

Pop, Pop, Popcorn

Grades 3-5

English Language Arts, Math, Science



Objectives

Students will discover the phenomenon of popcorn popping, discover the life cycle of a plant by growing a popcorn necklace, read about the history of popcorn while locating and paraphrasing the main idea and supporting details, and learn how matter is conserved as popcorn absorbs water.

Vocabulary

cob—the woody core on which the kernels of corn are arranged

corsage—a bouquet of flowers usually worn at the shoulder

meal—ground seeds of a cereal grass

pottery—articles made from clay that is shaped while moist and hardened by heat

Background

There are several different kinds of corn. The corn on the **cob** we like to eat is called “sweet corn.” It is picked while still tender. Other kinds of corn are allowed to dry on the stalk. That kind of corn is ground into **meal** for cornbread, tortillas, and corn chips. Dried corn is also used to feed livestock.

Popcorn is made from another kind of corn that is allowed to dry on the stalk. Popcorn kernels are dry outside, but they have water stored inside. When you heat popcorn, the water inside begins to boil. As it turns to steam, the water expands, or takes up more space. This causes the corn to swell until the steam shoots out, and the corn pops. Air rushes in and fills the space left by the escaped steam.

Popcorn has an ancient history. Popcorn ears over 5,600 years old have been found in the Bat Cave in New Mexico. The size of these ears ranged from 1/2 inch to 2 inches long. They are the oldest ears of popcorn known. Grains of popcorn over 1,000 years old were discovered on Peru’s east coast. This popcorn was preserved so well that the corn would still pop.

In 1492, Christopher Columbus saw West Indian natives wearing **corsages** made from popcorn. About 1612 in the Great Lakes region, French explorers observed the Iroquois popping popcorn in **pottery** with heated sand. The Frenchmen took part in an Iroquois dinner that included popcorn soup. Ancient poppers made of soapstone, pottery and metal have been found in Indian excavation sites. Most of these have tripod legs and are large clay containers with lids to be set directly in the fire. The Papago Indians of Arizona still pop corn in clay pots up to eight feet wide. These pots are known as “ollas.” Researchers have documented these poppers go back in design 1,500 years, to the South American Indian and Mexican cultures. Some tribes popped oiled popcorn while it was still on the cob. Somehow the corn stayed attached to the cob, and it was eaten like corn on the cob. The Winnebago Indians have a long history of enjoying popcorn on the cob, stabbing a stick through the cob and holding the ear close to the fire.

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Home versions of popcorn poppers were invented in 1925 and quickly snapped up by those able to afford them. Poppers were even manufactured in junior-high metal shop classes to keep up with the demand. During the Great Depression, popcorn was a popular snack because it was cheap, at 5-10 cents a bag. While other businesses failed the popcorn business thrived and became a source of income for some struggling farmers. During World War II, sugar rations diminished candy production, causing Americans to eat three times more popcorn than they had before.

Most of the corn used for popcorn production today is grown in Nebraska, Indiana and Texas. Oklahoma farmers grow corn across much of the state, but most of that is used for feeding cattle and other livestock. The popcorn you buy in the store is usually white or yellow, but popcorn kernels can be almost any color. Some of them are red, some are purple, and some are black. No matter what color it is on the outside, all popcorn is white when popped. Today the American public eats over one billion pounds of popcorn per year. The average American eats about 70 quarts per person annually. Popcorn is a healthy snack. It is low in fat and calories and has no sugar. It has more nutrients than many other snacks.

Additional Reading

Aliki, *Corn is Maize*, Collins, 1986.

Basel, Roberta, *From Corn to Cereal*, Capstone, 2005.

DePaola, Tomie, *The Popcorn Book: 40th Anniversary Edition*, Holiday House, 2018.

Gibbons, Gail, *Corn*, Holiday House, 2009.

Landau, Elaine, *Popcorn!*, Charlesbridge, 2003.

Peterson, Cris, *Popcorn Country: The Story of America's Favorite Snack*, Boyd Mills Press, 2019.

Ruddell, Deborah, *The Popcorn Astronauts: And Other Biteable Rhymes*, Margaret K. McElderry Books, 2015.

Websites

<https://www.youtube.com/watch?v=rllDiPSZffc>

<https://www.youtube.com/watch?v=FSZd33awqQk>

<https://www.popcorn.org/Facts-Fun/History-of-Popcorn/Recent-Popcorn-History>

<https://www.youtube.com/watch?v=joFzepw3lfs>

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Activity 1

Grades 3-5 Teacher Resources and Standards

Activity 1: Weighing Popcorn, (Science, Math) 1-2 50 minute class periods

Discover the phenomenon of popcorn popping. What makes popcorn pop? What particles are in a kernel of popcorn that cannot be seen? Predict if one cup of kernels and one cup of popped popcorn will weigh the same. Measure the popcorn and record results. Why did the weight of the popcorn change?

Oklahoma Academic Standards

Activity 1: Weighing Popcorn, (Science, Math)

- 4.GM.2.5 Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money using addition, subtraction, multiplication, or division as appropriate (customary and metric).
- 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.

Materials:

- popcorn
- air pop popcorn maker
- scales
- measuring cups
- Activity 1 Worksheet 1 “Popping Popcorn Graphic Organizer”
- Video: “How It’s Made-Popcorn”: <https://www.youtube.com/watch?v=rIldiPSZffc>
- Video: “Popcorn Popping at 30,000 FPS in Ultra Slow Motion”: <https://www.youtube.com/watch?v=FSZd33awqQk>

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Activity 1 Continued

Grades 3-5 Teacher Resources and Standards

Procedures

1. Provide each student with a copy of the **“Popping Popcorn Graphic Organizer.”**
2. Ask the students to discuss the following question with their group, "What do you think happens to popcorn before, during, and after popping?"
3. Instruct the students to record their ideas in the appropriate sections of the graphic organizer. Allow time for each group to share their ideas with the class.
4. Explain to the students that in order to understand how popcorn pops, it is helpful to know more about the parts of a popcorn kernel, how it is grown, and how it differs from other types of corn.
—Watch “How It’s Made-Popcorn” video: <https://www.youtube.com/watch?v=rIldiPSZffc>
5. Provide one cup unpopped popcorn for each group of students to explore.
—Students will weigh the popcorn to the nearest ounce and the nearest gram. Students will determine the mass and volume of the unpopped corn. Students will estimate what the corn will weigh after it is popped.
—Pop the popcorn using an air popper.
—Students will weigh the popped popcorn and compare it with the weight of the unpopped corn to the nearest ounce and gram. Students will determine the mass and volume of the popped corn and compare it with that of the unpopped corn.
—Students will determine why the weight is different. What particles can they not see? (ANSWER: The water that was inside the seed before it popped.)
6. Discuss the phenomenon of popping popcorn.
—What makes the kernel pop? What is inside the kernel? (water)
—Watch “Popcorn Popping at 30,000 FPS in Ultra Slow Motion” video: <https://www.youtube.com/watch?v=FSZd33awqQk>
—What is popcorn made of? (ANSWER: A popcorn kernel has three parts—the pericarp, germ, and endosperm. The pericarp is the hard, outer shell surrounding the kernel. Inside the kernel is the germ, or seed embryo, and the endosperm. The endosperm contains trapped water and starch.)
—How does popcorn pop? (ANSWER: As the kernel heats up, the water inside boils and turns into steam. Because the pericarp is hard, pressure from the steam builds up inside the kernel. The starch gelatinizes and the pressure eventually becomes so great that the kernel bursts open, and the starch solidifies to form the white, puffy part of the popcorn.)
7. Allow time for students to add to, revise, and/or question their original ideas on their graphic organizer. Share any additions, revisions, or questions with the whole group. Ask the students to share how their thinking changed and why. Use the completed graphic organizers to evaluate student understanding.
8. Based on what they learned, students will determine how much unpopped popcorn they would need to provide enough popped popcorn for the entire class, if each student gets one cup of popcorn.

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Activity 1 Worksheet 1: Popping Popcorn Graphic Organizer



Name: _____ Date: _____

What do you think happens to popcorn before, during, and after popping? Record your ideas in the appropriate sections of this graphic organizer.

BEFORE



DURING



AFTER



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Activity 2

Grades 3-5 Teacher Resources and Standards

Activity 2: Grow a Popcorn Necklace, (Science) 1-8 50 minute class periods

Discover the life cycle of a plant by growing a popcorn necklace.

Oklahoma Academic Standards

Activity 2: Grow a Popcorn Necklace, (Science)

- 3.LS3.1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
- 4.LS1.1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 5.LS1.1 Support an argument that plants get the materials they need for growth chiefly from air and water.

Materials:

- popcorn kernels
- water
- small jewelry baggie
- cotton balls
- yarn
- hole punch
- Activity 2, Worksheets 1 & 2 “Popcorn Necklace Observations”

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Activity 2

Grades 3-5 Teacher Resources and Standards

Procedures

1. Divide students into groups and provide each group with an ear of corn, preferably an ear of dried popcorn. Ask each group to make a chart of similarities and differences between the kernels on an ear (each kernel is an individual offspring of the plant that produced the ear). Discuss the possible sources of variation (sexual reproduction, open pollination).
2. As a class, brainstorm reasons why farmers might not want variation among plants they grow. Explain that in general, it is easier for farmers to manage uniform crops. For example, most corn is harvested using a machine called a combine. All of the corn is harvested at the same time, so it is best if it all matures at the same time.
3. Students will continue their investigation of corn by observing how corn seeds germinate and begin to grow. *Teaching Tip: The corn seeds will sprout in three to six days. Starting on a Friday and making the first observations on Monday works well. Soak popcorn kernels in water for an hour or overnight. This will help them sprout quicker. They will sprout without soaking them.*
4. Provide each student with 1-3 popcorn seeds and the “**Popcorn Necklace Observations**” worksheets. Students will begin their corn observations by drawing a picture of each seed and writing several sentences to describe it.
5. Students will dip a cotton ball in water and place in the baggie for moisture. Place the soaked popcorn kernel in the baggie. Zip the baggie shut. Use a hole punch to poke a hole in the baggie, above the zipper. Use the yarn to thread through the hole and make a popcorn necklace for students to wear. Baggies can also be hung in the window.
6. In three to five days a small root will emerge. The next day a small shoot should start growing.
7. Discuss and observe the life cycle of a popcorn plant. Students should record observations of the life cycle. Discuss Inherited traits from the parent plant.

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Activity 2 Worksheet 1: Popcorn Necklace Observations

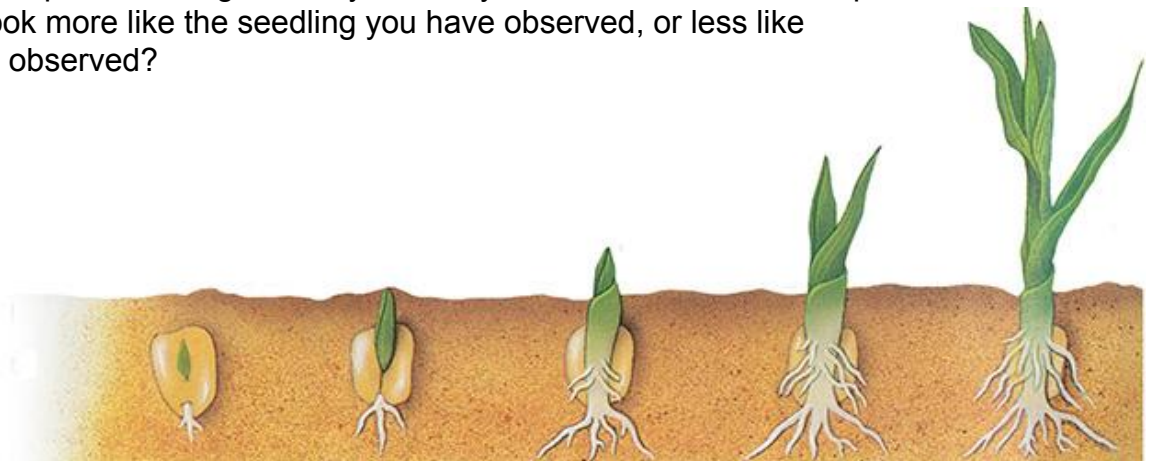


Name: _____ Date: _____

Draw a picture of each popcorn seed and write sentences to describe each one in the space below.

Discuss: What would happen if your popcorn plant grew to maturity, flowered, self-pollinated, went to seed, and you took the seeds and planted them? Would that seedling be likely to look like the seedling you have observed, or would it be likely to look different?

Discuss: What would happen if your popcorn plant grew to maturity, flowered, was cross-pollinated by a popcorn plant from the person sitting next to you, and you took those seeds and planted them? Would that seedling look more like the seedling you have observed, or less like the seedling you have observed?



*** Questions from Utah Ag in the Classroom*

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Activity 2 Worksheet 2: Popcorn Necklace Observations



Name: _____ Date: _____

For one week, record the changes you observe in your seeds. Include observable traits such as: number of days from “planting” until the root and the shoot can be seen; root and shoot lengths and color; and number of leaves and roots. Use hand lenses to observe the roots and shoots as they emerge and grow. Use rulers to measure the length of roots and leaves as they grow. Compare your graph with classmates and discuss similarities and differences.

DAY 8			
DAY 7			
DAY 6			
DAY 5			
DAY 4			
DAY 3			
DAY 2			
DAY 1			
	POPCORN KERNEL 1	POPCORN KERNEL 2	POPCORN KERNEL 3

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Activity 3

Grades 3-5 Teacher Resources and Standards

Activity 3: Popcorn History, (English Language Arts) 1 50 minute class period

Students will read about the history of popcorn. They will locate and paraphrase the main idea and supporting details. They will answer questions, using the text to support their answers.

Oklahoma Academic Standards

Activity 3: Popcorn History, (English Language Arts)

3.2.R.1 Students will locate the main idea and key supporting details of a text or section of text.

4.2.R.4 Students will begin to paraphrase main ideas with supporting details in a text.

5.2.R.3

3.3.R.7 Students will ask and answer inferential questions using the text to support answers.

4.3.R.7

Materials:

- Activity 3, Reading Page “The History of Popcorn”
- Activity 3, Worksheet 1 “The History of Popcorn Reading Comprehension”
- Video: Valdes History of Popcorn <https://www.youtube.com/watch?v=joFzepw3lfs>

Procedures

1. Watch the Valdes History of Popcorn video. Discuss what facts the students found interesting.
2. Pass out “The History of Popcorn” reading page and reading comprehension page.
3. Ask students to discuss the similarities and differences between the reading page and the video.

Popcorn is a type of corn that is allowed to dry on the stalk. Popcorn kernels are dry outside, but they have water stored inside. When you heat popcorn, the water inside begins to boil. As it turns to steam, the water expands, or takes up more space. This causes the corn to swell until the steam shoots out, and the corn pops. Air rushes in and fills the space left by the escaped steam.

Popcorn has an ancient history. Popcorn ears over 5,600 years old have been found in the Bat Cave in New Mexico. The size of these ears ranges from 1/2 inch to 2 inches long. They are the oldest ears of popcorn known. Grains of popcorn over 1,000 years old were found on Peru's east coast. This popcorn was preserved so well that the corn would still pop.



Home popcorn poppers were invented in 1925. The poppers were quickly bought by those able to afford them. The demand was so large that poppers were even made in junior high metal shop classes. During the Great Depression, popcorn was a popular snack because it was cheap, at 5-10 cents a bag. While other businesses failed, the popcorn business thrived and became a source of income for some struggling farmers. During World War II, sugar rations caused less candy to be produced. As a result, Americans ate three times more popcorn than they had before.



Most of the corn grown for popcorn today is grown in Nebraska, Indiana and Texas. Some popcorn is grown in Oklahoma. The popcorn you buy in the store is usually white or yellow. However, popcorn kernels can be almost any color. Some of them are red, some are purple, and some are black. No matter what color it is on the outside, all popcorn is white when popped. Today the American public eats

14 billion quarts of popcorn per year. The average American eats about 43 quarts of popcorn each year. Popcorn is a healthy snack. It is low in fat and calories and has no sugar. It has more nutrients than many other snacks.

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Activity 3 Worksheet 1: The History of Popcorn Reading Comprehension



Name: _____ Date: _____

1) What is the main idea of "The History of Popcorn" reading page?

2) What details support the main idea?

3) What facts did you find the most interesting?

4) Explain in your own words, why popcorn pops.

5) When did popcorn become a popular snack? Explain why it was popular.

6) If you had to choose between popcorn and candy, what would you choose? Why?

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Activity 4

Grades 3-5 Teacher Resources and Standards

Activity 4: Popcorn Expansion, (Science) 2 50 minute class periods

Students will fill a jar with popcorn and weigh it, then add hot water. Did the weight of the container change as the water was absorbed, or was the amount (weight) of the matter conserved even as it changed forms (water was absorbed)?

Oklahoma Academic Standards

Activity 4: Popcorn Expansion, (Science)

- 5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

Materials:

- Activity 4 Worksheet 1 “Popcorn Expansion Chart”
- small jar with lid
- popcorn kernels
- hot water
- thermometer
- scales

Procedures

1. Fill a small jar with popcorn kernels. Pour in hot water up to the rim.
2. Weigh the container and record the temperature of the water.
3. Have students predict if the mass will be more or less when the water is cooled by air and absorbed by the popcorn.
4. Place a plastic dish or lid on top of the jar.
5. After fifteen minutes, thirty minutes, forty-five minutes, and one hour check the jar. The kernels will begin to swell and lift the cover slightly. Weigh the container. Check the temperature of the water.
6. Check the jar again the next day, after 24 hours. The water-soaked kernels should have pushed the cover off the jar. Weigh the container. Check the temperature of the water.
7. Did the weight of the container change as the water cooled and was absorbed, or was the amount (weight) of the matter conserved even as it changed forms (water cooled and was absorbed)?

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Activity 4 Worksheet 1: Popcorn Expansion Chart



Name: _____ Date: _____

Fill a jar with popcorn and hot water and weigh it. Record the temperature of the water. Every 15 minutes for one hour record the weight of the container and the temperature of the water.

PREDICT: Will the weight of the container change as the water cools and is absorbed? Explain your reasoning.

PHYSICAL STATE OF POPCORN AND WATER	TEMPERATURE (F°)	MASS (GRAMS)
POPCORN WITH HOT WATER ADDED		
POPCORN AND WATER AFTER 15 MINUTES		
POPCORN AND WATER AFTER 30 MINUTES		
POPCORN AND WATER AFTER 45 MINUTES		
POPCORN AND WATER AFTER ONE HOUR		
POPCORN AND WATER AFTER 24 HOURS		

EXPLAIN: Was the amount (weight) of the matter conserved even as it changed forms (water was cooled and absorbed)? Why do you think this happened?
