

Suggested Internet Resources

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

- www.galaxy.net/~k12/machines
This Marvelous Machines web site lists a series of simple machine experiments and other activities designed for student inquiry.
- www.fi.edu/qa97/spotlight3/spotlight3.html
The Franklin Institute Online presents information on simple machines.
- www.coe.uh.edu/archive/science/science_lessons/science1/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.

TEACHER'S GUIDE

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The Way Things Work Video Series includes these 26 programs:

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| • BALLOONING | • INCLINED PLANES | • SCREWS |
| • BELTS & GEARS | • LEVERS | • SENSORS |
| • COOLING | • LIGHT | • SINKING |
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Teacher's Guides Included
and Available Online at:



800-843-3620



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Inclined Planes

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.



Program Summary

Most tools of today look different than 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 *Inclined Planes*, inhabitants of Mammoth Island decide to build new roads to handle the increasing mammoth traffic. In order to make gravel for the roads, they smash boulders into bits by dropping them off a wooden tower. While this method does produce the needed gravel, the Islanders find it is extremely difficult and even dangerous to hoist boulders up the side of a tower. Olive suggests that they roll the boulders up an earthen ramp instead of hauling them up the tower, and proves that it takes less effort to roll the boulders up the ramp which allows them to get the job done more easily!

The ramp the Islanders use to help them get their work accomplished is an example of a simple machine called an inclined plane. An inclined plane is a simple machine consisting of a sloping flat surface. While it is easier to move heavy objects using an inclined plane, we have to move them further to complete the work. For example, it is much easier to push a lawnmower up a long, sloped ramp than it is to lift it straight up into a truck by hand.

Another use of an inclined plane is the wedge. Wedges can help get work done by moving — if you push down on a wedge, like an axe blade, the downward force is converted into a greater sideways force. Wedges can also hold things in place, like a doorstop.

When simple machines are combined, they create useful compound machines. Electric hedge trimmers and can openers are just two examples of useful inventions based on the principle of the inclined plane!

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.

inclined plane — A simple machine consisting of a sloping flat surface that makes lifting heavy loads easier by increasing the distance the load is moved.

machine — Any device that helps you do work.

mechanical advantage — The number of times a simple machine multiplies the effort force. The mechanical advantage of an inclined plane can be found by dividing its length by its height.

power — A measure of how quickly work is done.

(Continued)

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.

wedge — A machine consisting of two back-to-back inclined planes. A wedge looks like an inclined plane but it works differently. It can either hold things together, as in a doorstop or nail, or it can split things apart, as in an axe or chisel.

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.
- Why do we use tools? How do tools help us?
- What is a simple machine? What are some uses for a simple machine?
- How does a plow make a farmer’s job easier?

Follow-up Questions & Activities

- What kinds of tasks involve the use of simple machines? Have the class make a list of all the inclined planes 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.
- In small groups, have students research medieval castles and the technology available to people in the Middle Ages. Ask them to design and draw machines that could have been created during that time period. Ask other groups to research the pyramids of ancient Egypt and come up with a theory on how they were created.
- 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 a ramp makes moving heavy objects easier. Have them predict the relationship of the length and height of an inclined plane and the amount of force needed to do work. Using plywood or cardboard ramps and spring scales, have students measure the amount of force needed to pull an object like a toy car up different inclines of the same length, but of varying heights. Record the force for each. Ask them to find the ideal mechanical advantage of the different ramps by dividing the length of the inclined plane (the effort distance) by the height of each plane (the resistance distance). Were their predictions correct?