



*Drexel-SDP GK-12 ACTIVITY*

## Activity Template

**Subject Area(s)** Physical Science, Measurement

**Associated Unit**

**Associated Lesson**

**Activity Title** Slippery or Sticky?

**Grade Level** 6 (5-6)

**Time Required** 45 Minutes

**Group Size** 3

**Expendable Cost per Group** US\$2.00

### Summary

In this activity, students measure the frictional force between two objects using a simple method. Students place a small wood block on a piece of cardboard and tilt the cardboard until the block begins to slide. The students measure the angle reached when the block began to slide. This procedure is repeated while varying the surface on which the block is resting. Students compare the frictional force between the block and cardboard, sandpaper, plastic wrap, and aluminum foil.

### Engineering Connection

Engineers often need to know the physical properties of the materials they are working with. However, in some cases these properties are not known and engineers must find a way to measure the properties of interest in a quick and simple way. The frictional force between two materials is an important property that engineers must know. For example, mechanical engineers must know how friction effects the movement of the many components in a car.

### Keywords

force, friction, protractor, measurement

### Educational Standards

- Science: 3.2B, 3.2C, 3.4C

- Math: 2.3

### Pre-Requisite Knowledge

Ability to measure angles using a protractor.

### Learning Objectives

After this lesson, students should be able to:

- Explain the nature of the friction force
- Describe a method to find qualitative information on the relative coefficients of friction of different interfaces

### Materials List

Each group needs:

- One medium piece of cardboard with a crease in it, the edge of a box works well
- One small piece of aluminum foil
- One small piece of plastic wrap
- One small piece of sandpaper
- One small wood block
- One protractor
- Tape

### Introduction / Motivation

Friction is important in our everyday life, even though we rarely notice it. Without friction we wouldn't be able to walk and cars would slide like they were on ice. But sometimes we would also like friction to be as small as possible, like inside car engines, on our frying pans, or even joints inside our bodies. It is very important for us to be able to understand what materials are slippery and what materials are sticky. However, one of the interesting things about friction is that one material isn't always necessarily sticky or slippery. It also depends what material you are trying to slide on the first material. How sticky or slippery two objects are when they are touching each other is described by something called the coefficient of friction. The lower the coefficient of friction, the more slippery those objects will be. In this activity we will be able to find which materials have a higher coefficient of friction when in contact with wood. We will test cardboard, aluminum foil, sandpaper, and plastic wrap and find which ones have higher coefficients of friction than others.

### Vocabulary / Definitions

Word	Definition
Friction	The force resisting lateral motion (sliding) of two objects in contact.
Coefficient of Friction	The ratio of the frictional force to the normal force.
Normal Force	Component of the contact force between two objects perpendicular to the surface of contact.

### Procedure

#### Background

#### Before the Activity

- Prepare the materials for each group.

### **With the Students**

1. Divide the class into groups of three.
2. Introduce friction and the experiment.
3. Have each group hypothesize which material they think will have the greatest coefficient of friction (be the stickiest) and write it down in their science notebook.
4. Explain to the class that they will place the wood block on the cardboard and tilt the cardboard up until the block slips off. The students should write their procedure in their science notebook. Then they will measure the angle at which the block began to slip and record this data in their science notebook.
5. Have each group tape the aluminum foil piece onto the cardboard and repeat the experiment with the wood on the foil. Repeat this procedure for all of the materials.
6. Have each group rank the materials in order of lowest coefficient of friction to highest coefficient of friction by comparing the angles at which the block began to slip.

### **Investigating Questions**

If cars had wooden wheels, what surface would be best for driving on? Why?

### **Assessment**

#### **Pre-Activity Assessment**

*None*

#### **Activity Embedded Assessment**

*Science Notebook:* Read through each group's notebook. See if their hypothesis is clear, the procedure is easy to follow, and their results are noted.

#### **Post-Activity Assessment**

*Lab Report:* Have the students write a formal lab report which follows the scientific method.

### **Owner**

Drexel University GK-12 Program

### **Contributors**

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