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**Interactions**  
**Inventions Solve Problems**  
**Push and Pull**

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**Objectives:**

The student is expected to:

- SCI3.1 (A) demonstrate safe practices during field and laboratory investigations.
- SCI3.2 (A) plan and implement descriptive investigations including asking well-defined questions, formulating testable hypotheses, and selecting and using equipment and technology.
- SCI3.2 (B) collect information by observing and measuring.
- SCI3.2 (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence.
- SCI3.2 (D) communicate valid conclusions.
- SCI3.5 (B) observe a simple system and describe the role of various parts such as a yo-yo and string.
- SCI3.7 (A) gather information including temperature, magnetism, hardness, and mass using appropriate tools to identify physical properties of matter.

**Summary:**

Students have just completed an introductory activity on simple machines and throughout this unit they will learn how many machines use force and motion to make our lives easier. In this activity they will discover how force is measured and will learn about the relationship of force and motion, as people create inventions to solve problems.

**Activity Prerequisites:**

Students should have completed all previous activities in this Organizing Idea.

**Vocabulary:**

- **gravity:** force that pulls things back to Earth's surface
- **force:** push or pull
- **work:** amount of force (push or pull) applied over a specific distance
- **motion:** a change in position
- **pulley:** a wheel with a groove in the rim in which a rope moves when force is applied
- **spring scale:** a tool that measures how much pull is on an object
- **newtons:** unit of measure for force

**Materials:**

**Handouts:**

- "Measure Your Pulls" student handout
- "Simple Machines Graphic Organizer" teacher/student handout from activity two
- "Developing Scientific Thinking Rubric" teacher/student handout
- "Simple Machine Song" student/teacher handout/transparency

**Books:**

- science textbook

**PISD Video Streaming Library ([video.pisd.edu](http://video.pisd.edu)):**

The following video clip is also posted on the "Streaming Videos Chart" of the PISD Integrated Curriculum

Web site:

- *Simple Machines: A First Look:*
  - [Work, Force, and Machines](#) (00:41)

### **Technology:**

- *The Way Things Work* CD ROM (optional)
- *Learn about Simple Machines* computer software

### **Supplies:**

- **Per student group:**
  - one spring scale
  - two pieces of string
  - two wooden blocks

### **Procedure:**

1. Create a class T-chart with machines that move so quickly that you have trouble seeing them. (Ex: blades of a fan, bicycle wheels, etc.) On the other side of the chart, think of things that move slowly (Ex: hands on clock, steering wheel etc.).
2. Discuss vocabulary for this activity. Guide students to realize that it is the amount of force applied that can make things move quickly or slowly and that it takes a lot of energy to overcome gravity.
3. Show the video clip from the PISD Video Streaming Library ([video.pisd.edu](http://video.pisd.edu)). *Simple Machines: A First Look: Work, Force, and Machines* (00:41) and discuss the fact that people need things in the material world to help them solve problems and to make their work easier. Simple machines save people time and energy.
4. Have students use the computer software, *Learn about Simple Machines*, to investigate information on simple machines and force.
5. Tell students they will conduct an investigation of simple machines. They will be given a student handout to follow. Their work will be evaluated using the "Developing Scientific Thinking Rubric."
  - Distribute the rubric and review the vocabulary and expectations outlined on the rubric.
  - Emphasize the skills listed in the **Developing** column for third graders.
  - Remind students to use the rubric as a guide while completing the activity.
  - Depending on how you conduct the investigation in your classroom, students' **Independence Level** may or may not be included in the evaluation.
6. Divide students into groups to conduct an investigation. Explain the "Measure Your Pulls" student handout.
  - Guide students in completing the Hypothesis and Variables sections.
  - Each group will follow all steps on the handout and record their Results, Conclusions, and Further Question.
  - This activity can best be done in a multitasking setting.
7. After all students have completed the "Measure Your Pulls" student handout, have students copy the definition for pulley from the "Simple Machines Graphic Organizer" teacher transparency in their "Simple Machines Journal." They should draw a picture of a pulley below their definition.
8. Review "Simple Machine Song" to reinforce lesson.

### **Teaching Tips:**

Multitasking stations could include:

- "Measure Your Pulls" student handout & activity
- Simple Machine illustrations and paragraph (from U3A02 "Why Simple Machines?")
- The Way Things Work CD ROM
- HyperQuest on HyperStudio
- science textbook
- Learn about Simple Machines computer software

### Additional Activity:

1. Challenge students to brainstorm machines that utilize a pulley that were invented to solve a problem for humans.
2. Introduce The Way Things Work CD ROM for students to explore several examples of machines that have been invented to solve problems. Some examples found on the CD ROM include: screw - faucet, pulley - chain hoist, lever - scales, wedge - plow, wheel/axle - car steering, etc. This can best be used as a multitasking activity.
3. Introduce the Learn About Simple Machines software and show the students how the program is divided into sections. Tell them that they will use this software throughout this unit.

### Assessment:

"Measure Your Pulls" student handout should be assessed using the "Developing Scientific Thinking Rubric."

### Lifelong Learner Traits:

Self-directed learners who accept and seek new challenges in learning (1)  
 Complex thinkers who construct meaning, solve problems, make and evaluate decisions using a variety of thinking strategies (8)  
 Responsible citizens who demonstrate respect and concern for self and others (11)  
 Responsible citizens who assume responsibility for own actions (12)  
 Responsible citizens who cooperate with others (15)  
 Collaborative contributors who work with others, acknowledge and contribute ideas, suggestions, and effort (16)

### English Handouts:

[Developing Scientific Thinking Rubric U3A03](#)  
[Measure Your Pulls](#)  
[Simple Machine Song U3A03](#)

### Spanish Handouts :

[Guía del desarrollo del pensamiento científico- 3T2U3A03](#)  
[Mide tu fuerza al jalar](#)  
[Canción de máquinas simples 3T2U3A03](#)

**Duration:** 90 minutes