

# ENGINEERING

Teachers, please copy both sides of this page for your students to take home.

Dear Students and Parents,

We hope you enjoyed your recent day of science exploration and investigation with Pacific Science Center's *Engineering* van. The Science On Wheels program, which began operating in 1974, is an interactive outreach program that travels to schools across the state of Washington.

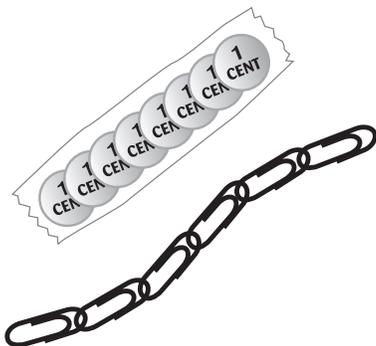
The *Engineering* van provides students with hands-on science experiences. Students participate in a lively assembly, explore an interactive exhibit area and receive a 45-minute hands-on lesson. Our goal is to foster an interest in science, technology and mathematics.

We encourage you to talk about our visit and investigate the activities below. They require few materials and are easy to do. Remember: your child and his or her friends will be the ones to invent new solutions for the future! We hope you enjoy doing these activities together!

~Science On Wheels Teachers

## Materials

- storage containers and other household items (paper towel rolls, plastic cups, spoons, string, pipe cleaners, boxes, etc.)
- scissors
- glue
- tape
- graph paper
- white paper
- colored pencils or crayons



## Get Wired

Today, electricity can be found all around us, from computers in school classrooms to cellular phones. Electrical engineers are the people that design, test and re-design all electrical systems that we see in our daily lives. They work with many different people like architects, computer scientists, and mechanics to make sure their projects are safe, affordable, and long-lasting.

### Design

Place the battery upright on a table with the positive (nobbed end) pointing up. Touch the bottom end of the light bulb to the top of the battery. Now you have an open circuit and the bulb will not light. Use the piece of aluminum foil as a wire and connect the bottom of the battery to the side of the light bulb, as seen in the picture. Now you should have a closed circuit. You will know your circuit is closed when the light bulb lights up!



### Test

Using some of the other mentioned materials, test which things will close the circuit and which things will not. For example, tape a row of pennies together, as shown in the picture, and see if the string of pennies will close your circuit and light up the bulb. Make sure all of the pennies are touching one another.

### Re-Design

What if you use more than one material at once (i.e. paper clips and pennies)? What are some other objects in your home that you can test? Design a set-up that produces the brightest light. Is there a way to make the bulb light up only a little bit?

# Straw Towers

## Materials

- drinking straws
- straight pins
- scissors
- blow dryer

The Space Needle in Seattle is 605 feet tall. The John Hancock building in Chicago is 1127 feet tall, and it has a swimming pool on the 44th floor. How do architects and engineers make sure a skyscraper will remain upright in strong winds (especially in Chicago, the “Windy City”)?

## Design

Work with your family to build the tallest free-standing structure possible. Experiment with various shapes.

## Test

Hold down the base of the structure and use a blow dryer on a no-heat setting to test how well the structure would stand up to a wind storm.

## Re-Design

Based on your test, which shapes are the sturdiest? What was the strongest part of your building? Re-design your building to make it stronger!



# Oobleck



Oobleck is a non-Newtonian liquid, meaning it is a liquid that doesn't follow all of Newton's laws of liquids. Sometimes it seems like a liquid, sometimes it seems like a solid.

## Design

Put the water and food coloring in a large bowl and begin adding corn starch and mixing. Eventually the mixture will get thicker; keep adding and stirring until you can no longer stir it.

## Test

First, take a moment to play with the Oobleck. How would you describe it (sticky, slimy, crunchy...)? Squeeze it into a ball shape. How long does it hold the shape? Pour it into another container and see what happens.

Design your own tests. If you drop it into the bowl, what does it do? Can you break it?

## Materials

- spoon
- clear drinking glass
- water (1 cup)
- food coloring (optional)
- corn starch

## Resources

Find these books at your local library or book store:

*Underground*, by David Macaulay, 1983

*Building Big*, by David Macaulay, 2000

*Physics for Kids: 49 Easy Experiments with Electricity and Magnetism*, by Robert W. Wood, 1991

## Credits

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