

Capitol Park Museum

660 N. Fourth St.
Baton Rouge, LA 70802

Simple Machines

Elementary Learning Module

Grades Three and Four

A cross-curricular lesson linked to the common core state standards.

PERFORMANCE TASKS:

Students will observe a demonstration of each of the six simple machines. Each student will be given a booklet with drawings and a summary of the function of each machine. The students will tour the galleries of the Louisiana State Museum to locate and identify examples of simple machines. Students will predict and evaluate the outcome of the function of each machine. Students will be divided into six groups of three or four students and each group will construct one of the six simple machines. Each group will orally report on the construction and function of their machine. The students will then develop a fictional story in which one of the six machines is the main character in the story. In writing the story, students will use the knowledge gained from their observations to summarize the function and the description of their machine. Each student will read their story or perform a skit based on their story for the class.

STUDENT LEARNING:

- work collaboratively
- work independently
- identify the functions of the six simple machines
- compare and contrast the functions of the six simple machines
- describe the function of each of the six simple machines
- predict outcomes
- construct simple machines
- develop a fictional story
- sketch the six simple machines

STANDARDS:

Reading
3-5.2, 3-5.3, 3-5.4, 3-5.5

WRITING
3-5.2, 3-5.3

SPEAKING and LISTENING
3-5.2, 3-5.4, 3-5.6

LANGUAGE
3-5.1, 3-5.2

GLE's
Science – Grade 3
2, 3, 4, 11, 16, 17, 23, 26, 31, 32, 33

Science - Grade 4
2, 3, 4, 11, 16, 17, 23, 26, 31, 32, 33

INSTRUCTIONAL FOCUS:

Science- recognize the six simple machines and understand the function of each machine

Writing – write an informative/explanatory narrative in the form of a short fiction story

Speaking and Listening-present a story orally and listen to other stories

Language-demonstrate command of the conventions of Standard English grammar

Reading-identify key ideas and details

GRADING

We suggest you grade on ability to recognize the six simple machines and understand their function as well as on writing style and grammar, presentation, and ability to identify key ideas and details

MATERIALS

Materials vary with each activity: books, paper, thumb tacks, toy cars, milk jugs with screw tops and pop-on tops, ropes or heavy string, coins, rulers, pencils, spring scale, spools of thread, erasers, popsicle sticks, broom handles, scissors

LEARNING MODULE: SIMPLE MACHINES

Pre-Visit Activities

We suggest that you use these pre-visit classroom activities to prepare your students for a rewarding Museum visit. Before your visit, introduce your students to the six types of simple machines. During their visit to the Capitol Park Museum, they will learn more about simple machines in everyday life and discover examples of simple machines in our galleries.

Teacher Notes

A **machine** is any device that can apply **mechanical energy** (energy an object has on that is produced by a machine) at one point and deliver it in a more useful form at another point. Therefore, a machine is any device that provides a “mechanical advantage”. Put simply, a machine is anything that produces work, or motion. You are doing **work** when you use a **force** to cause motion.

When you think of machines, you probably think of cars, tractors, fans, airplanes, or anything with a motor. However, not all machines need a motor to make them run. Do you know that hammers, nails, scissors, and bottle openers are machines? They are called simple machines.

Simple machines provide a mechanical advantage that makes our work faster and easier, and they are all around us every day.

To give an example of how we use simple machines suppose that your job requires you to take a box of books to the library. The box of books weighs 100 pounds. You have made plans to have someone with a truck drive you to the library. However, the box is too heavy for you to pick up and place in the bed of the truck. You definitely need a mechanical advantage! You decide to place the books in a wagon and pull the wagon to the truck. The rotating wheels on the wagon (a simple machine called a wheel and axle) make it much easier to move the box of books. Once you are at the truck, you find a board to make a ramp (inclined plane), placing one end of the board on the ground and the other on the edge of the truck bed. After pushing the box of books up the ramp and into the truck bed, you realize you are very thirsty. You find a bottle opener (lever) and use it to pry the lid off a soda bottle. You enjoy a refreshing drink and smile as you remember how a few simple machines just made your life (and work) a lot easier.

Words to Know

- Machine
- Work
- Force
- Mechanical advantage
- Simple machine
- Wedge
- Inclined plane
- Pulley
- Wheel and axle
- Screw
- Lever
- fulcrum

Resource site: <http://www.edheads.org/activities/simple-machines/>

Pre-Visit Activities

Simple Machines Pre-Visit Activities

Directions

Use the activities on the following pages to introduce six types of simple machines to your students. Each activity demonstrates how one type of simple machine provides a “mechanical advantage” and makes work easier.

Activity 1: Wedge

Materials: Paper, scissors

Activity Procedure

- Give each student or each group of students two pieces of paper.
- Ask the students to divide one sheet of paper into two equal parts using just their hands.
- Give each student or group of students a pair of scissors. Ask the students to use the scissors to divide the paper into two equal parts.
- Ask students to compare the two sheets of paper. Encourage students to identify which method of dividing the sheets of paper looks neater or more precise. Question: Did the scissors provide a “mechanical advantage?” In what way?
- Ask students to examine the scissors and explain how they work. Explain that each blade is a sharpened wedge. As the scissors blades meet, they cut, or separate, the paper neatly.



Definition: Wedge

A wedge is an inclined plane that is thick at one end and tapers to a point on the other end.

Wedges are used to push two objects apart or cut an object into pieces. A wedge can also be used to hold objects in place. When you use a pair of scissors, you are using two wedges that are joined together to cut or separate an object.

Activity 2: Wheel and Axle

Materials: Toy cars, box, skateboard

Activity Procedure

- Give each group of students a toy car with the wheels and axels removed. Ask the students to demonstrate pushing the car on a table.
- Ask the students: “How well does the car move?” and “What is missing from the car?”
- Explain that a wheel and axle is a simple machine that helps move the car with less



Definition: Wheel and Axle

A wheel and axle is a wheel with a rod, called an axle, through its center. Both parts move together to help move a heavy load with less effort.

Pre-Visit Activities

effort. Demonstrate using a toy car with wheels and axles attached.

- To demonstrate how a wheel and axle can make work easier, ask a student to move a heavy box across the room. Questions to ask: How difficult is it to move the heavy box? What simple machine could you use to move the load more easily?
- Ask students to move the heavy box using a skateboard. Encourage students to discuss how the wheels and axles on the skateboard make work easier.

Activity 3: Pulley

Materials: School flagpole and flag

Activity Procedure

- This activity takes place on the school grounds near the flag pole and flag.
- Explain that in this activity, students are to raise the flag to the top of the pole. Ask students to jump to the top of the flagpole to attach the flag. Of course, they will not be able to do this.
- Explain that a pulley is a simple machine that can make the work of raising the flag seem much easier.
- Ask students to attach the flag to the rope and pull it up, noting that as they pull down on the rope, the flag moves up along the pole. Ask students to examine how the rope and grooved wheels work together to raise the flag.



Definition: Pulley

A pulley is a simple machine made up of a wheel and a rope. The rope fits into the wheel and one end of the rope is attached to the load. When you pull on one side of the pulley, the wheel turns and the load moves.

We use pulleys because they let us move loads up, down, and to the side.

Activity 4: Screw

Materials: two empty milk jugs, water, screw top that fits one of the jugs, press-on bottle top

Activity Procedure

- Fill both jugs with water.
- Place a press top on one jug and a screw top on the other jug.
- Ask a student to drop the jug that has the press-on top. Ask students to explain the result.
- Ask another student to drop the milk jug that has the screw-on bottle top. Ask students to explain the result.
- Compare how well the two types of closures worked. Explain that the screw-on lid is actually a screw; the threads on the lid close the jug more tightly than does the press-on lid. When the force and weight of the water is applied to the lids, the screw-on lid kept the water in the jug better than did the press-on lid.



Definition: Screw

A screw is a specialized inclined plane that is used to raise and lower things as well as hold things together. They can be used to press or crush objects as well.

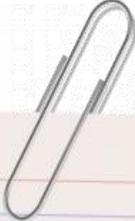
Pre-Visit Activities

Activity 5: Lever

Materials: ruler, pencil, coins

Activity Procedures

- Explain that students will build a lever that will help move an object. They will build a simple catapult (a lever) that shoots coins (the load) into the air, thus moving a heavy load a great distance.
- Give each set of students a pencil, ruler, and a coin.
- Ask students to place the pencil on a flat surface and place the center of the ruler across the pencil to form a right angle. One end of the ruler should rest on the flat surface while the other end will be raised in the air.
- Place a coin on the end of the ruler that is resting on the flat surface. Explain that the pencil acts as the fulcrum and the coin acts as the load that needs to be moved
- Ask students to drop a light weight or another coin on the raised end of the ruler. Ask students to explain what happens.
- Ask students to try the same experiment using with different load weights, dropping the weight from different heights, and placing the fulcrum in different positions. The students can develop a chart on which to record the results of their experiments.
- Note: If your school has a see-saw, demonstrate how it is an example of a lever.



Definition: Lever

A lever is a simple machine that is made up of a board or bar that rests on an object. The object that holds up the bar is called a fulcrum.

Levers are used to make moving heavy objects much easier by using less force.

Activity 6: Inclined Plane

Materials: board, chair, books, rope

Activity Procedures

- Tie several books together with a rope. Place the books on the floor. The task is to move this load of books by placing it in the chair.
- Ask students to pick up the stack of tied books and place it in the chair. Ask students to explain how much force it took to move the books. Questions to ask: Was this a difficult task? Is there a simple machine that could make this work easier?
- Place one end of the board on the floor and one end on the front edge of the chair seat to make a ramp. The board should be slanted and secure enough not to fall.



Definition: Inclined Plane

An inclined plane is a flat surface with one edge raised higher than the other.

Inclined planes are used to make the job of moving heavy objects easier. An object can go up an inclined plane or down.

Pre-Visit Activities

- Ask students to push the books up the board toward the seat of the chair. Did this action make moving the books from the floor to the chair easier? Ask students to explain what they think happened. How much force was used?
- Ask students to stand near the chair and pull the books off the floor. Did pushing or pulling take most force?
- Explain that objects are usually moved straight up and down. This takes the most work and is harder if objects are heavy. With an inclined plane, the slope makes it easier to push or pull the object.

Post-Visit Activities

Use our post-visit activities to reinforce what your students learned during their visit to Capitol Park.

Make Simple Machines

- **Inclined Plane:** Place two books on a flat surface; prop the third book up against the other two, leaving one end of the book on the flat surface.
- **Wheel and Axle:** Place a pencil between two spools of thread. Tie a piece of string around the axle (pencil). Tie a small object, such as an eraser, to the other end of the piece of string. The axle will move the object across a distance by turning the wheels (spools of thread).
- **Wedge:** A thumb tack can function as a wedge. Have the students create the wedge by attaching a piece of paper to a cork board with the thumb tack.
- **Lever:** Place a popsicle stick on top of and across the pencil. The Popsicle stick would have just enough room to totter a few inches on each side. The students can test the lever by placing a small object, such as a small rock, on one end of the ruler and then using their finger to apply pressure on the other side of the ruler.
- **Screw:** The screw is a simple inclined plane wrapped around a center pole creating screw shape. Have the students cut long thin triangles of paper. Have them wrap them around a pencil, then pull the pencil out. The paper will form the shape of a screw.
- **Pulley:** Have two students hold two brooms about two feet apart from each other. Attach one end of a rope to one broom handle. Thread the rope around the other broom handle and back once more making a Z shape. Have another student hold the free end of the rope and pull on the rope while the other students hold onto the broom handles.

Creative Writing Activities

- Have students write a story in which a simple machine is the fictional main character. Have the students create a problem that the character (simple machine) resolves.
- Have third grade students write a sentence about how the installation of the pulley system on Louisiana shrimp boats has benefited the market and reduced operating cost, which in turn lowers consumer cost.
- Have fourth and fifth grade students write a paragraph on how the installation of pulleys on Louisiana shrimp boats can reduce cost to Louisiana shrimpers, and how the choice to use simple machines can affect family budgets.

Simple Machines in Everyday Life

Ask students to look for examples of simple machines at work in their daily lives. Students can prepare an investigation journal in which they record examples of simple machines at work. Ask students to watch for examples of how a simple machine could have made work easier.

| Simple Machine | How is it being used? |
|----------------|-----------------------|
| Example 1: | |
| Example 2: | |