Lesson: How Do Rivers Power Mills?

(To follow Amplify CKLA K, Knowledge 10, Lesson 3: The Breadmakers: Millers and Bakers)

At a Glance

In this lesson, students extend their understanding of colonial breadmaking by investigating how millers in New Hampshire used water power to make their work easier.

Primary Focus Objectives

- Students will analyze a painting of a New Hampshire mill.
- Students will compare a video animation to a diagram of a grist mill and add labels to the diagram.
- Students will use simple tools to experiment with how water can move gears.

Formative Assessment

- Group discussion and labeling

Standards

CCSS.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.

CCSS.ELA-LITERACY.RI.K.1
With prompting and support, ask and answer questions about key details in a text.

Materials

- Image: Grist Mill at Oliverian Falls
- Vocabulary Card: gristmill
- Video: Gristmill
- "A Mill in Action" worksheet
- Pitchers, dish pans, bath toy waterwheels
- Pairs of smooth flat stones and a grain sample (e.g., oats)

Time Needed

One to two 30-40 minute class periods.

Learning Activity

1. **Analyze the painting.** Project the image and guide a group discussion about the features of the gristmill and the environment where it is situated. *(10 minutes)*

2. **Review the Vocabulary Card.** Project or display the Vocabulary Card and connect the word to the building in the painting. Review the purpose of a gristmill and why it was so important to colonial towns. (*10 minutes)*

3. **Compare the animation to a diagram.** Project the video animation and discuss the connections between the moving parts. Distribute the diagrams and support students as they label the parts of the gristmill. *(20 minutes)*

4. **Experiment with water power.** Provide small groups with a dish tub of water and a variety of waterwheel bath toys and cups and support an exploration of the power of flowing water. *(10 minutes)*

5. **Optional: grind grain.** Help students grind a small amount of a grain between two flat stones. Talk about how having a machine to do the work would change the task*. (15 minutes)*

Educator Rationale and Answer Guide

Connection to Amplify

In this lesson, students extend their understanding of the work of colonial millers and bakers by investigating how people in colonial New Hampshire used the colony's many rivers to power early factories: grist mills. Students employ speaking and listening skills while analyzing and discussing a variety of visual material: a painting, a video animation, and a diagram. Two hands-on activities are suggested to enrich and reinforce student understanding of the technology involved with mills. The labeling activity, water power experiment, and grain grinding can be set up as stations for small groups to work through.

Analyze the painting

This painting offers a clear visual definition of grist mills in New Hampshire. The caption provides background information specific to this grist mill, however, it is a design common to grist mills that would have been built all over the colony. A group discussion should ensure that students observe the movement of the river, the materials used to construct the mill, and the proximity of the mill to roads and other buildings. Challenge students to think about where the big waterwheel is located. (It's inside the lower part of the structure, hidden from view. A clue is the small opening where water is pouring out of the building.)

This is an opportunity to reinforce with students how New Hampshire's many rivers helped people grow their settlements into towns. If students completed the Moose X Amplify Lesson: Bartering in a Colonial New Hampshire Town, they may recall the number of rivers, streams, and mills featured on the map of colonial Hampton. Mills were usually a requirement when people were given a charter to establish a town. Saw mills and grist mills helped people use water power to produce the most essential products (wood for construction of houses and barns, and grain for feeding people and animals) for a town's success. Water power plus human power made the process much faster.

Review the Vocabulary Card

Project or display the Vocabulary Card and discuss the definition of the specific type of mill that is featured in the painting and this lesson. Use the visual on the card to reinforce the basic process of turning wheat into bread.

This is a good place to pause if dividing the lesson across two class sessions.

Compare the animation to a diagram

Project the animation and talk with students about how the water sets the machinery inside the grist mill in motion. Ensure that students observe the water moving the large water wheel, which then turns a spindle that turns the heavy mill stones. Help students find the grain being poured from a hopper into the mill stones and then coming out as flour or meal into the bin. Use the provided large label set to show the name of each part of the animated mill. An answer key is provided.

Distribute "A Mill in Action" and support students as they cut and paste the labels to the correct part of the diagram. Consider creating stations for this activity and the next two activities in this lesson and have students move through them in small groups.

Experiment with water power

Consider demonstrating this activity to the whole group and then setting up a station for a small group. Encourage students to experiment with pouring water slowly and quickly onto the waterwheel toy. How does that change the movement of the waterwheel. If you have access to a toy that connects gears to a waterwheel, or allows students to create different gear configurations, this is an opportunity for them to see how water can move multiple gears. Discuss what happens to the waterwheel when all the water runs out of the cup. What would happen to a mill if the river dried up or was blocked by a fallen tree?

Optional: Grind grain

If you have access to some flat smooth stones and a small amount of oats or another non-allergenic grain like dried corn, quinoa, or rice, set up a station where students can try grinding the grain between two stones. Label one stone the bedstone (it will stay still) and one stone the runnerstone (it will be moved on top of the bedstone). Discuss what it was like to do that work. Was it hard or easy? Which grains were easier to grind? Which were harder? Was the meal or flour smooth or gritty? Talk about why people used water power to help them complete that hard work.

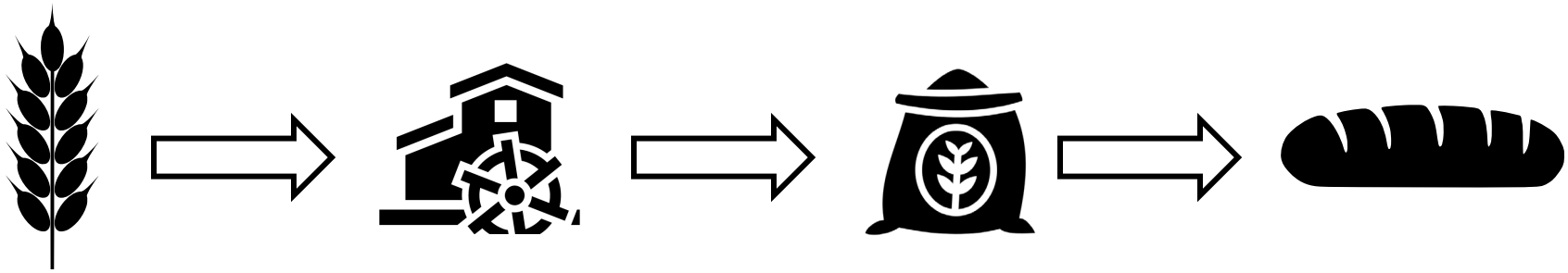
Gristmill at Oliverian Falls

Source: New Hampshire Historical Society

GRISTMILL

Definition: A mill where grain is ground into flour to feed people or animals.

How to use it: The farmer took his wheat to the **gristmill** to grind it into flour for making bread.

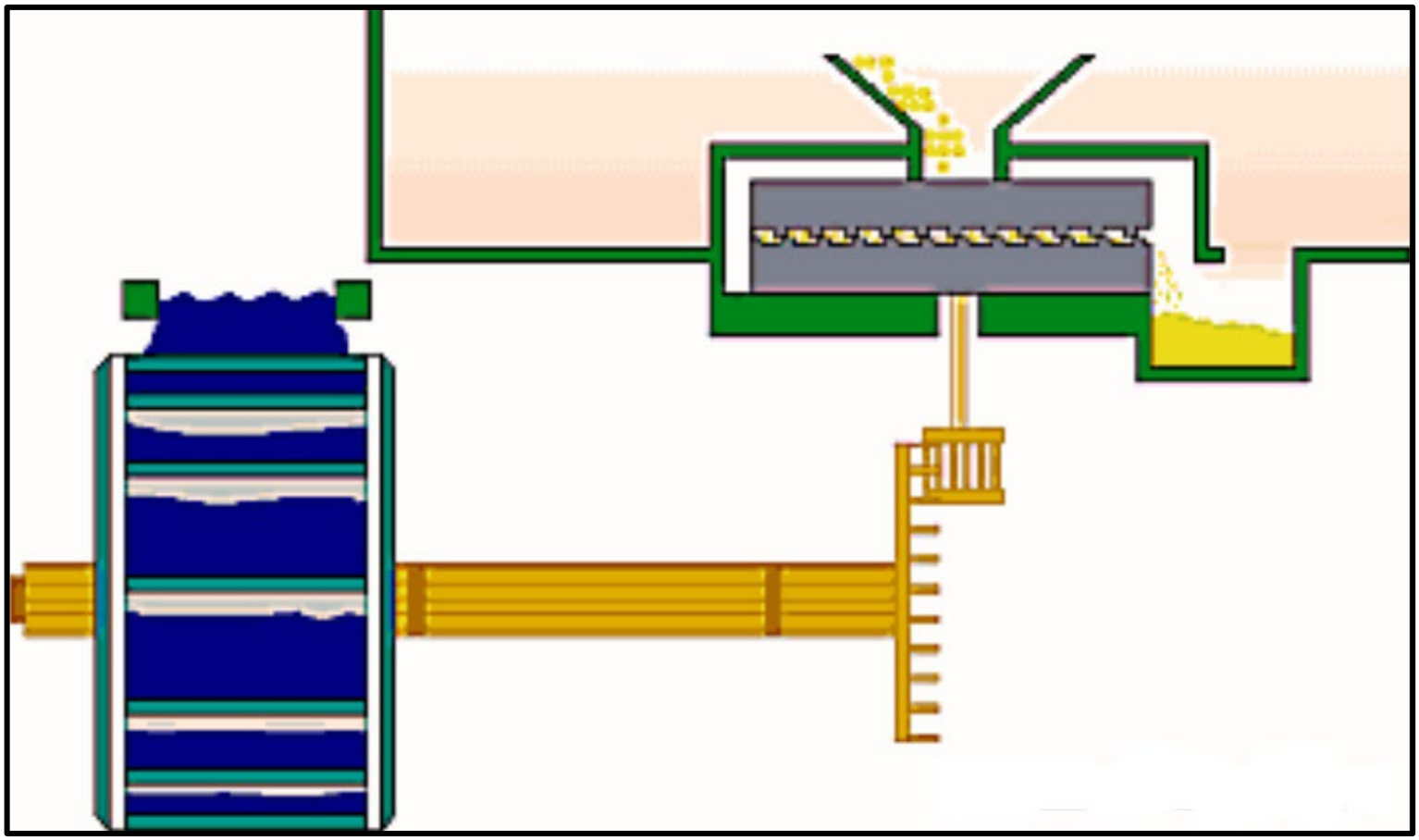


Mill Labels for Educator Use

river water	waterwheel	drive shaft
gears	spindle	hopper
grain	bedstone	runnerstone
flour or meal		

A Mill in Action

Cut out the labels and paste them next to the correct part of the grist mill.



river water

waterwheel

drive shaft

gears

spindle

hopper

grain

runnerstone

bedstone

flour or meal

A Mill in Action – Answer Key