

Pancakes and Syrup

Purpose: This lesson introduces students to food science – specifically physical and chemical changes, and liquids and solids. Measuring and mixing ingredients also give students the chance to explore Minnesota agriculture products and discover the impact of American Indians.

Time: 1 hour, each activity

Level: 2-3

Materials:

Activity 1

- *Pancake, Pancake!* By Eric Carle
- Agriculture is Everywhere Placements from Minnesota Agriculture in the Classroom <http://www.mda.state.mn.us/en/kids/teachresources/agiseverywhere.aspx>
- Pancake ingredients
 - 1 egg
 - 1 ¼ cups buttermilk
 - 2 Tbsp. veg. oil
 - 1 ¼ cups flour
 - 1 tsp. baking powder
 - 1 tsp. baking soda
 - ½ tsp. salt
- 1 gallon sized Ziploc Bag
- Flat topped electric griddle
- Measuring spoons and cups
- Butter
- Syrup – “real” maple syrup and non-maple syrup
- Spray oil for the griddle
- Plates, napkins, and forks for each student

OPTIONAL

- Cream
- 2 oz. containers with lids

Activity 2

- *Sugar From Trees* – Young Naturalist article from the MN DNR’s March-April 2009 [Minnesota Conservation Volunteer](http://www.dnr.state.mn.us/young_naturalists/syrup/index.html) or use exert included. http://www.dnr.state.mn.us/young_naturalists/syrup/index.html
- 5 Ws + H Graphic Organizer
- Pancakes and Syrup Worksheet
- Pure maple syrup
- Artificial maple syrup (made from corn syrup)

Minnesota Science Standards and Benchmarks

- 2.2.1.2.1 Observe, record and recognize that materials can be a solid or a liquid and can change from one state to another.
- 3.1.3.2.1 Understand that everybody (including Minnesota American Indian tribes) can use evidence to learn about the natural world, identify patterns in nature and develop tools.

Minnesota Math Standards and Benchmarks

- 3.1.3.1 Read and write fractions with words and symbols. Recognize that fractions can be used to represent parts of a whole, parts of a set, points on a number line, or distances on a number line
- 3.1.3.2 Understand that the size of a fractional part is relative to the size of the whole.

Minnesota/Common Core Language Arts Standards and Benchmarks

- 2.1.1.1 Ask and answer such questions as who, what, where, when, why and how to demonstrate understanding of key details in a text
- 2.2.3.3 Describe the connection between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text.
- 3.1.3.3 Describe characters in a story and explain how their actions contribute to the sequence of events
- 3.2.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text using language that pertains to time, sequence and cause/effect.

Minnesota Social Studies Standards and Benchmarks

- 3.4.1.2.3 Compare and contrast various ways that different cultures have expressed concepts of time and space.

Minnesota Health Education Standards and Benchmarks

- 2.1.1, 3.1.1 Students will identify indicators of mental, emotional, social, and physical health during childhood – nutrition.

Background

You may have heard the saying “breakfast is the most important meal of the day.” Most people instantly know that the statement is referring to the nutrients and energy that a healthy breakfast supplies. However, traditional breakfast foods are important to Minnesota farmers because of the many ingredients that are produced in our state. Wheat, milk, eggs, soybeans that produce vegetable oil, and sugar beets that produce sugar, are just a few products that are produced by Minnesota farmers that make breakfast possible for people around the world.

The kitchen is also a great place for students to make observations and explore basic scientific concepts. Minnesota is home to many of our country’s largest Agricultural Food Science companies – General Mills, Pillsbury, and Land O Lakes. Almost everything we eat has a basis in the food science and processing aspects of agriculture. Pancakes are a breakfast food that is easily made in the classroom. Pancakes also provide opportunities to observe changes of matter and also physical changes that are taking place. Making your own butter can also reinforce these scientific processes. The syrup that is traditionally served with pancakes provides an opportunity to discuss maple syrup production that is part of our American Indian history in Minnesota. In addition, the maple sap production and tapping process is tied closely to the interior morphology of a maple tree.

Procedure

Activity I: Pancakes

1. Introduce/show the book *Pancakes, Pancakes!* By Eric Carle. Ask the students:
 - a. Why is it important to eat a healthy breakfast? (*provides nutrients and energy needed to be alert and ready for action during the day*)
 - b. What are some of your favorite breakfast foods?
 - c. What ingredients are needed to make these foods (*wheat, eggs, oil sugar, etc.*)
 - d. Where do these ingredients come from? (*Farms in Minnesota!*)
2. Read the book to the students or if you have multiple copies have students read the book aloud in groups.
3. Ask students which of the ingredients mentioned in the story are produced by Minnesota Farmers (*All!*). Hand out the Agriculture is Everywhere Placemats available FREE from Minnesota Agriculture in the Classroom. Have students locate where the different ingredients are produced in Minnesota.
<http://www.mda.state.mn.us/en/kids/teachresources/agiseverywhere.aspx>
4. Show students the ingredients list (written on the board, projected on a screen, etc.) for pancakes. Ask students:
 - a. Are any of the ingredients different from the products mentioned in the story?
 - b. How do we figure out how much $1\frac{1}{4}$ cups of flour are? (*use measuring cups*)
 - c. Hold up the $\frac{1}{4}$ measuring cup. How many of these would it take to fill the 1 cup measurer? (*4 - Demonstrate!*)
 - d. Looking at the amounts, which ingredient is needed in the largest amount? (*buttermilk, flour are the same*)
 - e. Which do we need more of sugar or baking powder?
 - f. If the recipe called for $\frac{1}{2}$ tablespoon of vegetable oil and $\frac{1}{2}$ tsp. of salt, which would be needed in the larger amount? (*oil*)
5. Tell students that math is needed to make pancakes but, cooking is also a scientific process. Ask students:
 - a. Why is making pancakes a scientific process? (*physical changes, temperature changes*)
6. Tell student that they will be making a sequencing chart on the whiteboard that describes the steps they will follow while making pancakes. They will use this chart to decide when scientific events occur. Add the ingredients to the gallon zip-lock bag in the order listed. As each item is added, have a student record - using words and/or pictures - what is happening on the white board. Number these steps or use arrows to show the sequence. Ask students:
 - a. When an egg is cracked open does the egg change? (*in shape but not in composition, so the change is physical not chemical*)

Butter Making

Show students how to turn a liquid into a solid they can eat! You will need heavy whipping cream and 2 oz. (approximately) containers with lids.

1. Group students into teams of 3-4
2. Pour whipping cream into containers until each is half full.
3. Let the students attach the lids – check to make sure they are securely closed.
4. Have the students shake the container to “churn” the cream.
5. Students should shake the containers until they can no longer hear the liquid moving. Check to see if the cream has separated into milky liquid (whey) and creamy solid butter.
6. Help students carefully pour off the liquid. Serve their homemade butter on bread, crackers or pancakes.

- b. What happens to the flour when added to the buttermilk and eggs? (becomes more like a liquid)
 - c. Baking soda and baking powder don't taste very good so why are they added? (cause a chemical reaction that causes the batter to rise when heated)
7. When all ingredients are in the bag, zip it shut and gently mix. Review the steps the students have recorded. Ask students:
 - a. Which steps involve physical changes where the ingredient looks different but it's still the same – like when a piece of paper is torn into smaller pieces? (all steps)
 - b. Is the batter a liquid or a solid? (liquid) How can you tell? (takes the shape of the bag)
 - c. What would happen if we poured the batter on a cold griddle? (would remain liquid and run down the edge)
 - d. Do you think the state of matter – liquid or solid – will change once it's heated on a hot griddle? (yes – becomes solid)
8. Pour the batter onto the hot griddle. Instruct students to watch carefully. Inform students that the pancake batter looks different but it still contains the original ingredients. The batter changed from a liquid to a solid. This is an example of a physical change.
9. You may choose to make butter with the students (see instructions in the side bar) to highlight another example of physical change.

Activity 2: Maple Syrup

1. Access the article *Sugar from Trees*. This Young Naturalist article is from the Minnesota DNR's March-April 2009 Minnesota Conservation Volunteer.
http://www.dnr.state.mn.us/young_naturalists/syrup/index.html
An excerpt from this article is included with this lesson to use if you do not want to utilize the entire article.
2. Have students read the article or read it aloud to them. Assist students in completing the 5 Ws + H graphic organizer. Discuss with the students the thoughts they recorded in their graphic organizer.
3. Hand out the Pancakes and Syrup worksheet. Inform students that you will complete this as a class to better understand how maple trees produce the sap that is used to make syrup. Tell students that you will be acting this process out.
 - a. Ask for one student volunteer to be the **heartwood**. This student must stand very tall and proud. **The heartwood is in the center of the tree and supports the tree so it can also stand tall and proud.**
 - b. Ask for four more student volunteers. Have these students form a circle around the heartwood. Tell the class that this circle of students represents the **sapwood**. **The sapwood carries water from the roots all the way to the ends of the branches.** In late winter, the sapwood pulls up water that also picks up stored sugar and other nutrients in the tree. The sapwood carries this sugar and nutrients to the buds that will soon bloom in the spring. This water with sugar is called sap and is used to make maple syrup. Instruct the students in the sap wood circle to reach down to their toes, pretend to grab water and then reach up to the ceiling, pretending to pass the water and sugar to the rest of the tree.

- c. Ask for 6-8 more student volunteers. Have these students form a circle around the sapwood. These students represent the **phloem** (flow-em). Tell students that plants are able to make their own food in their leaves. **The phloem moves the food from the leaves to the rest of the plant.** Instruct the students in the phloem circle to reach above their heads, pretend to grab food, then squat down and open their hands to pass the food on.
 - d. Ask for 5 more student volunteers. This group of students will slip in-between the sapwood and phloem. They represent the **cambium. Cambium is a thin layer that causes the tree trunk to grow.** Have these students walk in a circle to represent movement and growth.
 - e. The remaining students will lock arms/hold hands around the heartwood, sapwood, cambium and phloem. Tell the students that this ring represents the **bark. These students must protect the tree and not let anything in to damage the heartwood, sapwood, cambium or phloem.**
 - f. Review the roles of each part of a trunk of a tree by asking a member of each part (heartwood, sapwood, cambium, phloem, and bark) what he/she is doing. If you would like, tell the students that you are going to chop the tree down. Act this out and then let all students fall to the ground.
4. Once students return to their seats, look at the diagram of the cross section of a tree trunk on their worksheet. Review the parts of a tree and read the caption about how the maple trees are tapped to remove the sap.
 5. Have students complete the worksheet as a class. The following information will help you fill in the blanks.
Answer key for worksheet paragraph:
Sap is sugar that is stored in the trunk of the tree during the year. Sap flow requires cool nights (below freezing) followed by Warm days. When a hole is drilled into the sapwood, the sap flows out of the tree. It takes approximately 40 gallons of sap to produce one gallon of syrup.
In the sugar house, the sap is heated on a stove. This causes the water in the sap to steam off, condensing the sap, which brings out a sweet maple flavor not present before it was heated. This is a chemical change.
 6. Have the students try pure maple syrup on their pancakes, or set up a tasting station for students to compare pure maple syrup and artificial maple syrup (made from corn syrup).

Additional Activities

- Explore literature that tells the story of maple syrup.
 - *Little House in the Big Woods* by Laura Ingalls Wilder Chapter 7: the Sugar in the Snow
 - *Sugarbush Spring* by Marsha Wilson Chall. The story of a girl and her grandfather tapping maple trees and making maple syrup.
- Check with the Minnesota DNR to see if there are any state parks in your area that have syrup-making events. These are usually held in March. http://www.dnr.state.mn.us/state_parks/index.html

- Consult the teacher's guide that accompanies the article *Sugar from Trees* for additional ideas.
http://www.dnr.state.mn.us/young_naturalists/syrup/index.html

Adapted from Utah Agriculture in the Classroom

In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651/201-6000. TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider.

Sugar from Trees

By Teresa Marrone

Minnesota Conservation Volunteer

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First Sugar Bushes

Hundreds of years, ago, American Indians used natural signs, not thermometers, to tell them when it was time to start making syrup. For example, when the crows and eagles started to return to Minnesota from their winter grounds the Ojibwe Indians knew that the sap would soon start flowing, so they moved their camps to the sugar bush (name sometimes used for the maple woods). They cut out wedges in the trees, then used hollowed out sumac stems, or carved pieces of cedar to funnel the dripping sap into a container, typically made of birch bark.

Then they collected the sap in a hollowed out log or birch bark container. They cooked the sap in a clay pot or birch bark container. Some historical accounts say they pulled red-hot rocks from a fire and dropped them into a container to heat the sap. When enough water had boiled away, the sap was sweet and thick and ready to use as syrup.

Often, Indians continued boiling the syrup until so much of the liquid had evaporated that the mixture became grainy and solid after it cooled. This maple sugar was popular because it was easy to store and transport. Indians, and later European settlers, used maple sugar throughout the year to sweeten berries, to season meats and other foods and to enjoy as candy. With the addition of water, the sugar became syrup again.

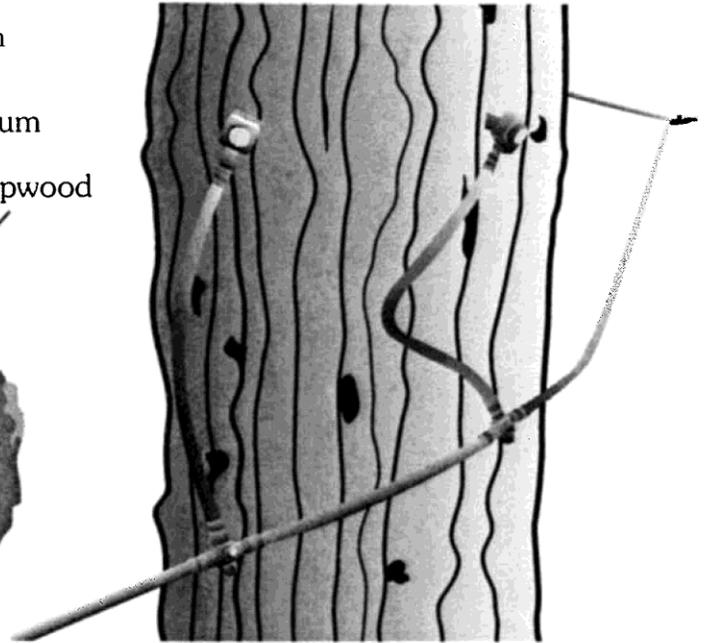
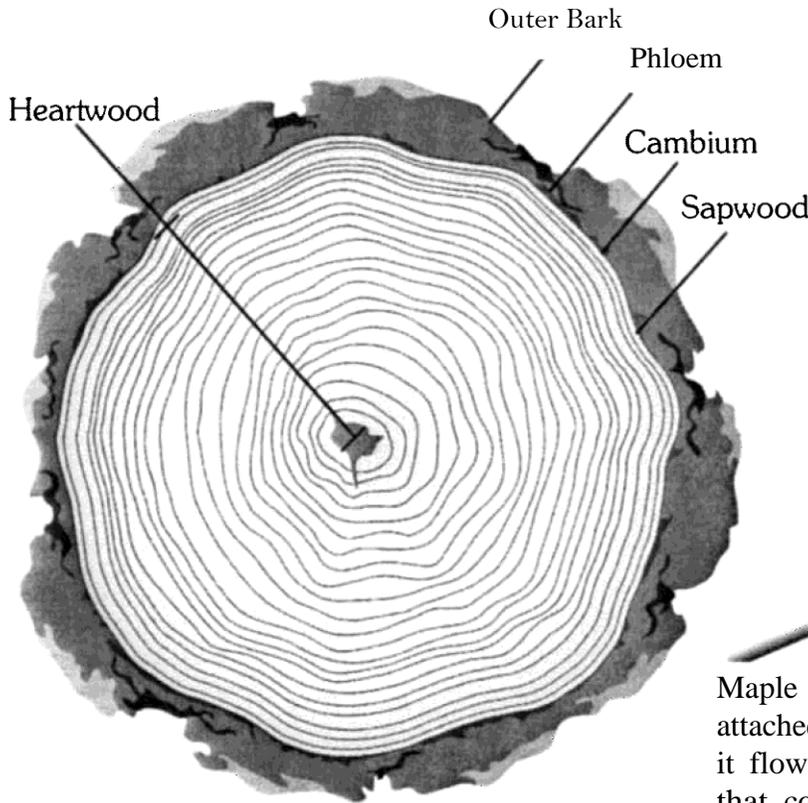
NAME _____

Fill in each row with details you learn by reading the article.

Who is this article about?
What did they do?
Where did this happen?
When did it happen?
Why did it happen?
How did they do it?

Pancakes and Syrup

Name: _____



Maple trees are tapped with small spigots that are attached to hoses. As the sap drips out of the tree, it flows down one hose and into another hose that collects the sap from many other trees and takes it to a large tank.

Instructions: Listen closely as your teacher reads to you two paragraphs about the harvesting of maple syrup. As you listen, follow along in the paragraphs below and fill in the blanks with the correct word from the box.

trunk cool warm sapwood 40 heated chemical

Sap is sugar that is stored in the _____ of the tree during the year. Sap flow requires _____ nights (below freezing) followed by _____ days. When a hole is drilled into the _____, the sap flows out of the tree. It takes approximately _____ gallons of sap to produce one gallon of syrup.

In the sugar house, the sap is _____ on a stove. This causes the water in the sap to steam off, condensing the sap, which brings out a sweet maple flavor not present before it was heated. This is a _____ change.

