



Simple Machines

Educator Notes

Learning Objectives

- Define simple and compound machines.
- List the six simple machines and explain their purpose.
- Provide examples of simple and compound machines.

Educator Background

In this lesson, students are constructing a compound machine they feel would be beneficial to use aboard the International Space Station. First, they learn about the six simple machines, their purposes, and how they combine to create compound machines.

A simple machine is an object used to help complete a task by changing the direction of motion or the amount of required force. There are six simple machines: screw, inclined plane, wedge, lever, wheel and axle, and pulley. A compound machine is a machine consisting of two or more simple machines. Some examples of compound machines are clippers, a manual pencil sharpener, a crane, and a bulldozer.

Screw: helps to fasten two objects together (examples: screw, bottle caps)

Inclined Plane: uses an angled plane, or surface, to move objects more easily (examples: ramp, stairs)

Wedge: uses two inclined converging planes in order to split, or separate, objects (examples: door stop, knife)

Lever: uses a surface situated on a fulcrum (pivoting point) to move an object (examples: seesaw, scissors)

Wheel and axle: a wheel attached to an axle used to turn or move a load (examples: bicycle, clock)

Pulley: uses a wheel and axle to change the direction of an object (examples: elevator, water well)

When two or more simple machines are combined, it creates a compound machine. Compound machines may be utilized to complete more specific tasks.



NASA astronaut Stephanie Wilson, mission specialist, retrieves a tool from a drawer in the Unity node of the International Space Station. Credits: NASA

Grades 3 to 5

Suggested Pacing

60 minutes

- Inquiry Discussion – 5 min
- Simple Machines Activity – 15 min
- Watch STEMonstration video – 5 min
- Compound Machines Activity – 25 min
- Final Discussion – 10 min

Materials

- Simple Machines Student Worksheet
- Pencil
- Various classroom objects serving as examples of simple machines
- Tape
- Glue

National STEM Standards

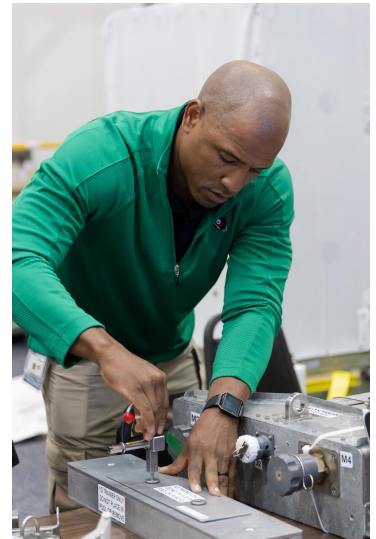
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Facilitate the Challenge

Ask (Inquiry Discussion)

- Additional background information should not be given to the students prior to these questions due to it being an inquiry-based learning lesson. Use this discussion and the following activity to segue into the Simple Machines STEMonstrations video. Start this activity by asking students the following:
 - As you look around the classroom, what items do you see helping to make our day easier? Have students explain how the items make certain tasks easier.
 - When you look closely at the object, what specific parts help it to function properly?
 - What similarities do you notice among these items? For scissors to work properly, there must be a sharp edge. For a door to open, there must be a knob attached to a pivoting rod. These items we use so often to make tasks easier are called simple machines.
- Pass out the Simple Machines Student Worksheet and go over each of the six different simple machines with your students.



NASA commercial crew astronaut Victor Glover gets training on some of the tools he will need during spacewalks on the International Space Station. Credits: NASA

STEMonstrations Video

- Watch the Simple Machines STEMonstrations video, available at <https://www.nasa.gov/stemonstrations>.
 - Discuss the similarities and differences between how simple machines may be used in the microgravity environment of the International Space Station versus how we typically use them here on Earth.

Explore (Simple Machines Activity)

- Have students look at the Simple Machines Student Worksheet and describe what a compound machine is. Show them a pair of scissors and explain why a pair of scissors is a compound machine. Tell students the pair of scissors consists of two different simple machines, making it a compound machine.
 - Ask the class to think about which two simple machines make up this compound machine.
- Divide students into groups of two or three.
- Tell students to walk around the classroom and look for an example of each of the six simple machines listed on their Simple Machines Student Worksheet. Encourage students to be creative and look for examples of compound machines.
- Ask student groups to share their examples of simple machines and to explain each item's purpose in the classroom.
 - How does the item make their day easier?
 - Discuss whether astronauts living in a microgravity environment aboard the space station will need the simple machines selected by the student groups.

Create (Compound Machines Activity)

- Ask students to sit in their original groups.
- Using their own examples or those pointed out by their classmates, ask students to combine two or more of these simple machines to create a compound machine to be used aboard the International Space Station.
- During this time, students may use tape or glue and other supplies, with educator's permission, to assemble a compound machine.
- Students prepare for a final presentation to demonstrate their compound machine and address the following questions:
 - What are the simple machines used in this compound machine?
 - What is the purpose of this compound machine?
 - Why would the International Space Station benefit from having this compound machine on board?

Share (Final Discussion)

- Allow students time to share their group's compound machine with the class, and have each group address the presentation questions listed in the Create section of this lesson plan.
- Following the presentations, ask the class these questions and hold a class discussion about each one.
 - What are some similarities among the compound machines created today?
 - What are some differences between the compound machines created today?
 - What would happen if one or more of the simple machines used to make the compound machine were missing?
 - Why are simple machines essential to our everyday lives?

Extensions

As an extension to this lesson, instruct students to look for at least five examples of compound machines at home and create a list. In class, have students write down which simple machines make up each compound machine they found at home.

More To Explore

Simple Machines https://www.grc.nasa.gov/WWW/k-12/Summer_Training/KaeAvenueES/SIMPLE_MACHINES.html


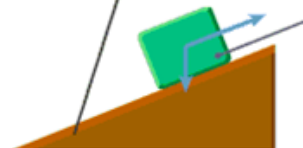

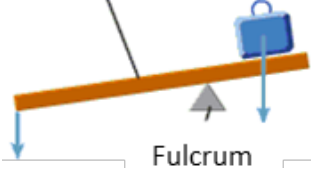
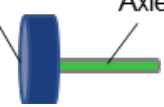
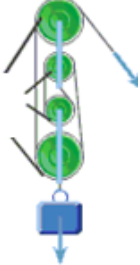
Simple Machines Student Worksheet

Classroom Observations

Directions: Identify and draw examples of the six types of simple machines in your classroom. Explain how each simple machine makes your day easier.

Simple Machine	Classroom Example	Drawing
Screw	Example: _____ How this item makes my day easier: _____	
Inclined Plane	Example: _____ How this item makes my day easier: _____	
Wedge	Example: _____ How this item makes my day easier: _____	
Lever	Example: _____ How this item makes my day easier: _____	
Wheel and Axle	Example: _____ How this item makes my day easier: _____	
Pulley	Example: _____ How this item makes my day easier: _____	

Simple Machines

Simple Machine	Description	Image
Screw	A screw helps to fasten two objects together.	<p>Screw</p> 
Inclined Plane	An inclined plane uses an angled surface to move objects easily.	<p>Inclined Plane</p> 
Wedge	A wedge uses two inclined planes that converge in order to split, or separate, objects.	<p>Wedge</p> 
Lever	A lever uses a surface situated on a fulcrum, or pivoting point, to move an object.	<p>Lever</p>  <p>Fulcrum</p>
Wheel and Axle	A wheel attached to an axle is used for transportation or movement.	<p>Wheel</p>  <p>Axle</p>
Pulley	A pulley uses a wheel and axle to change the direction of an object.	<p>Pulleys</p> 

When two or more simple machines are combined, it creates a **compound machine**. Compound machines may be utilized to complete more specific tasks.