

**Project FOCUS  
Best Lessons  
FOURTH GRADE**

**Title of Lesson:** The Basics of Simple Machines

**Theme:** Physical Science

**Unit Number:** 5      **Unit Title:** Force, Motion and Simple Machines

**Performance Standard(s) Covered (enter codes):**

**S4P3. Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object.**

**S4CS6. Students will question scientific claims and arguments effectively.**

**S4CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.**

**S4CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.**

**Enduring Standards (objectives of activity):**

**Habits of Mind**

- Asks questions
- Uses numbers to quantify
- Works in a group
- Uses tools to measure and view
- Looks at how parts of things are needed
- Describes and compares using physical attributes
- Observes using senses
- Draws and describes observations

**Content (key terms and topics covered):**

Simple machines identification and explanation of uses (lever, pulley, wedge, inclined plane, screw, wheel and axle).

**Learning Activity (Description in Steps)**

**Abstract (limit 100 characters):** Students will discuss all of the Simple Machines and Observe How a few work.

**Details:** After giving a brief explanation of what each simple machine is the students will observe the following machines: [Students will take turns at each machine and rotate through within the lab center [and write observations at each one]]

### **Lever:**

Have a stack of about 3 or 4 books. Ask the Student to try to lift the books with their finger under the bottom of the books. Then place the end of an unsharpened pencil under the edge of the bottom book in the stack. Use the second pencil by placing it under the first pencil near the edge of the books and ask the student to push down on the free end of the first pencil and try to lift the books. Ask students which was easier to do and why.

### **Pulley:**

Have the hanger contraption ready before class: Unwrap the wire at the neck of a clothes hanger. Run the clothes hanger wire through the hole of an empty thread spool. Reattach the wire at the neck of the hanger. suspend the clothes hanger with the spool from a rod or a chair. Cut a piece of string so that it touches the floor, loops over the thread spool and down halfway to the floor again. Punch a hole near the rim of a small paper cup and a second hole on the opposite side. Do the same to a second paper cup. Through the punched holes, tie a cup to each end of the piece of string. Loop the string with the cups on either end over the thread spool. One cup should be sitting on the floor and the other cup should be off the floor. Have the students place 10 pennies [or any other small object like marbles in the cup sitting on the floor. Have the students add pennies one at a time to the empty cup until the cup on the floor starts to move. Ask the students how many pennies are needed to make the cup move? How many pennies are needed to make the cups balanced? Ask what motion makes the cups move or be balanced [the swiveling spool, aka the pulley]

### **Inclined Plane**

Before the students start, prop the ends of a yardstick and ruler onto two or three books to make two ramps so that one ramp is steeper than the other. Loop rubber bands together in a chain and attach one end of the chain to a heavy object [such as a block of wood by tacking a thumbtack into the wood and using the rubber bands on the chain]. After the rubber bands are attached, have the students lift the block by the rubber bands on both ramps. Make the students note which ramp needs more effort and how much the rubber band stretches each time. [If using a block or heavy object is out of the picture you can use a marble and slide it down the two ramps to see how the inclined planes steepness can affect motion as well].

### **Screw:**

Bring in a screw to just show what they look like in person and discuss how they are used [Do this simple machine last if there is time left]

At the end be sure to ask how simple machines are useful [they make everyday forces easier to apply by lessening the work used to move objects]

### **Materials Needed (Type and Quantity):**

A Screw

#### **Lever:**

- Four books
- Two unsharpened pencils

#### **Inclined Plane:**

- Ruler

- Yardstick
- Two or Three books
- Rubber bands
- Thumbtack and Block of wood [or a heavy object]

**Pulley:**

- Wire clothes hanger
- Empty thread spool
- String
- Two paper cups
- 30 pennies [or some small object like marbles]
- Scissors
- Single-hole puncher

**Notes and Tips (suggested changes, alternative methods, cautions):**

Be sure to have the systems set up before the lesson so that students have time to observe and interact with the home made simple machines.

**Sources/References:**

- 1) <http://education.usace.army.mil/clubhouse/science/experiment.cfm?Topic=simmach&Id=89>
- 2) [www.arvindguptatoys.com/arvindgupta/physicsexperiments.pdf](http://www.arvindguptatoys.com/arvindgupta/physicsexperiments.pdf)
- 3)