



Build a Tree by Joseph Cornell **With discussion questions from the Teva Learning Center**

Objective: Students will work together to demonstrate the anatomy and functioning of a tree.

How it works: This game has a magical power to create joyous camaraderie, as well as teach tree biology. It's amazingly effective for drawing a group together. Players act out the various parts of a tree: the taproot, lateral roots, heartwood, sapwood, phloem/cambium, and bark. In large groups, more than one player can take each role.

The heartwood section pantomimes providing strength and support for the tree. The roots (taproot and lateral) anchor the tree in the ground and draw up water and trace minerals. The sapwood carries water up to the branches and leaves. The cambium is the growing part of the tree. The phloem carries the food from the leaves to the rest of the tree, and the bark protects the tree.

HEARTWOOD: To begin play, choose two or three tall people and ask them to play the heartwood. Have them stand with their backs to each other. Tell the rest of the group, "This is the heartwood - the inner core, the strength of the tree. The heartwood's job is to hold the trunk and branches upright so the leaves can get their share of the sun. The heartwood has been around a long time - so long that it's dead; but it's well preserved! The heartwood used to be alive, but its thousands of little tubes that carried water up and food down are now all clogged with resin and pitch." Tell the heartwood players that their job is to "stand tall and strong." They can beat a hand against their chest and sing a "boom" heartbeat.

TAPROOT: Next, ask several people to play the taproot. Tell them to sit down at the base of the heartwood, facing outward. Tell them: "You are a very long root, called a taproot. Plant yourself deep in the ground - about thirty feet. The taproot enables the tree to get water from the deep in the earth, and also anchors the tree firmly to the ground. When storms come, the taproot keeps the tree from being blown over by high winds." Be sure to say that not all trees have a taproot (e.g., redwoods), but that this one does. They can bring their knees towards their chest and make slurping sounds as they draw water and nutrients.

LATERAL ROOTS: Choose people with long hair who look as if they won't mind lying on the ground. Ask the "lateral roots" to lie on their backs with their feet up against the trunk and their bodies extending away from the tree. Tell them: "You are the lateral roots. There are hundreds and hundreds of you. You grow outward all around the tree, like branches but underground. You also help hold the tree upright. At your tips are tiny root hairs." They can suck and draw water and nutrients as well.

At this point, kneel beside one of the lateral roots and spread his hair out around his head. Continue your narrative: "Trees have thousands of miles of root hairs that cover every square inch of soil into which they grow. When they sense that there is water nearby, the cells grow toward it and suck it up. The tips of the root hairs have cells as tough as football helmets. I want the lateral roots and taproot to practice slurping up water. When I say 'Let's slurp!' you all go like this. (Make a loud slurping noise.) Okay, let's hear you slurp!"

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Xylem: Now ask a small group of people to play the xylem. Choose enough people to form a complete circle around the heartwood. Have them circle the heartwood, facing inward and holding hands, being careful not to step on any roots! Tell them: "You are part of the tree called the xylem. You draw water up from the roots and lift it to the tree's highest branches. You are the most efficient pump in the world, with no moving parts. You're able to lift hundreds of gallons of water a day, and you do this at speeds of over 100 miles an hour! After the roots slurp the water from the ground, your job is to bring the water up the tree. When I say 'Bring the water up!', you go like this: 'Xylem!' (ascending in pitch and volume) (As they do this, they throw their arms up into the air.) Let's practice. First we'll have the roots slurp. "Let's slurp!" Follow this immediately by commanding the xylem, "Bring the water up! Xylem!"

CAMBIUM: Select a group to play the cambium. Have them form a circle around the sapwood, also facing inward and holding hands. Tell them: "Toward the inside of the tree from you is the cambium layer, the growing part of the tree. Every year it adds a new layer to the xylem and phloem. A tree grows outward from its trunk, and also from the tips of its roots and branches. The cambium can hold hands and shake their butts singing "We make cells! Cha Cha Cha!"

PHLOEM: Behind you, toward the outside of the tree, is the phloem. This is the part of the tree that carries food manufactured by the leaves and distributes it to the rest of the tree. Have them stretch their arms upward and outward so that they intersect each other's arms at wrists and forearms, leaving their hands free to flutter like leaves.

"When I say 'Let's make food!' raise your arms and flutter your leaves and absorb the energy from the sun and make food. And when I say 'Bring the food down', you go 'Whooo!'" (Make the 'Whooo!' a long, descending sound while you bend at the knees and drop your arms and body toward the ground.) "Let's practice."

Go through all the sounds and motions with all the parts, in this order: "Let's slurp!" "Let's make food!" "Bring the water up!" "Bring the food down!" (Notice that the cambium/phloem ring makes food before the sapwood brings the water up. Make sure also that they don't raise their arms and flutter their leaves until you say "Let's make food." This way their arms won't get tired.)

BARK:

Ask the remaining people to play the bark. Have them circle around the tree, facing outward. Tell them: "You are the bark. What kind of dangers do you protect the tree from?"

Suggest fire, insects, extreme temperature changes, and little boys and girls with pocket knives. Tell the bark how they protect the tree: "Raise your arms like a football blocker with both elbows out and both fists close to the chest. (Pause) Do you hear that high pitched sound? It's a feisty and very hungry long-snouted pine-borer. I'll go and see if I can stop it. If I don't come back, you'll have to stop the pine-borer yourselves."

Disappear behind a tree and come out as a pine-borer. Ham it up by scowling, using branches for your antennae, and turning your head back and forth. Zero in with your antennae and point your long borer-snout toward the tree. Now run or walk quickly around the tree, pretending to try to penetrate the bark's protective layer. The "bark" people should try to fend you off.

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Additional Program Ideas: If you have enough students (you can meet another group to do it) you can also have a few students play **Mycorrhizal Fungae**- Fungus that is intertwined with the tree's root hairs which gives water and nutrients to the tree and take sugars. You can take the group/tree through the seasons, slowly awakening as the sap starts flowing in the late winter, building up to spring and full-blown growth in summer and dormancy in late fall.

Some Teva suggestions for Post Activity Discussion:

- ☆ Every week in Shabbat morning services we sing *etz chayim he* (she is a tree of life). Who or what is the “she”? Is there a tree IN your synagogue? (Hint: what are we putting in the *aron*/ark when we sing *etz chayim he*?) Yes, the Torah!
- ☆ Why do we call our Torah an *etz chayim* – a “living tree”? How is the Torah “alive”? How is our Torah like a tree? Think about the parts of a tree that you just learned (review, if needed). What is the newest part of the tree? What is the newest part of Torah or Judaism? What is our heartwood? Our roots?
- ☆ If the discussion is going well...continue!
 - Ecologically, what are trees doing this time of year? How can we protect and help trees? The Torah guides us in learning how to be a good person year-round. How else do trees help us? (*reducing the carbon dioxide in the atmosphere and giving us oxygen to breath, providing peaceful beautiful places to read, pray, climb, providing habitat and food for wildlife, giving us shade, fruit, wood, paper, medicines, rubber, etc.*)
 - What are Jews doing this time of year – any holidays? What month and season are we celebrating in the Jewish (agriculturally-based) calendar? (E.g., “We are celebrating Hag Ha’Aviv/the Festival of Spring/Passover,” or “We are counting the Omer – counting the 49 days between Passover and Shavuot, from the barley to the wheat harvests,” or “We just ended the outdoor harvest holiday of Sukkot,” or “We are about to celebrate Tu Bishvat – the birthday of the trees,” etc.)

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