

Rings of Time: Innovating K-12 Education with Dendrochronology Project

Lesson Title: What is Dendrochronology?

Grade Level: Second Grade

Lesson Length: 50 minutes

AZ Science Standard:	2.L2U1.9 Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive.
Learning Objective:	Students will be able to identify the parts of a tree ring. Students will be able to classify what a wide and narrow ring is through measuring and referencing classification values.

Vocabulary	Materials
<ul style="list-style-type: none"> • Dendrochronology • Pith • Early wood • Late wood 	<ul style="list-style-type: none"> • Presentation • Activity Sheets <ul style="list-style-type: none"> ○ Parts of a Tree ○ Structure of a Tree Ring ○ Measuring Tree Rings ○ Measuring Tree Rings Answer Key ○ Vocabulary Matching • Coloring utensils (<i>class set</i>) • Rulers (<i>class set</i>) • Blank paper (<i>class set</i>) • Kahoot
Guiding Questions: What is an annual ring? What are the six character traits that make a cross section most ideal to study? What makes a tree ring wide versus narrow?	

Engagement/Introductory Activity

The introductory activity leading into the lesson will occur as follows:

*Note: Teachers can optionally include the worksheet for students to fill out instead of the body movement activity or in addition to. If only doing the movement activity, **delete slides 3 and 4**. If only doing the worksheet, **delete slide 2**. If doing both, keep slides 2 - 4.*

Topic Addressed - The Parts of a Tree

Have students stand up so they can use their body to demonstrate the different parts of a tree.

- Teacher will ask students to plant their feet firmly into the ground
 - What does this represent on a tree?
 - The roots!
- Teacher will ask the students to stand up straight with their hand by their sides
 - What part of the tree is our strong body?
 - The trunk!
- Teacher will ask students to put their arms out in the air
 - What do our arms represent on a tree?
 - The branches!
- Teacher will ask students to wiggle their fingers tips
 - What do our moving fingers represent on a tree? When wind moves through a tree they move with the wind...
 - The leaves!

Students may sit back down and get ready for the exploratory activity...

Exploratory Activity 1

Topic Addressed - Structure of a Tree Ring

Teachers will pass out the “Structure of a Tree Ring” worksheet.

Students will attempt to label the parts and types of the tree rings using the word key.

In the next section, the teacher will go over the parts and types of the tree rings and help students fill in the blanks correctly.

Explain 1

Topic Addressed - Structure of a Tree Ring

Example introduction into this section of content that the teacher can choose to follow or adapt:

“Now that we have finished our worksheets, let's review the parts and types of tree rings. Up here (*show slide 6 to 7 while explaining this portion*) we see a cross section of a tree. This is a slice of the trunk of a

tree. Cross Sections are also called Tree Cookies or Tree Cores. Each cross section has multiple rings in it. Follow along on your worksheets as we go over parts of the cross section and parts of the rings within the cross section.”

Now use slides 8 to 16 to review the blanks on the worksheet, correlating vocabulary, and additional information:

Pith: the center of the tree cookie

The pith is the oldest part of the tree. (Yellow star on their worksheet)

Early Wood: the lighter part of the tree ring ; this grows during the first part of the trees growing season

Late Wood: the darker part of the tree ring ; this grows during the later part of the trees growing season

Slide 15 to 16:

- The early wood plus/with the late wood makes up one annual ring. This means that each ring equals one year of growth.
- The outermost ring is the youngest part of the tree. (Green triangle on their worksheet)
- The bark is the only living part of the tree.

Now teacher will move into discussing the ideal character traits a tree should have to be used in dendrochronology [Slides 17 to 23]:

“We have learned what a tree cross section is made up of. But how do we know this information in the first place? And what can we do with it? Is there anything the rings can tell us about trees? Well the field of dendrochronology is how scientists have found out this information. Can anyone guess what dendrochronology is?”

Define Dendrochronology: the science that deals with dating and studying the annual tree rings

Trees should have some characteristics to make them the most ideal to study. Here are those traits:

1. Has Rings - not all trees have rings because some, like the palm tree, are grasses!
 - a. *Image citation*
2. Distinct Ring Boundaries - this means you can see each ring clearly like in the picture.
3. Rings are Annual - it grows 1 ring per year.
4. Sensitive Growth - these are trees with rings that look different from one another every year.
 - a. Ask students: **Which picture do you think shows a tree with sensitive growth?**
 - b. Answer: **A**
5. Circular Shape
 - a. Ask students: **Which cross section is more ideal to study?**
 - b. Answer: **the circular one**
 - c. *Optional Question: Why do you think it's better to study the circle cross section? Because you can see the full ring all the way around the tree and it had uniform growth over its lifespan. It did not have events that caused it to start regrowing making it harder to tell how old it is.*
 - d. *Image citation*

6. Long Ring Record - this means the more rings it has the older the tree is so the further back in time we can count.

Exploratory Activity 2

Topic Addressed - Measuring Tree Rings

Teachers will pass out the “Measuring Tree Rings” worksheet, a ruler to each student/pair of students, and give each student two colors: one for the narrow rings and one for the wide rings.

Instruct students to take their rulers and measure the width of each ring for Tree Cookie A and B. Direct them to the correlating worksheet so they can fill out the corresponding questions. Make sure students...

- write which color they choose for narrow rings
- write which color they choose for wide rings
- color each tree cookie
- answer as many comparison questions as they can

Give students about 10 minutes to complete their worksheets.

Explain 2

Topic Addressed - Measuring Tree Rings

After students have finished their worksheets move into explaining the content expressed:
Use slides 25 to 31

What do the rings inside a tree tell us?

- The first ring around the pith is the “first year of growth” ring
- The rings tell us how old a tree is. Since each ring equals one year of growth, the more rings a tree has the older it is. **On your worksheets, what tree did you put to be the oldest?** (*B is right because it has more total rings*)

Remember that trees need sunlight for energy, water, and nutrients from the soil to grow. What happens if it does not get these things? Does it stop growing?

- No, it still grows but only a little bit.

So if it is only growing a little, what width do you think the tree rings will be?

- They will be more narrow! This means it had a hard year of growth with little nutrients, water, or sunlight.

And if a tree gets a lot of the things it needs, the tree rings will be...?

- They will be wide! This means it had a good year of growth with lots of sunlight, water, or nutrients.

For trees living here in Tucson, Arizona what resource is the most important for trees to grow?

- Water is the limiting factor

So what does that mean if we get more rain here?

- The rings in the trees here will be wider!

Optional Information: Scientists can use the number of rings a tree has and whether each year was good or bad to make a timeline of the resources available throughout history. For example, if we take Tree Cookie A on your worksheet and know that it started growing in the year 2000, we can see that it lived for 7 full years or until 2006. Then we can look at how many wide or narrow rings it has and count to figure out what year was good or bad for the tree. So, if the first ring is the year 2000, then the second ring is 2001. We see that the ring is narrow. So the year 2001 was a bad year with little resources for the tree.

Extension Activity/Questions

Topic Addressed - Create Your Own Tree Cookie

Note: Depending on which option teacher chooses delete or keep slide #32

Option 1: Have students make their own tree cookie!

Instructions:

1. Use a blank piece of paper or blank back of a worksheet
2. Pick how old you want your cross section to be
3. Draw a pith at the center
4. Now make circles around your pith for how many years old you want your tree cookie to be
5. Make some wide and some narrow for good and bad years
6. Now label!
 - a. Age
 - b. Wide rings
 - c. Narrow rings
 - d. Write what resource your tree was lacking to make its rings narrow

Option 2: Use the [attached document](#).

Evaluation Activity

Note: Depending on which activity teacher chooses delete slide #33 or #34

With whatever time is remaining in class, pass out the “Vocabulary Matching” worksheet and help students with any questions they have.

OR

Use the linked [Kahoot](#) to review the lessons vocabulary.