



Simple Machines **TOUR EDUCATOR'S GUIDE**

PRE- AND POST-VISIT LESSON PLAN IDEAS & STRATEGIES / GRADES: 4TH- 8TH

Overview

Simple machines have played a large role in human history, supporting our everyday lives, and allowing for countless innovations. In the mid-19th century, simple machines supported and eased the working lives of villagers and farmers. During The Farmers' Museum Simple Machines tour, students will have the opportunity to view the museum, and history, from a scientific and mathematical perspective.

Our historic village interprets the 1840s in central New York and highlights various crafts and trades, as well as family life and agriculture in this time period. Through observation, explanation, primary sources, and hands-on demonstrations, students will understand how simple machines were important in the past and how they are still necessary and useful today.

During Your Visit

TOUR STRUCTURE

In order to best prepare and plan for your trip, we want you to know what to expect during your tour. Museum teachers will lead your students throughout our village. Throughout the tour, students will have the opportunity to participate in hands-on demonstrations, examine primary sources from the time, and see science and mathematics at work in the lives of 19th century villagers and farmers. Students will investigate the different classes of simple machines, including levers, pulleys, wheel and axles, inclined planes, screws, and wedges.

Groups will visit the Blacksmith Shop to learn about levers, discussing the different classes of levers and

pointing out examples in the shop. At the farmyard, they will learn about pulleys, which were often used to move loads between barn floors. Students will be able to try out a pulley system and feel the difference in weight. They will also make a stop at our farmhouse to talk about common wedges, such as knives and axes. To learn about inclined planes and screws, students will check out the stairs going to Todd's General Store and the screws on our broomwinder in the Westcott Shop. And a ride on the Empire State Carousel will bring wheels and axles to life. Groups will also explore the rest of the village, looking for more examples of simple machines as they go.

LOGISTICS OF THE TOUR

Environmental Conditions

The Simple Machines tour explores our recreated 1845 village. This tour includes spending time inside our historic buildings as well as walking outside to get to and from these buildings. Not all buildings are heated, and many rely on wood-burning stoves and fireplaces. Our walkways are made out of a variety of materials including packed dirt, gravel, wood, and stone. We suggest dressing in layers, and wearing appropriate weather gear, including boots.

Groups

Typically, we ask that you divide your students in to roughly equal groups of 10-15 prior to arrival, unless otherwise directed by Education Staff ahead of time. Each group must have at least one adult chaperone with them at all times. You will tour around the Historic Village in these groups with a Museum Teacher, but will rejoin your school as a whole for your scheduled lunch time.

Length

This tour normally lasts 2 hours, not including a lunch break. If you plan to visit for a longer or shorter time, or would like to visit a specific location at our museum, please contact Education staff.

When you arrive

When you arrive, your bus should pull into the main parking lot of The Farmers' Museum and Museum staff will greet you. It is important that you bring everything you will need with you, as the bus will be parked in a lot further down the street and you will not have access during your visit.

Once you have unloaded, you should head to the Louis C. Jones Center (on the right hand side just past the admissions kiosk as you enter the Main Barn) for orientation and to drop off your lunches. We ask that you leave your lunches, coolers, backpacks, etc., on the table(s) nearest the front of the Louis C. Jones Center. At this time, you may also want to take a bathroom break as a group prior to starting your tour. Restrooms are located just inside the front door in the two large silos.

At this time, the lead teacher should check in with our Admissions team. You will be asked for the final tally of students, one-on-one aides, and adults with your group; we suggest using your confirmation worksheet as a place to collect all this information the morning of your visit. You will also pay at this time. After you have checked in and your group has been oriented, museum staff will ask you to help divide your students into their pre-assigned groups, and you will set out for your tour!

Additional Information

Please consult The Farmers' Museum Tour Information document that you received, which can also be found on our website, for additional information concerning the logistics of your visit.

TOUR LEARNING STANDARDS

Social Studies

STANDARD 1: HISTORY OF THE UNITED STATES AND NEW YORK

Use a variety of intellectual skills to demonstrate their understanding of major ideas, eras, themes, developments, and turning points in the history of the United States and New York.

Mathematics, Science, & Technology

STANDARD 1: ANALYSIS, INQUIRY, AND DESIGN

Use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

STANDARD 4: SCIENCE

Understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas and science.

STANDARD 5: TECHNOLOGY

Apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

English Language Arts Common Core

READING

Craft & Structure

- Interpret words and phrases as they are used in a text, including determining technical meanings, and analyze how specific word choices shape meaning.

Integration of Knowledge and Ideas

- Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

LANGUAGE

Vocabulary Acquisition and Use

- Determine or clarify meaning of unknown or multiple meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
- Acquire and use a range of general academic and domain specific words and phrases.

SPEAKING AND LISTENING

Comprehension and Collaboration

- Prepare for and participate effectively in a range of conversations and collaborations, building on others' ideas and expressing their own clearly.
- Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Pre-Visit Lessons and Activities

LESSON ONE: A SIMPLE MACHINE SCAVENGER HUNT

Overview

Throughout this lesson, students will have the opportunity to learn about and experience the role that simple machines play in their daily lives. As part of this lesson activity, students will examine various simple

machines and their properties, and then participate in a school scavenger hunt to identify as many simple machines as they can.

LESSON TWO: SIMPLE MACHINES AND A JIGSAW

Overview

This lesson will offer students the opportunity to examine various types of simple machines through a jigsaw activity. Each group of students will be assigned a type of simple machine and become the expert on that device. Then, they will teach the rest of the class about their machine type.

LESSON THREE: THE SIMPLE MACHINES TRAIN

Overview

During this lesson, students will have the opportunity to examine primary source documents. In small groups, students will visit various stations in the classroom, examining primary sources that reflect the relationship between simple machines and agriculture.

Post-Visit Lessons and Activities

We hope that you and your students had a memorable and educational experience at The Farmers' Museum. The following lesson and activity ideas can be used to create closure and to serve as an evaluative tool for your students' learning experience with us.

STUDENTS COULD...

Create a classroom exhibit or bulletin board that depicts what students learned about simple machines and their roles in the 19th century.

Present an oral report in small groups that highlights different simple machines that they discovered during their time at The Farmers' Museum; this activity could be made into an event in which students' parents are invited to attend and see and hear what their students experienced while on their field trip.

Write a short essay that identifies what students learned from their field trip and compare and contrast 19th century and 21st century simple machines in the context in which they examined them at the museum.

Illustrate "Then & Now" drawings, comparing the ways in which simple machines were used in the 19th century and how they are used today.

Create a documentary about a simple machine or machines that students learned about, including its history, uses, and examples. Students can be divided into small groups to accomplish this project, each taking on a role as a researcher, editor, writer, and director.

Act out a skit or scene that describes how simple machines were invented or used to make labor quicker and easier.

Compose a persuasive essay that explains which simple machine was the most useful to farmers and villagers in the 19th century and why.

LESSON ONE: A SIMPLE MACHINE SCAVENGER HUNT

OVERVIEW

Throughout this lesson, students will have the opportunity to learn about and experience the role that simple machines play in their daily lives. As part of this lesson activity, students will examine various simple machines and what makes them so, and then participate in a school scavenger hunt to identify as many simple machines as they can.

Learning Objectives

STUDENTS WILL...

- Describe the six basic kinds of simple machines.
- Identify different examples of simple machines in various settings.
- Explain the role that simple machines play in their daily lives.

New York State Learning Standards

MATHEMATICS, SCIENCE, & TECHNOLOGY STANDARDS

Standard 1: Analysis, Inquiry, and Design

- 3.1: Use various means of representing and organizing observations and insightfully interpret the organized data.

Standard 4: The Physical Setting

- 4.1.v: Observe and explain energy conversions in real-world situations.
- 5.1: Explain and predict different patterns of motion of objects.

ENGLISH LANGUAGE ARTS COMMON CORE

LANGUAGE STANDARDS

Vocabulary Acquisition and Use

- Acquire and use a range of general academic and domain specific words and phrases.

ESSENTIAL & TOPICAL QUESTIONS

What are simple machines?

What are the classes of simple machines: screw, wedge, inclined plane, lever, pulley, and wheel and axle?

How do they impact our lives on a day-to-day basis?

PROCEDURE

To begin, the teacher may want create a KWL chart about simple machines with students. This will help guide instruction and help serve as an informal pretest of prior knowledge and experience.

After discussing the chart, the teacher can begin a class discussion about the different types of simple machines, explaining and showing examples of the six basic types of simple machines: screws, wedges, wheel & axles, levers, pulleys, and inclined planes. It may be helpful for students to use a vocabulary sheet to organize the definitions and examples of each of the different types of machines (See included *Simple Machines Vocabulary Guide*).

Once students have gained the basic understanding of what simple machines are, what they do, and how they work, they can find examples of simple machines in the classroom and school environment.

The simple machines scavenger hunt will provide students with the opportunity to identify and describe various simple machine examples independently or with a partner or small group. Using the *Where are they?* worksheet provided, students can explore the school for simple machine examples and record their findings. Then, using their findings, they can organize the different examples that they found by the type and determine which is the most and least common type of machine used in the school.

After students have had time to find examples, the teacher can lead a debriefing discussion where students share their findings and the process by which they identified their examples. At this point, students should be able to explain and answer the essential questions as well.

SUPPLEMENTAL LEARNING OPPORTUNITIES

STUDENTS CAN...

Create a documentary about simple machines, their history, and their role in the daily lives of the people who use them.

Locate more examples of simple machines at home or in the community as part of a homework assignment.

Write a brief report about one of the examples that they found, examining that object in depth and describing what it is, how it works, what it is used for, and any other important information.

LESSON TWO: SIMPLE MACHINES AND A JIGSAW

OVERVIEW

This lesson will offer students the opportunity to examine various types of simple machines through a jigsaw activity. Each group of students will be assigned a type of simple machine and become the expert on that device. Then, they will teach the rest of the class about their machine type.

Learning Objectives

STUDENTS WILL...

Identify and describe different types of simple machines.

Explain how their machine works and provide examples for further study.

Collaborate with team members to create a method of sharing their machine with the rest of the class.

New York State Learning Standards

MATHEMATICS, SCIENCE, & TECHNOLOGY STANDARDS

Standard 4: The Physical Setting

- 4.1.v: Observe and explain energy conversions in real-world situations.
- 5.1: Explain and predict different patterns of motion of objects.

ENGLISH LANGUAGE ARTS COMMON CORE

SPEAKING AND LISTENING

Comprehension and Collaboration

- Prepare for and participate effectively in a range of conversations and collaborations, building on others' ideas and expressing their own clearly.

Presentation of Knowledge and Ideas

- Present information, findings, and supporting evidence such that listeners can follow line of reasoning and development.
- Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

ESSENTIAL AND TOPICAL QUESTIONS

What are simple machines?

How do they impact daily and modern life?

PROCEDURE

To begin, ask students to list objects or machines that reduce the amount of effort that is needed to do certain kinds of work. After this discussion, explain that many of these objects are made up of specific types of simple machines that help minimize the amount of work needed to do a task.

Explain that the students will be the teacher for this lesson. Divide the class into six groups.

Then, give each group a particular simple machine (wedge, lever, pulley, wheel and axle, inclined plane, and screw) to study.

These groups will examine their simple machine, explain what it is, how it works, provide examples of different types of machines, and create a diagram of what this simple machine looks like. They should then create a presentation to share their simple machine with the rest of the class.

NOTE: The Simple Machines Vocabulary Guide may be a helpful student tool for this lesson.

Students will teach their simple machine lesson to the rest of the class.

At the end of the presentation, students can answer and address the essential and topical questions.

SUPPLEMENTAL LEARNING OPPORTUNITIES

STUDENTS CAN...

Design a PowerPoint presentation to share their project.

Create their own simple machine with craft and other supplies.

Write a persuasive essay about which type of simple machine is the most helpful in everyday life.

LESSON THREE: SIMPLE MACHINES TRAIN

OVERVIEW

During this lesson, students will have the opportunity to examine primary source documents. In small groups, students will visit various stations in the classroom, examining primary sources that reflect the relationship between simple machines and agriculture.

Learning Objectives

STUDENTS WILL...

Identify and describe different types of simple machines.

Explain how their machine works and provide examples for further study.

Collaborate with team members to create a method of sharing their machine with the rest of the class.

New York State Learning Standards

MATHEMATICS, SCIENCE, & TECHNOLOGY STANDARDS

Standard 4: The Physical Setting

- 4.1.v: Observe and explain energy conversions in real-world situations.
- 5.1: Explain and predict different patterns of motion of objects.

ENGLISH LANGUAGE ARTS COMMON CORE

SPEAKING AND LISTENING

Comprehension and Collaboration

- Prepare for and participate effectively in a range of conversations and collaborations, building on others' ideas and expressing their own clearly.

Presentation of Knowledge and Ideas

- Present information, findings, and supporting evidence such that listeners can follow line of reasoning and development.
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ESSENTIAL AND TOPICAL QUESTIONS

What are simple machines?

How do they impact daily and modern life?

PROCEDURE

Begin by asking students what primary sources are. Discuss how primary sources are first-hand accounts of events that happened and can include newspapers, diaries, photographs, and drawings that were created during a specific era that is being examined.

Then, discuss how objects can also be examples of primary sources because they help us understand the people and events that occurred in the past (painting a picture of what the past looked like).

Divide the class into small groups of 3-4 students. Explain that they are going to examine some primary sources to find out more about the types of simple machines that existed and helped farmers do their work more efficiently.

Set up small stations around the room, using various primary source documents at each one. Then, allow students, in their small groups, to circulate around the room examining and recording information about the primary sources, using the *Simple Machines Train Graphic Organizer*.

Note: It may be useful to use the following primary sources available through The Farmers' Museums Harvest of History website: www.harvestofhistory.org.

- Prints: *Haying, Combine- Patented 1879, Delivery of Milk to Factory, Threshing Grain.*
- Advertisements: *Advertisement for John Deere Tractors, Buckeye Mower Broadside*
- Objects: *Cheese Press, Froe, Plow*
- Diary: *Diary of Ann Scutt, January-June 1860*

After each of the groups have visited most or all of the primary sources, have students return to their seats to debrief and share what they learned about simple machines from the primary sources they looked at.

Conclude the lesson by discussing what primary sources tell us about 19th-21st century New York farming culture.

SUPPLEMENTAL LEARNING OPPORTUNITIES

Write a diary entry using one of the primary sources as the basis for your observations.

Design a new invention that incorporates at least two classes of simple machines and compose a report detailing the invention process and product.

Illustrate their understanding of the relationship between agriculture and technology by drawing a farming scene that depicts a simple machine in use.

Observe examples of simple machines and describe how they function via a multimedia presentation or written or oral report.

NAME: _____

DATE: _____

SIMPLE MACHINES VOCABULARY GUIDE

	DEFINE IT (What is it?)	DESCRIBE IT (What does it do?)	DISTINGUISH IT (What are examples?)
PULLEY			
LEVER			
WEDGES			
INCLINED PLANE			
WHEEL & AXLE			
SCREW			

SIMPLE MACHINES VOCABULARY GUIDE: TEACHER'S KEY

	DEFINE IT (What is it?)	DESCRIBE IT (What does it do?)	DISTINGUISH IT (What are examples?)
PULLEY	A grooved wheel, which moves a rope or belt around the pulley.	Moves loads up, down, or side-ways.	Flag pole, crane, mini-blinds.
LEVER	A straight rod or board that rests of pivots on a fulcrum.	Lifts or moves loads.	Seesaw, wheelbarrow, bottle opener, shovel.
WEDGES	Two inclined planes joined back-to-back; at least one of the slanting sides ends with a sharp edge.	Cuts or spreads objects apart.	Knives, nail, push pin, chisel, ax, front of a boat.
INCLINED PLANE	A sloping surface that changes the distance and effort needed for doing certain kinds of work.	Moves loads up or down a slope/hill.	Staircase, ramp, escalator, slide, a drinking glass (as it is being tipped).
WHEEL & AXLE	A wheel with a rod (or axle) that runs through the center of it; both pieces move together.	Lifts or moves loads.	Wagon, door knob, pencil sharpener, bicycle, car.
SCREW	An inclined plane wrapped around a cylinder.	Holds or lifts objects together.	Screw, jar lid, drill, corkscrew, spiral staircase.

NAME: _____

DATE: _____

WHERE ARE THEY? SIMPLE MACHINE SCAVENGER HUNT

With your group, explore the classroom and school to identify various examples of the simple machines that we discussed in class. Find as many examples as you can of levers, pulleys, wedges, screws, inclined planes, and wheel & axles. Be sure to fill out the chart below with your findings (you may use the reverse side of the paper if you run out of space). Good luck!

	OBJECT	MACHINE TYPE	FUNCTION	LOCATION
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

NAME: _____

DATE: _____

SIMPLE MACHINES GRAPHIC ORGANIZER

STATION	WHAT TYPE OF PRIMARY SOURCE IS IT?	WHEN WAS IT CREATED?	WHO WAS THE CREATOR?	WHAT TYPE OF SIMPLE MACHINE IS IT?	WHAT DOES THE SOURCE TELL US?	FUNCTION	WHAT QUESTION/S DO YOU HAVE ABOUT IT?
1							
2							
3							
4							
5							
6							
7							
8							