

- www.abc.net.au/science/k2/moments/s560777.htm
The "Great Moments in Science" Web site contains a page that explains the history of screws.
- www.howstuffworks.com/engine.htm
Students can use the topical index on this site to find many answers to their questions about simple machines and how they work.

Suggested Print Resources

- Douglas, Lloyd. *What Is a Screw?* Children's Press, New York, NY; 2002.
- Glover, David. *Screws (Simple Machines)*. Heineman Library, Crystal Lake, IL; 2002.
- Kerrod, Robin. *Machines (Let's Investigate)*. Benchmark Books, New York, NY; 1996.
- Macaulay, David. *The New Way Things Work*. Houghton Mifflin, New York, NY; 1998.
- Walker, Sally. *Screws (Early Bird Physics)*. Lerner Publications, Minneapolis, MN; 2001.



Screws

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.

TEACHER'S GUIDE

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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 to get the job done more easily. When simple machines are combined they create useful compound machines.

In *Screws*, inhabitants of Mammoth Island are in the process of building a new observation tower out of stone blocks, when one of the Islanders gets trapped at the top of the tower. With the help of a visiting gallant knight and his trusty mammoth, they are able to build a ramp around the cylindrical structure and create a giant simple machine known as a screw. A screw is an inclined plane wrapped in a spiral around a pole. Screws change the direction of effort, so when force is applied to turn a screw in a circle, the threads (the inclined plane) help move the screw down into wood. In the case of the Islanders, turning the tower into a giant screw allows them to spin it, moving the tower down into the soil, bringing the trapped inhabitant of Mammoth Island close to the ground.

Many machines use the principle of the screw to do work. Sometimes, it's to lift or lower things. That's what a screw jack is used for. In other cases, screws are used to hold things together. Bolts are simply screws with straight sides and a blunt end, and can be used with nuts to hold things together.

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. The threads of a screw are really an inclined plane wrapped in a spiral around a post.

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.

screw — A simple machine made of an inclined plane wrapped around a post. Screws are used to lift or lower things and also to hold things together.

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.

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. How do machines make work easier?
- 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.
- Discuss the difference between a mountain road that winds around a mountain and one that goes straight up and down. Which road would make traveling to the summit easier? What's the difference between the two roads?
- What are some simple machines?
- How does a screw do work?
- Why is it easier to screw into something than to simply push it in?

Follow-up Questions & Activities

- What kinds of tasks involve the use of screws? Have the class collect for display objects that make use of this simple machine (car jack, jar lid, wood screws, bolts, swivel chair). In small groups, allow students to handle the items collected and discuss how they do work.
- To demonstrate that a screw is really an inclined plane, have students cut right triangles from paper. (The dimensions should be about 5 inches, by 9 inches, by 10.3 inches.) Direct them to use a marker to color the longest edge of the triangle. Then have them position the shortest side (5 inches) of the triangle along the side of a pencil and evenly wrap the paper around the pencil by rolling the pencil.
- Show students a screwdriver, a block of wood, and four screws of the same length but with different numbers of threads. Ask students to predict which screw will be the easiest to screw into the wood. Have them count the turns of the screwdriver required for each screw and have them compare the results with their predictions.
- Have students research and report on interesting machines that use the concept of a screw in their designs. Some examples are Archimedes' famous water screw, and screw presses to mint coins, print books and make olive oil. If possible, build a model of one for classroom display.

Suggested Internet Resources

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

- www.fi.edu/qa97/spotlight3/spotlight3.html

The Franklin Institute Online presents information on simple machines, including the screw.

- www.mos.org/sln/Leonardo/InventorsToolbox.html

This site includes pages about simple machines along with illustrations of some of Leonardo da Vinci's amazing inventions, such as the “air screw.”

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