Seed Germination Necklace

Suggested Grade Level: K-2 (can be adapted for all elementary levels)

Time: 50 minutes

Subject: science, plant growth & development, germination study

Overview: Students will plant a wheat kernel and soybean seed in a small clear bag and watch them grow to learn about germination.

Learning Objectives:

1. Define what plants need to grow
2. Explain the importance of light and water in plant growth
3. Compare the germination and growth rates of soybeans and wheat
4. Describe the difference between a monocot and a dicot
5. List careers related to farming

Background Information:

Germination is the beginning of the growth of a seed, spore, or bud. Though several factors can influence the process, germination of most seeds occurs in response to warmth and water. Each seed has an embryo or baby plant in it. When a plant grows underground, it cannot use the sun to make food during root formation. It must rely on the stored food inside the seed called the cotyledon and oxygen from the environment to produce energy. If a plant has one cotyledon, like wheat, it is called a monocot. Flowering plants like soybeans have two cotyledons and are called dicots. Temperature is also an essential factor. Some seeds germinate when it's cold. Other seeds only germinate when the weather reaches warmer temperatures, which is why we see more plant growth in the spring in temperate climates.

Wheat is a grain (a plant that produces a dry edible seed called a kernel) mainly used for human consumption. The plant is an annual grass that will grow 2-3 feet tall. We use wheat to make pasta, cereal, pretzels, and licorice, along with many other food items. It is also used to make cosmetics, pet foods, paper, soap, and trash bags, to name just a few products that we don't eat.

The soybean (an annual legume of the pea family) is an edible bean with numerous uses. The United States leads the world in producing soybeans, which are grown in more than 30 states, including Kansas. We use soybeans to make cooking oil, peanut butter, cheese, and salad dressing, to name a few of the products humans enjoy. Soybeans and soybean meal are also significant sources of protein in livestock and pet food. Other products made with soybeans include medicine, car wax, crayons, glue, and plastics.

Kansas Connections:

Wheat Facts

- On average, Kansas is the largest wheat-producing state. Nearly one-fifth of all wheat grown in the United States is raised in Kansas, which is why it is called the "Wheat State" and "Breadbasket of the World."
- All the wheat grown in Kansas in a single year would fit in a train stretching from western Kansas to the Atlantic Ocean.
- Six classes of wheat are grown in the United States; Kansas produces three of them:
    - Hard Red Winter (95 percent) - High in protein, strong gluten, used for yeast bread and rolls, grown in all Kansas counties. Kansas is responsible for producing 40% of U.S. Hard Red Winter wheat.
    - Soft Red Winter 91 percent) - Used for flatbreads, cakes, pastries, and crackers and grown in the eastern part of the state.
    - Hard White (3 percent) - Used for yeast bread, hard rolls, tortillas, and noodles. This new class of wheat is grown in the western and central parts of Kansas.
- One 60-pound bushel of wheat provides about 42 pounds of white flour, enough for about 70 1-pound loaves of white bread.
- Each American consumes about 134 pounds of wheat flour per year.

Soybean Facts

- Soybeans are the second most-produced crop in the U.S. Kansas ranks 10th in the nation for soybean production.
- Soybeans are 18% oil and 38% protein.
- Kenlon Johannes, Former CEO of the Kansas Soybean Association - used to be an elementary school teacher. He is known as the Godfather of Biodiesel fuel because of his work with others to create this alternative fuel. He has also designed soy-based foams, adhesives, and coding. (Kansas Farmer Magazine - American Soybean Association Honors Kansas Soybean Leader April 23, 2020)
- Biodiesel is a clean-burning fuel produced from renewable resources, including soybean oil. Using biodiesel in automobiles builds demand and adds value for soybeans, creates environmentally-friendly jobs, and decreases foreign oil use. (Kansas Soybeans)
- Damaged or discolored soybeans not used for human consumption are an excellent protein source for livestock. Unharvestable beans are often grazed by livestock. These opportunities take full advantage of production when part of the crop would have been otherwise lost.

Materials In the Kit:

- Jewelry Sized Resealable Plastic Bags
- Water Beads
- Wheat and Soybeans
- Yarn

Materials the Teacher will Need to Provide:

- Single hole punch

Instructional Format:

1. Share background and Kansas industry information with students.
2. Conduct an engagement exercise.
3. Students will follow procedures to make a Germination necklace.
4. Upon completing the lesson, students will discuss the activity and observe their wheat for germination and growth for 7-10 days.

Engagement:

"How Does a Plant become a Plant" Youtube Video Seed Germination Video
Soybeans: An A to Z Book by Susan Anderson and JoAnne Buggey
Seed--Soil--Sun: Earth's Recipe for Food by Cris Preston
The Little Red Hen and Grains of Wheat read on video

Discussion Question: What did you eat today made from wheat or soybeans?
A soybean plant grows about 36" tall. How tall are your classmates in comparison?
Wheat grows between 2 and 6 feet tall, but most wheat grows 4 feet tall. Is that taller than your teacher?

Procedures:

1. Punch a hole in the top of a small plastic bag above the seal.
2. Place two to three water beads into the bag. Explain that water is an essential nutrient and a critical factor in engaging the seed to germinate.
3. Gently push in a wheat kernel and a soybean seed.
4. Seal the bag firmly.
5. Insert the yarn through the hole in the top of the bag and tie the ends together to make a necklace.
6. Encourage students to wear the necklace under their shirts to keep it in a warm, dark place.
7. Have students check their necklaces daily for germination and record the growth.

Vocabulary:

- **germination:** The process of a plant emerging from seed and beginning to grow.
- **embryo:** The part of a seed that develops into a plant.
- **cotyledon:** Part of the embryo within a seed. The cotyledon(s) provide nutrients (food) for the germination plant. In some plants, they form into the first leaves of the plant, cotyledon or seed leaves.
- **monocot:** A flowering plant with an embryo that has one cotyledon. Grass and wheat are examples of monocots.
- **dicot:** A flowering plant with an embryo that has two cotyledons. Soybeans and blackberries are examples of a dicot.

Related Careers:
There are many ways to earn a living or to work in agriculture. Some jobs connected to wheat and soybean production are *farmer, mechanic, seed sales,* and *scientist.*

A *farmer* plans the crops that will be planted, including what crop, such as soybeans or wheat, the type of seed which will be best for the location and weather conditions, and determines the nutrients to be added to the soil to help the crops grow. They drive machinery to prepare the ground for planting, plant the seeds, and harvest the crops. The more crops and acres of land the farmer has, the more time and machinery they need to do their job. Farmer's crops may be used for human or livestock consumption.

A *mechanic* will work on the large machinery that is used for farming. They will need a shop and many specialized tools to do their work. Sometimes mechanics have to travel to the field to fix something the farmer is using to finish the harvest before the weather damages the crop.

Seed salespeople have to know all of the types of seeds their company has available for the farmer to use and the properties or unique characteristics of each one. For example, which seed will grow better in very hot weather? Which see will grow better without a lot of water? The seed salesperson will often travel to farms and talk with farmers about their crops and help them determine which seeds are best for their farms.

The *scientist* works in a laboratory and/or greenhouse, learning about the seeds and plants and working to improve them. The scientist shares information about what they learn with salespeople and farmers to help them increase the yield (amount of soybeans or wheat produced per acre), so farmers can produce more food on the land they have. Scientists have greatly helped farmers increase their production.

Assessment:
See attached worksheets.

Standards:
Next Generation Science

K-LS1-1: Use observations to describe patterns of what plants and animals need to survive.
1-LS3-1**:** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.

National Ag Literacy Outcomes:

T2.K-2 Plants and Animals for Food, Fiber & Energy Outcomes

e. Identify the importance of natural resources (e.g. sun, soil, water, minerals) in farming
f. Identify the types of plants and animals found on farms and compare with plants and animals found in wild landscapes

Companion Resources: Found on KFAC Website
Wheat Fun Facts Poster
Wheat Growth Cycle Poster
Wheat Plant Parts Poster
Soybean Fun Facts Poster
Soybean Growth Cycle Poster
Soybean Plant Parts Poster

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References:
Kansas Farmer. April 23, 2020. “American Soybean Association honors Kansas Soybean Leader.” https://www.farmprogress.com/soybeans/american-soybean-association-honors-kansas-soybean-leader.

Kansas Soybean Commission, Youth Education, https://kansassoybeans.org/about-the-checkoff/youth/.

Kansas Wheat Commission, 2021, Nutrition Education, https://nationalfestivalofbreads.com/nutrition-education.

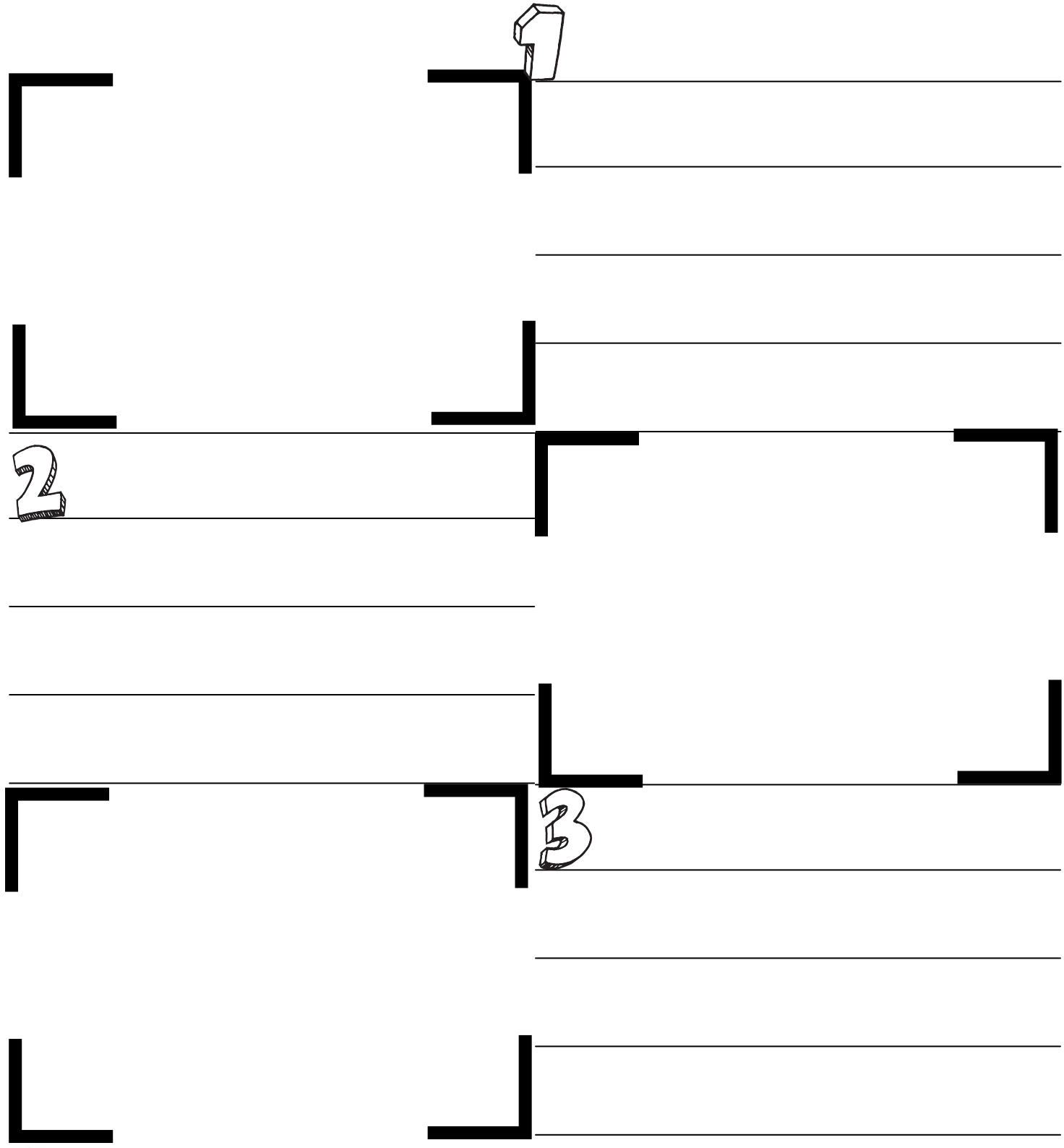
Web Page Items: Online worksheet for virtual learning.-- https://www.liveworksheets.com/worksheets/en/Science/Plants/Germination_se652067t

Name:_____

HOW MY SEED GREW

When seeds start to grow, it is called germination.

Complete the following journal about what happens to your seed.

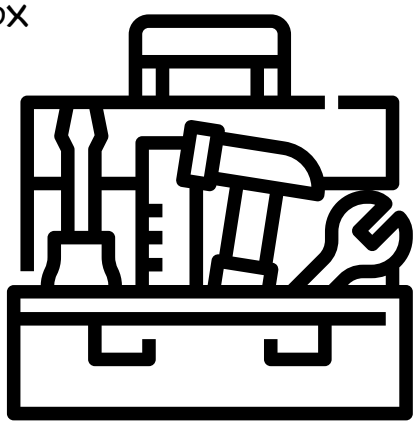


Name:_____

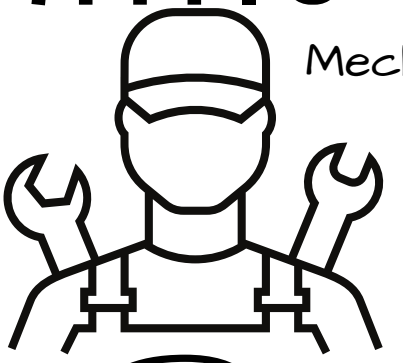
Careers & Tools

Farmer

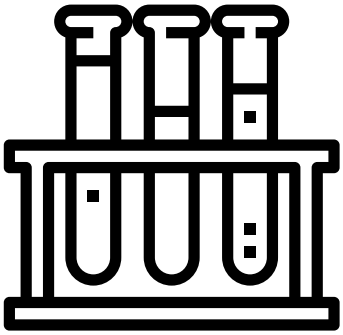
Toolbox



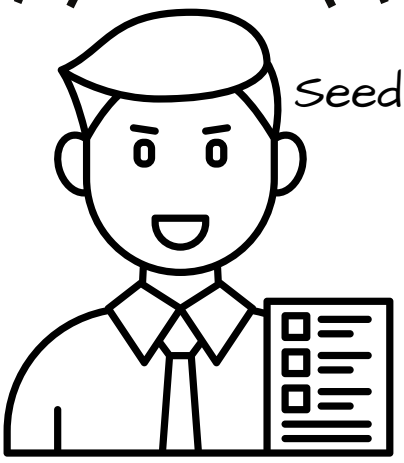
Mechanic



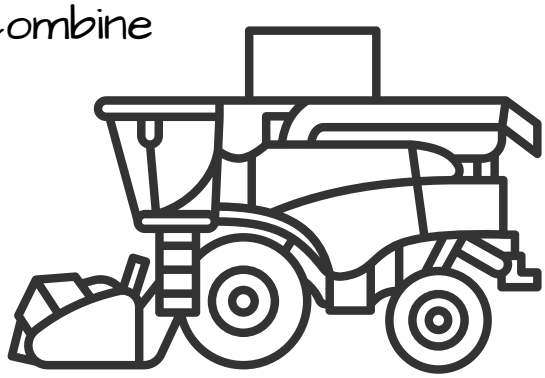
Beakers



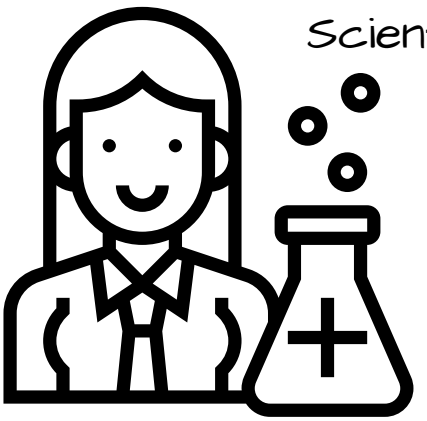
Seed Sales



Combine



Scientist



Laptop