

# Tree Factory

By acting out the parts of a tree, students will learn about the structure of a tree. They create a tree factory.

Activity  
**63**

## Levels

Activity: Grades 3-6

Variation: Grades PreK-2

## Subjects

Science, Physical Education,  
Performing Arts

## Concepts

- Populations of organisms exhibit variations in size and structure as a result of their adaptation to their habitats. (4.1)
- The structure and scale of an ecosystem are influenced by factors such as soil type, climate, availability of water, and human activities. (4.2)

## Skills

Ordering and Arranging,  
Representing, Identifying  
Attributes and Components,  
Comprehending



## Differentiated Instruction

Prior Knowledge, Curricular/  
Personal Connections, Paired/  
Cooperative Learning, Key  
Vocabulary, Higher Order  
Thinking, Oral/Reading/  
Writing Skills



## Technology Connections

Digital/Video Cameras,  
Presentation Software, Graphic  
Organizer Software

## Materials

Slips of paper, paper sack, tape  
(optional), yarn or string, art  
supplies (see "Assessment  
Opportunity")

## Time Considerations

Preparation: 20 minutes  
Activity: 50 minutes

## Related Activities

*The Closer You Look, Bursting  
Buds, Looking at Leaves, How  
Plants Grow, Soil Stories, Trees  
in Trouble, To Be a Tree*

## OBJECTIVE

- Students will understand the structure of a tree and how different parts of a tree help the tree function.

## ASSESSMENT OPPORTUNITY

- Pass out art supplies such as drawing paper, scissors, construction paper, toilet paper rolls, straws, aluminum foil, scissors, and tissue

## BACKGROUND

From a tree's tiny **root hairs** buried in the ground to the highest leaves in its **crown**, each part of a tree plays a role in helping it to function. Here's a rundown of the various parts of a tree and what each one does:

### Leaves

Leaves are the food factories of a tree. Using energy from the sun, which they capture with a pigment called **chlorophyll**, leaves convert carbon dioxide and water into oxygen and sugar (food!). This

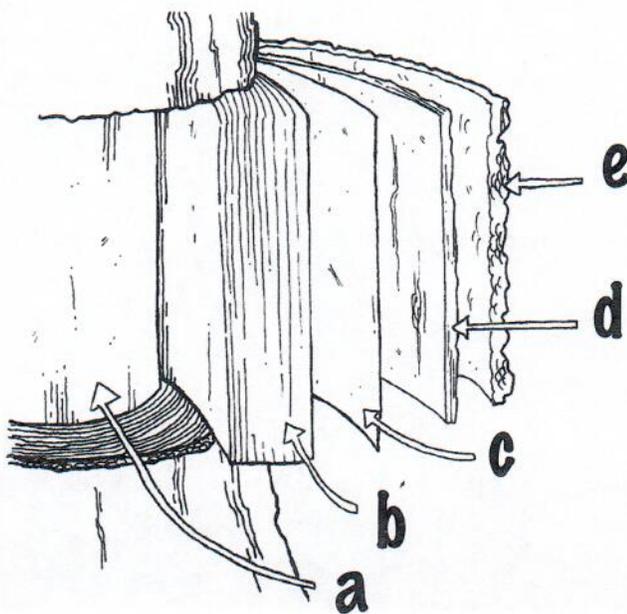
process is called **photosynthesis**. The gases needed for and generated by photosynthesis enter and exit through tiny holes called **stomata**, on the under surface of the leaves. Water vapor also exits through the stomata in the process of **transpiration**.

### Trunk and Branches

The trunk provides support for branches, which in turn support the tree's leaves. The trunk and branches contain the tree's "pipes"—the tubes that transport water and nutrients to the leaves, and sugar from the leaves to the rest of the tree.

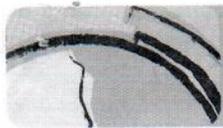
They also contain the growing layer of the tree that makes the trunk, branches, and roots of the tree thicker each year. Here's a look at a tree trunk from the inside to the outside and a description of what each layer does: (see diagram)

### Tree Trunk Layers



**a. Heartwood** forms the central core of the tree, is made up of dense dead wood, and provides strength for the tree.

**b. Xylem**, (*ZYE-luhm*), also called sapwood, carries water and nutrients up from the roots to the leaves; older xylem cells become part of the heartwood.



c. **Cambium** (KAM-bee-uhm), a very thin layer of growing tissue, makes cells that become new xylem, phloem, or cambium.

d. **Phloem** (FLOW-uhm), also called the inner bark, carries water and the sugar made in the leaves down to other parts of the tree such as roots, stems, buds, flowers, fruits.

e. **Bark** protects the tree from injury caused by insects and other animals, by other plants, by disease, and by fire; bark characteristics vary from species to species (for example, it may be thin, thick, spongy, rough, smooth, covered with spines, and so on, depending on the type of tree).

### Roots

A tree's roots help anchor the tree in the ground. They also absorb water and nutrients from the soil. Trees have lateral roots that spread out from the tree and cover a broad area. Some trees also have a **taproot** that grows straight into the ground. As a tree's lateral roots grow away from the tree, they branch into finer and finer roots called **rootlets**. The rootlets themselves are, in turn, covered by even finer **root hairs**. These root hairs absorb approximately 95 percent of the water and nutrients absorbed by the tree.

#### GETTING READY

1. Write the following parts of a tree on separate slips of paper and put them in a sack. (We've included enough parts for a group of 30 students. You may need to adjust the numbers depending on the size of your group. For much smaller groups, you could create a "cross section" view of the tree with just one or two students representing each part.)



Heartwood	(1)
Xylem	(3)
Lateral roots	(3)
Cambium	(5)
Phloem	(6)
Bark	(8)
Leaves	(4)
Total =	30 slips of paper

2. Make four branches for your tree by cutting yarn or string into four 6-foot (1.8-m) lengths.
3. Find a large, open area where the students can build the tree.
4. For the Variation, you will need to find an outside area that has a tree and enough space to allow the students in your group to spread out and sit on the ground.

#### DOING THE ACTIVITY

Act #1

1. Ask students what people need to survive (food, water, air). Identify parts of the body that help provide those basic needs (for example, nose to breathe, mouth to eat). Explain that trees are like people in many ways.

*Note:* Throughout the activity, as new terminology is introduced, relate it to the human body to provide connections (heartwood = heart; xylem, cambium, phloem = veins; taproot = feet; lateral roots = toes; bark = skin; leaves = hands).

2. Ask the class to think about trees and what they need to survive. (Food, sun, water, air, and space) List the ideas on the board. When students have completed the list, ask them how the tree gets these things, especially since trees can't move around the way most animals can. For example, ask students how a tree gets the water it needs.

- Where does the water come from?
- How does it get into the tree?
- How does it get around to all parts of the tree?
- How do trees get the food they need?
- How do they keep from blowing over in the wind?

3. Use the Background information to answer the questions raised in Step 2.

4. Tell students that they're going to create a tree by acting out the tree parts they just discussed. Have each student pick one slip of paper from

the sack (prepared earlier) to find out what role to play in the tree. Take students to an area with lots of space to build the tree.

5. Ask students what makes up the center of the tree and gives the tree strength. (heartwood) The students portraying heartwood should stand in the center of an open area, tighten their muscles, and chant, "I support; I support."

6. Ask students what tree part transports water to all parts of the tree. (xylem) Have the xylem students join hands to form a small circle around the heartwood. Have these students chant, "Gurgle, slurp. Gurgle, slurp. Transport water," as they raise their joined hands up and down.

7. Ask students where the water in the xylem comes from (it's absorbed by the roots). Then have the taproot sit down with his or her back against the xylem, and have the lateral roots lie down on the ground with their feet toward the xylem and their arms and fingers spread out to represent root hairs. Have the roots make sucking noises.

8. Ask students where the water in the xylem travels (to the leaves). Then have the heartwood hold the ends of the four pieces of yarn or string that you cut earlier. Give the other end of each piece to a different student who represents leaves. Ask the leaves what they do all day (make food through photosynthesis). Have the leaves flutter their hands and chant, "We make food; we make food."

9. Ask the leaves what happens to all the food they make using sunlight, air, and water. (It gets transported to the rest of the tree.) Ask everyone what part of the tree transports the food from the leaves to the rest of the tree. (phloem) Have the phloem students join hands and form a large circle around the tree. Then have them simulate the role of the phloem by reaching above their heads and grabbing (for food), and then squatting and opening their hands (releasing the food) while chanting, "Food to the tree!"



10. Ask students if they've left out an important part of the tree. What layer produces new xylem and phloem to keep the tree growing and healthy? (cambium) Have the cambium students form a circle between the phloem and the xylem. Tell them to sway from side to side and chant, "New phloem, xylem, and cambium. New phloem, xylem, and cambium."

11. Ask students what final component of their tree is missing—it's something that protects the tree. (bark) Have the bark students lock arms and form a circle that faces out from the center of the tree. Ask them to look tough. Have them march in place chanting, "We are bark. Please keep out."

12. When the tree is completely assembled, have all students act out and chant their parts simultaneously. If you want, you can end the session by telling the students their tree is old and falls over. Let everyone carefully fall down.

Activity adapted in part from Cornell, Joseph. *Sharing Nature with Children II*. Nevada City, CA: Dawn Publications. 1989.

## Variation

1. Ask students to name things that living things need to survive (sun, air,

water, food, and space). List their ideas on the board. They will now go outside and find out how members of one group of living things (trees) get the things they need to survive.

2. Take students outside and have them sit down around a tree. Ask how trees get the water they need.
  - Where does the water come from? (rain, snowmelt, groundwater)
  - How does it get into the tree? (It's absorbed by the roots.)
  - How does it get around to all parts of the tree? (Tiny "pipes" in the xylem carry water to the trunk, branches, and leaves.)

As the students discuss each question, have them act out the answers. For example, they can simulate rain falling by patting their hands on their legs or the ground, they can simulate roots by lying on their backs with their arms and legs spread out as they make slurping sounds, and they can simulate xylem chanting, "Gurgle, gurgle, gurgle. Water to the tree."

3. Next, ask students where trees get the food they need to survive. Do they chase after animals? Grab things with their branches? (No! They make their own food in their leaves by using energy from the sun.) Then have the stu-