KANSAS CORN STEM

Kansas Corn:
How does it grow?

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

KANSAS CORN COMMISSION

Kansas Corn: How does it grow?

Grade Level: 2nd

Lesson 1: Thinking About Plants (30 minutes)

Key Question

- What do you think plants need to live and grow?

Learning Objectives

- The children will contribute examples of different types of plants based on previous knowledge.
- The children will identify characteristics of different types of plants.
- The children will propose answers to the question, "what do plants need to live and grow?"

Materials

- Live samples of different types of plants (house plants or outdoor plants), or pictures of different types of plants (see slideshow)
- Blank paper
- Crayons (blue and black)

Guided Teaching

Introduction

Introduce the topic and assess the children for prior understanding:

- Ask your child to quietly draw or write down different types of plants they know about.
- Compare drawings with your other children's drawings. Did they have similar and/or different types of plants?
- Ask your child what characteristics they think plants have?
    - "What do plants have?"
    - "What makes a plant a plant?"
- Guide discussion, but do not correct or explain to them. This discussion is to get them thinking and comparing ideas.
- Instruct your child to circle the indoor plants they drew with a black crayon and then outdoor plants with a blue crayon. If unsure, circle with both black and blue.

Further Discussion

Lead further discussion so students explore ideas of what plants need, whether indoors or outdoors, by asking questions such as:

- "Why do you think some plants are grown indoors?"
- "Can the outdoors be too dry or too cold for some plants, but not others?" "Too hot?" (Note: Most

houseplants originated in tropical or subtropical climates, similar to indoor conditions.)
- "What do indoor plants and outdoor plants have in common?"
- "What do all plants need to live and grow?" Create this list on a paper that can be used as a reference throughout this unit.

Guided Discussion

Guide the discussion toward questions about what plants need to live and grow, whether they're indoor or outdoor plants. Encourage wondering and leave questions open for investigation, such as:
- "Do plants need light?"
- "Do plants need water?"
- "Do plants need soil?" (see note below for your own reference, though allow your child to ponder this for investigation)
- "Do plants need air?"
- "Do plants need other plants?"
- "Do plants need food like we need food?" (see note below)
- "Do you think plants need the same things that we need as humans? Or do they have different needs?"
- "Do plants need the same things when they're just sprouting from the seed versus once they've grown leaves?"

Closing

Close the lesson in anticipation of the investigation coming up:
- "Hmmm... I wonder if you have some very interesting ideas and thoughts about what plants need. I want you to think about how we can investigate these ideas using tests with plants."
- If using the slideshow (available online), use the slide with Farmer Ken asking, "what does corn need to grow?"

Early Elementary Activity

Science
- Through the lesson your child should've come to the conclusion that plants need water, soil and sunlight to grow. On a piece of paper, write these three things at the top to create a heading: water, soil, sunlight. Then draw lines going down to create a chart. Under the heading words, have your child draw or write about what would happen if water was not given to a plant. Have your child draw or write about what would happen if a plant has a different type of soil. Lastly, have your child draw or write about what would happen if sunlight was taken away from a plant. *Keep this chart for the remainder of the unit.

Kansas Corn: How does it grow?
Grade Level: 2nd

Writing

- Write about what would happen if you were a corn farmer. Pretend that instead of giving your corn water, you gave your field another type of liquid. Choose what type of liquid it would be and then write about how it would change the growth of your plants.

Upper Elementary Activity

Science

- One thing we did not talk about during this lesson is that plants need space to grow. Plants need enough room or space to grow big enough and healthy enough. Do some research on why space is important to the plants and their root system. Would having too much or too little space be harmful to a plant?
- Keep notes and draw pictures if needed. Keep your information for the rest of the unit.

Writing

- Write about being a corn farmer. Pretend you do not have a lot of land to grow corn; however, you need to grow a large amount of corn for the livestock in the area. Brainstorm different ways you can grow large amounts of corn in a small space. Then write and draw about your idea you think would work the best.

Kansas Corn: How does it grow?
Grade Level: 2nd

Lesson 2: Testing our Ideas (45 minutes, then 2-4 weeks of growing and observing)

Key Question

- Can corn grow with different types of light sources or NO light?

Learning Objectives

- The children will plan and conduct an investigation to test environmental factors on corn (example: different types of light).

Materials

Suggestion: gather materials after your child has decided what light sources they would like to test for their experiment. Ideas are provided below.

- Corn seeds
- Different types of light: grow light, lamp, box with holes in it, clear tote to put over the plant, etc.
- Measuring spoon
- Planting container
- Planning and Recording Sheets (page S1) or science journal
- Labels or markers

Guided Teaching

Introduction

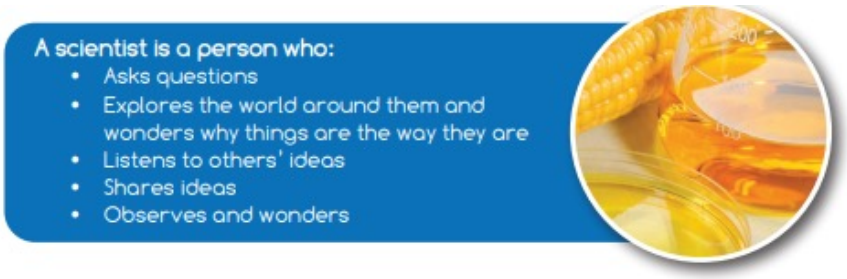
Introduce the topic and ask for prior knowledge with questions such as:

- "What do we think that plants need to live and grow?"
- Farmers need to consider such needs and they need to provide the best conditions for their plants to live and grow.
- "How can we investigate the needs of corn plants?" (For instance, we know plants need sunlight to grow. However, can plants grow when other types of light or no light are given?)

Become a Scientist

- Ask the question, what is a scientist?
- Let your children share their ideas about what they think of when they think of a scientist.
- Scientist are found in a lot of jobs and places around the world. Without scientists we would not have the food, medicine, technology or simple items we use every day.

Kansas Corn: How does it grow?
Grade Level: 2nd

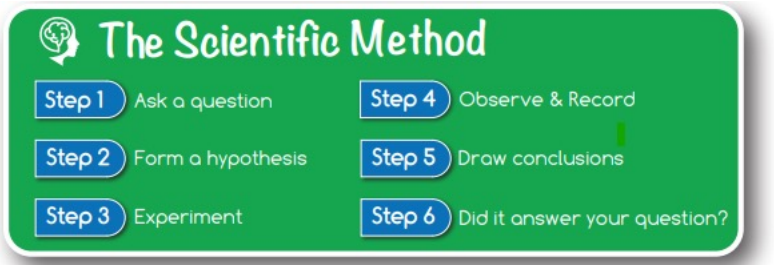


What is an experiment?

- Ask your children what is an experiment? Let your children share ideas about what they think an experiment is.
- An experiment is when an idea is tested to see if it will work. Experiments have been used for many years to test ideas or to see why things in the world work as they do.
- Example would be Isaac Newton. He did experiments to explain gravity. Norman Borlaug created a new type of wheat that saved one billion people from starvation.

Scientific Method

- When scientist conduct an experiment, they use the "scientific method." This is a list of steps scientist use to make sure they do their experiment in the correct way. This explanation leads into the start of the children creating their own method.



Scientific Method Step 1: Ask a Question

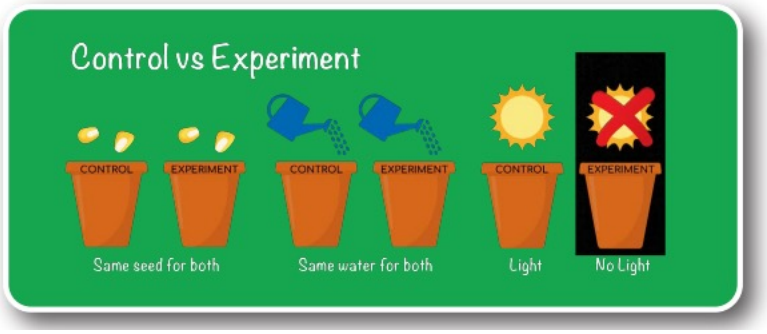
- Each experiment starts out by asking a question you want to test out.
- For this experiment the question is: Do different types of light affect plant growth?
- Ask children if they think light affects plant growth. (Write down responses to keep for future discussion)
- Ask children to come up with a list of different types of light they would like to use. At this time, your child will need to pick what type of light, or lack of, they would like to use for their experiment.

Kansas Corn: How does it grow?
Grade Level: 2nd

Examples of light sources: box with holes, lamp, grow light, clear tote to put over the plant, indirect sunlight, closest or cabinet for no light, etc.

Scientific Method Step 2: Form a Hypothesis

- Make a prediction about how well your corn will grow with these different light sources. Hand out the Planning and Recording Sheet or have your children record the appropriate information in a journal.
- Children will write down what light source they want to test and then write down their hypothesis about how well their corn will grow. If you have multiple children have them each choose a different light source.
- Discuss the experiment and the importance of having a control plant and experimental plants.
- The control plant will use the same type of soil, the same pots, the same amount of corn seeds, the same amounts of water each day, and the prescribed amount of light as all other plants. During this planning process, it is important to state that in order for this to be a true experiment, all steps of the experiment must be the same except for what you are testing which is the light source. You as the educator can oversee the control plant or assist the children in taking care of all plants, including the control plant, to make sure each plant is taken care of the same except for light.
- The experimental plants will have the same soil, pots, seeds and water as the control plant. The variable for the experimental plants is light.



Set up Experiment-Plant Corn

- Following your child's plans, provide them the materials needed for their investigation(planting pots, soil, measuring spoons for water, items to block light, etc.) and tell them how much time they will have (consider 2-4 weeks for seeds to germinate and grow).
- Watch this video of Farmer Bill who provides suggestions on best way to set up the experiment and plant the corn. https://bit.ly/3U0DLcB
- After the children have planted their corn, review the variables between the control plant and experiment plants.
- Decide who is going to plant the control plant and follow the same procedure.

Kansas Corn: How does it grow?
Grade Level: 2nd

Start the Investigation

Water the plants with the amount of water for optimal growing conditions. Farmer Bill made suggestions in his video.

- Be sure to label the pots to identify the light source.
- Have the children set their corn pots in their lighting conditions. Remind children that this is the experimental part, this is what you are testing. Can corn grow with different types of light?
- On the Planning and Recording Sheet or in a journal have the children draw a picture of what their seed looks like now, and what they think it will look like at the end of the investigation.
- Put the "control" plant in full sunlight. The corn plant will mimic what a corn plant gets in a farm field- full sunlight. During the next several weeks have the children compare their plants to the control plant.
    - If it is cold outside keep in mind that temperature also impacts plant growth. Putting plant in a window for full sunlight but where it may be colder during winter months may slow down growth.
- Once planted, emergence of leaves above the soil will take approximately 5-7 days.

Planting Directions and Optional Growing Conditions

- Fill each pot with unpacked soil to top of pot. Around 1 ½ cups. Pack soil lightly until each pot with soil looks similar.
- Add 5 tablespoons of water.
- Plant 2-3 seeds in each pot approximately ½ to 1 inch deep.
- Plant the control plant in or near a window with access to light.
- Try to place all plants in areas with similar temperatures.
- Touch soil of every pot daily. If it is moist, don't add water. If it is dry, add two tablespoons. (Note: based on light conditions, some may need less water to keep moisture the same in to all pots.)

Scientific Method Step 4: Observe and Record

- Have your children water their plants as directed with measuring spoons over the next 7-28 days making sure they touch their soil daily and add water only when it feels dry.
- Provide observation times during the days/weeks for the children to observe (draw) and record (describe) the progress (or lack of progress) of their plants on their Planning and Recording Sheet or in their journal over 7-28 days.
- As you start to see the plants grow, watch the "Experiment Check-in" video with Farmer Bill.
    - https://bit.ly/3znenpL

Kansas Corn: How does it grow?
Grade Level: 2nd

Early Elementary Activity

Writing

- In their science journal, have your child write a conclusion at the end of week 1. Children can write about their prediction and what was correct or different since the beginning of the experiment. This would be a nice way to do a midway check through of the experiment.

Art

- After week 1, have your children draw a picture of the control plant. Next to it, draw a picture of the "other types of light source" plants. Discuss the similarities and differences that are observed.

Upper Elementary Activity

Writing

- In their science journal, have your child write a conclusion at the end of week 1. Children can write about their prediction and what was correct or different since the beginning of the experiment. This would be a nice way to do a midway check through of the experiment.

Art

- After week 1, have your children draw a picture of the control plant. Next to it, draw a picture of the "other types of light source" plants. Label the two plants with the plant parts names. Example: stem, leaves, etc. Then under the drawings, create a Venn Diagram to show the similarities and differences that are being observed.

Kansas Corn: How does it grow?
Grade Level: 2nd

Lesson 3: Analyze Findings (30-40 minutes)
*This should take place after 1-2 weeks of growing.

Key Question

- What do plants need to live and grow?

Learning Objectives

- The children will find patterns in their findings and identify what corn needs to live and grow (evidence).
- The children will record survival rates and represent these on a bar graph.
- The children will conclude from observations that plants depend on water and light to grow in their environments.

Materials

- Science journal
- Planning and Recording Sheet
- Corn plants

Guided Teaching

Scientific Method Step 5: Analyze Findings

- Analyze findings and discuss after 7-28 days.
- Have these materials with you for your discussion: Science journal or planning and recording sheets and plants.
- Take a look: How did the plants grow in their different light sources?
- What did they look like at the end of the investigation compared to the control group?
- Discuss and explain: "What were the best growing conditions? How do you know that? How did the plants tell you that? What is your evidence?"
- Record: Show a drawing and write the best growing condition that was tested.
- Report and record findings: Have your children take turns reporting their findings, making note of their findings about each variable.

Scientific Method Step 6: Did you answer your question?

- Do different light sources affect plant growth?
- Form conclusion: Discuss what corn plants need to live and grow. They need water, light and air.
- Compare your prediction to your findings. Were they similar? Were they different?
- Discuss: Was anything surprising? Did your results turn out differently than what you originally thought?
- Was your hypothesis correct? Talk about how the children's hypothesis was correct or incorrect.

Kansas Corn: How does it grow?
Grade Level: 2nd

- Watch Farmer Bill video to compare results.
  - https://bit.ly/3U2iX4B

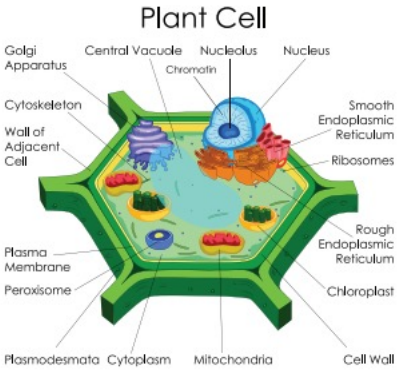
Conclusion

- Ask your children at the end of their investigation, "do different types of light affect plant growth?" Have them refer back to their responses weeks prior.
- Why do you think farmers plant their corn only in certain times of the year?
- Do you think the amount of light the corn plant will have access to makes a difference? (Notes: farmers plant in the spring when there begins to be more light available for the corn to grow. Light also provides heat to the ground in the spring which the corn seed needs to sprout. You did not test temperature, but these two factors are linked when trying to get a plant to start growing.)

Why Plants are Green

Looking at just one observation factor, the color of the plant, plants are green because their cells contain chloroplasts that absorb sunlight and turns it into energy for the plant. Inside those chloroplasts is chlorophyll which absorbs deep-blue and red light, and it reflects the color green.

- Healthy Plant- Adequate sunlight, produced adequate chlorophyll making it dark green.
- Light Green Plant- Plant did not produce as much chlorophyll causing the plant to be light in color.
- White Plant- Plant had no light and did not produce chlorophyll.



Early Elementary Activity

Writing

- In their science journal, have your child write a conclusion to the experiment. They can use the questions from the conclusion section to help lead their writing. They can also write about their prediction and what was correct or different from the outcome.
- For younger children, they can draw pictures and write a sentence under each picture to show the difference in the plants.

Kansas Corn: How does it grow?
Grade Level: 2nd

Science

- Compare the color of the corn plant that received sunlight and a plant that did not receive light. What is different? Why is that? With your parents' help, do some research. Why is it that a plant with no light has a purplish stem or is light in color, compared to the plant that had direct sunlight. Do you know a farmer? Ask them! I bet they will know!
- Hand out the "Miracle of Corn" Mystery of Corn reader. Discuss that water is another important factor needed for a plant to grow. Use the reader to learn more about water.

Upper Elementary

Writing

- In their science journal, have your child write a conclusion to the experiment. They can use the questions from the conclusion section to help lead their writing. They can also write about their prediction and what was correct or different from the outcome.
- For older children, this would be a good writing activity to turn into a five paragraph paper. Following the writing process, your child can turn this into a scientific paper, if wanted.

Science

- Do some research on roots! Through these experiments children were able to see the corn plant grow in different types of light. How do the corn plants with limited light all compare to the control plant?
- Children should come to the conclusion that all the corn plants grew, however, they all look different. A plant with no light, will have a purple stem and/or be light in color compared to the plant that had direct sunlight, having green stem.
- Do some research: Why do the stems look different? What was that plant missing?
- Hand out the "Miracle of Corn" Mystery of Corn reader. Discuss that water is another important factor needed for a plant to grow. Use the reader to learn more about water.

PLANNING AND RECORDING SHEET

What Is the question?

Explain the light source you are testing.

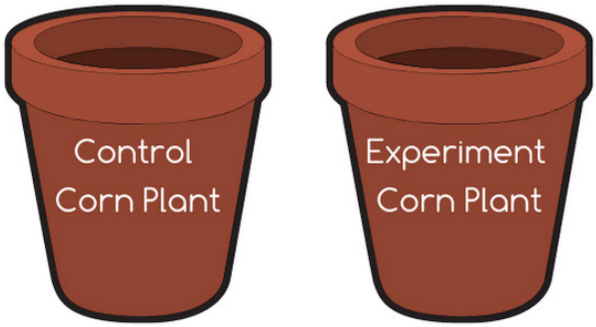
Hypotheses (What you think will happen)

PREDICTION (complete after setting up experiment)

OBSERVATIONS

Day: Notes: 	Day: Notes: 	Day: Notes: 
Day: Notes: 	Day: Notes: 	Day: Notes: 

CONCLUSION



Explain your results:

Was your hypotheses correct?

What did you learn?