



*Drexel-SDP GK-12 ACTIVITY*

## Activity

**Subject Area(s):** Nanoscale  
**Associated Unit:** Nanotechnology  
**Associated Lesson:** Nanoscissors

*Bitten by a mitten*



**Grade Level:** 5-8  
**Activity Dependency:** Use hands to write and build  
**Time Required:** 30-60 minutes  
**Group Size:** Entire classroom  
**Expendable Cost per Group:** Oven mit per student, though winter gloves should also work

**Summary:** *Students will find that manipulating and working with very small objects on the nanoscale is difficult and requires specialized tools. This is done by working with macroscale objects such as legos and handwriting. Once the students work with their nimble little fingers they are asked to do the same tasks with gloves on, and report on the results.*

**Engineering Connection:** Nanotechnology, atoms, tools

**Keywords:** Size scaling, size comparison, nanotechnology

### **Educational Standards**

- Science: [PA] 3.1.7BD, 3.2.7ABCD, 3.4.7A
- Math: [PA] 2.1.5AD, 2.2.5ABCDEF

### **Learning Objectives**

After this lesson, students should be able to:

- **Identify that materials consists of atoms, or building blocks way too small for humans to detect with their eyes or normal everyday tools.**
- **Identify the limitations of using improper tools to either view or manipulate objects on a smaller scale**

### **Materials List**

Each group needs:

- **A handful of legos**
- **A worksheet with writing blocks**
- **A pencil**
- **An oven mitt or winter glove**
- **A stopwatch**

### **Introduction / Motivation:**

*Scientist and engineers develop future technologies through careful manipulation of materials on the atomic scale. That is, they use specialized tools to create function in these small building blocks so that they may be used in devices seen in everyday life. Typically tools or instruments such as a scanning electron microscope, atomic force microscope and others deal with materials on the nanoscale, which means objects less than 100 billionths of a meter. That is equivalent to finding a single golf ball in the state of Maryland. Students will get an idea of how difficult it is to "play" with atoms by using gloves and legos*

### **Vocabulary / Definitions**

Word	Definition
Nanoscale	Objects less than 100nm or 100 billionths of a meter

### **Procedure**

1. After explaining the concepts of the nanoscale and atomic tools, students should be given a handful of legos and the attached worksheet. Each group should be given a stopwatch.\
2. Students should build a shape out of the legos that they can remember. They should time themselves or have a neighbor time them. Record the time and the shapes into their notebooks.

3. Students should then repeat step 2 wearing either oven mitts or winter gloves. They should be sure to build the same exact lego shape and time themselves yet again.
4. Students may then take the worksheet provided and write their names and the date ***without touching the sides of the block***. Be sure that they write each letter within a single block. Tell them if they happen to touch the side of the block to not erase it, it is important.
5. Repeat step 4 with the gloves on, have the students count the number of blocks that they touched in step 4 and then in step 5.

### **Investigating Questions:**

1. How much time did it take to build the legos without gloves? With gloves? Calculate the percentage difference in time between building without gloves and building with gloves.
2. Count the total number of blocks used to write your name and date. Then count the number of blocks touched while writing without the gloves and then with the gloves. What is the percentage of blocks touched without the gloves? What is the percentage of blocks touched with the gloves? What is the difference between the percentages?

**References:** <http://mrsec.wisc.edu/Edetc/IPSE/educators/activities/mittenChall.html>

### **Owner**

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