

Popping Popcorn!



Lesson Overview

Learners learn what makes popcorn pop and then use what they learn to design an experiment to test an idea.

Suggested Grade Levels: 3~6

Standards for Lesson

Content Standard A: Science as Inquiry

Content Standard B: Physical Science

VA SOL:

3.1 a, c, f, j; 3.3 b; 4.1 a, b, c, d, e, f; 5.1 c, d, f, g; 5.4 a, c;

6.1 c, e, f, g; 6.2 a, e; 6.5 b; LS.1 a, b, c, f, g;

PS.1 a, b, d, g, h; PS.2 a, c, d; PS.5 a, c; PS.6 a, c; PS.7 c, d

Time Needed

This lesson takes several class periods. Sample schedule:

- | | |
|------------|---|
| Day One: | Complete the Engage and Explore portion of the lesson |
| Day Two: | Complete the Explain portion of lesson |
| Day Three: | Complete the Elaborate and Evaluate portion of the lesson |

Materials for Lesson

- Popcorn-popped
- Test tube
- Candle
- Test tube holder
- Oil
- Un-popped kernels of popcorn
- Hand lenses
- 4 glass test tubes

- 1 wire test tube holder
- 1 large sturdy candle attached to a base
- 1 aluminum pie pan to hold the candle
- 1 wooden test tube rack
- Safety goggles
- Safety poster (see page 70)
- Cooking oil (5 ml)
- Lighting device – matches/lighter

Content Background

Information for teacher: Why Popcorn Pops

Popcorn is the product of a small-scale explosion. It's true! Popcorn kernels contain moisture. When that kernel is heated to about 400 degrees, the moisture turns to steam, expands, and tries to escape. When there's enough pressure built up for the steam to burst through the kernel's hard outer shell, we hear the pop of the kernel-explosion. The kernel turns itself inside out, and that's the part we eat.

Brainiac Fact: The popcorn explosion is called the rate of expansion. It's measured using the Cretors Metric Weight Volumetric tester (MWVT), the standard measurement for the popcorn industry. The higher the MWVT number, the fewer the number of kernels that remain un-popped after heating. Pop Weaver[®] popcorn is developed specifically to provide the highest expansion rate compared with other commercially available hybrids.

Engage

Ask students how many of them like popcorn. Why do they like popcorn? Tell students that in this activity, they are going to collect some data, actual measurements about popcorn. First, to begin with, they will hear a short burst about the history of popcorn. As they listen to the story, students should be listening for key details about popcorn. Have them write these details in their science notebook. They might want to use these later for the final assessment. Introduce The Popcorn Book by Tommie de Paola, by telling students that the author's favorite good is popcorn. Read aloud up to page 21, stopping before the explanation of what makes popcorn pop. After reading the story, give each student a kernel of popped popcorn, a kernel of un-popped popcorn and a hand lens to make observations about the popcorn. Have students draw a picture of un-popped popcorn kernel and a popped popcorn kernel. Students should make drawings and list some physical properties about both in their science notebook.

Explore

Tell students that they are going to get even more specific with their descriptions by using scientific tools to measure their popcorn. Give each group 30 un-popped and 30 popped kernels of popcorn. Have them use a balance to find the mass of the un-popped and popped popcorn.

Next, take the same 30 kernels and find the weight of the popcorn.

After students have made these measurements, have them answer the following questions in their science notebook:

- What difference did you observe between the un-popped and popped popcorn?
- What do you think happened inside the popped popcorn kernel when it was heated?

Exit Ticket out of the Room: 5-3-1: List 5 things you observed about the popped popcorn kernels; list 3 things you observed about the un-popped popcorn kernels; list 1 thing you learned about popcorn.

Explain

Go back to their measurements and observations about their popcorn. Have students share this data.

Now tell the students that today they are going to make some more observations about popcorn. The observations they collect today will help them design their final experiment and their poster.

Distribute the Popping Secrets! sheet.

Have students work through the set-up of the activity. (This is an activity because the students are not testing a question—they are just making observations)

Have students complete the activity. Work with students to write up their conclusions.

Explain to students how popcorn pops.

Elaborate

Design an experiment to test how heat affects how popcorn pops. Teachers will guide students to design their own experiment to test how temperature affects how popcorn pops. This experiment can be completed by the entire class or in small groups. Each individual child would

design their own poster that shows how the particles in a kernel of popcorn move to make it pop and present their findings to their classmates.

THINK-PAIR-SHARE: Using the 4-question design sheet, have students **THINK** about question one and record responses. After one minute, have students pair with their shoulder partner and **RALLY ROBIN** to compare and add answers. Then allow students share answers with the class. Some ideas that students might generate based on changing the materials include:

How does microwave popcorn compare to stove-top popcorn? Develop an experiment that lets you find out for yourself. (Students would need to research the temperature of the microwave and stove - how hot would it get?)

How does popping popcorn change when it's popped from frozen, cooled, or room temperature kernels? You'll need a day to let the seeds get to their respective temperatures before popping. (This is looking at changing the temperature of the popcorn kernel.)

How does popcorn brand affect the way it pops? (Students could research the MWVT number for each brand.)

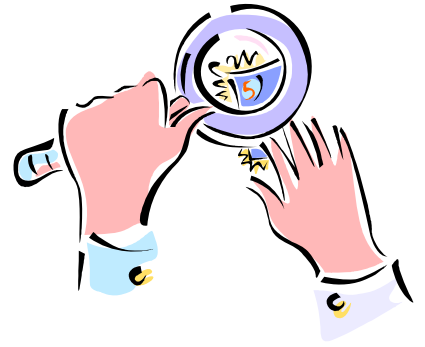
Evaluate

Participation – Following lab safety rules and procedures

Popcorn poster

Class Presentation

POPPING SECRETS



Popcorn Looks Like What?

Popcorn Observations and Measurements

Use the following boxes to make observations of your popcorn samples.

Un-popped Popcorn

Use a hand lens to observe and record observations about an un-popped popcorn kernel and draw it in this box.

Popped Popcorn

Use a hand lens to observe and record observations about a popped popcorn kernel and draw it in this box.

Mass: _____

Weight: _____

Mass: _____

Weight: _____

Observation Sheet



What do you see with your eyes?



What do you smell with your nose?



What do you hear with your ears?

Setting up the Activity

- ✓ Check the boxes as you complete each step.
- One student from each team, attach the base of the candle first to the pie plate using a lump of clay
- Each student places a test tube in the wooden test tube rack.
- Use an eye dropper to place 2 drops of cooking oil into the bottom of each test tube.
- Place 2 kernels of un-popped popcorn in each test tube.
- Before you begin, make some predictions about what you think you will observe.
- Read over the safety rules.
- Use a test-tube holder to heat the oil.

Directions for Heating Oil and Popcorn

When you are heating a test tube, you do not put it directly in the flame. Hold it just above the flame, and move it in small circles as you are heating it. This will keep the popcorn and the oil from burning, and keep the test tube from getting coated with black carbon (soot). Keep the top of the test tube pointed away from everyone.

You will heat one test tube at a time. Each team member will heat a test tube. Make careful observations as you are heating the test tube. Keep track of time; after two minutes, you will count the number of kernels popped and record your observations on your lab sheet.

POPPING SECRETS Lab Sheet



What do you predict will happen when you and your teammates begin to heat the test tube?

Data Results:

Test Tube	# of kernels popped after 2 minutes	Observations
1		
2		
3		
4		
Average		

Conclusions:

What did your team notice on the sides and top of the test tube as you heated it?

What was the mean (average) number of popcorn kernels that popped?

What conclusions can you make from your data?

What do you think makes popcorn pop? What is your evidence?

4-Question Experimental Design Sheet

What did the popcorn kernel do when put in oil?

What materials would you need to have in order to conduct an experiment on popcorn?

What could you change about each material to affect how the popcorn pops?

If you change _____, what could you describe or measure to determine if _____ affects how popcorn pops?

3. Safety Sheet

The following safety rules are to apply to this activity:

1. Roll up long sleeves and tie back long hair.
2. Wear safety goggles over your eyes.
3. When you heat anything in a test tube, point the open end away from yourself and others.
4. Keep your work area clean and clear of materials that might catch on fire.
5. Do not eat the popcorn!

Safety Check-Off Sheet

Before you begin, check here to make sure you are ready for the activity:

- Are your sleeves rolled up?
- Long hair tied back?
- Do you have your goggles on?
- Do you have a wire test-tube holder?
- Do you know where to point the test tube when heating it?
- Is your work area clean and clear of materials that might catch on fire?