Objective: Students will understand the structure of a tree & how the different parts help the tree function.

Vocabulary & Background Information~

***Leaves***: Leaves are the food factories of a tree. Using energy from the sun, which leaves 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 exits through the stomata in a process of **transpiration**.

***Trunk and Branches***: The trunk provides support for the branches, which support the tree’s leaves. The trunk and branches contain the tree’s “pipes” or 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 make the trunk, branches, and roots of the tree thicker each year. Looking at a tree trunk from the inside out…

1. **Heartwood** the core or heart of the tree, is made up of dead wood, & provides strength.
2. **Xylem** (ZEYE-luhm), also called sapwood, carries water & nutrients up from the roots to the leaves; older xylem cells become part of the heartwood.
3. **Cambium** (KAM-bee-uhm), a thin layer of growing tissue, makes cells that become new xylem, phloem, or cambium.
4. **Phloem** (FLOW-uhm), inner bark, carries water & sugar made in leaves down to other parts of the tree like roots, stems, buds, flowers, fruits.
5. **Bark** protects the tree from insects & other animals, harmful plants, disease, and fire; bark characteristics vary from species to species (it may be think, thick, spongy, rough, smooth…).

***Roots***: A tree’s roots anchor the tree to the ground & absorb water & nutrients from the soil. Trees have **lateral roots** that spread out over a large 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**. Rootlets are covered by even finer roots called, **roothairs**. Roothairs absorb 95% of the water & nutrients absorbed by the tree.

Materials needed:

1. Write the parts of a tree on separate cards (include enough cards for the number of students you’re working with). For a class of 30~heartwood-1, xylem-3, lateral roots-3, cambium-5, phloem-6, bark-8, leaves-4
2. Make 4 branches by cutting yarn or string into 4-six foot pieces.
3. Find a large, open area where the students can build the tree.

Doing the Activity:

1. Ask students what people need to survive (food, water, air). Identify parts of the body that help provide those basic needs (nose to breathe, mouth to eat). Explain that trees are like people. Relate new vocabulary of the tree parts to the human body to provide connections (heartwood=heart; xylem, cambium, phloem=veins; taproot=feet, lateral roots=toes; bark=skin; leaves=hands).
2. Ask students to think about trees and what they need to survive (food, sun, water, air, and space). List their ideas on the board. Ask them how trees get these things, *“How does a tree get 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 trees keep from blowing over in the wind?”*
3. Tell students they’re going to create a tree by acting out the tree parts just discussed. Each student picks a card to find out what role to play in the tree.
4. Ask “What makes up the center of a tree and gives it strength (Heartwood)?” The student with the heartwood card stands in the center of the open area, tightens their muscles and chants, “I support, I support”.
5. Ask, “What tree parts transports water to all parts of the tree (Xylem)?” Have the xylem students join hands to form a small circle around the heartwood chanting, “Gurgle, Slurp. Gurgle, slurp. Transport water.” As they raise their joined hands up and down.
6. Ask, “Where does water in the xylem comes from (it’s absorbed by the roots)?” Have the taproot sit down with his or her back against the xylem, & have the lateral roots lie down on the ground with their feet toward the xylem & their arms & fingers spread out to represent root hairs. Have them make sucking noises.
7. Ask, “Where does the water in the xylem travel to (to the leaves)?” Then have the heartwood hold the string/yarn. Give the other end of each piece to a different student who represents the leaves. Ask the leaves what they do all day (make food through photosynthesis). Have the leaves flutter their hands & chant, “We make food, we make food.”
8. 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 & form a large circle around the tree. Then have them simulate the role of the phloem by reaching above their heads & grabbing (food) then squatting & opening their hands (releasing food) while chanting, “Food to the tree!”
9. What layer produces new xylem and phloem to keep the tree growing & healthy (cambium)? Cambium student form a circle between the phloem & xylem. They sway side-to-side chanting “New phloem, xylem, & cambium. New phloem, xylem, & cambium.”
10. What final component of the tree is missing-it protects the tree (bark). Have the bark students lock arms & form a circle that faces out from the center of the tree. Look tough & chant, “We are bark, please keep out!”
11. When the tree is completely assembled, have all students act out & chant their parts simultaneously.

Assessment: Pass out tree handouts. Students label the parts & functions of a tree.

Vocabulary word definitions

**Leaves** are the food factories of a tree.

**Chlorophyll** is a green pigment in leaves that allow leaves to capture energy from the sun.

**Photosynthesis** is the process where leaves convert carbon dioxide and water into oxygen and sugar (FOOD!).

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 exits through the stomata in a process of **transpiration**.

The **trunk** provides support for the **branches**, which support the tree’s leaves. The trunk and branches contain the tree’s “pipes” or 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.

**Heartwood** is the core or heart of the tree and provides the tree’s strength.

**Xylem** (ZEYE-luhm) carries the water and nutrients up from the roots to the leaves.

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

**Phloem** (FLOW-uhm) carries water and sugar made in the leaves down to other parts of the tree like roots, stems, buds, flowers, and fruits.

**Bark** protects the tree from insects and other animals, harmful plants, disease, and fire.

**Roots** anchor a tree to the ground and absorb water and nutrients from the soil. Trees have **lateral roots** that spread out. Some trees have a **taproot** that grows straight down into the ground. Finer and finer roots that grow off lateral roots are called **rootlets**. Rootlets are covered by even finer roots called, **root hairs** which absorb 95% of the water and nutrients absorbed by the tree.