



Tree Friends

Program Purpose:

The purpose of this program is to introduce students to tree structure and use.

Length of Program: 1½ hours

Age: Grades 2nd – 5th

Maximum Number of Participants: 20

Objectives:

After completion of all activities, students will be able to:

- Identify their special tree using all senses except sight.
- Compare and contrast the value of a standing tree to a harvested tree.
- Identify six different internal parts within a cross section of tree trunk (bark, phloem, xylem, cambium, heartwood, and roots).
- Compare and contrast a fictional story of tree use to actual tree use
- Explore their feelings and values related to trees and tree use.

Preparation:

Before the class arrives:

- Obtain “Tree Friends” kit from the storage room.
- Make sure exhibit room (“Tree of Life”) is available.

Basic Outline:

Choose age appropriate activities.

- I. Introduction (5 minutes)
- II. “Meet-A-Tree” (20 minutes)
- III. “Tree Factory” (25 minutes)
- IV. Water and Trees
- V. Oxygen and Energy
- VI. Song – Parts on a Tree
- VII. Exploring the “Tree of Life” (10 minutes)
- VIII. Tree Parts Quiz (10 minutes)
- IX. Reading of *The Lorax* or *The Giving Tree* (15 minutes)
- X. Discussion & Conclusion (5 minutes)

Materials:

10 Blindfolds
Nametags for “Tree Factory”
Triangular tree cookie exhibit
The Lorax or *The Giving Tree* book
3 different noisemakers
Paper and Pencils

Introduction:

Introduce yourself and the class. Briefly overview the activities of the class: meeting your own personal tree friend, learning the internal parts of a tree and becoming a functioning tree factory, and hearing a fun story about the importance of trees, followed by a discussion of your own feelings and values towards trees.

“Meet-A-Tree”:

This activity can be conducted from the sandlot, but may also be used as a trail activity (try to pick a spot with a diverse stand of trees). Pair up students and hand each pair one blindfold (in the winter, hats and scarves may be used as blindfolds). The seeing partners will carefully guide their blindfolded partners to any tree. Once there, the blindfolded partner should explore the tree as completely as possible, using all senses except sight. Encourage the students to feel the bark and try to put their arms around the tree. Reach high for the lowest branch (can they touch any leaves?) and crouch low to explore the roots. Is there moss or lichen growing on the trunk of the tree? Can they feel any insects on the tree or holes where insects might live? What does their tree smell (taste?) like? They can even name their tree. When the blindfolded partners are sufficiently acquainted with their trees, the seeing partners should lead them back to the starting point, remove the blindfolds, and challenge their partners to find their trees again. The students can play “warmer or colder” if their partners need help. Once the trees have been successfully found, the partners switch.

“Tree Factory”:

Remain in the sandlot for this activity. Introduce the concept of a cross section of wood, and pass around the tree cookies as examples. Tell the students that in the next 20 minutes, they will magically become a fully functioning cross section of tree, complete with all the working parts. Each student will play a role and receive a nametag, picked from a bag. Each role has a different sound and action to make. Explain that we will start in the center of the tree and work our way out. (Numbers of students playing each role will vary with the size of the group.) *For younger student they can simulate the actions all together. Just roots, sapwood, leaves, heartwood, bark, rain, seeds.*

Heartwood (1 person)

Heartwood makes up most of the trunk and s
tree; giving it its shape and strength. It is m
dead xylem cells. After a few years the sapwood in most

trees gets filled in with resin-like material and slowly changes into heartwood. It is darker in color than sapwood. It acts as the central “plumbing system” in the tree, forming a network of tubes that carry water and minerals up from the roots to the leaves, and food (sugar) from the leaves down to the branches, trunk and roots. A tree that has had its heartwood hollowed out by insects or disease may bend and break during high winds.

ACTION: Stand in the center of the circle and beat chest. Look tough and strong.

SOUND: “Boom boom, boom boom...” (Heart beating) or “I support, I support”

Roots (2 people)

The roots are underground branches that take up water, minerals, and nutrients from the soil. They also help to anchor the tree in place by firmly holding onto the soil. Large taproots and lateral roots branch into smaller and smaller roots. An average tree has millions of these small rootlets, each covered with thousands of fine root hairs. The root hairs make it easier to soak up water and dissolved minerals from the soil, accounting for about 95% of all that the tree absorbs. Most of the rootlets lie very close to the surface of the ground where most of the water and nutrients are located.

ACTION: Sit at the feet of the heartwood, on opposite sides, facing outward. Pump knees up and down. Look thirsty.

SOUND: Slurping noises

Brake down into taproots (1) and lateral roots (2)

ACTION: The taproot sits down with their back against the sapwood and have the lateral roots lie down on the ground with their feet toward the sapwood and their arms and fingers spread out to represent root hairs.

SOUND: Sucking sounds

Xylem/Sapwood (3 people)

The xylem is made up of the youngest layers of wood and transports water, nutrients, and minerals from the roots to all parts of the tree. The xylem also makes up the bulk of the trunk of the tree. Dead xylem becomes heartwood. Living xylem is also called *sapwood*.

ACTION: Form a ring holding hands around the heartwood (may have to straddle the roots). Still holding hands, crouch down and make the sound while standing up.

SOUND: Musical “xylem” climbing note or “Gurgle, slurp, gurgle, slurp”

Cambium (4 people or 5)

The cambium is a single layer of cells that produce new xylem and phloem cells. You would need a microscope to see it well. The cambium is what makes the trunk, branches, and roots grow thicker.

ACTION: Form a ring around the xylem, but don’t hold hands. Wiggle butts while making the sound. Or Hold hands and sway side to side.

SOUND: Chant: “We make cells!” or “new phloem, sapwood and cambium”

Phloem (5 people or 6)

The phloem is a thin layer that acts as a food supply line transporting sap (water containing dissolved sugars and nutrients) made in the leaves to all parts of the tree, including the roots. It also transports sap up from winter storage in the roots to the buds in the spring so new growth can occur. (example: the sap of sugar maples rises from the roots and is tapped by people to make maple syrup). Dead phloem becomes part of the outer bark. Living phloem is also called *inner bark*. If you were to cut a band around the trunk, through the bark and phloem, the tree would probably die. That’s because the phloem would be severed and food could no longer flow to the lower trunk and roots.

ACTION: Form a ring around the cambium, holding hands. Make sound while crouching down. Or Reach above their heads, grab for food then squat down and open hands.

SOUND: Musical “phloem” descending note or “Food to the tree”

Bark (remaining students, minus 1 or 8)

The bark protects the tree from invading diseases and insects. Some trees have very thick bark that helps prevent damage from fires. Others have bad-tasting chemicals in their bark that discourages hungry insects. And some bark is covered with spines or thorns that keep browsing mammals away. Dead phloem cells become bark.

ACTION: Form a ring around the phloem, holding hands, facing out.

SOUND: Chant: “We protect, *woof!*” or “We are bark, please keep out”

Leaves (4)

From skinny pine needles to broad palm leaves they all serve the same purpose – to make food for the tree. They use carbon dioxide from the air, water from the roots, and energy from sunlight to make glucose. This process of photosynthesis can only take place in the presence of chlorophyll – the green pigment found in all green plants. Chlorophyll absorbs the sunlight needed. During photosynthesis leaves release oxygen.

$CO_2 + H_2O + \text{sun energy} = \text{glucose} - O_2$

ACTION: Have the heartwood hold the ends of four pieces of string. Give the other end of each piece to a different leaf. Flutter their hands.

SOUND: “We make food, we make food”

Before you bestow the final role on the last student, take the tree through the four seasons. (Make sure to tell the last student that you have a very special role that you are saving for him/her.)

Spring: The tree factory comes to life, very slowly. Each person makes the appropriate sounds and actions in slow motion.

Summer: The tree factory is in full swing! Everyone plays his or her roles loudly and vigorously.

Fall: The tree factory slows down again. Each person makes the appropriate sounds and actions in slow motion.

Winter: The tree factory is dormant. No one moves or makes a sound.

Instruct the tree factory through 1 ½ cycles, to the second summer. Then introduce the final role:

Wood boring beetle (1 person)

Many insects, including this one, attempt to burrow into trees to eat the sap, lay eggs, and make a home inside the tree. Once holes are made, they become entry points for disease and other insects.

ACTION: Attack the tree to reach the heartwood.

Attempt to find a weakness in the bark and enter the tree.

SOUND: Gnawing sound

Water and Trees:

Trees, like all living things, could not survive without water. Here are some of the reasons that water is so important to a tree:

- A large percentage of each living cell in a tree is made up of water
- Water helps move dissolved minerals and gases from cell to cell
- Water pressure inside a leaf's cells helps maintain the leaf's shape
- Water is needed in order for photosynthesis to occur
- Water carries dissolved sugars down through the phloem to the branches, trunk and roots

Although trees use a lot of water every day, they also lose a lot of water. About 99% of the water the roots absorb from the soil evaporates from the leaves through a process called transpiration – evaporation through tiny pore – stomata. As water evaporates, it pulls up more water from the roots to the leaf. This “transpiration pull” is one of the things that help move water and minerals through the tree and help keep trees cool in hot weather.

Oxygen for Energy:

Tree cells need oxygen in order to break down the sugar and release the energy they need to grow. All surfaces of the tree absorb oxygen, even the roots, that's why many trees drown if their roots become waterlogged.

The Parts of the Trees ~ tune *Wheels on the Bus*

1. Ask the kids to compare their bodies to the parts of a tree.
Example:
Roots=Feet
Tree trunk=Legs/Trunk

Branches=Arms

Leaves=Hands/Fingers

2. Discuss the function of seeds. Ask the kids to describe any experiences they have had planting seeds and watching them grow.
3. Review each tree function in the song individually. Ask the kids to suggest movements for the different stages.

The roots on the trees go

Slurp, slurp, slurp (possible movement: pump front part of feet up and down)

Slurp, slurp, slurp

Slurp, slurp, slurp

The roots on the trees go

Slurp, slurp, slurp

All around the town.

The trunks of the trees grow

Strong and straight (possible movement: stand very straight and pump out chest)

Strong and straight

Strong and straight

The trunks of the trees grow

Strong and straight

All around the town

*The bark on the tree protect the tree
(Possible movement: hug your body)

*The branches on the trees reach for the sky
(Possible movement: reach upward with arms)

*The leaves on the trees make food, food, food (Possible movement: with arms stretching upward, stretch out hands/figures while clenching and unclenching figures in a pulling-in movement)

*The seeds on the trees can grow a new tree
(Possible movement: crouch down, then stretch upward while spreading arms in a fan shape)

Exploring the “Tree of Life”:

Bring the class to the exhibit room in the nature center. Have the students take off their shoes before entering the “Tree of Life.” Before you allow them to enter, tell them to look for a particular poster inside the tree, which will show the locations of all internal parts of a tree on a cross-section, or tree cookie. Tell them they will have a test after they are done exploring. Give them about 5-10 minutes inside the “Tree of Life.” (This is also a good time for the instructor to take a break.)

Tree Parts Quiz:

Call the group back together. Roll out the triangular tree cookie exhibit. As an assessment, ask the students to form a ring around the triangular exhibit and point to the different internal parts of the tree cookies as you list

them. For example, “Everyone please point to where you think the xylem is on any tree cookie.” Walk around to check if students are pointing correctly. After listing all the internal parts of the tree, ask the students to find insect damage on a tree cookie. After the assessment, have all the students sit on one side of the exhibit and show them the correct positions of the internal parts on several tree cookies. This is also a good time to talk about the process of **girdling** trees. Girdling occurs when an animal or person removes the outer layers of the woody stem, including the bark, phloem, and perhaps cambium. When a ring of tissues is stripped off from the entire circumference of the tree, the phloem can no longer conduct sap down to the roots, and the tree will die. Once students know the position of phloem (right underneath the bark), it should become clear why girdling can cause tremendous damage to trees.

Reading of *The Lorax*:

Teaches about tree conservation.

Have the students sit in a semicircle on the floor while you read *The Lorax* or show the video or slide show. If time permits, ask students if they would like to take turns reading. You can also ask the teacher or a parent chaperone if they would like to read. A fun adaptation to add is to assign roles to different students. The Lorax character stands with a fist in the air and says, “I speak for the trees!” Give different noise-makers to the Swomee-Swans, Brown Bar-ba-loots, and Humming-Fish. Afterwards, use the following discussion questions to help students explore how the characters in this fictional story are similar to and different from us.

1. Why did the Onceler cut down the truffula trees?
2. Are thneeds good?
3. Did the others in the story care that the truffula trees were disappearing?
4. Who valued the thneeds?
5. Who suffered as a result of thneed production?
6. Did the Onceler care about the negative side effects of thneed production?
7. What happens to the Onceler after the last truffula tree is cut down?
8. What should the Onceler have done differently, if anything?
9. What should the consumers of the thneeds have done differently, if anything?
10. What are our ‘thneeds’?
11. Are you an Onceler in any way?
12. Are you like the Lorax in any way?
13. What other things have no tongues, like the truffula trees? Would you speak for them?

Reading *The Giving Tree*:

Illustrates how a tree progresses through its life. Ask what value do trees have in the forest?

- Provides shade in summer for people and animals
- Provides shelter and homes for insects, birds, and animals
- Provides food for insects, birds, and animals
- Creates oxygen
- Absorbs carbon dioxide, a greenhouse gas
- Holds soil to prevent erosion
- Trees that drop their leaves add fertilizer to the soil
- A tree left standing can continue to grow to be harvested at a later date

What value do trees have if harvested?

- Wood can be burned for warmth and light
- Wood can be made into paper, furniture, and lumber

How would the students feel if they knew their favorite tree would be cut down? How would they feel if their tree were to die naturally and tip over? What value does a dead or rotting tree have in the forest?

- Provides shelter and homes for microorganisms, insects, birds, and animals
- Adds fertilizer to the soil as the wood decays

After this students should understand that trees, living or dead, standing or harvested, have many different uses.

Conclusion:

Review question can be used at the end to once again reemphasize the knowledge covered in this lesson.

- What part of the tree is like human skin?
- What function does the heartwood provide for the tree?
- Where is “tree food” made?
- What is needed to make “tree food?”
- What moves the tree’s food from the leaves to the roots?
- What does the sapwood do?
- Why do humans need trees?
- Can you name several products that are made from trees?

Ask the students to close their eyes and try to imagine what Upham Woods would look like without trees. Is treeless land pretty? Ugly? Neither? Which kind of land would the students appreciate more on a hot summer’s day? On a cold, windy day? In the fall? In the spring?

Have the students consider how they benefit from trees. Give each student a blank piece of paper; have each draw a small tree in the center. Have students draw eight lines radiating from the tree like the spokes of a wheel. On each line, have them write the name of something the tree give to them (examples: beauty, shade, protection

fro wind, furniture, pencils, paper, apples, something to play on).

Before the students leave, they must pass through the “Door of Knowledge.” Each student must tell you something new they learned in class. They must listen to each other’s answers because each answer must be different. If the students have trouble, prompt them with questions about the different internal parts of trees and their functions, the uses of standing vs. harvested trees, and what girdling is.

References:

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