



Food Science/ Healthy Living:

Project: Popcorn Science

Supplies:

¾ cup popcorn kernels
¼ cup water
1 ½ teaspoons vegetable oil
Masking or painter's tape
Marker or pen
2 resealable containers with lids, approximately 16 ounces each
¼ cup dry measuring cup
Liquid measuring cup
Rimmed baking sheet
Oven mitts
Cooling rack
3 medium or large bowls, all the same size if possible
Colander
Paper towels
3 clean brown paper lunch bags (make sure to use plain bags with no writing as colored inks are often not microwave-safe)
Measuring spoons
2 large microwave-safe plates

Time: 45 minutes, plus prep time that should start 1 day in advance

Hypothesis (prediction):

What to Do:

1. **Hydrated kernels:** At least 8 hours before (or the night before) you pop all your kernel samples, make your hydrated sample of popcorn kernels ("hydrate" means "to add water"). Use a piece of masking or painter's tape and a pen/marker to label 1 resealable container "Hydrated." Measure ¼ cup of popcorn kernels and ¼ cup of water into the container. Seal the container. Set the container aside on a shelf or counter for at least 8 hours or up to 24 hours. *Special note:* Don't leave the kernel/water mixture on the counter for more than 24 hours—it will start to smell and ferment. Gross! If you need to leave it longer than that, store the container in the refrigerator.
2. **Dehydrated kernels:** On the day of but at least 2 ½ hours before you pop all the kernel samples: make your dehydrated sample of popcorn ("dehydrate" means "to take away water"). Heat your oven to 200 degrees F.

Measure ¼ cup of popcorn kernels and spread them into an even layer on a rimmed baking sheet. Place the baking sheet in the oven. Bake the kernels for at least 2 ½ hours. Don't worry—the kernels won't pop in the oven. Popcorn kernels need to reach about 356 degrees F/180 degrees C to pop.

Use oven mitts to remove the baking sheet from the oven (ask an adult for help if necessary). Place the baking sheet on a cooling rack and let the kernels cool completely, about 15 minutes. Once the kernels have cooled, place them into the second resealable container and seal the container. Use a piece of masking or painter's tape and a pen/marker to label the container "Dehydrated."

3. Set out your 3 medium to large bowls. Use masking or painter's tape and a pen/marker to label the bowls "Dehydrated," "Hydrated," and "Control." This will help you keep track of your popcorn samples.
4. Set the colander in the sink. Open the container of kernels you soaked overnight and pour them into the colander. Gently shake the colander to remove excess water. Spread the kernels on a paper towel. Use a second paper towel to blot the kernels until they are dry. Set paper towel with the kernels aside.
5. It's time to pop the kernels! First, pop your **control** sample. Measure ¼ cup of popcorn kernels and place them in 1 brown paper lunch bag. Drizzle the kernels with ½ teaspoon of oil. Fold over the top of the bag 3 times to seal (do not tape or staple it).
Shake the bag to coat the kernels evenly with oil, place the bag on its side on 1 large microwave-safe plate, and shake the kernels into an even layer in the bag. Place the plate in the microwave and cook until the popping slows down to 1 or 2 pops at a time. This should take about 3 to 5 minutes. Use oven mitts to remove the plate from the microwave (the plate will be very hot—ask an adult for help if necessary). Set the popcorn aside to cool slightly. Carefully open the bag (be careful of hot steam) and pour the popcorn into the bowl labeled "**Control.**" Taste one of the kernels. (OK, maybe a few . . . you can't eat just one piece of popcorn!) Set the bowl of popcorn aside.
6. Pop your dehydrated sample of popcorn using the same process, but swap in the second microwave-safe plate. (The first will be very hot). Carefully open the bag (be careful of hot steam) and pour the popcorn into the bowl labeled "**Dehydrated.**" Take a taste, if you want. Set the bowl of popcorn aside.
7. Finally, pop your hydrated sample of popcorn using the same process. Use the first microwave-safe plate again, now that it has cooled. Use oven mitts to set aside the plate that's currently in the microwave. Carefully open the bag (be careful of hot steam) and pour the popcorn into the bowl labeled "**Hydrated.**" Take a taste, if you want. Set the bowl of popcorn aside.

Reflect:

1. Compare your 3 samples, side by side and complete Table 1
2. Taste-test each of the popcorn samples!
3. How do your results compare with your original hypothesis?

Table 1:

Description	Control	Dehydrated	Hydrated
Best Flavor			
Best Texture			
Fluffiest			
Most chewy			
Hardest			
Softest			
Favorite			

Apply:

Why does popcorn pop? The short story is that a typical un-popped kernel contains a small amount of water in its center. When heated quickly enough, the water inside the kernel turns into steam. The steam pushes against the inside of the kernel as it gets hotter and eventually the pressure from the steam overcomes the strength of the kernel and pops it. The explosion causes the soft tissue inside the kernel to puff outwards, giving a popped kernel its characteristic appearance.

Indiana ranks second in the nation in popcorn production. According to My Indiana Home, some of the leading popcorn companies in Indiana include: Cousin Willie's, Pop Weaver, Gutwein Popcorn, and Yoder Popcorn. Pop Weaver produces almost 30 percent of the world's popcorn! However, nowhere is popcorn more popular than in the United States. We consume, on average, 52 quarts per person each year!

Popcorn is a healthy, natural, whole-grain snack, contains no sugar or gluten and is packed with antioxidants and dietary fiber.

Fun fact: Kernels that don't pop are called "spinsters".

Bonus: Try the recipe for real-buttered popcorn listed in the resource section and attached to this lesson!

Background: When this experiment was done in America's Test Kitchen, they weighed the kernels before adding the water or putting them in the oven. They also weighed the kernels again after they had soaked overnight (draining off the water first) or been in the oven. The hydrated popcorn gained about 30 percent of its weight by taking in water through tiny holes in the outsides of the kernels. The dehydrated popcorn, on the other hand, lost about 7 percent of its weight because water inside the kernels evaporated in the warm oven through those same tiny holes.

Resources:

<https://www.americastestkitchen.com/kids/activities/the-secret-to-fluffy-popcorn>

<https://www.americastestkitchen.com/kids/recipes/real-buttered-popcorn>

<https://www.cool-science-projects.com/popcorn-science-project.html>

<https://www.my-indiana-home.com/farm/popcorn-production-in-indiana/>