

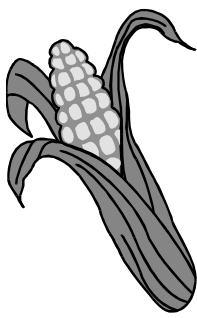


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<p>THE BASICS</p>	<p>THE TOOLBOX</p>	<p>EDUCATION STANDARDS</p>	<p>Problem Solving Math Standard: Using a variety of mathematical strategies to analyze materials, and measure, design, and construct an appropriately-sized container.</p>
<p> Grade Level: K-12</p> <p> Estimated Time: 50 min.</p>	<ul style="list-style-type: none"> • Different types of popcorn • Hot air popper • Potholders • Construction paper • Tape/glue • Scissors • Calculator • Rulers • Paper bags • Pencils 	<p>SAFETY CONCERNS</p>	<p>This activity involves the use of electricity and heat. Stagger the use of the popper to avoid overheating the popper.</p>
		<p>FOR KIDS WITH DISABILITIES</p>	<p>Students with visual impairments may use their hands to note differences. Students with dexterity impairments may work with a partner.</p>



Educational Objective:

To observe and classify materials, make volume measurements, and design and construct an appropriate container.

Background:

The earliest popcorn was probably a wild corn. This corn, called maize, was the basic food plant of many cultures. The earliest type of maize that has been discovered is popcorn. Archaeologists, botanists, and geneticists all explored discoveries from an ancient dwelling at Bat Cave, New Mexico in 1948. From excavations of the site, they learned that in earlier times, Native Americans had lived in the cave for more than three thousand years.

One of the earliest foods of the inhabitants of Bat Cave was popcorn. Corn cobs and popcorn kernels found there were carbon dated from 2,000 BC. Would you believe that a kernel of popcorn that was three thousand years old would pop if you heated it? Well they did. Altogether, they found 766 corn cobs (without kernels) and 299 loose kernels. Six of the kernels were already partially or completely popped. The information gained from the explorations of the cave made it clear that Native Americans were the first to cultivate corn, and that popcorn was one of their earliest foods.

Botanists classify all corn plants within the species, *Zea Mays* L. There are five types of corn: dent, flint, flour, sweet, and pop. The popcorn kernels can be classified into two primary types: the rice kernels that are long, flat, and pointed with dented sides, and the pearl kernels that are short, and have smooth, rounded crowns.

Whether or not a popcorn kernel pops depends on a number of factors: the moisture content of the kernel; whether the outside shiny, hard covering of the kernel, called the pericarp, has been damaged during harvest or handling; the condition of the starchy white substance inside of the kernel, called the endosperm; and the way the kernel was dried after harvest. A popcorn kernel expands best when popped if the moisture content inside the kernel ranges from 13.5% to 15.5%. After heating, the pericarp splits, and the endosperm expands.

Questions to Ask Students As They Do This Activity:

- Do you see any differences between the unpopped kernels? The popped kernels?
- What do you notice about your popped and unpopped kernels?
- How are you going to design your container? How do you determine the volume of your container? (length x width x height) Which container is closest to the right size?

WEB SITES

- **The Measure of a Box**
<http://www.nsf.gov/od/lpa/nstw/teach/nstw1996/mix/actvty2.htm> (Grades 3-9)
- **Fish Sorting**
http://www.pbs.org/wgbh/nova/teachers/activities/2215_reef_01.html (K-4)

SOFTWARE

- **Microsoft Excel**
Design a chart or graph similar to the one you drew on paper showing how many of each of the different types of kernels you found. (Grades 4-12)
- **Blue Falls Elementary**
Tom Snyder Productions, 1998.
(Grades 3-4)

READING ROOM

- Hewitt, Sally. **Sorting and Sets.** Raintree Steck-Vaughn, 1996. (Grades K-4)
- Aliko. **Corn is Maize.** HarperCollins, 1996. (Grades K-3)
- Ripley, Catherine. **Why Does Popcorn Pop? And Other Kitchen Questions.** Owl Books, 1997. (Grades 1-4)

Career Connections

Architects and interior designers need to estimate the amount of space needed for a new building, and then must design and construct an appropriately-sized structure to fit those needs.

293 ACTIVITY SHEET

Classification:

1. Collect a sample of unpopped and popped popcorn kernels.
2. Spread the kernels and divide into different groups based on their appearance.
3. Record all the different groupings you found.

Volume Measure:

1. Let's discover how much popped popcorn we would have if we popped two hundred and ninety-three popcorn kernels. (The number of unpopped, loose kernels found at Bat Cave.)
2. Count out two hundred and ninety-three unpopped kernels. Set them aside to be popped.
3. Work with your partner to build a container. The container should be large enough to hold the popcorn when it is popped. You want to be able to close the lid, and you don't want any unused space in the container.
4. Pop the kernels in a hot air popper and then pour them into your container.
5. You may alter your container if you choose, and measure your container with a ruler or meter stick.
6. Calculate the volume of your box in cubic inches or cubic centimeters.
7. Now, you can find out how much your popcorn kernels expanded when they popped. You and your partner can record your results on a group graph.

Ordering:

1. Pop your 293 kernels of corn.
2. Cover your work area with a large sheet of paper for a graph. Draw a graph like the following:

Large	Medium	Small	Un-accounted for	Unpopped	Total
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3. Pour the popped corn onto your work area. Work with your partner to order the flakes according to size. Record the number of flakes in each group.
4. Record the total number of flakes.
5. Calculate the percentage of your sample that was small, medium, large, unaccounted for, or unpopped, and graph your results.

Adapted from Family Science, Portland State University – Northwest Equals, 1988.

