- **www.fi.edu/qa97/spotlight3/spotlight3.html**
  The Franklin Institute Online presents information on simple machines.
- **www.coe.uh.edu/archive/science/science_lessons/scienceles1/finalhome.htm**
  This web site describes the six simple machines and includes experiments and a quiz.

## Suggested Print Resources


- Lafferty, Peter. *Eyewitness Books: Force & Motion*. DK Publishing, New York, NY; 2000.
- Macaulay, David. *The New Way Things Work*. Houghton Mifflin, New York, NY; 1998.
- Nankivell-Aston, Sally. *Science Experiments with Simple Machines*. Scholastic Library Publishing, New York, NY; 2000.
- Tocci, Salvatore. *Experiments with Simple Machines*. Children's Press, New York, NY; 2003.



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TEACHER'S GUIDE


# Levers

## Grades 3–6

Journey to Mammoth Island, a whimsical place where investigating scientific principles is always an adventure. Olive, a young girl, assisted by the Island's mammoth population and a visiting inventor helps the locals discover why and how machines work. Science facts are clearly demonstrated, giving kids an opportunity to see how important everyday machines are linked together by the science that drives them. Students come to see that science is a way of organizing information about the world, explaining why things work the way they do and allowing us to predict what might happen in new situations.

This guide provides a brief synopsis of the program, background on the science concepts presented, discussion topics, additional activities, vocabulary and suggested print and Internet resources.

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## Program Summary

Most tools of today look different from those of the past, but they are just modifications and combinations of very ancient tools called simple machines. We are surrounded by simple machines that make our lives easier by helping to get a job done with less effort. Simple machines have very few moving parts, or no moving parts at all. They enable us to use less effort to push or pull an object, and they can be found almost anywhere work is being done. Machines do not increase the amount of force applied, they just use the force in a way that gets the job done more easily.

In *Levers*, inhabitants of Mammoth Island have decided to enter their heaviest mammoths into a competition and are trying to find the best method to weigh them. After observing some children playing on a see-saw, Olive decides to use a simple machine called a lever to get the job done. A lever is considered a simple machine. It is a rod or bar that turns around a point called a fulcrum or pivot and is used to move a load.

There are many different kinds of levers. A seesaw and a hammer's claws are examples of levers that have the fulcrum between the effort and the load. A wheelbarrow is an example of a lever with the load between the fulcrum and the effort, and a fishing rod is an example of a lever with the effort between the fulcrum and the load.

When simple machines are combined they create useful compound machines. Scissors, pliers, nail clippers and tweezers are just a few examples of useful inventions based on the principle of the lever!

## Glossary

The following words are included for teacher reference and for use with students to extend the subject matter in the show.

**effort** — The force applied to get work done.

**energy** — The ability to do work.

**force** — A push or a pull on an object that causes a change in motion.

**fulcrum** — The fixed balancing point of a lever. An example of a fulcrum is the middle bar in a seesaw.

**lever** — A simple machine consisting of a rod or bar that turns around a point called a fulcrum or pivot and is used to move a load.

**load** — The resistance or weight that is moved using a lever.

**machine** — Any device that helps you do work.

**mechanical advantage** — The number of times a simple machine multiplies the effort force.

**power** — A measure of how quickly work is done.

**simple machines** — Devices with few moving parts that can be used to reduce the amount of effort needed to do work. The six basic simple machines are the lever, the wheel and axle, the pulley, the inclined plane, the wedge and the screw.

**first class lever** — A lever that has the pivot (fulcrum) between the effort and the load.

**second class lever** — A lever that has the load between the pivot (fulcrum) and the effort.

***(Continued)***

**third class lever** — A lever that has the effort between the pivot (fulcrum) and the load.

**work** — To move or change something. Doing work takes energy. When you use force to make something move, you are doing work.

## Pre-viewing Discussion

- Ask students to define "work" and explain how work gets done.
- Explain that force is a push or a pull on an object. Use a small force to push open the classroom door, then illustrate that a larger force would push the door open even more. Ask students to come up with other examples of forces (pushes or pulls) that will move objects in the classroom.
- What are some uses for levers?
- What is the pivot point of a lever called?
- What do you call the force that is applied to the lever?

## Follow-up Questions & Activities

- What kinds of tasks involve the use of simple machines? Have the class make a list of all the levers that they encounter in the course of a week. After going over the list, have students write a story describing a day without the help of simple machines.
- Give small groups of students a pencil, a ruler and fifty pennies. Direct each group to make a lever by placing the ruler across the pencil. The pencil (fulcrum) is first placed under the four-inch mark on the ruler. Ten pennies (the load) are placed between the end of the ruler and the one-inch mark. Have each group add and record the number of pennies needed on the opposite end of the ruler to lift the ten pennies (load). The experiment can then be repeated with the ten pennies at one end and the pencil (fulcrum) at the six-inch and eight-inch marks under the ruler. Direct the groups to record the number of pennies needed to lift the ten pennies (load) at the different points of the ruler on a chalkboard chart. Challenge them to work out the mechanical advantage using the ratio of the distance of the effort arm to the resistance (load) arm.
- Have students disassemble some common tools and list and describe or sketch all the different components in an "Inventor's Journal." How many components are simple machines? Have them chart their results, and then brainstorm with a partner to come up with a design for a new invention that would be comprised of some of the parts in the sketches.
- Ask students to explain why levers make it easier to move heavy objects. Have them build a catapult or a balance. Make sure that students have ample time to design, build, and test their devices.

## Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- **www.enchantedlearning.com/physics/machines/Levers.shtml**
  This Enchanted Learning Web page contains basic information on levers along with animations.

***(Continued)***