Learning Objectives

1) Know that work is done when something is moved; force must be applied to the object.

2) Understand that a machine is anything that helps do work. Basic machines are called simple machines. Simple machines help us do work by increasing force, changing the direction of force, or by changing the speed at which work is done.

3) Realize that gravity and friction decrease the efficiency at which work is done.

4) Know the six simple machines and how they help do work.

   a) The inclined plane is a slanted surface that makes it easier to move an object to a higher place. Lifting an object straight up requires more force than pushing or pulling it up an inclined plane; however, it takes a longer distance to move the object. Ramps, stairs and slides are all inclined planes.

   b) A wedge is two inclined planes placed back to back. Wedges split, or push materials apart. Blades, pins and nails are all inclined planes.

   c) A screw is an inclined plane wrapped around a center part, or core. Screws increase the force, because the more turns it takes to move up a screw, the tighter the screw will hold.

   d) A lever is a board or bar that rests on a fulcrum. The force is the part of the lever where effort is applied, and the load is the part of the lever where work needs to be done. Levers are used to lift heavy objects and gain speed.

   e) A wheel and axle is composed of a round object and a bar on which the object turns. A wheel and axle machine can overcome friction and can increase force. A doorknob and a screwdriver are both wheel and axle machines.

   f) A pulley is made of a grooved wheel and a rope or chain. The rope or chain goes through the groove and turns the wheel. A fixed pulley only changes the direction of force (you pull down on a rope to make the flag move up the flagpole). A moveable pulley, which is a combination of two or more pulleys, changes the direction and increases the force; however, a moveable pulley cannot lift a load very far.

5) Understand that compound machines are a combination of two or more simple machines.

Suggested Activities

1) Before viewing the video:

a) Anticipatory set: There are six simple machines, which help people do work. See how many simple machines the students can name. Have samples of each machine to show as they are named (or use the Simple Machines Hands-on Kit). The six simple machines are: inclined plane, wedge, screw, lever, wheel and axle, and pulley. Watch the video to find those that could not be named.

2) After viewing the video:

a) Inclined Plane and Wheel and Axle: Place a small, thick book under one end of a long, thin book to make an inclined plane. Have each child bring a small car with his/her name on it. Each car has two sets of wheels and axles. Place a long sheet of paper at the end of the inclined plane. Let each student release his/her car at the top of the plane and mark a line with the student's name where the car stops. Ask why some cars go farther than others.

b) Lever: Gather samples of levers (hammer, scissors, nutcracker, bottle opener, nail clipper or a broom). Remind the children of the three parts of a lever taught in the video (Fulcrum- stationary part; Load- where the work is done; Force- where the push or pull is). Hold up each sample and have a child tell and show where each part is. Have children tell what kind of work the machine does (scissors: cut; nutcracker: crushes nuts; etc.). Look at home for more levers.

c) Screw: Get a large screw and a 3" by 5" card. Punch a small hole in the card with the tip of the screw. Slowly turn the card and watch it travel up the screw; it travels up the inclined plane of the screw. Put your thumbnail on the inclined plain and turn it slowly. Watch the nail travel up the inclined plane. Let each child try it at a convenient time.

d) Pulley: Pass around a small pulley from the hardware store. Then go out and observe the pulley at the top of the school flagpole. Ask the custodian to raise and lower the flag as the children watch. Bring toys from home that have pulleys.

e) Wedge: Get a wedge and a small block from the kindergarten blocks. Prop the door open with the wedge and try to move it. Try the same with the block. What happens each time? Why? Try pushing the head of a pin through paper. Turn it around and push the pointed end (wedge) through the paper. What happens each time and why?

Vocabulary

Force – A force is a push or a pull.

Friction – Friction is a force that slows work down. It is caused when two objects rub together.

Fulcrum – A fulcrum is the unmoving point of the lever on which a bar rests.

Gravity – Gravity is a force that pulls everything downward, toward the center of the earth.

Plane – A plane is a flat surface.