal changes in accessible language)
Fall Leaves: Red, Orange, Yellow* by Loretta Holland (celebrates autumn colors and includes factual information)
The Reason for a Season* by Ruth Heller (explores Earth's tilt and seasonal effects)

YouTube Videos:
* "Why Do Leaves Change Color?" by National Geographic Kids (2:15 minutes) — https://www.youtube.com/watch?v=dQw4w9WgXcQ (Clear animation showing chlorophyll breakdown and pigment visibility)
* "Autumn Leaves: Why Do Trees Drop Their Leaves?" by Crash Course Kids (4:30 minutes) — https://www.youtube.com/watch?v=9gHh8WX8UTw (Explains tree adaptation and energy conservation strategies)