KANSAS CORN STEM

Kansas Corn: Kernel Kode Breakout

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Updated 2024

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KANSAS CORN COMMISSION

kscorn.com

Kansas Corn: Kernel Kode Breakout
Grade Level: Middle School / High School

Overview
Corn is a vital part of the Kansas economy and landscape. As cities grow, many people move away from an agricultural understanding, even though it is essential to their lives. This breakout is designed to provide students basic knowledge of corn and the many benefits it provides to us. Students will also be introduced to the various stages of corn growth and where corn is primarily grown. This breakout complements the Seed to STEM labs Explore Corn and Growing Degree Days found at www.kansascornstem.com. It can be used as a introductory to one or both of those labs or this activity can be altered to serve as more of an assessment following the completion of the Explore Corn and Growing Degree Days labs.

Next Generation Science Standards (NGSS)
Middle School Science

- **LS1-1.** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- **LS1-7.** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
- **LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- **LS 3-2.** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

High School Science

- **ESS3-2.** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Learning Objectives
- Students will understand and be able to identify corn in various stages of growth.
- Students will identify different types of corn.
- Students will understand how corn goes from the vegetative to reproductive stage.

Materials
- *The Many Uses of Corn* Poster in Black and White
- *The Many Uses of Corn* Poster Puzzle Pieces
- *Products made from Corn* infographic
- Nine corn image cards/corn type cards
- Six growing stage corn cards
- Explore Corn Sheet

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- Four envelopes with regions names
- USDA Corn Production Map

Breakout Edu Tips
If this is your first time using a Breakout Edu box, you are in for a treat. Once you've done one breakout box your students will be ready for the next time.

You can use breakout boxes as a whole class, in addition to small group. You have the opportunity to give students hints. Every box comes with at least two hint cards. If you have a higher performing group, you may want to challenge them with less hints, while a different hour may need more hints.
Having a visual timer for students while they are working is really helpful. It allows them to budget their time and when they may want to use their hints. As the teacher, you have the discretion to hide things wherever best fit in your room. Feel free to make adjustments! Just make sure the clues for the locks don't change, otherwise students may not be able to get in.

Background Information
Why is corn a valuable crop? How does corn grow, pollinate, and produce kernels? What farming techniques are important to increase corn yield?

Corn is a grass, native to the Americas. Evidence in central Mexico suggests corn was used there about 7,000 years ago. Various Native American tribes shared their knowledge of corn, also known as maize, with early European settlers, saving many from starvation. Early American colonists grounded dried corn as meal for flour to use in porridge, cake, and bread. Sweet corn, served as "corn on the cob," was not developed until the 1700s.

Along with wheat and rice, corn is one of the world's major grain crops. It is the largest grain crop grown in the United States. About 9% of all the corn is used to produce food for humans: corn meal, cooking oils, margarine, corn syrups, and sweeteners (fructose). About 64% of all corn is used as feed for livestock. Corn is harvested for either grain or silage, with most of the grain going to dairies, animal feeding operations, and poultry operations. Corncobs have been used in the manufacturing of nylon fibers as well as being a source for producing degradable plastics. Ethanol, made from corn, is a renewable fuel used in today's cars.

Corn is pollinated by wind and is typically planted in 30-inch rows. A single seed, or kernel, of corn may produce a plant that yields more than 600 kernels of corn per ear. Approximately 22,000 to 35,000 individual plants may be grown on an acre of land. Hybrid corn is developed to produce from one to two ears per plant. More than 80 million acres of the heartland are planted in corn each year. That's almost as big as 60 million football fields!

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After the corn is harvested, the farmer begins to prepare the soil for the next season by mixing in nutrients, such as potassium and phosphorus, with some form of tillage (breaking up soil) to incorporate them. In the spring, the farmer will do a light tillage pass to create smooth bedding for planting. When the ground temperature is ready (50°F and expected to rise), the farmer will plant the corn seeds. The farmer will then add fertilizer, two inches deep and two inches to the side of the kernels, to help the seeds get a healthy start. After the seed is planted, most farmers will spray a pre-emergent herbicide to prohibit weed growth. When seedlings emerge and grow, the farmer will inject the soil with some form of nitrogen fertilizer before the V8 (eighth leaf development) stage. This spring fertilizer will allow for the plant to "green-up" and establish good photosynthetic activity through harvest. The farmer will continue to scout the crop through maturity for any additional pests. The farmer will harvest the crop when it is ripe in the fall.

Breakout Activity

Game Name
Exploring Corn

Game Designer
Kansas Corn Commission and Jessica Sadler

Content Areas
STEM, Agriculture, Corn, Science

Recommended Ages
K-Adult

Ideal Group Size
Can be used small group or whole class

Suggested Time
30-40 minutes

Story
There's a locked box in the room. Why are people trying to open it? Think of the story as a script that the facilitator could read to introduce the game to the group about to play. It can be a few sentences to a few short paragraphs. Many games have a story and a logical progression. If there is not a structured story, having a defined theme can help with the creation process. Take a look at some of the games in the Breakout Edu game library for inspiration. You can use different curriculum topics, favorite movies, or books for inspiration as well.

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Farming your main crop this year has been really tough. Looking at your crop compared to your neighbors, you can see there is room for improvement in your management practices. Unsure what to do, you begin talking with a nearby neighbor and farmer about their corn. They are willing to help you out, but you need to make sure that you have a good knowledge about corn before starting. It's time to show what you know, before it's too late.

Lock Combinations

The following codes will open the locks on the box.

3-Digit Lock - 3 Numbers
600 (average amount of kernels)

4-Digit Lock - 4 Numbers
7,000 (Approximate 1st usage of corn)

ABC Lock - 4-5 Letters for the ABC Multilock
SWEET

*Color Lock - 5 Colors for the color Multiloc*k
Orange, Green, Yellow, Red, Blue

Key Lock - Where is the Key Hidden?
Teacher's Choice

Directional Lock- 5 Directions for the Directional Multilock
Right, Up, Left, Down, Left

Setup Instructions

Steps

1. For the color lock, students will need a copy of The Many Uses of Corn. The main paper is in black and white, while the pieces are in color. Students will need to read the information on The Many Uses of Corn and match the pieces to the area they belong. Once all pieces are matched, they will see that 1 is orange, 2 green, 3 yellow, 4 red, and 5 blue. They will need to put those colors in to the color lock to open it. The colors are ordered by the amount of pieces for that area. Meaning orange is first with 1, green is second with 2 and so on.

2. Use the Products Made From Corn infographic to help students find the hidden key. This infographic

should be printed off. Look over the list and find something you have in your classroom or can easily bring in. Using the invisible ink pen, circle the item. Then write "Find it to find the key." You may want to leave the blacklight by this clue. If you have a group that works really quickly, you can hide the light and even the batteries to make it work. Whichever item you circle in the infographic, have it out somewhere in the room with the key underneath it. I like to hide it in an area under an item they may not traditionally look under without the clue.

3. Students will need to identify what kind of corn images are in the box. They can label them using the included title strip. Then they will need to decide what type is referred to as "corn on the cob." The answer is "sweet" and will open the 5 letter word lock.
4. Have the Corn Production sheet printed and write the question "What region is corn mainly grown in the United States?" on the board. Around the room, you should have the region envelopes hung. The Midwest envelope will contain the Corn Vegetation Phase cards. Students will need to figure out how to order these cards. Once they have the arrows on the cards in order, they will have the code for the directional lock.
5. Have copies of the Explore Corn background sheets laying around. The answers for the 3-digit and 4-digit lock will come from this reading. Cutting the reading up and leaving the paragraphs more spread out can create an extra challenge.
6. When students unlock the main box, inside they will find a prize, typically candy. You can also include the questions below on half sheets of paper for students to turn in as exit tickets.
7. It is also possible to include ears of corn or other supplies that would lead your student into completing other Seed to STEM labs.

Tags or Keywords
STEM, Agriculture, Corn

Additional Requirements
All Breakout Edu games should be able to be played with the standard Breakout Edu kit. Yet, some games require uncommon items. If your game relies on any additional items, please list them below and explain their use.

These are materials you will need for extension activities that could be placed in the large breakout box. To access the Explore Corn lab descriptions, visit www.kansascornstem.com

Materials for Explore an Ear of Corn

- Ear of Corn Worksheet
- Ear of Corn Labeling Answer Key
- Ears of dried corn

- Corn plant
- Electronic scale
- Cutting mat

Materials for Leaf Collar Method

- Leaf Collar Method Worksheet
- Knives
- Cutting mats
- Ear of dried corn
- Corn plants
- Electronic scales

Teacher Resources

Check the Youtube Channel Kansas Corn STEM for new videos in the future.

Reflection and Conclusion

At the completion of this breakout, your students should have a better understanding of corn types, corn production, and how corn plays a daily role in their lives. Feel free to give students the following questions as an exit ticket or knowledge check at the end of the breakout. If you have groups that do not breakout, it is always nice to go over the information and/or clues that would have lead to the last locks coming off.

Questions

1. What region in the United States produces the most corn?
2. List five products that are made using corn.
3. About how many corn plants can be grown on an acre of land?
4. What new knowledge do you have about the corn plant?
5. Name four types of corn are there.

Any educator electing to perform demonstrations is expected to follow *NSTA Minimum Safety Practices and Regulations for Demonstrations, Experiments, and Workshops*, which are available at http://static.nsta.org/pdfs/MinimumSafetyPracticesAndRegulations.pdf, as well as all school policies and rules and all state and federal laws, regulations, codes and professional standards. Educators are under a duty of care to make laboratories and demonstrations in and out of the classroom as safe as possible. If in doubt, do not perform the demonstrations.

Seed to STEM

Seed to STEM

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Seed to STEM

Seed to STEM

Seed to STEM

Popcorn

Dent

Sweet

Indian / Flint

What type of corn is referred to as “corn on the cob.”

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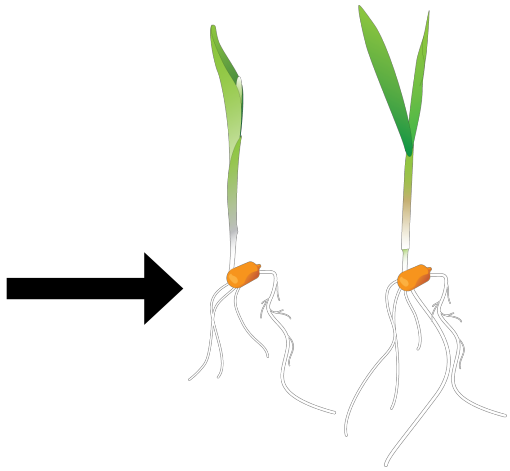
VE-V1



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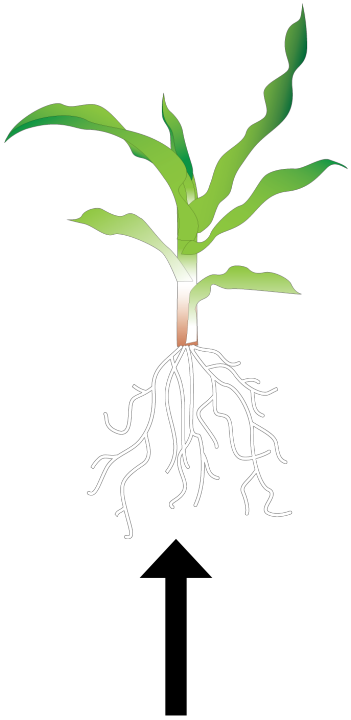
V3



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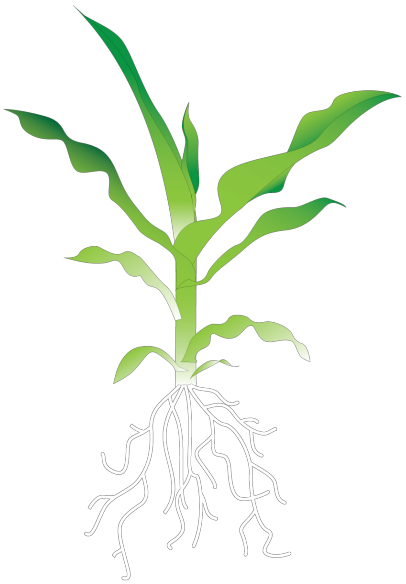
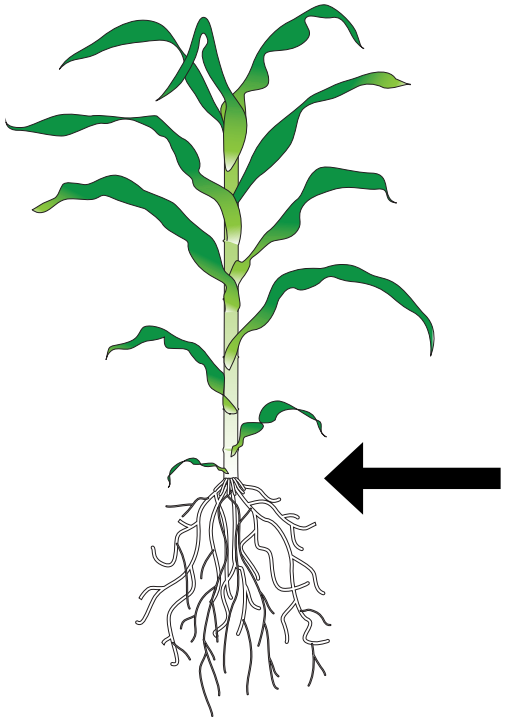
V6



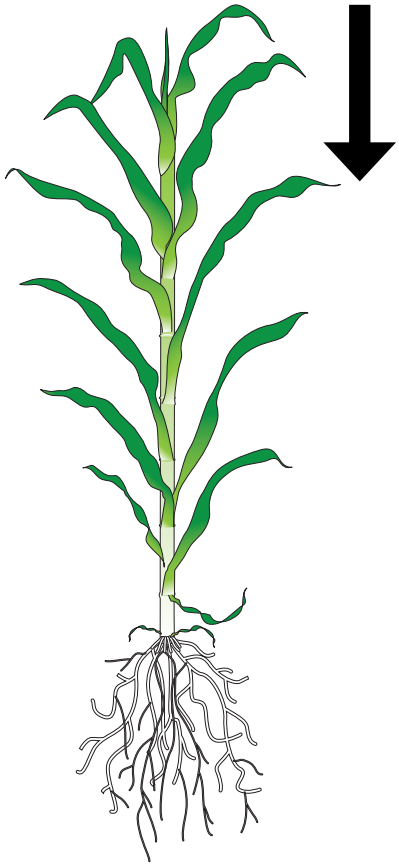
KANSAS CORN STEM

V9



KANSAS CORN STEM

V(n)



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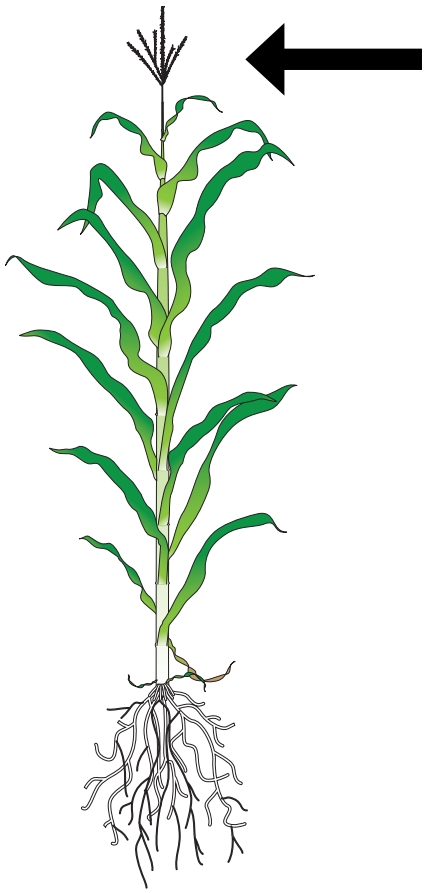
VT



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Explore Corn

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