Corn

*Lesson Plan for Grade 3, Science*

*Prepared by NAITC*

*Modified by Mississippi State University, School of Human Science*

*for Mississippi Farm Bureau Federation - AITC*

# OVERVIEW & PURPOSE

Students will observe the growth of ornamental corn and popcorn seeds, observe similarities and differences between the two varieties, and discuss heredity.

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# EDUCATION STANDARDS

**Mississippi College-and-Career Readiness Standards:**

L.3.2.3 Describe and provide examples of offspring from two parent organisms as containing a combination of inherited traits from both parent organisms.

ELA-SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 3 topics and texts, building on others’ ideas and expressing their own clearly.

**NALOs**

T4.3-5 c Identify examples of how the knowledge of inherited traits is applied to farmed plants and animals in order to meet specific objectives (i.e., increased yields, better nutrition, etc.).

T4.3-5 d Provide examples of science being applied in farming for food, clothing, and shelter products.

# OBJECTIVES

* Students will investigate the genetic variation present in plants
* Students will observe two varieties of Zea *mays*, corn and popcorn, that have been selected over time for different traits

# MATERIALS NEEDED

Activity 1

* Pictures of crops
* Pictures or ears of dried popcorn and ornamental corn

Activity 2

* Cotton balls (1 per student)
* Small plastic jewelry bags (1 per student)
* Popcorn seeds (1 per student)
* Ornamental corn seeds (1 per student)
* Necklace-length piece of yarn (1 per student)
* Water (1 cup per group)
* Permanent markers (1 per group)
* Hand lenses (1 per student or pair)
* Metric rulers (1 per student or pair)
* Pictures of mature popcorn and ornamental corn plants

# Lesson Set Up:

1. Print the “We’re expecting” activity sheet (1 for every student)
2. Have materials ready for students to pick up and use to make their living necklaces.
3. Have a place ready to put students germinating seeds (with access to sunlight) and leave for about 6 days.

# Vocabulary

**cross-pollination:** transfer of pollen from one plant to another

**ear:** female part of a corn plant that contains the cob, the silks, and the eggs that will become kernels

**hybrid:** produced by cross-pollinating two different inbred parent plants; plants are high-yielding and vigorous but results of saving seed are unreliable

**kernel:** the seed of a corn plant and the part that we eat

**open-pollination:** pollination that occurs naturally without human interference; open-pollinated varieties are developed simply by saving seed from the most desirable plants, resulting in high genetic diversity among offspring

**self-pollination:** transfer of pollen from the male part of a flower to the female part of that same flower or another flower on the same plant; in corn this rarely happens in the field, but it may be done by plant breeders to develop desired traits

**tassel:** the male part of a corn plant that emerges from the top of the plant and bears many small flowers that release pollen grains

# Ag Facts:

* In most countries corn is called maize.
* Maize is a native Taino word meaning “sacred mother,” or “giver of life.”
* The ear or cob is part of the flower, while the individual kernel is a seed.
* The average ear of corn has 800 kernels in 16 rows.
* The top producing county of corn in Mississippi in 2018 was Leflore.

# Background Information for Teacher:

Every person (except for an identical twin) has a unique set of inherited traits that makes him or her identifiable as an individual. This is true of all organisms that reproduce sexually. However, have you ever tried to distinguish one bean plant from another bean plant? Or one corn plant from another corn plant? Plants grown as crops have been selected to minimize trait variation because it is easier for farmers to manage a more uniform crop. In this activity, students germinate two types of corn seeds: popcorn and ornamental corn. As a result of their observations, students will see that seedlings of the popcorn variety (which have been bred for uniformity) are very similar, while more variation can be observed among the ornamental corn seedlings.

Understanding heredity in plants—especially crop plants—can be complicated. Many crop plants are propagated asexually, making it easy to grow a uniform crop. Crops like potatoes, garlic, and raspberries can reproduce simply by being split into pieces from which they will regrow. For example, one garlic plant produces many cloves. If these cloves are separated and replanted, they will grow many, genetically identical garlic plants (like identical twins). Corn does not reproduce in this way.

Every corn plant has both male (**tassel**) and female (**ear**) parts. In order for kernels to form on a cob, each one must be fertilized by a grain of pollen. Pollen comes from the tassels at the top of the plant where it is easily picked up by the wind. For fertilization to occur, the pollen must land on a silk strand that sticks out the end of the ear. The pollen is transported down the silk to the egg, which will grow into a kernel after fertilization. As in all organisms that reproduce sexually, the sperm (pollen) and the egg each contribute half of their genes to the offspring (in this case, the corn that will grow from the kernel), creating a genetically unique individual with some traits from each parent.

If farmers select kernels from their best corn plants to save for seed, they know that half of the genes came from the mother plant. However, they do not know anything about the father plants. In the field, most corn silks are pollinated by surrounding plants, a process known as **cross-pollination**. Because pollen is blown in on the wind (**open-pollination**), the many kernels on a single ear can be pollinated by many different father plants. Planting the kernels from an open-pollinated ear of corn produces plants as similar as half-brothers or -sisters. In order to select for a more uniform and genetically similar crop, the source of pollen must be controlled—a difficult proposition on a windy day. The ears must be protected from chance pollination and then hand-pollinated with a tassel from the desired father plant. Then, the kernels will produce plants that are as similar as brothers and sisters.

Many farmers and gardeners plant hybrid varieties of corn and other vegetables. It takes years of controlled pollination to develop hybrids. First, a carefully selected plant with desirable characteristics is self-pollinated for seven generations, resulting in an inbred plant. Inbred plants have stunted growth and do not yield well, but when two different inbred plants are cross-pollinated, their progeny grow vigorously, yield well, and reliably express desired traits—these are hybrid varieties. Development of hybrids has greatly increased agricultural productivity, but seed saved from a hybrid is unreliable. For this reason, some gardeners and farmers prefer non-hybrid varieties.

# LEARNING PROCEDURES

Interest Approach:

1. Remind students about the similarities and differences among humans that come from inherited traits. Ask students to point out some of their inherited traits.
2. Ask students if plants have traits that are inherited through their genetics just like humans. Tell your class that you are going to investigate the genetic variation present in plants.

**Activity 1: Trait Variation**

1. Remind students about the similarities and differences among humans that come from inherited traits. Tell them that the class is now going to investigate the amount of variation present in crop plants.
2. Divide students into groups and provide each group with a picture of a field of crop plants, such as corn, beans, etc. Ask each group to make a chart of the similarities and differences they can see between plants in the pictures. Discuss how the amount of variation they observe compares to the amount of variation that can be observed in humans. As a class, brainstorm reasons why farmers might not want variation among plants they grow to produce crops. (Answer: Farmers do not want variation because they want everything to be uniform because this makes it easier to harvest, and makes the product more appealing to the consumer).
3. Show each group of students an ear of dried popcorn and an ear of ornamental corn. If you do not have ears of corn available, you can use pictures or have students compare all of the popcorn seeds and all of the ornamental corn seeds that will be used in Activity 2.
4. 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). As a class, discuss their observations. Discuss the possible sources of variation (sexual reproduction, open pollination). Also compare the traits of the two corn varieties.
5. Explain to the students 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. However, sometimes variation is desirable. Ornamental corn is used mostly for ornamental purposes, so variation in the color of the kernels is desirable.

**Activity 2: Living Corn Necklace**

1. Tell the students that they will continue their investigation of corn by observing how corn seeds germinate and begin to grow. They will observe two varieties, ornamental corn and popcorn, that have been selected over time for different traits.
2. Provide each student with one popcorn seed and one ornamental corn seed. Ask each student to begin his or her corn journal by drawing a picture of each seed and writing several sentences to describe it.
3. Provide groups with the materials needed for each student to make a “Living Necklace” (plastic jewelry bag, cotton balls, and yarn), permanent marker(s) and a cup of water. Direct students to make their necklaces as follows:
   * Use the permanent marker to label one side of the bag *P* and the other side *I*.
   * Dip a cotton ball in water so that it is thoroughly wet but not dripping. Excess water will cause the seeds not to sprout.
   * Place the cotton ball in the small plastic bag.
   * Put one popcorn seed on the side of the cotton ball facing the label *P*.
   * Put one ornamental corn seed on the other side of the cotton ball, facing the label *I*. The labels will help students remember which seed is which.
   * Seal the bag. String the yarn through the hole in the jewelry bag. Tie a knot in the end of the string to form a necklace.
   * Bags can be hung from tacks on a bulletin board and taken down for student observations.
   * *Teaching Tip: The corn seeds will sprout in three to six days. Starting on a Friday and making the first observations on Monday will speed up this activity.  
        
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4. For one week have students record in their journals the changes they observe in their seeds, including information about 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.
   * *Teaching Tip: It is difficult to take the seedlings out of the bags and get them back in without breaking the roots. Ask students to measure through the bag instead. The roots will curl, so you may want to suggest measuring them in sections and estimating as necessary.*
5. In small groups, have students make charts or graphs of the data they collected for measurable traits (leaf and root length). Ask them to look for differences between the popcorn and ornamental corn.
6. As a class, discuss how each group compared their data for popcorn and ornamental corn. Which kinds of charts or graphs worked the best? Were there noticeable differences between the popcorn and ornamental corn seedlings?
7. Discuss how plant breeders control inheritance and work to develop seeds that will reliably express desired traits. Popcorn has been selected for different traits than ornamental corn.
8. Compare the traits of the corn seedlings to those of mature corn plants (using photographs).

**Concept Elaboration and Evaluation**

After conducting these activities, review and summarize the following key concepts:

* Plants inherit specific traits from the parent plant just like humans or animals inherit traits from their parents.
* Farmers use science and genetics to improve their crops.

# Additional Learning Procedures

To help students review and elaborate more about corn try using the [“I used to think… Now I think..”](https://drive.google.com/file/d/1W5p9rtSF7MjLaG--bW3aT6qQPt4t28a3/view?usp=drive_link) method to allow students to think deeper and make new connections.

Additional texts to include:

[Let’s Pop Pop Popcorn](https://www.agfoundation.org/recommended-pubs/lets-pop-pop-popcorn)

[From Corn to Cereal](https://www.agfoundation.org/recommended-pubs/from-corn-to-cereal)

[Corn](https://www.agfoundation.org/recommended-pubs/corn-a-true-book)



Source: <https://www.agclassroom.org/teacher/matrix/>

*For more information and additional lessons visit*

*https://msfb.org/ag-in-the-classroom/lesson-plans/.*