

# Simple Machines UBD Unit Plan

## Established Goals:

3.2 The student will investigate and understand simple machines and their uses. Key concepts include

- a) purpose and function of simple machines;
- b) types of simple machines;
- c) compound machines; and
- d) examples of simple and compound machines found in the school, home, and work environments.

## What essential questions will be considered?

**Interpretation:** What do compound machines reveal about human creativity?

**Perspective:** What are the limits to simple machines?

## What understandings are desired?

Students will understand that...

- **Interpretation:** What do compound machines reveal about human creativity?  
If children can answer this question, they understand that creativity and invention is what makes technological advancement possible
- **Perspective:** What are the limits to simple machines?  
When students answer this question they understand that there are no limits to simple machines. Students understand that there is potential that has not yet been reached.

## What key knowledge and skills will students acquire as a result of this unit?

### Essential Skills:

- Identify the six simple machines.
- Explain the applications of each simple machine.
- Identify simple machines in daily life.
- Define each simple machine.
- Explain the difference between a simple and compound machine.
- Define a compound machine.
- Recall examples of compound machines.

### Essential Knowledge:

- The six simple machines:
  - a simple machine is a basic mechanical device that makes work easier
  - lever: a stiff bar that moves about a fixed point (fulcrum). It is a simple machine that is used to push, pull, or lift things. Examples include a seesaw, crowbar, and shovel.
  - Screw: an inclined plane wrapped around a cylinder or cone. A common use of the screw is to hold objects together. Examples include a jar lid and wood screw.
  - Pulley: a wheel that has a rope wrapped around it. Pulleys can be used to lift heavy objects by changing

- Identify what simple machines are in use within a compound machine.
  - Form an opinion on how creativity is related to developing compound machines and justify reasoning. (EQ1)
  - Generate a list of tasks that would make the day more productive if there was technology that made the task more efficient/completed the task on its own.
  - Generate a list of tasks that would make the day easier for a person with a different background.
  - Justify the potential simple machines still have today. (EQ2)
- the direction or amount of the force. Examples include a flagpole.
  - Wheel and Axle: consists of a rod attached to a wheel. A wheel and axle makes it easier to move or turn things. Examples include bicycle wheels, roller skates, and a doorknob.
  - Inclined Plane: a flat surface that is raised so one end is higher than the other. The inclined plane helps move heavy objects up or down. An example is a ramp.
  - Wedge: wide at one end and pointed at the other to help cut or split other objects. Examples include a knife or ax.
- Compound machines:
    - A compound machine is a combination of two or more simple machines.
    - Scissors: consist of two levers and two wedges. The fulcrum of both levers is where they are joined together. The blades themselves are wedges, with a sharp cutting edge and a thicker dull edge.”
    - Wheelbarrow: used to carry heavy objects. It consists of two simple machines: a lever and a wheel and axle. Effort is applied to the lever by picking up the handles of the wheelbarrow. The rolling wheel turns the axle and increases the force, making it easier to push the load.
    - Bicycle: The wheels and pedals each form a separate wheel and axle system. The brakes and brake handles are levers, and the seat adjustment is a screw.
  - Johannes Gutenberg invented the printing press in 1440
    - print became more accessible, the average joe now had access to literature.
    - Made of simple machines like levers and screws.
  - Rube Goldberg went to school to be an engineer, and after graduating, he decided to become an artist. He drew cartoons of inventions that did simple things in very complicated ways. His inventions involved many complex systems of simple machines, all organized in logical sequences, to accomplish simple tasks.

## Performance Based Evidence (PBE)

- **Interpretation:** What do compound machines reveal about human creativity?  
If children can answer this question, they understand that creativity and invention is what makes technological advancement possible
  - **Title:** You're the Author!
  - **Goal:** Students show understanding that compound machines are technological advancements spawned from human creativity and innovation.
  - **Role:** Author
  - **Audience:** Book publisher (public library librarians)
  - **Situation:** You have been asked to write a children's book about an inventor and their invention that made an impact on the world.
  - **Product:** A children's book created on the app Book Creator
  - **Standards:**
- **Perspective:** What are the limits to simple machines?  
When students answer this question they understand that there are no limits to simple machines. Students understand that there is potential that has not yet been reached.
  - **Title:** Crazy Coasters!
  - **Goal:** Students show understanding that through creative thinking, simple machines have limitless potential.
  - **Role:** Roller coaster engineer
  - **Audience:** The board of directors from Kings Dominion (high school AP Physics class)
  - **Situation:** You have been asked by the directors of Kings Dominion to design the newest roller coaster.
  - **Product:** A model of the proposed roller coaster, and pitch explaining why your design uses simple machines to create a new and unique experience roller coaster riders will have never experienced before.
  - **Standards:**

## Other Evidence:

- Test assessing:
  - the six simple machines and their application
  - three compound machines
  - definitions of a simple and compound machine
  - Know who Johannes Gutenberg and Rube Goldberg are and their significance
- Quiz on the six simple machines and definition of a simple machine
- Quiz on three compound machines and definition of a compound machine
- Simple machine scavenger hunt where students find simple machines in their everyday life
- Observe students ability to label simple machines in a compound machine
- Observe students in a discussion of machines they wish existed to make their lives easier and how they would design the machines. Create a class list.

- Collect students response to the prompt: What is an area of your life that a machine could make easier? Draw a picture of the machine in use.
- Discuss and observe about people of different backgrounds and different aspects of their lives. Generate a class list of ways to make their lives easier.
- Collect student response to the prompt: What is a machine you could invent to make someone else's life easier? How would you design this machine?

**Metacognition:**

- How can you assess your knowledge of simple and compound machines and their importance in your world?
- Why do you think compound machines take creativity or do not take creativity?
- Why are simple machines so important to technological advancement?
- How well do you feel you understand what a simple machine is?
- How well do you understand how simple machines can be transformed and combined to create new inventions?
- Why do you think technological advancement is or is not important?

## References

(2003). *Compound Machines: A Physical Science Activity*. Retrieved from:  
[www.galileo.phys.virginia.edu/](http://www.galileo.phys.virginia.edu/)

(2015). *4.48: Compound Machine*. Retrieved from: [www.ck12.org](http://www.ck12.org)

(2015). *30.4: Compound Machines*. Retrieved from: [www.ck12.org/](http://www.ck12.org/)

Bendewald, M. & Zarske, M. S. & Yowell, J. (2007). *Lesson: Rube Goldberg and the meaning of machines*. Teach Engineering: Curriculum for k-12 teachers. Retrieved from:  
[www.teachengineering.org](http://www.teachengineering.org)

Wishnia, S. (2009, March 30). *How did the printing press change history?* Retrieved from:  
[www.teacher.scholastic.com](http://www.teacher.scholastic.com)

Virginia Department of Education. (2012). *VA standards of learning curriculum framework: Grade three*. Retrieved from: [www.doe.virginia.gov](http://www.doe.virginia.gov)