

Hardwood Lumber Lesson Plan

Keywords: hardwood , softwood , grading, dry-kiln, sawmill, and board foot

Lesson Plan Grade Level: 6th- 8th

Total Time Required For Lesson: 50 minutes (as one continuous time block)

Setting: Classroom

Subjects Covered: Science, Math

Topics: Wood Products, Lumber

Goals For The Lesson:

Students will be capable of identifying hardwood tree products.

Students will be competent of recognizing similarities and differences between hardwood and softwood trees.

Students will gain an understanding of the process of creating wood products.

Materials Needed:

Hardwood Lumber flier (from the Woods Series)

Hardwood Lumber Pretest (one for each student)

Hardwood Lumber Posttest (one for each student)

Hardwood tree leaves

Softwood tree leaves (needles)

Measuring tape

Paper (for math problems)

Chalkboard/ chalk

Appendix 1

State Standards Addressed: *E&E Standards: 4.2.7, 4.8.7*

Mathematics Standards: 2.2

Teaching Model: Experiential Learning Model (Experience, Share, Process, Generalize, Apply)

Methods:

Preparation:

Read through the entire lesson to ensure your understanding of the material and activities.

Be sure to have all the copies and materials before beginning the lesson.

Place the following words on the chalkboard (you may write them before or during the lesson):

Air dry
Debark
Cut
Transport to a sawmill
Saw into boards

The students will be placing these words in order later in the session.

Doing The Activity:

Introduction to the lesson:

“During today’s lesson we will be learning about hardwood trees and hardwood lumber products. Our goals will include identifying the differences and similarities between hardwood and softwood trees, understanding the process of creating hardwood lumber products, and recognizing hardwood products. Can anyone give me an example of a hardwood product? (allow a few minutes for responses) Now we are going to see how much you already know about hardwood lumber.”

Steps:

(Experience and Share Stages 18 minutes)

1. Administer the pretest to the students; explain that the purpose of the pretest is to test knowledge the students already have acquired on the subject. (allow approximately 7 minutes for the test then collect)
2. Ask the students if they would like to make any comments concerning the pretest.
3. Hold up the hardwood and softwood leaves to the class. Ask the students to describe the differences and similarities of the leaves. (all answers are acceptable as long as they are observable) If the students have not mentioned the type of leaves ask if they can identify the leaf type of each. (hardwood- broad and flat green leaves, turn colors and fall during Autumn/ softwood- needle-like, most stay green year round)
4. Explain to the students that they will be reading more about hardwood and softwood trees in the ‘Hardwood Lumber’ flier.
5. Hand out the flier to the students. Ask the students to read the flier silently. After they have completed the reading they should write down or be capable of citing three facts they had learned from the information.
6. When all the students have completed the reading, ask if there are any questions.

(Share and Process Stages 10 minutes)

7. Ask the students to share their facts (ask the students to listen carefully in order not to repeat).
8. Tell the students that they will be learning how to calculate board feet. A board foot is a standard unit of volume measure for lumber.
 - Board feet is measured 12 inches square and 1 inch thick; therefore one board foot is $1(12)(12)= 144$ cubic inches (you may want to ask the students if they can figure out how many cubic inches are in a board foot before giving them the answer). Write all the steps of the equation on the chalkboard.

9. Ask the students if they know how many board feet are required to build a house with 1,800 square feet of living space. (answer=10, 000 board feet) So if 10,000 board feet are required, how many boards that measured 2"x4"x 6' would be necessary to build the house? Explain to the students that if they were not successful in reaching the answer they will learn throughout the lesson. Let's try some examples first:

- Here are two basic equations to calculate board feet:

$$\frac{(\text{Length in feet})(12\text{in./foot})(\text{Height in inches})(\text{Width in inches})}{144 \text{ cubic inches}} = \text{board feet}$$

OR

$$\frac{(\text{Length in feet})(\text{Height in inches})(\text{Width in inches})}{12} = \text{board feet}$$

- If we had a 2"X4" measuring 10 feet long how many board feet would it contain. Ask the students to complete the math at their seats. (You may want to draw it on the board so the students can see the dimensions.)
- Monitor by walking around to see if any students require assistance.
- Once the students have completed ask a volunteer to write out the equation on the chalkboard. Go over the problem together and ask if there are any questions.
- There are 2 ways to compute the solution:
 - a. $\frac{(10\text{ft})(12\text{in./ft.})(2)(4)}{144 \text{ cubic inches}} = 6.7 \text{ board feet}$
 - b. $\frac{(10\text{ft})2\text{in}(4\text{in})}{12 \text{ in./ft.}} = 6.7 \text{ board feet}$

10. Ask the students to compute how many (approximately) 2"x4"x6' boards they would need to build a house. Ask a volunteer to share their answer and place the equation on the board:

$$a. \frac{(6')(12\text{in./ft.})(2'')(4'')} {144 \text{ cubic inches}} = 4 \text{ board feet}$$

OR

$$\frac{(6)(2)(4)}{12\text{in./ft.}} = 4 \text{ board feet}$$

$$b. \frac{10,000 \text{ board ft.}}{4} = 2500 \text{ boards}$$

- Once the students have completed ask a volunteer to write out the equation on the chalkboard. Go over the problem together and ask if there are any questions.

11. Explain to the students that most of Pennsylvania's hardwood lumber is used to construct furniture. If a dining room table (seats approximately 8 people) required 40 board feet how many 1"x6"x4' boards would you need to build the table? Ask a volunteer to share their answer and write the equation on the board.

$$a. \frac{(4ft) \cdot (12in/ft) \cdot (1in) \cdot (6in)}{144cubic\ in.} = 2\ board\ feet$$

OR

$$\frac{(4ft) \cdot (1in) \cdot (6in)}{12} = 2\ board\ feet$$

Therefore you would need 20, 1"x6"x4' boards:

$$b. \frac{40\ board\ feet}{2\ board\ feet} = 20\ boards$$

- If there is time remaining you may give the students additional board dimensions and ask them to determine the board feet.

12. Ask the students if there are any questions. Then ask the students if there are any real life situations where the information could apply (constructing furniture, purchasing wood, tree houses, etc.) Provide examples if the students do not.

13. Explain to the students that it is time to review the information.

(Generalize and Apply Stages 10 minutes)

14. Complete discussion questions (Appendix 1) to review for the posttest. Allow the students to refer to the flier if necessary.

15. Ask the students if there are any questions. Ask the students to discuss what they learned today.

16. Administer the posttest. Allow the students enough time to complete.

Assessment:

The students will be evaluated through participation during discussions and the activity. The students will be evaluated upon completion the posttest.

Conclusion To The Lesson: "This completes today's lesson on Hardwood Trees. Does anyone have any further comments concerning the lesson?"

References and Resources:

Hardwood Lumber flier
The Pennsylvania State University
112 Agricultural Administration Building
University Park, PA 16802

How to Estimate the Value of Timber in Your Woodlot
(West Virginia: West Virginia University 1989), 20.

This lesson was prepared by Katie Roth, Middle School Teacher and Sanford Smith, Extension Specialist Penn State School of Forest Resources.

Appendix 1 – Discussion Questions- Hardwood Lumber

1. What are the 2 categories of Pennsylvania trees? (*hardwoods/ softwoods*)
2. Who can describe a similarity (then a difference) between these trees? (*both grow in PA, in forests, have leaves etc.*)
(*Hardwoods- green, broad, flat leaves, fall off during autumn/ Softwoods- needle-like, usually remain green year round*)
3. Ask the students to define the following terms:
 - *grading- sorted and inspected for appearance and beauty*
 - *dry- kiln- a large, low temperature oven that is used to dry wood*
 - *debark- remove the bark*
4. What percent of the trees harvested in Pennsylvania are used to make hardwood lumber? (*70%*)
5. Ask the students to place the words on the chalkboard in order.
 - Cut*
 - Transported*
 - Debarked*
 - Air dried*
 - Kiln- dried*