

# Knowing Energy: Stair Climb



## Energy Revealed Activity

Level 1-2: Grades 3-8

Level 3-4: Grades 9-12

## Main Objectives

This activity and the associated video introduces learners to energy and power and their associated units and terms. It allows learners to experiment with these concepts as they record themselves climbing stairs.

## Learning Outcomes

By the end of this activity, learners will:

- Understand the concepts of energy and power and their associated units and terms
- Complete a stair climbing experiment to test and measure your own energy and power
- Practice utilizing equations to answer basic energy questions in their worksheet

## Length of Activity

1 hour

## Materials List

General Overview Guide

Stair Climb Learner Worksheet

Stair Climb Learner Worksheet Answer Key

Stairs you can easily measure

Timer

Scale to weigh yourself

## Step 1

Review the General Overview Guide to understand how the Knowing Energy Video Series works with its associated activities.

## Step 2

Before learners get started on this activity, be sure to introduce them to the first two Knowing Energy videos in the series:

- a. Introduction Video (1:28 minutes)
- b. Energy Basics Video (8:56 minutes)

The Energy Basics Video introduces learners to the concepts of energy and power and their associated similarities and differences, as well as the units that define them. Learners are encouraged to take notes during the video to help complete the worksheet later on.

## Step 3

- a. Allow learners to view the Stair Climb Experiment Video (2:17 minutes) and hand out the Stair Climb Learner Worksheet. Depending on the learner's grade level, direct them to complete either or all of levels 1-4.
- b. The video itself will direct learners on what to do, so allowing them to re-watch, or to go over their task as a class is vital for their understanding. The experiment itself can be done in pairs.
- c. Be sure to remind learners of the equations, and conversions that were introduced to them in the activities video. These concepts can be further discussed as a class before learners tackle this worksheet.

## Step 4

Be sure to go over as a class the answers to the worksheet and refer to the Stair Climb Learner Worksheet Answer Key for any confusion.

## Teaching Tips

### 1. Level 1

- The basic equation to find Watts developed is  
Watts = Joules x Time (s).
- Joules = (Weight in kg x  $9.8\text{m/s}^2$ ) x height of stairs in metres. The 9.8 comes from the force required to overcome the force of gravity, which is  $9.8\text{m/s}^2$ .

### 2. Level 2

- The number of Watts generated at a faster speed should be higher than the original calculation. The Watts generated at a slower speed should be lower. Time is a very important variable, this applies to many things in energy. For example, a microwave clock typically uses more energy than the microwave while cooking since the time is far greater.

### 3. Level 3

- Smaller people will develop less power than larger people at the same speed, this is fairly intuitive but often misunderstood. In order to calculate horsepower (hp), the Watts generated should be the Watts you generated divided by 746 W.

### 4. Level 4

- The energy required to climb one stair at a time or two should be the same at a given time since the power generated is the sum of all stairs. If you could jump up all stairs at once it would be the same. A bike will not increase your ability to generate more power however it can decrease the power required since a bike can build momentum (gliding).
- The bonus question requires learners to find the intersection between two equations, one for the 100 lbs person and 1 for the 150 lbs person (tip lbs must be converted to kg).