3.E.1 Maple Trees – Structure

Creating sketches of maple trees' structures

Grade Level	3
Sessions	(1): 1 at 50 minutes
Seasonality	February or March
Instructional Mode(s)	Whole Class, Individual
Team Size	N/A
WPS Benchmarks	03.SC.TE.04, 03.SC.LS.06
MA Frameworks	3-5.TE.2.1, 3-5.LS.0.2
Key Words	Bark, Fruit, Leaf, Maple, Sketch, Twig

Summary

Students will study important structures of maple trees and will learn to sketch maple bark, fruit, leaves, and twigs. This lesson provides background information useful for continued study of maple trees and the maple sugaring process.

Learning Objectives

2002 Worcester Public Schools (WPS) Benchmarks for Grade 3

1. 03.SC.TE.04 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
2. 03.SC.LS.06 Study maple trees and go maple sugaring. Identify the structures in the maple tree and their functions.

2001 Massachusetts Frameworks for Grade 3

1. 3-5.TE.21 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
2. 3-5.LS.02 Study maple trees and go maple sugaring. Identify the structures in the maple tree and their functions.

Additional Learning Objectives

1. Students will be introduced to the vocabulary appropriate to discussing structures (see Vocabulary with Definitions) of maple trees.
2. Students will create sketches of various maple tree structures.

Required Background Knowledge

None

Essential Questions

1. What is a sketch (see Vocabulary with Definitions)?
2. Why is a sketch a good way to represent information?
3. How can a sketch show various structures of a maple tree?
4. What are the various maple tree structures?

Introduction / Motivation

The instructor might open a class discussion about how people use maple trees. The instructor may then introduce the idea of conveying information through sketches. Sketches are commonly used by scientists and engineers to (a) quickly record information, (b) to capture the essence of an object studied in the field, or (c) to create a working image of a particular thought.

Procedure

The instructor will:

1. Show students pictures or examples of maple trees. This can be done by reading an appropriate science textbook, by reading a children's book about maple sugaring (see Additional Resources), or ideally, by allowing students to examine real maple leaves, bark and twigs.
2. Ask students to use the attached worksheet (see Maple Trees – Sketching Structures) or a large sheet of paper to sketch the important basic structures of maple trees: leaves, twigs, bark, and fruit (see Vocabulary with Definitions).
3. As a class, discuss the function of each structure (see Vocabulary with Definitions). Consider allowing small groups of students to each present one maple structure and its function(s).

Materials List

Materials per class	Amount	Location
Examples of Maple Trees: in books; in pictures; or real leaves/bark/twigs/fruit	Varies	Outdoors, see Additional Resources

Materials per student	Amount	Location
Maple Trees – Sketching Structures Worksheet	One	End of lesson plan – print or photocopy

Vocabulary with Definitions

1. *Bark* – the tough outer covering of trees that protects the inside of trees, creates new plant cells, and transports fluids.
2. *Fruit* – the seed-bearing part of a plant; maple fruit is called “samara”.
3. *Leaf* – a usually flat, green, plant structure used in photosynthesis and transpiration (breathing).
4. *Maple* – a type of tree found in northern, temperate regions that (a) looses its leaves during the winter, (b) has hand-shaped leaves, and (c) has winged, paired fruits.
5. *Sketch* – a brief outline or overview drawing.
6. *Structure* – the arrangement of various plant tissues.
7. *Twig* – a small branch that bears buds, leaves, and sometimes the flowers and fruit of a woody plant.

Assessment / Evaluation of Students

The instructor may assess the students in any/all of the following manners:

1. Collect student worksheets to determine whether students understand the use, function, and proper construction of a “sketch”.
2. Collect student worksheets to determine the extent to which students understand and can recognize various maple tree structures.

Lesson Extensions

1. Ask students to bring to class maple leaves and fruit.
2. Study the processes of sap collection, sap boiling, and maple syrup production in detail.
3. Bring to class samples of a recipe created with maple syrup.
4. Teach lesson 3.E.2 Maple Trees – Maple Syrup.

Attachments

1. Appendix A: Instructor's Notes
2. Maple Trees – Sketching Structures

Troubleshooting Tips

1. If students have difficulty sketching a maple leaf, they may trace their own hand. Maple leaves are palmate, meaning they have five points; thus, tracing one's hand approximates the structure of a real leaf.

Safety Issues

None

Additional Resources

1. Ehlert, Lois. Red Leaf, Yellow Leaf. 1991.
2. Linton, Marilyn. The Maple Syrup Book. 1983.
3. Mass Maple Association: Watson-Spruce Corner Road, Ashfield MA 01330. Online at http://www.massmaple.org. Via email at info@massmaple.org.

Appendix A: Instructor's Notes

The following information about maple tree identification was taken verbatim from http://www.massmaple.org/treeID.html (accessed 4 January 2005).

Maple Tree Identification

"The commercial production of maple products in North America occurs primarily in the northeastern United States and southeastern Canada. This is the geographic area of greatest abundance of sugar maple (*Acer saccharum*) and black maple (*Acer nigrum*), the two most preferred and most commonly tapped maple species.

"There are thirteen native maple species in North America. While most of these species are probably tapped to some extent, at least by hobbyists, sugar and black maple, along with red maple (*Acer rubrum*), provide most of the commercial sap. A fourth maple species, silver maple (*Acer saccharinum*), is sometimes tapped, particularly in roadside operations, and is often confused with red maple."

The "…sugar, black, red and silver maple…share several characteristics in common. All have leaves of similar shape: a single leaf blade with the characteristic maple shape, 3-5 lobes radiating out like fingers from the palm of a hand (palmately lobed) with notches (called sinuses) between the lobes. Like all maples, the leaves, buds and twigs of all four are attached in pairs opposite each other along the branches. Also, all four produce a fruit called a samara (or double samara), which is a pair of connected, winged seeds.

"Sugar and black maple are very similar species and unquestionably the most preferred species for producing maple products, primarily because of their high sugar content. Sugar maple occurs naturally throughout most of the northeastern United States and southeastern Canada….

"Identifying a tree as a sugar or black maple…is easily done from the leaves by observing 5-lobed leaves, the paired opposite attachment of the leaves along the stem and the lack of teeth along the leaf margin; from the bark of older trees by observing the long plates that remain attached on one side; from the twigs by observing the opposite

arrangement of buds and the relatively long, pointed, brownish terminal bud; and from the seed by observing its horseshoe shape and size. Distinguishing between sugar and black maple is best done by comparing the leaf structure (particularly the number of lobes, droopiness and presence or absence of stipules along base of petiole) and by the degree of bumpiness of the twigs.

“Sugar and black maples are found on a variety of soils and site conditions, but neither tolerates excessively wet or dry sites, and both grow best on moist, deep, well-drained soils. Black maple is more likely to be found along moist river bottoms. Both species can be found growing in pure stands, with each other, or with a wide variety of other hardwood species including American beech, American basswood, yellow birch, black cherry, northern red oak, yellow poplar and black walnut. Both species have been planted extensively as roadside trees which are often tapped as part of a sugaring operation. Plantations of sugar maple have also been established with the intent of developing efficient, productive sugarbushes. Both species are relatively long lived, capable of living well beyond 200 years, with trunk diameters greater than 30 inches and heights greater than 100 feet.

“Sugar and black maple both grow in the shade of other trees (they are shade tolerant), and trees of many different ages (sizes) are often found in a forest. Both species are also found in stands composed of trees that are essentially all the same age (size). Healthy sugar and black maple trees growing in overstocked uneven-aged or even-aged stands can be expected to achieve tapable size in 40 to 60 years, depending on overall site quality. Thinning or release cutting dramatically reduces this age-to-tapable-size.

“Sugar and black maple are particularly attractive as sugartrees because of their high sap sugar content and the late date at which they begin growth in the spring. Sugar and black maple have the highest sap sugar content of any of the native maples. While the exact sap sugar content of a tree will vary depending on many factors including genetics, site and weather, sugar and black maples generally average between 2.0 and 2.5 percent sap sugar content. It is not unusual to find many trees in a sugarbush well in

excess of 3 percent, and occasionally higher. Genetic research on sugar maple suggests that the sap sugar content of planted seedlings can be increased by controlled breeding. Other things being equal, higher sap sugar content translates to lower costs of production and greater profits.

“Black and sugar maples begin growth later in the spring than red or silver maple. As maples begin their growth, chemical changes occur in the sap which make it unsuitable for syrup production. The term "buddy sap" is often applied to late season sap which produces syrup with a very disagreeable flavor and odor. Because sugar and black maple resume growth later than red or silver maple, sap may be collected later in the spring.”

Maple Trees – Sketching Structures

Name: _____ Date: _____

Complete the chart below. In the empty boxes, make your own **sketch** of maple fruit, maple bark, a maple twig, and a maple leaf. Color your sketches.

Maple Tree Structure	Picture	My Sketch
Fruit		
Bark		

Twig		
Leaf		

Images from: http://www.massmaple.org/treeID.html (accessed 21 January 2006).