Renewable Resource

Earth & Space Science | Lesson Guide

4th Grade

Photo Description

This image shows the interior of a wooden shed or small building under construction. The walls are made of wooden frames with insulation material filling the spaces between the wooden beams. A large window lets light inside, and the roof is made of wooden beams arranged in a triangular pattern. This building demonstrates how people use natural materials, especially wood, to create structures we need.

Scientific Phenomena

Anchoring Phenomenon: Why do builders use wood to construct buildings?

This image illustrates renewable resource utilization—the practice of using materials that nature can replace over time. Wood is a renewable resource because trees grow back after being harvested, unlike fossil fuels or metals that take millions of years to form. When builders choose wood for construction, they are using a material that can be regrown through sustainable forestry practices. The insulation material visible between the wooden frames represents another important consideration: keeping buildings energy-efficient so we use fewer resources overall.

Core Science Concepts

* Renewable vs. Non-Renewable Resources: Renewable resources (like wood from trees) can be replaced by nature in a human lifetime, while non-renewable resources (like coal or oil) take millions of years to form.

* Energy Efficiency in Buildings: Insulation in walls helps trap heat in winter and keep heat out in summer, reducing the need for heating and cooling—which saves energy and reduces environmental impact.

* Properties of Materials: Wood is strong, can be shaped, and comes from living organisms, making it ideal for construction when managed responsibly.

* Sustainable Practices: Planting new trees to replace harvested ones ensures that wood remains available for future generations.

Pedagogical Tip:

When teaching about renewable resources, have students touch and observe wood samples of different types (pine, oak, etc.). This tactile experience helps fourth graders internalize the concept that wood is a real, workable material—not just an abstract idea. Ask: "Why do you think this wood is strong? What do you notice about its texture?" This grounds the lesson in observable evidence.

UDL Suggestions:

Multiple Means of Representation: Provide images of forests, sawmills, and finished wooden buildings to show the complete cycle. Use a timeline showing "Year 0: Tree planted" !' "Year 25: Tree harvested" !' "Year 50: New tree grows." This visual scaffold helps students understand the timescale of renewable resources.

Multiple Means of Action & Expression: Allow students to record their thinking through drawing labeled diagrams, building small structures with wooden blocks, or creating a photo collage showing renewable resources in their community.

Zoom In / Zoom Out

Ø=Ý, Zoom In: Cellular Level
Deep inside each wooden beam, tree cells are arranged in patterns called growth rings. Each ring represents one year of growth. The cells contain cellulose, a strong fiber that gives wood its strength. When trees grow, they take carbon dioxide from the air and store it in these cells—this is part of the carbon cycle that helps regulate Earth's atmosphere.

Ø<ß Zoom Out: System Level
This single building is part of a larger human system that depends on forests. Forests provide oxygen, absorb carbon dioxide, prevent soil erosion, and provide habitat for animals. When we harvest wood responsibly (planting new trees), we maintain this balance. A building like this might last 50+ years, during which time multiple new trees can grow to replace the harvested wood—creating a sustainable cycle that supports both human needs and environmental health.

Discussion Questions

1. Why do you think builders chose wood instead of plastic or metal for this building's frame? (Bloom's: Analyze | DOK: 2)
   - This question encourages students to think about material properties and availability.

2. What do you think happens to the space between the wooden beams after insulation is added? How might that help people who live in this building? (Bloom's: Explain | DOK: 2)
   - This question connects structure to function and energy efficiency.

3. If it takes 30 years for a tree to grow big enough to harvest for wood, how many trees need to be planted today to replace the ones used in buildings 30 years from now? (Bloom's: Evaluate | DOK: 3)
   - This question extends thinking about sustainability and planning.

4. Compare a wooden building to a plastic toy. Which is a renewable resource? Why is that important? (Bloom's: Compare | DOK: 2)
   - This question helps students distinguish between renewable and non-renewable resources.

Potential Student Misconceptions

* Misconception: "If we cut down trees to make buildings, we're running out of trees forever."
  - Clarification: When forests are managed responsibly, new trees are planted to replace the ones that are cut down. A tree can grow to full size in 20-40 years, and we can harvest it again. This is different from non-renewable resources like coal, which took millions of years to form.

* Misconception: "All the insulation in walls is made from plastic."
  - Clarification: While some insulation is plastic-based, much insulation today is made from renewable or recycled materials like cellulose (from paper), sheep's wool, or plant fibers. The material in this photo appears to be a natural fiber insulation.

* Misconception: "Wood buildings are weaker than buildings made of concrete or steel."
  - Clarification: Wood is very strong relative to its weight. Modern wooden structures can be just as safe and durable as other materials when built correctly. Many wooden buildings last over 100 years!

Extension Activities

1. Tree Ring Investigation: Bring in a tree cross-section or a picture of one. Have students count the rings to estimate the tree's age. Discuss: "Older rings are in the center—how do you think that happened?" Then compare ring width (wide rings = good growing years; narrow rings = difficult years). This connects to climate and environmental changes.

2. Build and Insulate: Provide students with small wooden blocks, straw, plastic wrap, and cotton batting. Have them design and build two small "buildings" side-by-side—one well-insulated and one not. Use a heat lamp or warm water to simulate heat. Measure which building stays cooler longer. Record data and discuss why insulation matters.

3. Renewable Resource Hunt: Send students on a scavenger hunt around the school or home to find items made from renewable resources (wood furniture, paper, cotton clothing, plant-based products) versus non-renewable resources (plastic, metal, glass). Create a class chart and discuss: "Which renewable resources do we use most? Where do they come from?"

Cross-Curricular Ideas

* Math: Calculate how many trees are needed to build a house, or estimate the height and age of trees used for lumber. Create a bar graph comparing the harvest time for different tree types (pine: 25 years; oak: 40 years).

* English Language Arts: Write a persuasive paragraph: "Why should builders use renewable resources?" or "Where does the wood in my school come from?" Interview a parent or local builder about building materials.

* Social Studies: Research how different cultures around the world use local, renewable resources to build homes (log cabins, adobe, timber-frame houses). Compare building styles across regions and connect to available resources.

* Art: Create a mixed-media collage showing the lifecycle of a tree: seed !' sapling !' mature tree !' harvested lumber !' finished building !' new tree planted. Use wood pieces, photos, and drawings.

STEM Career Connection

* Forester: A forester takes care of forests and decides which trees to harvest and where to plant new ones. They make sure forests stay healthy while providing wood for buildings and other products. Foresters often use computers to map forests and count trees! Average salary: $62,000/year

* Carpenter/Construction Worker: Carpenters cut and shape wood, then assemble it into buildings, furniture, and other structures. They read blueprints and use tools like saws, hammers, and drills. Some carpenters specialize in building energy-efficient, sustainable homes. Average salary: $54,000/year

* Environmental Engineer: Environmental engineers design buildings and systems that use resources responsibly and reduce waste. They figure out the best insulation materials, where to place windows for natural light, and how to collect rainwater. They help make buildings "green" and sustainable. Average salary: $96,000/year

NGSS Connections

Performance Expectation:
- K-ESS3-1 - Use a model to represent the relationship between the needs of different plants and animals and the places they live. (Note: This image aligns with upper-elementary thinking about resources.)

Disciplinary Core Ideas:
- K-ESS3.A - Living things need water, air, and resources from the land, and they live in places where their needs can be met.

Crosscutting Concepts:
- Cause and Effect - Harvesting trees (cause) can affect forest ecosystems (effect), but replanting trees (cause) restores them (effect).
- Systems and System Models - Forests are systems where trees, animals, soil, and water interact; building construction is a human system that depends on natural resource systems.

Science Vocabulary

* Renewable Resource: Something from nature that can be replaced or grown again within a human lifetime, like trees or crops.

* Insulation: Material placed in walls or roofs to keep heat in during winter and heat out during summer, helping save energy.

* Sustainable: Using natural resources in a way that doesn't use them up or harm the environment, so they'll be available in the future.

* Harvest: To collect or gather a crop or resource, such as cutting down trees for lumber.

* Cellulose: The strong material that makes up plant cell walls and gives wood its strength.

* Growth Ring: One of the rings visible in a tree's cross-section, showing one year of growth.

External Resources

Children's Books:
- The Giving Tree by Shel Silverstein (A classic story about a tree's relationship with a boy, raising questions about resources and sustainability)
- Where the Forest Meets the Sea by Jeannie Baker (Explores forests and human impact through collage illustrations)
- Trees: A Chapter Book by Susan L. Roth and Cindy Trumbore (Nonfiction exploration of how trees grow and help our world)