

## ENERGY FUNDAMENTALS – LESSON PLAN 1.6

# Simple and Compound Machines

This lesson is designed for 3rd – 5th grade students in a variety of school settings (public, private, STEM schools, and home schools) in the seven states served by local power companies and the Tennessee Valley Authority. Community groups (Scouts, 4-H, after school programs, and others) are encouraged to use it as well. This is one lesson from a three-part series designed to give students an age-appropriate, informed view of energy. As their understanding of energy grows, it will enable them to make informed decisions as good citizens or civic leaders.

This lesson plan is suitable for all types of educational settings. Each lesson can be adapted to meet a variety of class sizes, student skill levels, and time requirements.

### Public School System Teaching Standards Covered

- State Science Standards**
- [AL GLE 3.5.1](#) 3<sup>rd</sup>
  - [AL GLE 3.5.2](#) 3<sup>rd</sup>
  - [AL GLE 3.5.3](#) 3<sup>rd</sup>
  - [AL GLE 5.6.2](#) 5<sup>th</sup>
  - [GA S4P3](#) 4<sup>th</sup>
  - [MS GLE 2.c](#) 3<sup>rd</sup>
  - [NC 3.P.1](#) 3<sup>rd</sup>
  - [NC 5.P.1](#) 5<sup>th</sup>
  - [TN GLE 0307.T/E.1](#) 3<sup>rd</sup>
  - [TN GLE 0507.T/E.1](#) 5<sup>th</sup>
  - [VA 3.2](#) 3<sup>rd</sup>

Setting	Lesson Plan Selections Recommended for Use
Smaller class size, higher student ability, and /or longer class length	<ul style="list-style-type: none"> <li>• The “Modeling” Section contains teaching content.</li> <li>• While in class, students can do “Guided Practice,” complete the “Recommended Item(s)” and any additional guided practice items the teacher might select from “Other Resources.”</li> <li>• NOTE: Some lesson plans do and some do not contain “Other Resources.”</li> <li>• At home or on their own in class, students can do “Independent Practice,” complete the “Recommended Item(s)” and any additional independent practice items the teacher selects from “Other Resources” (if provided in the plan).</li> </ul>
Average class size, student ability, and class length	<ul style="list-style-type: none"> <li>• The “Modeling” Section contains teaching content.</li> <li>• While in class, students complete “Recommended Item(s)” from “Guided Practice” section.</li> <li>• At home or on their own in class, students complete “Recommended Item(s)” from “Independent Practice” section.</li> </ul>
Larger class size, lower student ability, and/or shorter class length	<ul style="list-style-type: none"> <li>• The “Modeling” Section contains teaching content.</li> <li>• At home or on their own in class, students complete “Recommended Item(s)” from “Independent Practice” section.</li> </ul>

**Electrical Safety Reminder:** Teachers should remind students that electricity is dangerous and that an adult should be present when any recommended activities or worksheets are being completed at home. Always obey instructions on warning labels and ensure one has dry hands when touching electronics or appliances.

## Performance Objectives

By the end of this lesson, students will be able to:

- Identify and explain simple machines and how they work.
- Identify and explain how compound machines work.

## I. Anticipatory Set (Attention Grabber)

### ? Essential Question

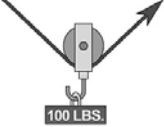



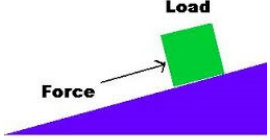

How can we make our work easier?

## II. Modeling (Concepts to Teach)

A **simple machine** is defined as a machine that **makes work easier** by allowing a person to push or pull objects over increased distances. There are few to no moving parts in a simple machine. And remember, work is defined as applying a force over a distance in the same direction as the force.

There are **SIX** simple machines:

Additional Information: <http://www.mikids.com/Smachines.htm>

	Type	Example
1	<b>Pulley</b> – A pulley is a simple machine that uses grooved wheels and a rope to raise, lower or move a load.	
2	<b>Lever</b> – A lever is a stiff bar that rests on a support called a fulcrum which lifts or moves loads.	
3	<b>Wedge</b> – A wedge is an object with at least one slanting side ending in a sharp edge, which cuts material apart.	
4	<b>Wheel and Axle</b> – A wheel with a rod, called an axle, through its center lifts or moves loads.	
5	<b>Inclined Plane</b> – An inclined plane is a slanting surface connecting a lower level to a higher level. The inclined plane is simply a ramp, which uses the force of gravity to do work.	
6	<b>Screw</b> – A screw is an inclined plane wrapped around a pole which holds things together or lifts materials.	

A **compound machine** is two or more simple machines put together to do work. Unlike simple machines, compound machines have moving parts. For example, a pair of scissors is two levers moving past each other to do work. Also, the blades of the scissors are wedges (another simple machine). A bicycle is a compound machine that includes 3 simple machines: wheel and axle, gears, and a lever (the pedals). Compound machines also make work easier!

### III. Checking for Understanding

Teachers can ask students these questions to determine understanding of concepts.

<b>REMEMBER</b>	List the simple machines that can make work easier. List the compound machines that can make work easier. (Teachers can list these on the board with help from students.)
<b>UNDERSTAND</b>	How do machines make work easier? (Class discussion)
<b>APPLY</b>	Illustrate a simple machine. (Teacher or student demonstrates use of a simple machine such as a door stop or ramp.)
<b>ANALYZE</b>	If you could only have one machine (simple or compound), what would you choose and why? (Have multiple students answer or everyone write down what they would choose.)
<b>EVALUATE</b>	Rate the importance of simple and compound machines. What would happen if there were no machines making our work easier? (Class discussion)
<b>CREATE</b>	Create a drawing of a simple or compound machine that would make something you don't like to do easier. (Students can draw a machine, such as a pulley in a tree house, on a piece of paper.)

## IV. Guided Practice Ideas

### Recommended Items

Simple Machine Experiment (using playground); Catapult Experiment

### Experiments

- A Slide is a Simple Machine Experiment (using playground):  
<http://www.eia.gov/kids/resources/teachers/pdfs/SlidePrimary.pdf>
- Catapult Experiment: [http://sciencegal-sciencegal.blogspot.com/search/label/enrichment and investigation](http://sciencegal-sciencegal.blogspot.com/search/label/enrichment%20and%20investigation)
- Simple Machines: Levers Experiment (using playground):  
<http://www.eia.gov/kids/resources/teachers/pdfs/LeverElementaryActivity.pdf>
- An Energy Playground – Using Human Energy: <http://www.planetseed.com/laboratory/energy-playground>

### Games

- Simple and Compound Machines: <http://schooltoolbox.weebly.com/simple--compound-machines.html>

### Practice that uses math/reading skills:

- Math: Equation for force (force = mass x acceleration). Teachers can review Newton's Second Law with students: <http://www.youtube.com/watch?v=nO7XeYPi2FU>. Students can do example problems: [http://share.nanjing-school.com/sciences/files/2013/02/8Sci\\_FM\\_2ndLawWS-1fdv8aq.pdf](http://share.nanjing-school.com/sciences/files/2013/02/8Sci_FM_2ndLawWS-1fdv8aq.pdf)
- Reading: Students can read and summarize an article about force and motion: <https://suite.io/harvey-craft/624s2a6>

## V. Independent Practice Ideas

### Recommended Items

Compound/Simple Machine Scavenger Hunt (see below)

### Other Resources

#### Personal Practice

- Writing Activity: Teachers write the following question on the board and ask students to copy and answer the question on a sheet of paper: Explain how simple and compound machines work, in your own words.
- Create a simple machine using household items. Teachers can ask students to brainstorm ideas and teachers can write them on the board. Students can then create simple machines if materials are available. (Ex. a match box car rolls down an inclined plane and cracks an egg open.)
- Journal (if the students have a journal). Teachers write the following question on the board and ask students to copy and answer the question in their journals: Explain how machines make work easier.

### **Practice That May Involve Parents or Guardians**

- At-home Activity: How Does Energy Work? Worksheet and Answer Key provided
- Scavenger Hunt – Simple Machines: Students find 5 simple machines in their homes and list them on a sheet of paper. (Ex. hammer, jar with a lid that screws on, etc.)
- Scavenger Hunt – Compound Machines: Students find 5 compound machines in their home and list them on a sheet of paper. (Ex. wheelbarrow, a pair of scissors, etc.)
- Build your own simple/compound machine (ex. a match box car rolls down an inclined plane and cracks an egg open).

## **VI. Assessment**

These items provide a check for understanding so teachers can easily determine whether concepts need to be reinforced. These items can be graded, if desired.

- How Do Machines Make Work Easier? Worksheet and Answer Key provided
- Journal (if completed as Personal Practice, as shown above)

## **VII. Materials Needed**

The following materials are needed for the **A Slide is a Simple Machine Experiment** in “Recommended Items” in the Guided Practice section.

- 1 playground slide
- 1 long rope (25 feet)
- 1 measuring tape
- 4 heavy books
- 1 sturdy canvas bag with handles

## **VIII. Closing the Lesson**

In addition to the Essential Question shown below, teachers can reference Performance Objectives at the top of the Lesson Plan.

### **Essential Question**

**How can we make our work easier?**

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WORKSHEET FOR SIMPLE AND COMPOUND MACHINES LESSON 1.6

NAME: \_\_\_\_\_

# How Do Machines Make Work Easier?

*Objective: Students will be able to identify and explain simple and compound machines and how each type of machine works.*

**1. How do machines make work easier?**

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**2. What is one type of simple machine?**

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**3. Draw an example of a wheel and axle:**

4. Is a wheel and axle a simple machine or a complex machine? Why?

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5. How have machines changed with technology?

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Answer Key

**ANSWER KEY FOR WORKSHEET: HOW DO MACHINES MAKE WORK EASIER?**

**1. How do machines make work easier?**

Ex. Machines make work easier by applying more force to an object than a person can naturally apply.

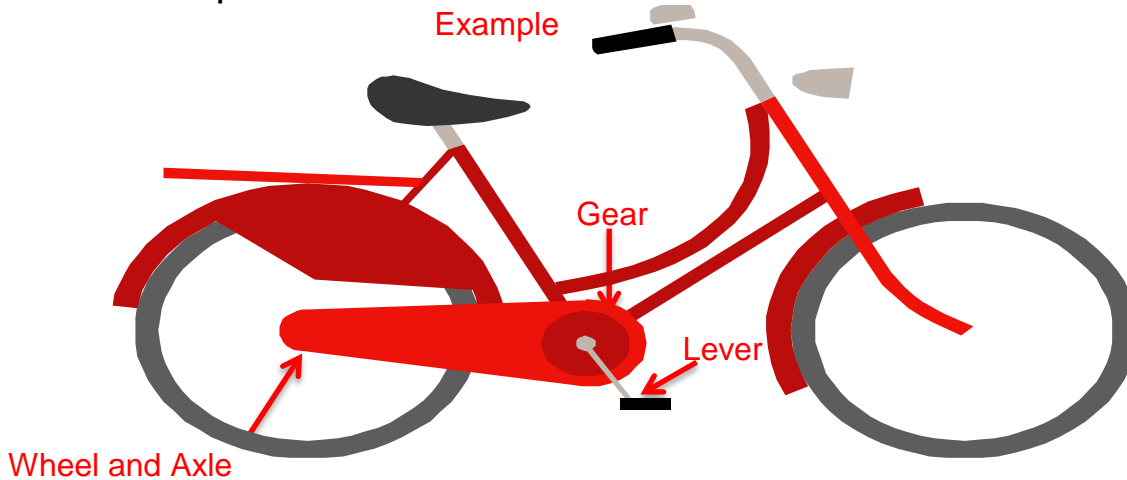
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**2. What is one type of simple machine?**

Ex. Pulley, lever, wedge, wheel & axle, inclined plane, or screw

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**3. Draw an example of a wheel and axle:**



**4. Is a wheel and axle a simple machine or a complex machine? Why?**

Ex. Simple machine – there are few moving parts.

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**5. How have machines changed with technology?**

Ex. As technology has progressed, it has provided us with more machines that are able to do more work.

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