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# Kansas Corn: Grow It Breakout Box

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



# Kansas Corn: Grow It Breakout Box

## Grade Level: 4th Grade

### Overview

This lesson can be used as a standalone lesson to introduce the different aspects of a family farm or be tied in as an informal assessment for the Kansas Corn lesson, CORN: Structurally Speaking.

In the fourth grade corn lesson, they are focusing on plant structures and functions. They observe, record and reflect throughout the module. By the end, they are asked to identify structures, draw plants and identify its parts. With this breakout, students will analyze recorded data, solve word problems and identify parts of plants so they can breakout.

### Kansas College and Career Ready Standards

#### Science

- **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

#### Language Arts

- **W.4.2.** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- **SL.4.1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- **4.NBT.A.** Generalize place value understanding for multi-digit whole numbers.
- **4.NBT.B.** Use place value understanding and properties of operations to perform multi digit arithmetic.

### Learning Objectives

- Students will construct an argument that plants, and animals have internal and external structures.
- Students will engage effectively in a range of collaborative discussions
- Students will identify place values of digits.

### Materials

- Emerging Corn Plant Structures and Functions
- Dr. Huge Brain Story
- Farmer Evelyn Word Problem
- Maze Direction Lock Worksheet
- Corn Plant Structures and Functions Word Bank and Descriptions
- Part of a Corn Plant Worksheet
- Emerging Corn Plant 4-Digit

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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.
- Do note, when programming the locks, there is a starter ring that has mini-teeth. This ring needs to come first.

### Breakout Activity

This lesson can be used as a standalone lesson to introduce the different aspects of a family farm or be tied in as an informal assessment for the Kansas Corn lesson, CORN: Structurally Speaking.

In the fourth grade corn lesson, they are focusing on plant structures and functions. They observe, record and reflect throughout the module. By the end, they are asked to identify structures, draw plants and identify its parts. With this breakout, students will analyze recorded data, solve word problems and identify parts of plants so they can breakout.

### *Game Name*

Grow It!

### *Game Designer*

Kansas Corn Commission, Josh Runyan and Shane Fairchild

### *Content Areas*

Science

### *Recommended Ages*

4th Grade

### *Ideal Group Size*

Small groups, depending on classroom needs.

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### *Suggested Time*

30 to 45 minutes

### *Story*

Dr. Huge Brain has a problem. His funding of his corn research is almost gone. Unless he and his team are able to find more funding, they will be shut down. Tomorrow, he is supposed to present the results of his team's work to the president of the university. If she likes the research, then they will continue his funding. This will enable them to work on more corn research.

Unfortunately, a strong thunderstorm has caused the university to lose power and it won't be back on until after his meeting. Because all the computers are down with the power outage, Dr. Brain must break into his research using manual locks. Yet, he doesn't have much time left to get them open. As a member of Dr. Brain's scientific team, your task is to solve the problems so Dr. Brain can open all of the locks and retrieve the research. Use all of your corn knowledge to breakout! Good luck; Dr. Huge Brain is counting on you!

### *Lock Combinations*

The following codes will open the locks on the box:

#### *3-Digit Lock - 3 Numbers*

1, 0, 0

#### *4-Digit Lock - 4 Numbers*

3, 2, 4, 1

#### *Letter Lock*

T, L, S, R, H

#### *Directional Lock*

↓ ← ↓ → ↓

## Setup Instructions

### *Steps*

1. Print off the resource documents listed in the materials section. The resources need to be printed in color and enough copies per the number of boxes you plan on using.
2. Change the locks to the appropriate lock combinations found in the lesson plan. If you are unsure on how to change the locks, please watch the official Breakout videos on YouTube entitled, "Setting Breakout EDU Locks".

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3. Grab the small breakout box. If you are planning on a breakout reward (Twizzlers are fun corn-based products to use), set it in the box before placing the direction lock on the box.
4. Place the now locked small breakout box and the, You Broke Out sheets inside the larger breakout box. Once complete, place the multi-lock mechanism on the bigger breakout box.
5. Once you have placed the multi-lock mechanism on the larger breakout box, you are ready to start placing the locks associated with the lesson. It is always a good idea to double check your locks before beginning the lesson.
6. Students should be handed the following resources, the story titled, “Dr. Huge Brain” along with the Maze Direction Lock worksheet, Corn Plant Structures and Functions word bank and descriptions, Emerging Corn Plant Structures and Functions for 4-digit lock, and Farmer Evelyn word problem for 3-digit lock.
7. Begin. Read the story and go over the locks with the students. We have found it to be helpful for a visual representation of the breakout timer to be running in the background. This can be found on YouTube by searching, Breakout EDU timer.
8. Once students have broken out, you can give them the key to open the small box. If you are willing, Kansas Corn would love it if you would to take a group picture with the breakout certificates and mention @kansas-cornSTEM in your tweet.





## Reflection and Conclusion

### Questions

1. Where do you think corn came from?
2. The corn seeds germinated best in which conditions?
3. What does a farmer plant in her/his field in order to grow corn?
4. How many of you have grown seeds before?
5. What do you wonder about now?



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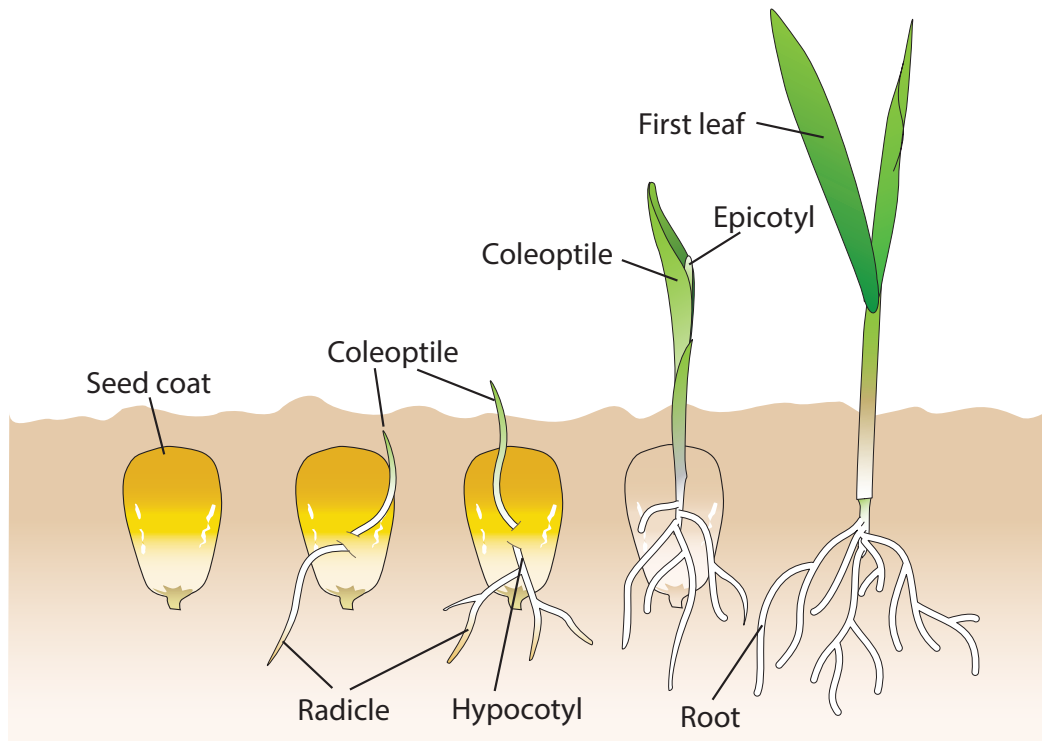
Lock Type	Lock Combination	How will they know the combo?	Where will it lead?
 <p>4-Digit Lock</p>	3241	<p>Using the Emerging Corn Plant Structures and Functions document and Emerging Corn Plant 4-digit sheet, students will be able to match the words from the first document to complete the crossword puzzle. The students will follow how a plant emerges to figure out the lock. 3241</p> <p>Across</p> <p>3. Radicle</p> <p>4. Hypocotyl</p> <p>Down</p> <p>1. Epicotyl</p> <p>2. Coleoptile</p>	By unlocking this lock, they are one step closer to opening all of the combinations to the larger breakout box.
 <p>3-Digit Lock</p>	100	<p>The 3-digit combo can be figured out by using the Farmer Evelyn word problem worksheet. Students can use the place value chart to find out how many times more bushels she will grow this year.</p>	By unlocking this lock, students are one step closer to opening all of the combinations to the larger breakout box.
 <p>Directional Multi-Lock</p>	<p>Down</p> <p>Left</p> <p>Down</p> <p>Right</p> <p>Down</p>	<p>The directional lock can be figured out using the Maze direction worksheet. The directions are determined based on which way you need to get through the maze. The correct sequence is the growth stages of corn.</p>	By unlocking this lock, they are one step closer to opening all of the combinations to the larger breakout box.
 <p>Word Multi-Lock</p>	TLSRH	<p>The combo can be figured out by finding the missing words on Part A of the Corn Plant worksheet. They can use the word bank and the Corn Plant and Structures vocabulary worksheet. They will fill in the blanks that are missing. Starting with the top of the plant (tassel) the first letter of each word that was written is the combination.</p>	By unlocking this lock, students are one step closer to opening all of the combination in the larger breakout box.

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 Large Lock Box	The purpose of this box is to conceal the smaller lock box that requires a key to unlock.	They will unlock the locks on the multi-lock mechanism in order to breakout.	Unlocking this box leads to the final clue to get the key to breakout.
 Smaller Lock Box	This box is concealed in the larger box with the key lock on it. The teacher decides how to hide the final key.	Unlock to complete the activity.	Completion

## Emerging Corn Plant Structures and Functions



**Seed coat:** protects the starch and embryo from insects and diseases, both at planting and in storage.

**Corn seed radicle:** first part of a growing plant embryo that emerges from the seed during germination. The radicle is the first root of the plant and grows downward in the soil.

**Corn seed coleoptile:** a pointed protective sheath covering the emerging shoot (epicotyl) that pushes above the ground for the first leaves to appear.

**Corn seed hypocotyl:** region between the radicle and the coleoptile, which forms more roots.

**Corn seed epicotyl:** region inside the coleoptile that forms the leaves and stems.

**First leaf:** the true first leaf comes from the inside of the coleoptile and is distinguished by having a rounded tip. All other future leaves have a pointed tip. This first leaf will fall off as the plant is growing and the stem is enlarging. After six leaves have grown, the first true leaf is hard to find.



## **Dr. Huge Brain**

Dr. Huge Brain has a problem. His funding of his corn research is almost gone. Unless he and his team are able to find more funding, they will be shut down. Tomorrow, he is supposed to present the results of his team's work to the president of the university. If she likes the research, then they will continue his funding. This will enable thwm to work on more corn research.

Unfortunately, a strong thunderstorm has caused the university to lose power and it won't be back on until after his meeting. Because all the computers are down with the power outage, Dr. Brain must break into his research using manual locks. Yet, he doesn't have much time left to get them open. As a member of Dr. Brain's scientific team, your task is solve the problems so Dr. Brain can open all of the locks and retrieve the research. Use all of you corn knowledge to breakout! Good Luck; Dr. Huge Brain is counting on you!

## Farmer Evelyn

Farmer Evelyn is getting ready to plant this year's corn crop. Last year, she harvested 1,750 bushels of corn. Since last year, Evelyn has purchased more acres of land to plant corn. She has a goal of producing 175,000 bushels of corn this year.

hundred thousands	ten thousands	thousands	hundreds	tens	ones

She is hoping that with Dr. Huge Brain's help, she will be able to increase her total amount of bushels. How many times more bushels of corn will she have to produce this year to reach her goal?

## Farmer Evelyn

Farmer Evelyn is getting ready to plant this year's corn crop. Last year she harvested 1750 bushels of corn. Since last year Evelyn has purchased more acres of land to plant corn. She has a goal of producing 175000 bushels of corn this year.

hundred thousands	ten thousands	thousands	hundreds	tens	ones
		1	7	5	0
1	7	5	0	0	0

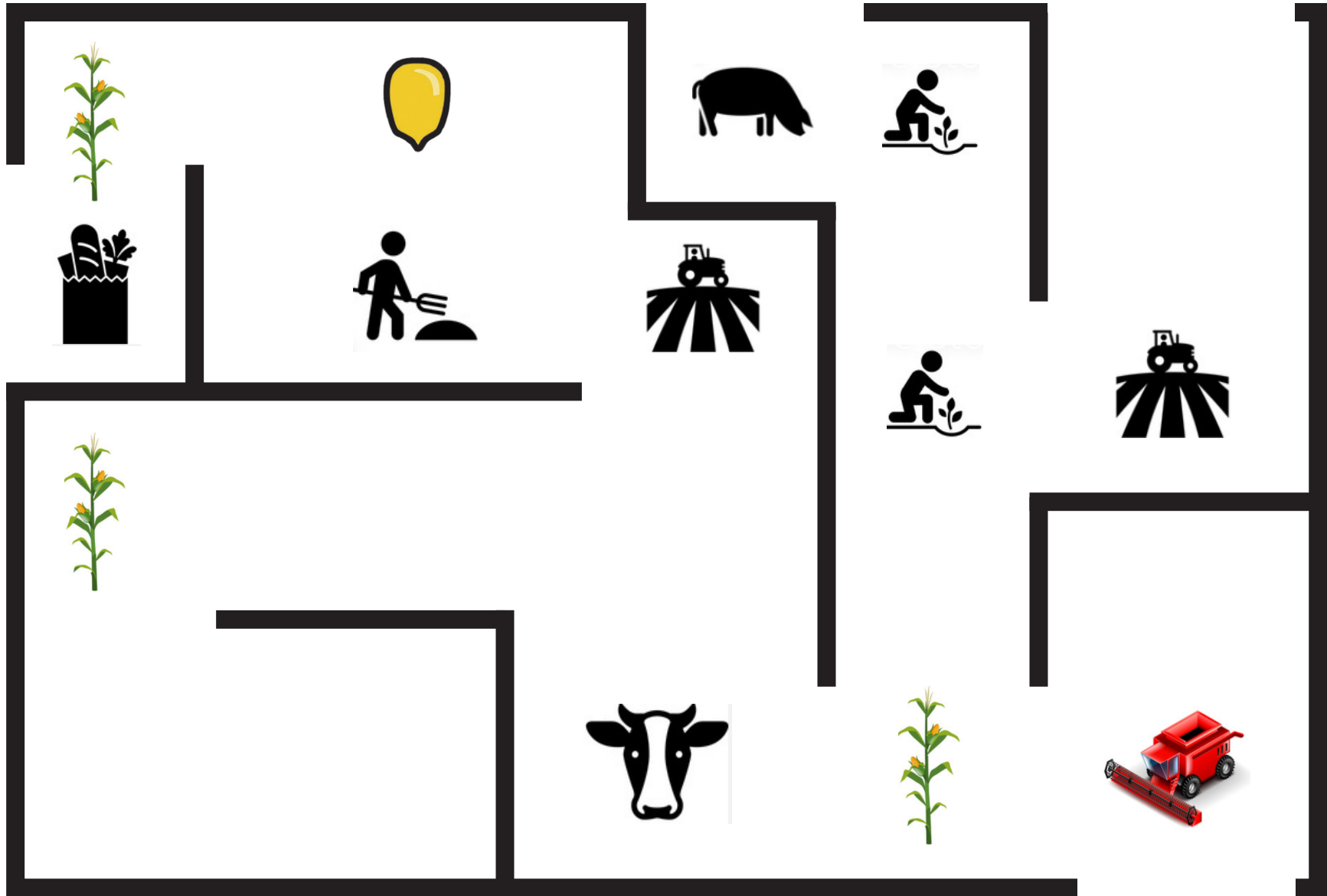
100 x more

She is hoping that with Dr. Huge Brain's help, she will be able to increase her total amount of bushels. How many times more bushels of corn will she have to produce this year to reach her goal?

START

START

START





## Corn Plant Structures and Functions

Dr. Brain included a letter lock on his research box. The problem is he can't remember what word he used. Sometimes, Dr. Brain is so smart that he even made things too difficult for himself. The good news is that he has two papers with pictures and information plus a word bank that will help him unlock the box. After looking at the research, he noticed some key information was left out. Will the information that was left help unlock the box or will it lead to just another dead end? Use all of your knowledge of plant structures to unlock the word lock.

Word Bank				
Tassel	Leaf	Silk	Husk	Ear
Kernel	Node	Stalk	Brace root	Roots

## Corn Plant Structures and Functions



**Tassel:** the male part of the corn plant that contains the pollen. The tassel is on top of the corn plant.

**Leaf:** a full-grown corn plant has 16-19 leaves although 5 leaves fall off by the time the plant tassels. The leaf provides the surface area where light is intercepted and photosynthesis takes place.



**Silk:** a hollow tube that comes from the female part (ovary) on the ear. The silk grows outside of the husk until the pollen lands on the silk. Then moves down silk tube to fertilize the ovary to form the seed. Each ear has one silk strand for each kernel on the ear.

**Husk:** leaf like structure that wraps around the ear for protection.

**Ear:** the structure that contains the kernels that are forming after fertilization. The female part of the corn plant.

**Kernel:** it is the corn seed with one main function, to make another corn plant.



**Node:** a place on the stem where growth occurs. Leaves, roots, ears, and tassels form from nodes.

**Stalk:** the main body (stem) of the corn plant. Stalks have to be sturdy to support the weight of the corn ears and provide pathways for the nutrients to move up and down the plant.

**Brace root:** roots that form above ground on the sixth node (the first five nodes are below ground where other roots are formed) Growth from this node down to the soil keeps the plant standing upright.



**Roots:** grow underground and bring water and nutrients to the rest of the plant.

## Parts of a Corn Plant

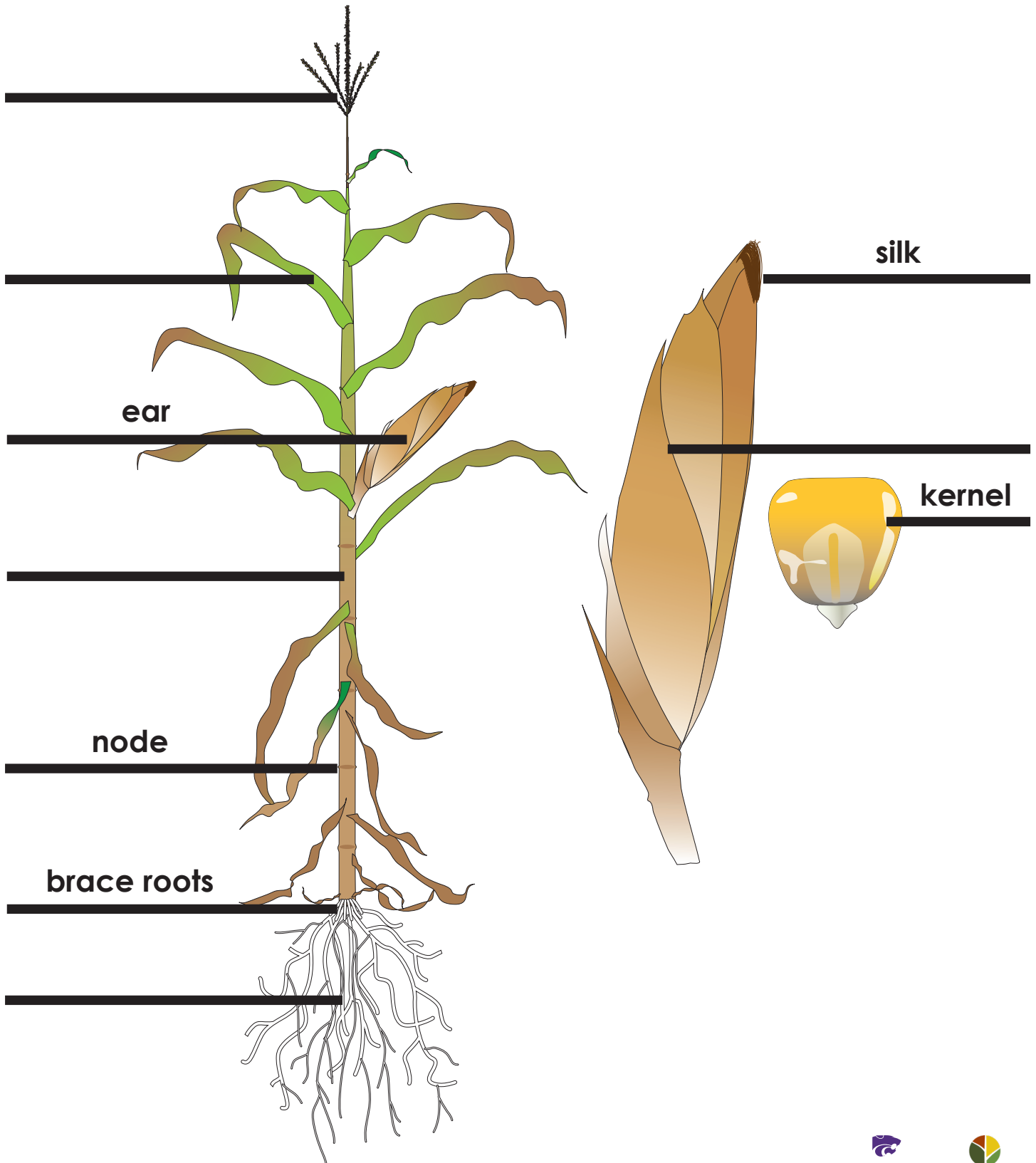


Image provided by

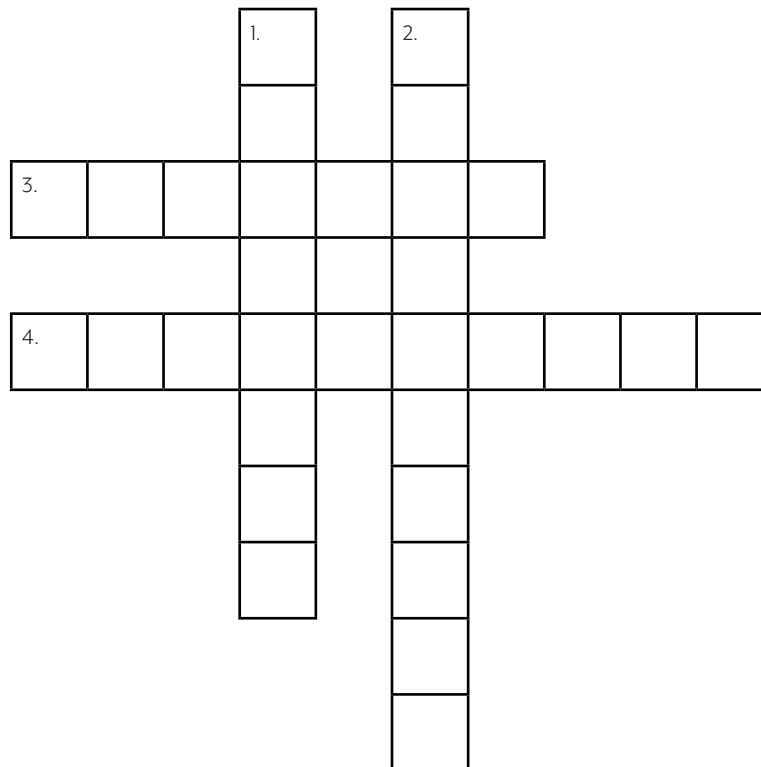


## Emerging Corn Plant - 4-Digit

Dr. Huge Brain has locked his research on how corn plants grow using a 4-digit lock. He knows that he will need to start with the seed coats because they protect the starch and embryo from insects and disease.

Dr. Brain's research assistant, Sara reminded him that the first leaf, the true first leaf, comes from the inside of the coleoptile and is distinguished by a rounded tip. All other future leaves have a pointed tip. This first leaf will fall off as the plant is growing and the stem is enlarging. After six leaves have grown, the first true leaf is hard to find.

This information has allowed Dr. Brain to concentrate his attention on the growth of corn between the seed coats and first leaf. Dr. Brain is hoping that you can help him open up his research on emerging corn plant.



### Across

3. First part of a growing plant embryo that emerges from the seed during germination. First root of the plant and grows downward in the soil
4. Region between the radicle and the coleoptile, which forms more roots.

### Down

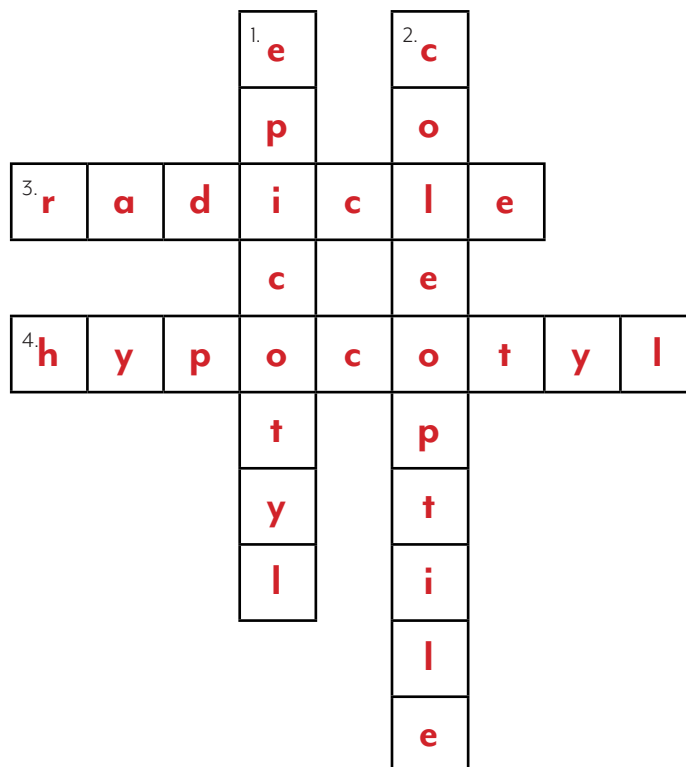
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# **CORN**GRATULATIONS

YOU BROKE OUT!

