



Kansas Corn: Show How You Grow Breakout Box

This breakout is made possible with the support and content contributions of the Kansas Corn Commission.



Kansas Corn: Show How You Grow Breakout Box

Grade Level: Middle School / High School

Overview

As cities grow, many people move away from an understanding of agriculture, even though it is essential to their lives. Most people are unaware of how growing degree days, also known as growing degree units, are a vital part of agriculture. This breakout is designed to provide students basic knowledge of how temperature and time play a role in how corn grows. This breakout complements the Growing Degree Days Kansas Corn STEM lab found at kansascornstem.com. It can be used as an introductory lab to one or all of those labs. Alternatively, this activity can serve as more of an assessment following the completion of Growing Degree Days.

Next Generation Science Standards (NGSS)

Middle School Science

- **LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

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 how to calculate growing degree days/units.
- Students will understand the ideal temperatures for growing corn.
- Students will understand how to calculate the growing degree days for chosen areas.

Materials

- Growing Degree Equations cards
- Sedgwick County, Kansas image
- Growing Degree Day Problem cards
- Approximate Growing Degree Days cards
- Farm Basics QR Code card
- Farm Basics Question card

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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 group 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.

Breakout Activity

Game Name

Show How You Grow

Game Designer

Kansas Corn Commission and Jessica Sadler

Content Areas

STEM, Agriculture, Corn, Science, Growing Degree Days

Recommended Ages

K-Adult

Ideal Group Size

Can be used in small groups or whole class

Suggested Time

30-40 minutes

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Story

You're sitting in class listening to your teacher speak about growing degree days during your agriculture unit. As you look around, you see that most of your classmates seem to be following right along while you are feeling a little lost. How is it possible that corn needs so many days to develop? You're certain that you do not understand correctly, so you stay after class to talk with your teacher. By the end of your conversation, you have a much stronger understanding of growing degree days. You're about to leave when your teacher mentions you may complete the following breakout for extra credit on the next test. Good luck!

Lock Combinations

3-Digit Lock - 3 Numbers

5, 6, 6

4-Digit Lock - 4 Numbers

0, 8, 1, 6

Color Lock - 5 Colors for the color Multilock

Blue, Orange, Red, Green, Magenta

Shape Lock



Key Lock -

Teacher Choice

Setup Instructions

Steps

1. Students will need the "Growing Degree Equations" cards to unlock the color lock on the hasp on main box. They will use the cards to build the equation to find the amount of growing degree days/units needed to grow corn. When the cards are arranged in the correct order, they will read them from left to right.
2. To solve the four-digit lock, students will need to use the image of Sedgwick County, Kansas, from the Corn Growing Degree Day Tool. The image asks students, "When will this corn be ready to harvest?" This clue should help them look for the maturity of the corn which is 118 days. They will use the day that corn is planted, 04-20, and move out 118 days from there leading them to August 16 or 0816. Place the lock on hasp on the large box.

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3. Students will need the three “Growing Degree Day Problems” to get into the three-digit lock. These have been numbered 1-3 and separated into three problem cards. Students will need to solve the problems and supply the number needed in the empty box. Once they have all three, they will be able to open the lock. Place the lock on hasp on the large box.
4. Students will need to use the “Approximate Growing Degree Days” cards to unlock the five-digit shape lock. The stage cards have been printed in green and the amount of growing degree days (GDD) have been printed in dark yellow. Students will need to match the amount of GDD with the respective stage. It will be best if students put the stages of corn in order first and then the GDD second, as they will just need to be ordered from smallest to largest at that point. Once they have been placed in order, they will be able to enter the shapes and open the lock. Place the lock on hasp on the large box.
5. To remove the key lock, students will need to watch the “Farm Basics” growing degree day video available via the QR Code card. Somewhere in your room, you will need to have the number 100. This can be on a piece of paper, built out of Legos, or 100-like beans in a space, if you’re trying to be very challenging. In the video, students will learn about how many growing degree days it takes to see corn emerge, which is 100 days. The “Farm Basics Question” card can be placed next to the QR Code card. You could always write the question on the board and attach the QR code there, if you did not want to print the question card. They will then need to find where you have placed the 100 in the room. You should hide the key near the location of your version of the 100.
6. This breakout does not require the small black box. You may place all locks on the hasp using the large black box.
7. It is also possible to include other supplies that would lead your students into completing other Seed to STEM labs.

Resources

Visit www.kansascornstem.com for updated resources, free lessons and supplies.

Reflection and Conclusion

At the completion of this breakout, your students should have a better understanding of how to calculate growing degree days (GDD), the ideal temperatures for growing corn, and how to calculate GDD for chosen areas. Feel free to give students the following questions as an exit ticket or a 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 led to the last locks coming off.

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Questions

1. Below what temperature will a planter see little to no growth? Answer: 50 Degrees F
2. What is another name for Growing Degree Days? Answer: Growing Degree Units
3. Why is it important to know how to calculate Growing Degree Days? Answers will vary
4. Above what temperature will a planter see decrease in growth? Answer: 86 Degrees F
5. As you move north in the United States, a crop would have to stay in the ground longer. Why might that be? Answer: There are more cold days causing growth to be slower.

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.

Show How You Grow

You're sitting in class listening to your teacher speak about growing degree days during your agriculture unit. As you look around, you see that most of your classmates seem to be following right along while you are feeling a little lost. How is it possible that corn needs so many days to develop? You're certain that you do not understand correctly, so you stay after class to talk with your teacher. By the end of your conversation, you have a much stronger understanding of growing degree days. You're about to leave when your teacher mentions you may complete the following breakout for extra credit on the next test. Good luck!

Growing Degree Equation Cards

GDD=

[(Tmax

+Tmin)

/2]

-50

Growing Degree Day Problems

1.

$$\text{GDD}^{\circ}\text{F} = (82^{\circ}\text{F} + 68^{\circ}\text{F}) / 2 = 7\Box$$



2.

$$\text{GDD}^{\circ}\text{F} = (73^{\circ}\text{F} + 55^{\circ}\text{F}) / 2 = \Box 4$$



3.

$$\text{GDD}^{\circ}\text{F} = (68^{\circ}\text{F} + 64^{\circ}\text{F}) / 2 = 6\Box$$



Sedgwick County, Kansas

GDD Start: April 20

Comparison Years: 2019, 2018, 2017

Corn Maturity Days: 118

Silking GDDs: 1452

Freeze Temperature (°F): 28

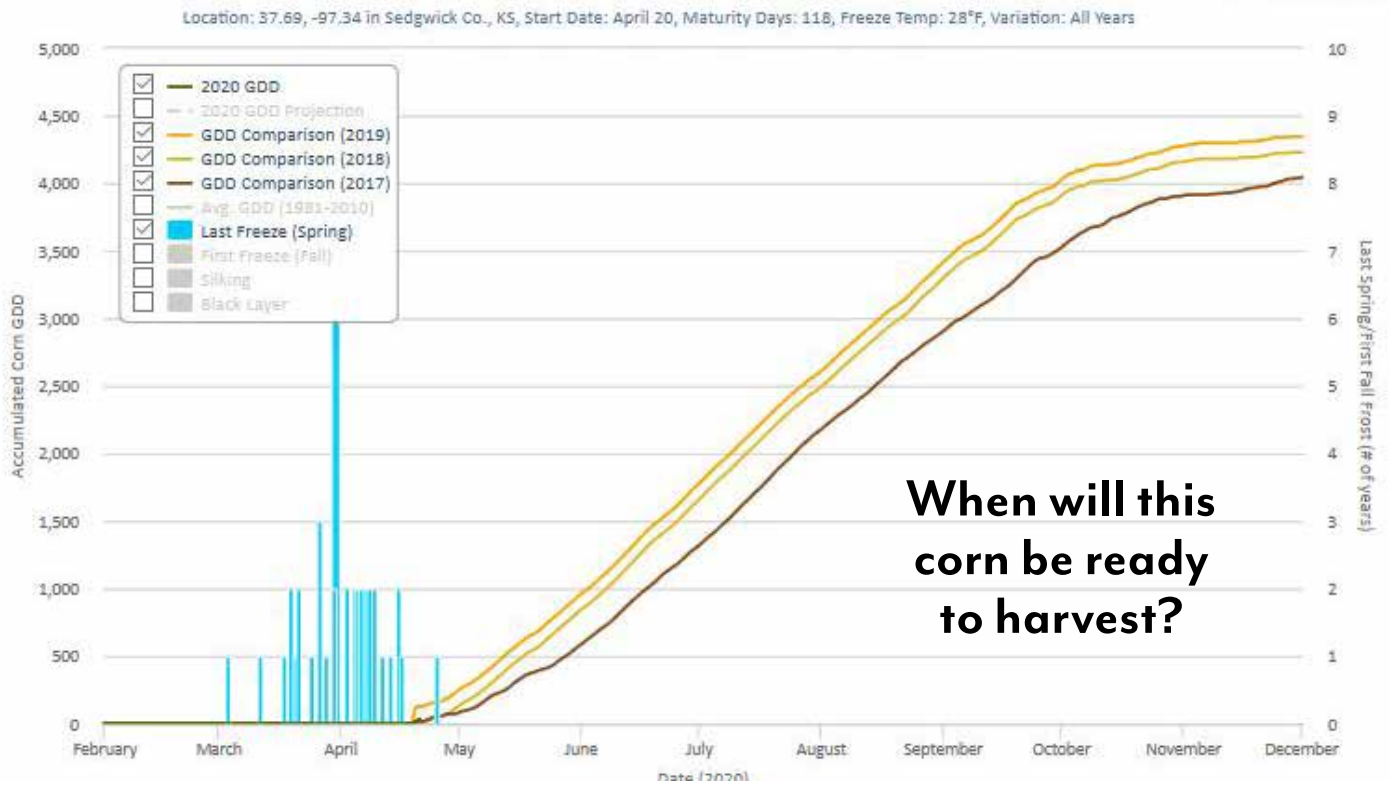
Variation: All Years

Current Day: Today

Black Layer GDDs: 2835

Corn Growing Degree Day Tool

Chart Options



VE

Emergence

KANSAS CORN
STEM

V6

Tassel Initiation

KANSAS CORN
STEM

VT

Tassel Emergence

KANSAS CORN
STEM

Silking

KANSAS CORN
STEM

R4

Dough Stage



KANSAS CORN
STEM

R5

Dent Stage

KANSAS CORN
STEM

R7

Physiological
Maturity

KANSAS CORN
STEM

125



KANSAS CORN
STEM

475

KANSAS CORN
STEM

1,150

KANSAS CORN
STEM

1,400

KANSAS CORN
STEM



1,925

KANSAS CORN
STEM

2,450

2,700



Approximate
Growing Degree
Days

Stage

GDD

Key Lock

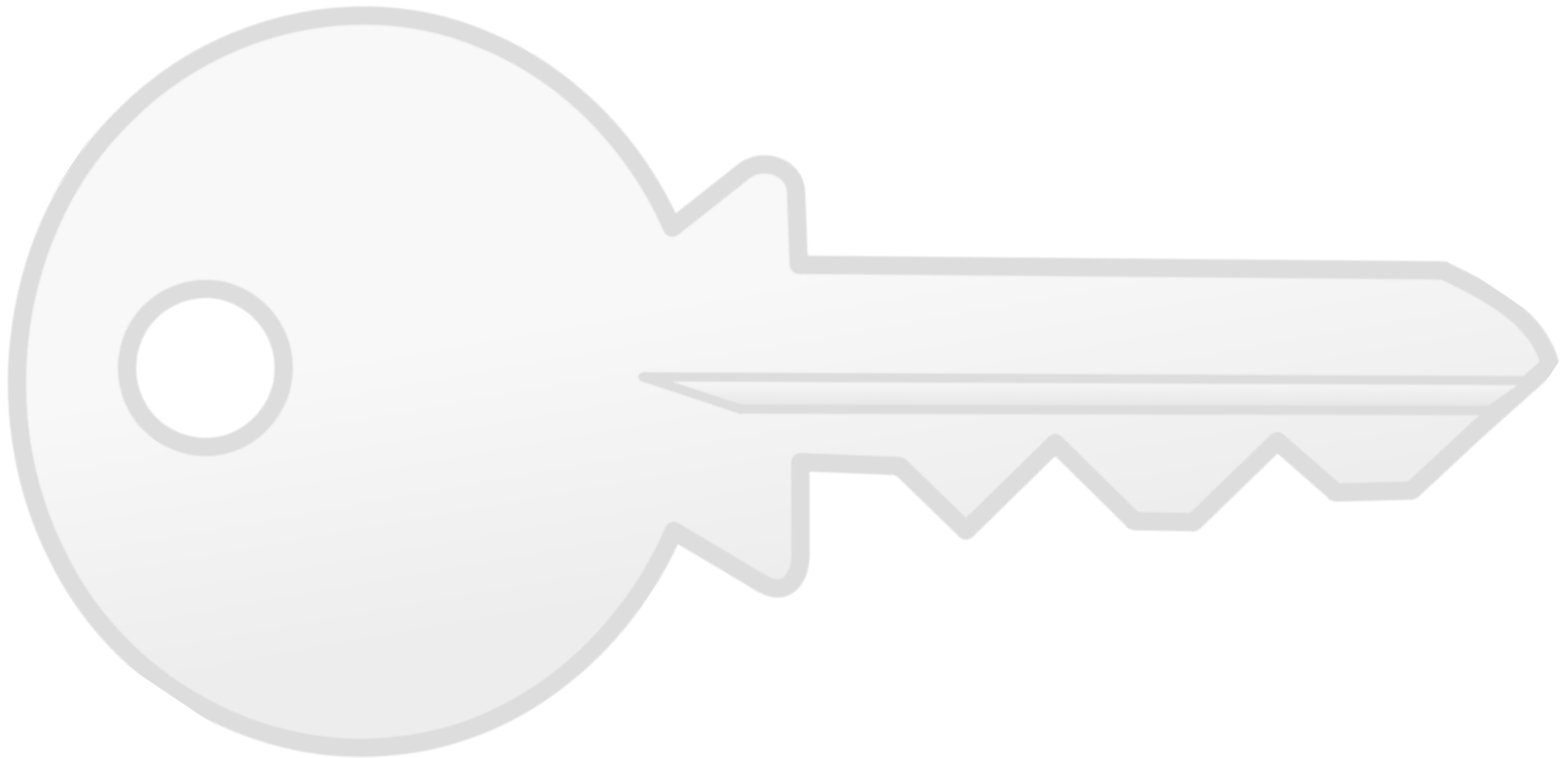


Farm Basics Question

About how many GDD
does it take for corn
emergence?

You're Almost Done!

Take this to your teacher for the KEY to your reward.



KANSAS CORN
STEM