[Download all associated files for this lesson from our website](http://peer.tamu.edu/DLC/NSF_Resources.asp?ID=1484&type=browse&num=10&terms=&content=allcontent&subject=allsubjects&grade=allgrades&query=query&hl=no&count=537&number=6&view=yes).

**Summary:** Put your student’s minds to work, learning about work! This lesson introduces the concept of physical work. With many examples and easy to understand explanations it is a perfect introduction to work in physics! Included are worksheets for an experiment and steps on calculating work.

**Keywords:** Work, force, distance, ramp, Newton

**Subject TEKS:**

Science 7.7A: Force, motion, and energy. The student knows that there is a relationship among force, motion, and energy. The student is expected to: contrast situations where work is done with different amounts of force to situations where no work is done such as moving a box with a ramp and without a ramp, or standing still.

**Grade Level:** 6th, 7th, 8th

**Learning Objectives:**

* Students will be able to define work.
* Students will be able to identify the factors that affect work.
* Students will be able to calculate the amount of work performed by an object.
* Students will understand that work is done only when the force and motion of the object are in the same direction.
* Students will understand that displacing the same object to the same location results in performing the same amount of work if effects of friction are neglected.

**Time Required:** 1 hr

**Materials:**

* Paper and pencil
* Computer and projector
* Work – Lifting
  + 3 objects with different masses
  + Spring scale
  + Meter stick
* Work – Ramps
  + Block cubes
  + Thin rubber bands
  + Tacks
  + A long ramp and a short ramp with a smooth surface
  + 2 Textbooks

**Expendable Activity Cost:** ~$15

**Background and Concepts for Teachers:**

Browse and review these listed websites:

* What is Work?

<http://physics.info/work/>

* Definition and Mathematics of Work

<http://www.physicsclassroom.com/Class/energy/u5l1a.cfm>

* Work

<http://www.ducksters.com/science/physics/work.php>

**Vocabulary/Definitions:**

* **Work** – Performed when a force that is applied to an object moves that object.

**Lesson Introduction/Motivation:**

* Online lesson plans to introduce basic concepts relating to energy:
  + Energy Conversion

[Download all associated files for this lesson from our website](http://peer.tamu.edu/DLC/NSF_Resources.asp?ID=996&type=browse&num=10&terms=&content=allcontent&subject=allsubjects&grade=allgrades&query=query&hl=no&count=537&number=6&view=yes).

* + Potential and Kinetic Energy

[Download all associated files for this lesson from our website](http://peer.tamu.edu/DLC/NSF_Resources.asp?ID=1480&type=browse&num=10&terms=&content=allcontent&subject=allsubjects&grade=allgrades&query=query&hl=no&count=537&number=6&view=yes).

**Requires**: Computer and projector

* Students can view a short graphical explanation of kinetic and potential energy before the lesson is started.

“Eureka 8 work”

<http://www.youtube.com/watch?v=qddydNEk-14>

**Requires**: Computer and projector

**Presentation/Explanations:**

Present the PowerPoint presentation at a slow pace making sure students understand each concept.

**Activity/Application:**

Class experiments: instructions in Work Activity Plan document.

* Work – Lifting
* Work – Ramps

**Lesson Closure:**

At the end of the course, ask students to reflect on what they learned about work. Things such as definitions and examples of the covered topics could be discussed. This could either be done in an interactive manner with the whole class or individually on paper.

**Assessment/Evaluation:**

Go over document called “Steps for Calculating Work” with students. This document contains multiple problems where either work, distance, or force need to be calculated. This could be done in class or as a homework assignment.

**Safety Issues:**

Be cautious when rubber bands are stretched out.

**Resources:**

* All Work and No Play

<http://www.physics4kids.com/files/motion_work.html>

* Hyperphysics

<http://hyperphysics.phy-astr.gsu.edu/hbase/wcon.html>

* Assessment taken from:

<http://www2.franciscan.edu/academic/mathsci/mathscienceintegation/MathScienceIntegation-1011.htm>

* Something About Ramps

<http://www.arvindguptatoys.com/arvindgupta/physicsexperiments.pdf>

**References:**

All images found on Google.

**Author:**

Undergraduate Fellow: Bagrat Grigoryan

Graduate Fellow: Jennifer Graham