

kidsGARDENING.ORG **LESSONS TO GROW BY**

Lessons to Grow By – Plant Parts

This month we are investigating important botany basics by studying plant parts. Take a look around your yard or a nearby green space and you will most likely notice a great diversity of plants. From tall trees with woody stems to the soft, creeping grass along the ground, plants can be found in a wide variety of colors, shapes, and sizes. Despite their differences in appearance, plants share a common set of parts. Learning about how the different parts function is essential to exploring plant growth and development. This foundational knowledge also contributes to our understanding of how to care for the plants in our gardens and environment.

Week 6: Seeds

Learning Objectives:

This week focuses on the structure of seeds. Kids will:

- Discover seeds contain baby plants inside.
- Explore the diversity of seeds in appearance and conditions needed for germination.
- Consider the importance of seeds in our world.

Materials Needed for the Week

Activity 1: Inside a Seed

- Dried lima beans (from the soup bean aisle at the grocery store)
- Paper towels
- Hand lens (optional)
- Inside a Seed Observation Page
- Inside a Seed Worksheet
- Small, clear cups
- Construction paper (optional)



After a sunflower's petals drop, the center develops into a disk filled with seeds.

Activity 2: Sorting Seeds

- A mixture of seeds of different colors, textures, and sizes.
A bag of mixed dried beans from the grocery store soup aisle will work, or you can save seeds from fruits and vegetables you eat. Old seeds from outdated seed packets are also great for this exploration. Or you may also be able to find seeds through a nature walk outdoors (fluffy seeds like dandelion and cattail can be a lot of fun for comparison). Large seeds like beans, corn, peas, and squash are easiest for young kids to handle.
- Seed Sorting Worksheet

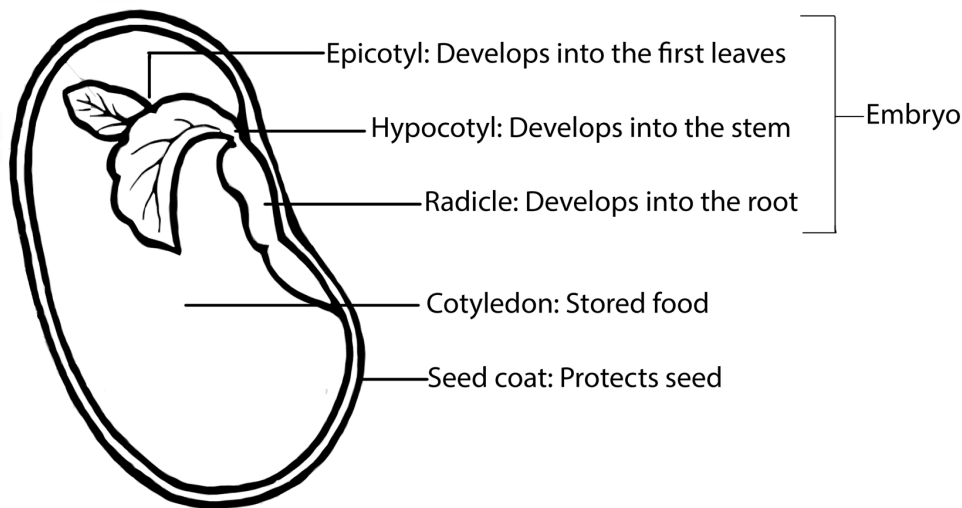
Activity 3: The Importance of Seeds

- The Importance of Seeds Reading Page
- Seeds collected from fruits and vegetables (optional)
- Soil (optional)
- Containers (optional)

Introduction

Seeds grow the next generation of plants. Inside every seed is an embryo which is the part that actually grows into the new plant. Each embryo is made up of the epicotyl (epp-eh-COT-uhl) which develops into the first leaves, the hypocotyl (high-poe-COT-uhl) which develops into the stem, and a radicle which develops into the root.

Anatomy of a Bean Seed



Additionally, the seed also contains a lunchbox of sorts. The embryo is surrounded by stored food that is used by the baby plant until it can start making its own food through photosynthesis. This stored food is called the endosperm (EN-doe-sperm) or cotyledon (cot-eh-LEE-don). (Some seeds have one cotyledon and some have two). Because seeds have their own source of nutrients to sustain them through early life, they do not require additional nutrients from the soil until their roots have time to become

established. The proteins, fats, and carbohydrates stored for the benefit of the young plant are what make seeds such a rich and vital food source for humans and other animals.

The seed is covered by a seed coat that protects the embryo and ensures it does not germinate until environmental conditions are optimal for growth. Germination is the botanical term for sprouting. Most seeds just need moisture and warm temperatures for germination. Water is taken in through the seed coat and the embryo's cells begin to enlarge and the seed coat breaks open. The root will extend outwards first, followed by the unfurling of the stem and leaves.

Seed Germination Adaptations

However, some plants' seeds have evolved to require special treatment beyond moisture and warm temperatures for germination to begin. Two common treatments needed are exposure to cold temperatures (also called **stratification**) and exposure to conditions that cause chemical or mechanical damage to the seed coat (also known as **scarification**). These special treatments evolved as survival mechanisms.

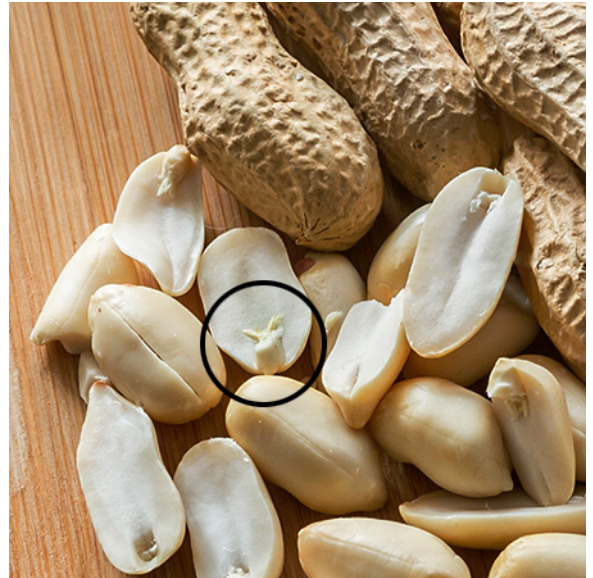
For example, the seeds of some plants that are native to cold-winter regions need a certain amount of exposure to cold temperatures before they germinate. If a seed dropped to the ground in the fall, would it be a good idea for it to begin growing and be a young seedling right before winter arrived? Of course not, which is why this built-in need for a period of cold before sprouting is so important.

Other seeds germinate better in dark conditions (an example is a pansy seed) and others germinate better when exposed to light (an example is a lettuce seed). There are even some tree seeds, such as those of certain pines, that must be exposed to fire before they germinate. This adaptation helps repopulate forest areas after wildfires.

When you purchase seeds, you will likely find planting instructions on the seed packet. If you collect seeds from nature, you may need to research their germination requirements.

Do All Seeds Germinate?

Even with the freshest seeds you will not get 100% of them to sprout. Seeds may be damaged by environmental conditions (too dry, too wet); they may not be fully mature; or they may possess genetic defects that hamper growth. Many seed companies include the expected germination rate on their packets. Measuring germination rates and expressing the results in charts or graphs makes an excellent math lesson.



The circle area shows a tiny embryo with two baby leaves inside the peanut.

Activity 1: Inside a Seed

1. Give kids a couple of dried lima beans to observe. Have them draw a picture of one of the beans on their **Inside a Seed Observation Page** and make notes about its appearance. What does it look like? What does it feel like?
2. Place the lima bean seeds in a container and fill it with water until the seeds are covered. Soak for at least 2 hours or overnight. You will want to have at least two seeds per child, but more can be helpful.
2. After the seeds have finished soaking, take them out of the container and place on a paper towel. Ask kids to draw what their bean seed looks like now and add additional observations. Did anything change? What does it look and feel like now?
3. Next, let them dissect their bean seed. Have them begin by carefully peeling away the seed coat, which should be loose after being soaked in water. Then very gently, have them split the seed in half. Inside the seed, they should be able to find a tiny embryo and possibly also remove it from its cotyledons. The tiny embryo is delicate and easily broken when the seed is split open, which is why it is good to have back-up seeds available. Use the diagram on the **Inside a Seed Worksheet** to help kids identify each of the parts. Have them record their observations and draw a third picture on their Observation Page. Look at the embryo with a hand lens if available.

Extension: To extend the lesson, you can make seed viewers to watch the seeds fully sprout. You can use new lima bean seeds or use the ones you have already soaked in water but did not dissect. You can also try seeing what happens if you to the embryos from the dissected beans that were separated from their cotyledons.

To make a seed viewer:

- Cut a piece of construction paper into a rectangular strip to fit inside the plastic cups. This is optional, but it helps with viewing.
- Ball up a few pieces of paper towels and place them inside the construction paper liner until the cup is full.
- Place 3 to 4 beans in the cup between the side of the cup and the paper towels or construction paper liner so the seeds are visible from the outside of the cup.
- Gently water the paper towels in the center until saturated.
- Place the cup (or cups if you would like to try multiples) on a shelf or windowsill and watch them grow. First you will notice the seed coat expanding (wrinkling) as the seed absorbs water. The root will start to grow in 2 to 3 days. Water as necessary to keep the paper towel and seeds continually moist. (Please note: seeds in the viewers will not grow well outside because they will



In this seed viewer, the bean seeds were placed between the moist paper towel and the side of the cup.

dry out too quickly so it is best to grow them indoors). Seed germination can be impacted if the temperatures are too cold (if you are comfortable, most likely your seeds will be too).

- After the roots emerge, the stem and leaves will begin to appear. You can continue to grow your plant as long as you want for observation; however, seeds that have been sprouted this way generally do not transplant well out into the garden, and they will not be able to go grow to maturity in the cup.

Activity 2: Sorting Seeds

1. Seeds come in so many different sizes, shapes, colors and textures. Give each child 10 to 15 assorted seeds. Help them brainstorm ways they are alike and how they are different.
2. Ask them to brainstorm different ways we could sort them based on the way they look. Give some examples for grouping such as: rough and smooth, dark colored and light colored, large and small.
3. Use the **Seed Sorting Worksheet** to help them come up with properties to sort their seeds. Below is a possible example of a chart that would allow you to sort them by size, shape, color and texture. (Feel free to use your imagination and come up with other properties. Smell, weight, and ability to float are other characteristics that have been suggested. Then below each characteristic, insert different adjectives you can use to describe them.

Sample Chart:

Size	Shape	Color	Texture
huge	oval	brownish	rough
tiny	round	tan	fuzzy
big	pointed	spotted	smooth
long		red	bumpy

4. Once you have created a chart, sort your seeds by each of these characteristics. Do all the same seeds fit in the same categories in each column? Do you think the appearance of the seed is related to the final appearance of the plant?

Extension: Plant some of your seeds and compare their growth. Do they all germinate? Can you figure out the germination rate? Do you think any of your seeds had special germination needs? Alternatively, showcase the diversity in appearance of the seeds by making seed mosaic art using construction paper and craft glue.

Activity 3: The Importance of Seeds

1. Together or independently, read the **Importance of Seeds Reading Page**. Have your kids complete the reading comprehension questions and then discuss your answers together.

2. One of the reasons seeds are very important to people is because they make new plants and plants are an important part of our diet. With many plants we eat the fruits and vegetables that develop around the seeds. However, we also eat seeds directly, too. Go on a hunt for seeds we eat in your kitchen and pantry. Some examples of things you might find include: pumpkin seeds, tree nuts, sunflower seeds, peanut butter, peas, corn, and beans. Many of our cereal grains like wheat and oats are seeds too.

3. Explain to kids that in addition to the baby plant, seeds also contain the stored energy/food that plants need to grow until they can make their own food. Share how seeds are kind of like a lunchbox for the baby plant. The proteins, fats, and carbohydrates stored for the benefit of the young plant are what make seeds such a rich and vital food source for humans and other animals.

4. Celebrate seeds with a fun seed snack. From roasted pumpkin seeds to popcorn, seeds are an important part of our diet.

Extension: You can extend the kitchen-based seed fun by saving seeds from your fruits and vegetables and planting them in soil. Some good candidates to try include orange, avocado, pepper, and tomato seeds.

Digging Deeper

You can use the following resources to dig deeper into this week's lessons:

Books and Additional Resources

A Seed is Sleepy by Dianna Aston

A Fruit is a Suitcase for Seeds by Jean Richards

Pumpkin Circle by George Levenson

Because of an Acorn by Lola Schaefer and Adam Schaefer

Little Acorn by Scholastic

Sunflower House by Eve Bunting

The Donkey Egg by Janet Stevens

The Reason for a Flower by Ruth Heller

Videos

Christine's Kitchen Scrap Gardening Video:

<https://www.youtube.com/watch?v=UYKiS68Vf4c>

The Crop Trust, Feeding a Growing World:

<https://www.youtube.com/watch?v=UGAMn4LALIs>

Bean Time-Lapse:

<https://www.youtube.com/watch?v=w77zPAAtVTul>

Additional Related KidsGardening Lessons and Activities to Try

Journey to the Center of a Seed:

<https://kidsgardening.org/lesson-plans-journey-to-the-center-of-a-seed/>

Germination Exploration:

<https://kidsgardening.org/lesson-plans-germination-exploration/>

Seed Banks:

<https://kidsgardening.org/lesson-plan-seed-banks/>

Kitchen Scrap Gardening:

<https://kidsgardening.org/garden-activities-kitchen-scrap-gardening/>

Seed Balls:

<https://kidsgardening.org/garden-activities-seed-balls/>

Save Your Seeds:

<https://kidsgardening.org/garden-activities-save-your-seeds/>

Seed Viewer:

<https://kidsgardening.org/garden-activities-seed-viewer/>

Seed Catalog Fun:

<https://kidsgardening.org/garden-activities-seed-catalog-fun/>

When to Plant Seeds:

<https://kidsgardening.org/gardening-basics-when-to-plant-seeds/>

Indoor Seed Starting:

<https://kidsgardening.org/gardening-basics-indoor-seed-starting-ga/>

Transplanting and Direct Seeding:

<https://kidsgardening.org/gardening-basics-transplanting-and-direct-seeding/>

Saving Seed:

<https://kidsgardening.org/gardening-basics-saving-seeds/>

Growing and Saving Heirloom Seed:

<https://kidsgardening.org/garden-how-to-heirloom-seed-saving/>

Starting Seeds for Hydroponics:

<https://kidsgardening.org/garden-how-to-starting-seeds-for-hydroponics/>