



Lesson Plan

LESSON PLAN: Every Tree for Itself

Try this activity simulation to give your students an understanding of the conditions that trees need to live and grow and to help your students learn that trees often must compete for their needs.

Level

Grades K-8

Subjects

Science, Math

Concepts

- The Earth's atmosphere, water, soil, climate, and geology vary from region to region, thus creating a wide diversity of biological communities. (1.3)
- Organisms are interdependent; they all depend on non-living components of the Earth. (2.1)
- Altering the environment affects all life forms—including humans—and the interrelationships that link them. (2.2)

Skills

Determining Causes and Effects, Identifying Relationships and Patterns, Predicting, Interpreting

Differentiated Instruction

Modified Materials, Real/Hands-on Learning, Curricular/Personal Connections, Oral/Reading/Writing Skills, Higher Order Thinking

Materials

8"X10" (20 cm X 25cm) pieces of blue, yellow, and green paper (or three colors of poker chips or Unifix cubes); (for Variation: markers or crayons: tree trunks or branch cross-sections showing annual growth rings, often available from tree-trimming services or forest industries)

Time Considerations

Preparation: 15 minutes

Activity: 50 minutes

OBJECTIVES

- Students will simulate how trees compete for their essential needs.
- Students will describe how varying amounts of light, water, and nutrients affect a tree's growth.

ASSESSMENT OPPORTUNITIES

- Have students draw a cross-section of a tree that shows ten years of growth and varying growing conditions for each of the years. Students then list the conditions that are represented in the rings, drawn, such as drought, competition, fire, cool spring and summer, insect infestation, abundance or lack of basic needs, forest thinning, animal damage, and so on.
- Have students write a story or create a skit from the perspective of a tree, describing ten years in the tree's life. Have them detail events that affect the tree both positively and negatively.
- Help students use tree data gathered in one of the rounds of the simulation to write a one paragraph description of the conditions their tree experienced.

BACKGROUND

What do trees need so they can grow? Some of their needs are the same as those of people and other animals. For example, trees need air and plenty of water and food. But while people and animals eat their food, trees get food in a different way. They produce it in their leaves from carbon dioxide and water using energy from the sun. And just as people and animals need certain vitamins for growth, trees need mineral nutrients, such as nitrogen and phosphorous, which they get from the soil.

If trees don't get enough water, sunlight or nutrients, they may grow slowly or die. Growth rings show this graphically. In general, wide rings indicate good conditions for growth (plenty of water, sunshine, and nutrients), while narrow rings often indicate less favorable conditions for growth (drought, insect damage, lack of nutrients, competition).

GETTING READY

Cut two 3"X3" (7.6 cm X 7.6 cm) squares of blue, yellow, and green construction paper for each student. To save time, you could use colored math cubes. They work much better than paper if you're doing the activity outdoors on a breezy day.

Depending on the individual student's skill level, plan to skip Steps 1-4 and have the students use a plain paper plate for Step 5.

DOING THE ACTIVITY

1. Pass out cross-sections from several trunks or branches (tree cookies), and have your students examine the growth rings. (If you don't have an actual cross-

section, draw a big one on the board.) Explain that the number of rings indicates the age of the tree trunk or branch at the time it was cut.

2. Give a large piece of paper (at least 8.5" X 11" or 22 cm X 28 cm) or a white paper plate to each student.
3. Using events from your life as an example, show students a timeline of your life. Then model how to translate the timeline to make growth rings on a paper plate.
4. Tell the students to imagine that they are trees. Have them draw a cross-section of themselves, representing their age in growth rings. (You might laminate these drawings for durability.)
5. Have students stand about three feet (91 cm) apart on pieces of paper or their paper plates. Tell students that they'll be playing a game called "Every Tree for Itself." The object of the game is for the "trees" to gather as many squares as they can. Explain that each colored square represents a tree requirement. Blue represents water, yellow represents sunlight, and green represents a nutrient such as nitrogen or phosphorous.
6. Equally distribute the colored squares on the floor around the students so the squares are about one to two feet (30-61 cm) apart.
7. Give a signal to start the first round. Have student trees reach with their branches (arms) to gather their requirements. Tell students that their feet are their roots and must remain planted on their paper at all times. They are not allowed to slide their paper along the

floor or step off it; they will be disqualified for doing so.

8. Allow student trees to gather these requirements for one 30-second round. (They can either collect all types of requirements at once or one type of requirement each round.) Have students use a notebook to record how many of each color requirement they gathered. Use the following questions to discuss the results of the first round:

- How many requirements did each tree get?
- Do any trees lack a particular requirement?
- What might happen to a real tree that lacked one of its requirements? (It might grow slowly or eventually die. Point out to the students, through, that different species of trees have different requirements.)
- Is there such a thing as too much water, sunlight, or nutrients? (Yes, every species has optimum levels beyond which the tree becomes stressed.)

9. Have students stand on their papers in groups of three to five. Gather the colored squares and spread them around the room again. Play another round and have student trees record their results.

10. Compare the results of this round with those of the first. In most cases, students will notice that each tree gathered fewer requirements. Ask if they can reach any conclusions about trees that grow close to each other. (Such trees compete for requirements. Often they don't grow as well as trees that are more widely separated from one another.) Ask if any trees "died" because

they couldn't get a particular requirement. (You can allow trees to fall down or look tired and droopy if they haven't received their vital requirements.)

11. Ask students how foresters might use their knowledge of competition in caring for a stand of trees. (Foresters plant trees a certain distance apart so the trees will be able to get enough nutrients. The distance varies depending on the species of the tree. Foresters also thin young stands of trees.)

12. Try several more rounds, comparing the results each time. Here are suggestions for setting up additional rounds. As before, each student should examine his or her results in each round. Older students can record those results and later graph or chart the results of each round and draw conclusions. Discuss what the results might tell students about strategies for managing forests (for example, thinning trees that are too close together).

- Have all the students stand close together.
- Put students closer together, but have only half of the class participate.
- Use fewer water squares (representing a drought).
- Use fewer sunlight squares (representing lack of sunlight for young trees because of overcrowding).
- Use fewer nutrient squares (representing poor quality soil).
- Add a new color of square (red, black, or brown), but don't tell students what it represents. After playing the round, tell them that the new color represents fire (red) or an insect infestation (black or brown) like bark beetles or gypsy moths. How would this new element affect the trees?



VARIATION—FOR OLDER STUDENTS

Before playing the game, pass out cross-sections from several trunks or branches (tree cookies), and have your students examine the growth rings. (If you don't have an actual cross-section, draw a big one on the board.) Explain that the number of rings indicates a tree's age. Point out that wider rings show years when the tree grew more, and narrower rings show years when it grew less. This variation in growth shows differences in the tree's ability to get its requirements.

You may want to include more colors in the game: one for sunlight, one for water, one for nitrogen, one for CO₂, and so on.

Play round one of the game as described, but do not distribute the chips equally around the students. Discuss what happens when tree requirements are not equally distributed in the environment.

After each round of the game, have students draw a "ring" on their piece of paper or paper plate to represent how much their tree grew that year based on the requirements they got.

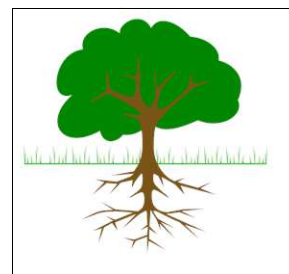
At the end of the game, students can write a life story of their tree to go along with cross-section they created on the paper or paper plate.

ENRICHMENT

- Assign values to the amounts of requirements the students gather in the activity. For example, a collection of three or more of each requirements could represent superior growth. Two of each requirements could represent average growth. And, one or fewer of each could represent poor growth. Using these values as a basis, have students record the numbers of trees that are growing very well, fairly well, and poorly for each round. Older students can use graphs to show results.

- For visual way to portray water absorption by roots, try the following:

1. Explain that, for many species of trees, the diameter of the spread of the tree's roots is roughly equal to the tree's height. Have students measure themselves and then make a circle (using chalk or strings) with a diameter equal to their height.
2. Play "Every Tree for Itself" with each student standing in the center of his or her circle. Tell the student trees they can gather water squares only within their circle of roots.
3. Play the game again using root circles, but this time have trees stand in clumps. Afterward, discuss the results of root competition.



READING CONNECTIONS

Boulton, Carolyn, *Trees*, Franklin Watts. 1984 Identifies many types of trees and describes how they grow and the kinds of leaves, fruits, and seeds they produce. Includes suggested experiments and projects. Grades 1-4, ISBN: 0531046354

Bourgeois, Paulette and Clark, Brenda, *Franklin Plants a Tree*, Scholastic, 2001. A story about Franklin and his friends planting saplings on Earth Day. Franklin finds it hard to believe that such a small sapling will ever grow into a big tree, but with water and lots of love, his tree begins to grow. Grades PreK-2, ISBN: 1550748785.

Ehlert, Lois, Red Leaf, *Yellow Leaf*. Harcourt. 1991. A child describes the growth of a maple tree from seed to sapling. A special glossary explains how roots absorb nutrients, what photosynthesis is, how sap circulates, and other facts about trees. Grades Pre-K-2, ISBN: 0152661972.

Kudlinski, Kathleen V. *How Plants Survive*. Newbridge, 2003. A plant's life is not as easy as you might think. Plants compete with one another for sunshine, wage battles for water, and struggle to protect their own patch of soil. Their lives are a constant battle for survival. Grades 2-6, ISBN: 0791074226

Mabey, Richard. *Oak and Company*. Greenwillow Books. 1983. Follows an oak tree and its company of plants and animals from its beginning as an acorn to its death 282 years later. Grades K-3, ISBN: 0688019935.

Every Tree for Itself

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