Deciduous Trees

Life Science | Lesson Guide

4th Grade

Photo Description

This image shows a wooden boardwalk extending over a calm lake surrounded by trees displaying beautiful fall colors. The trees have changed from green to bright yellows, oranges, and reds, showing the autumn season. Some trees still have green leaves while others have already lost their leaves completely.

Scientific Phenomena

The Anchoring Phenomenon shown here is seasonal leaf color change and leaf drop in deciduous trees. This happens because as daylight hours get shorter and temperatures drop in fall, trees stop producing chlorophyll (the green pigment that captures sunlight for photosynthesis). When chlorophyll breaks down, other pigments like carotenoids (yellows and oranges) and anthocyanins (reds and purples) become visible. Eventually, trees form a special layer of cells that cuts off the leaf from the branch, causing it to fall off. This helps the tree conserve energy and water during the harsh winter months when photosynthesis would be difficult.

Core Science Concepts

1. Seasonal Adaptations: Deciduous trees have evolved strategies to survive changing seasons by dropping their leaves to conserve resources during winter.

2. Photosynthesis and Plant Pigments: Chlorophyll masks other pigments during growing season, but when it breaks down in fall, yellow carotenoids and red anthocyanins become visible.

3. Plant Life Cycles: Trees follow predictable annual cycles of growth, reproduction, dormancy, and renewal that align with seasonal changes.

4. Environmental Responses: Plants respond to environmental cues like temperature and daylight length to trigger physiological changes.

Pedagogical Tip:

Use a "Wonder Wall" where students can post questions about what they observe in the image. This builds scientific curiosity and gives you insight into their thinking before formal instruction begins.

UDL Suggestions:

Provide multiple ways to explore this concept by offering real leaf samples, color-changing demonstrations with pH strips, and time-lapse videos of seasonal change to support different learning preferences and sensory needs.

Zoom In / Zoom Out

Zoom In: At the cellular level, specialized cells called "abscission cells" form a barrier between the leaf stem and branch. These cells cut off the flow of water and nutrients to the leaf, causing it to weaken and eventually fall off.

Zoom Out: This seasonal change is part of larger ecosystem cycles where fallen leaves decompose to provide nutrients for soil organisms, which then feed the trees and other plants, creating a continuous cycle of matter and energy flow through the forest ecosystem.

Discussion Questions

1. What patterns do you notice in how different trees are changing colors around the lake? (Bloom's: Analyze | DOK: 2)
2. How might the falling leaves benefit other living things in this forest ecosystem? (Bloom's: Evaluate | DOK: 3)
3. What would happen if trees didn't drop their leaves in winter? (Bloom's: Synthesize | DOK: 3)
4. Why do you think some trees in the image still have green leaves while others have changed colors? (Bloom's: Analyze | DOK: 2)

Potential Student Misconceptions

1. Misconception: Trees "die" in winter when they lose their leaves.
   Clarification: Deciduous trees are dormant but very much alive, similar to how some animals hibernate.

2. Misconception: Leaves turn colors because they are "dying."
   Clarification: Color change is an active process where trees are actually protecting themselves and preparing for winter survival.

3. Misconception: All trees lose their leaves in fall.
   Clarification: Only deciduous trees lose leaves; evergreen trees keep their needle-like leaves year-round as an adaptation to their environment.

NGSS Connections

- Performance Expectation: 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
- Disciplinary Core Ideas: 5-LS1.C (Organization for Matter and Energy Flow in Organisms), 5-LS2.A (Interdependent Relationships in Ecosystems)
- Crosscutting Concepts: Patterns, Systems and System Models

Science Vocabulary

* Deciduous: Trees that lose all their leaves each fall and grow new ones in spring.
* Chlorophyll: The green substance in leaves that captures sunlight to make food for the tree.
* Photosynthesis: The process plants use to make their own food using sunlight, water, and carbon dioxide.
* Adaptation: A special feature that helps living things survive in their environment.
* Dormant: A resting state where trees slow down their life processes during winter.
* Pigment: Natural substances that give leaves their colors.

External Resources

Children's Books:
- Why Do Leaves Change Color? by Betsy Maestro
- Red Leaf, Yellow Leaf by Lois Ehlert
- Fall Leaves Fall! by Zoe Hall

YouTube Videos:
- "Why Do Leaves Change Colors?" by SciShow Kids - Simple explanation of leaf pigments and seasonal changes (https://www.youtube.com/watch?v=CpEzQMp58Cg)
- "The Science of Fall Colors" by National Geographic Kids - Beautiful visuals showing the science behind autumn colors (https://www.youtube.com/watch?v=H9VDkvgHkzE)