Michigan State University Extension
Tollgate Farm and Education Center

The Story of Maple

Big Idea: Explore the science and history of how maple sap becomes maple syrup through the process of evaporation.

Big Question: How does maple sap become maple syrup?

Michigan NGSS Performance Expectations:

K-LS1-1	Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS3-1	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
2-PS1-4	Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they aren't.
H3.0.6	Use a variety of sources to describe interactions that occurred between Native Americans and the first European explorers and settlers in Michigan.
H3.0.7	Use a variety of primary and secondary sources to construct a historical narrative about daily life in the early settlements of Michigan.
4-LS1-1	Plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
G5.0.1	Locate natural resources in Michigan and explain the consequences of their use.
5-PS2-1	The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
5-LS1-1	Matter is transported into, out of, and within systems.Support an argument that plants get the materials they need for growth chiefly from air and water.
HS-LS1-2	Describe or illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Last Revised: 03/22/2022

Common Core ELA and Math Standards:

ELA-LITERACY.SL.K.1a-b	Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion). b. Continue a conversation through multiple exchanges.
ELA-LITERACY.SL.K.2	Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
ELA-LITERACY.SL.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood.
ELA-LITERACY.RI.1.6	Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.
ELA-LITERACY.SL.1.1a-c	Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion). b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges. c. Ask questions to clear up any confusion about the topics and texts under discussion.
ELA-LITERACY.SL.1.3	Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.
ELA-LITERACY.SL.2.1a-c	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). b. Build on others' talk in conversations by linking their comments to the remarks of others. c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
ELA-LITERACY.SL.2.3	Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
ELA-LITERACY.SL.3.1a-d	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher- led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others. d. Explain their own ideas and understanding in light of the discussion.
ELA-LITERACY.SL.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
ELA-LITERACY.SL.4.1a-d	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher- led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions and carry out assigned roles. c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others. d. Review the key ideas expressed and explain their own ideas and understanding in light of the

	discussion.
ELA-LITERACY.SL.5.1a-d	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher- led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions and carry out assigned roles. c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others. d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
Math.Content.K.CC.4-5	Count to tell the number of objects. 4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. 5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.
Math.Content.K.OA.1-2	Understand addition as putting together and adding to, and under- stand subtraction as taking apart and taking from. 1. Represent addition and subtraction with objects, fingers, mental images, drawings2, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. 2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
Math.Content.K.MD.1-2	Describe and compare measurable attributes. 1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. 2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.
Math.Content.1.OA.5-6	Add and subtract within 20. Work with addition and subtraction equations. ● Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). ● Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).
Math.Content.2.OA.2	Add and subtract within 20. ● Fluently add and subtract within 20 using mental strategies.2 By end of Grade 2, know from memory all sums of two one-digit numbers.
Math.Content.4.MD.1	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. 1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...

Content Outcomes:

- To explore the scientific processes involved in the production of maple syrup.
- To recognize and explore connections between the processes, tools, and cultures of maple sugaring.

Rotations:

(Wagon Ride to the Sugar Shack)

- Modern Day Evaporation — *Sugar Shack*
- Maple Tapping and Maple ID — *Sugar Bush*

(Wagon Ride Back)

- Maple Tasting — *Activity Center or Lower Barn*
- Tools and Methods — *Lower Barn*

Assessment:

Can students place the steps in maple sugaring in the correct order and describe the process? Revisit the big question at the end of the program and discuss, in pairs, small groups, or as a large group. What new understandings have students gained?

Program Introduction: Welcome to the Story of Maple Sugaring. We'll be going on a maple sugaring adventure together. What do you see inside this jar? Has the maple syrup in this jar always been syrup? How did it get into this jar? We need your help to find out! We'll identify and tap maple trees in the sugar bush and visit the sugar shack to observe Tollgate's maple sugaring operation. We'll explore the peoples who first discovered how to make syrup and sugar from maple trees and who are expert maple sugarmakers today. We'll even stop to explore the science of steam as we taste some maple syrup in our taste-testing lab. Together, let's explore the story of Michigan's agricultural sweet treat.

Tollgate would like to acknowledge that the land we are meeting on today is the original homelands of the Anishinaabe tribal nations. We owe a debt of gratitude to the people who first lived on this land. We honor and respect the many diverse indigenous peoples still connected to this land on which we gather.

Teacher Resources:

Background Information:

- Michigan Maple Syrup Association: https://www.michiganmaple.org/
- Maple Products from Quebec: https://www.puremaplefromcanada.com/

Children's Literature:

- The Sugaring Off Party by Jonathan London
- Maple Moon by Connie Brummel Crook

- Maple Syrup Season by Ann Purmell
- At Grandpa's Sugar Bush by Margaret Carney
- Sugar on Snow by Nan Parson Rossiter
- Sugarbush Spring by Marsha Wilson
- Sugar Snow adapted from Laura Ingalls Wilder books
- Sugaring by Jesse Haas
- Sugaring Time by Kathryn Lasky
- A Day at the Sugar Camp by Jessica Diemer-Eaton
- A Kid's Guide to Maple Tapping: Let's Make Maple Syrup by Julie Fryer
- The Gift is in the Making by Leanne Betasamosake Simpson

Curiosity Photos

Following are photographs and questions intended to inspire curiosity and wonder throughout the days leading up to your Tollgate visit.

How does maple sap become maple syrup?

What do you see?

How Maple Syrup Goes From Sap to Table

Last Revised: 03/22/2022

Who are they and what are they doing?

From The Pokagon Band of Potawatomi Cultural Activities Coordinator Nicole Holloway

What is coming out of the building?

What makes corn pop?

Last Revised: 03/22/2022