



## Botanical Garden Programs: Seeds & Sprouts

# SEEING SEEDS



Grades K–1

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### I. Introduction

In one important package, a seed provides protection for its contents, contains the ability to remain dormant, has stored food with which growth may begin, and has a tiny embryo—the plant’s next generation. Students will familiarize themselves with the diversity of seeds through an examination and sorting activity, then will study the anatomy of a seed as they begin to learn about the parts of a plant and how it grows. The lesson lays the foundation for learning about plant reproduction, growth and development, and adaptation. The lesson can be used as preparation for your class trip to the Huntington Botanical Gardens.

### II. Goals/Objectives

Upon completion of the activity, participating students will be able to:

- ✿ sort and classify seeds by external characteristics
- ✿ make predictions based on previous experiences
- ✿ pictorially and verbally label the internal and external parts of a seed

### III. California Content Standards for Science

California Department of Education (2000).

#### Kindergarten

##### Physical Sciences

- (1a) Students know objects can be described in terms of...their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, floating, sinking).

**Life Sciences**

- (2a) Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, insects).
- (2c) Students know how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs).

**Investigation and Experimentation**

- (3a) Observe common objects using the five senses.
- (3b) Describe the properties of common objects.
- (3d) Compare and sort common objects by one physical attribute (e.g., color, shape, texture, size, weight).
- (3e) Communicate observations orally and through drawings.

**Grade One****Life Sciences**

- (2b) Students know both plants and animals need water, animals need food, and plants need light.
- (2e) Students know roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.

**Investigation and Experimentation**

- (3a) Draw pictures that portray some features of the thing being described

**IV. Background**

From the tiny orchid seed, often smaller than 1/25 inch, to the coco-de-mer, measuring a foot long and 3 feet in circumference, seeds come in a variety of shapes, textures, and colors. Many seeds are familiar to us as food: corn, peas, coconut, grains, and more. It is no coincidence that we eat so many seeds. Humans can make good use of the proteins, fats, and carbohydrates concentrated in these little packages.

Seeds are the beginnings of a new generation of plant life. Inside each seed is an **embryo**, or new plant. Many times a seed dissection will reveal a (embryonic) **root** and **shoot**. This embryo is triggered to grow by water, oxygen, temperature, scarification (being bumped around or scratched up) or a combination of these factors. When a seed begins to absorb water and grow, it is called **germination**. The new plant uses the **stored food** called the **endosperm**, to begin growing. Often this endosperm is contained in the **cotyledons**, or **seed leaves**. A good example of this is the two halves of a bean. These are the seed's

cotyledons, or seed leaves. They will “feed” the growing plant before it has developed the next set of leaves—ones that will make food for the plant by photosynthesis. The seed is protected by a **seed coat**.

Most seeds are either **monocots** or **dicots**. This refers to the number of cotyledons, or seed leaves, present. Monocots, like corn, have one seed leaf. Dicots, like beans, have two seed leaves. There are many other differences in patterns of veins on leaves, flower part arrangement, wood, and internal structures that can be seen when comparing dicots and monocots. Some plants, like conifers, are **polycots**, and have many seed leaves.

## V. Materials Needed

- ✿ Variety of seeds, such as pinto, mung, soy, and lima beans, peas, “birdseed”, radish, alfalfa, etc. Bulk food sections at natural food stores often provide many options. Extras should be on hand for student to select one to grow as their “Bean Baby.”
- ✿ Large raw kidney or lima beans, enough for about 5 seeds per student. Three-quarters of these should be soaked for about 4 hours before the lesson.
- ✿ Magnifying lenses.
- ✿ A few copies of the plant seed model patterns on cardstock for tracing. Master attached.
- ✿ Scissors.
- ✿ Crayons.
- ✿ One small brass brad per student.

## VI. Preparation

1. Make small mixtures of many different kinds of seeds, enough so that each group has a small pile.
2. Prepare copies of the plant seed model on cardstock for students to use as templates for tracing their own. Make one assembled version of the model for demonstration.

## VII. Lesson Activities

### Part I

1. Spilt the class into pairs or small groups. Each group should have a pile of mixed seeds, and should discuss the similarities and the differences in their groups of seeds.
2. Ask the class to share characteristics of certain seeds (such as “green, round, smaller than..., spotted, etc.). Write the descriptive words on the board. Then

- help the class think of ways to group these characteristics into categories. For example, which words belong in the category “color”? Which belong in “shape”?
3. Next, ask the groups to try sorting the seeds into some of these categories. The class could start with “color”, and attempt to sort their large pile of mixed seeds into smaller piles of white, brown, and green seeds. They can be sorted into groups, or into a linear continuum. For some students, you may be able to now ask them to group their seeds based on two or more characteristics (e.g., small and green seeds).
  4. Next, each group can decide on their favorite way to sort the seeds, then challenge other groups to name the method they used. Alternatively, the class may pair up and each student can pick a favorite seed and challenge their partner to guess which one by asking descriptive questions. For example, “is the seed white? Is the seed bigger than a penny?”
  5. These groupings of seeds can be now used in some of the extension activities listed below (i.e. a seed picture frame could be created using a continuum or pattern based on color).

## Part II

1. Now ask the class what they think the seeds will grow into? [*A new plant.*] What experiences led students to provide these answers? “What do you think you might find inside a seed? Why?”
2. Pass a dry, raw (not soaked) kidney or lima bean out to each student. Have the students draw what they think the seed might look like on the inside, based on previous experience or classroom information.
3. Pass out magnifying lenses. Tell the students they will begin an examination of the parts of the seeds. To use the magnifying lens, students hold the lens above the seed, and move the lens back and forth until they can see the object magnified. Students should not put their eyes up next to the lens; this makes the object difficult to view. Begin by using the magnifying lenses to explore the outside of the seed. They are examining the seed coat. It is there to protect the seed.
  - o Do they see any cracks or bumps? Some students’ seed may be missing parts of the seed coat, so they can see the inner part of the seed.
  - o Do they see a small spot that looks like a hole? All students should be able to see a small part where the two halves of the seed join that is a small indentation. This is the point from which the new plant will emerge. Ask them to think about this part. Did they know this part was on their seed?

4. Next, divide the class into pairs and pass out two to four soaked seeds to each pair. What do they notice about the seed coat? Ask the class to gently remove the seed coat. What made the seed coat easy to remove? [*Soaking in water.*]
5. Guide the students to each gently pry apart the seed into two halves. Teachers may need to assist with this step. Have the students draw what they see inside. Encourage them to use the magnifying lenses. The pairs of students should be able to notice two halves (the seed leaves or cotyledons), and many seeds should contain a new root and new shoot. The shoot may even have small leaves. Some seeds may have been damaged in soaking or handling, so encourage the pairs to share when they find the various parts of the seeds. How does what they see and what they have now drawn compare to their original prediction?
6. Remind the class that the seed forms a new plant. Ask, “Does any part of the inside of the seed look like a familiar plant part? Which? Do you think the seed is alive? Why or why not?” Seeds are alive. They are simply dormant (resting) before they have the right things to germinate.<sup>1</sup>
7. Through this discussion, help student find the root, the shoot with new leaves, and the cotyledons, or seed leaves. Depending on the level of your students, you may be ready to help introduce the function of roots (water and nutrient uptake) and leaves (to make food). Ask how the seed might get food to grow before the leaves are big enough to make food. This is the job of the stored food in the seed.
8. Finally, use the patterns provided on **Student Handout One** to help the students create a model of their bean seed, labeling and coloring the parts. Fasten together with brads to complete the model.

## VIII. Discussion Questions

1. Do all seeds look the same? Do all seeds from the same plant look the same?
2. Are seeds living? Why or why not?
3. What surprised you about looking closely at your seed? Why?
4. Why does a seed have stored food? Why does it have a seed coat?
5. What new questions do you have about seeds?

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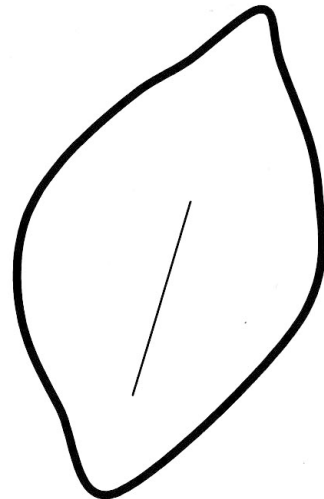
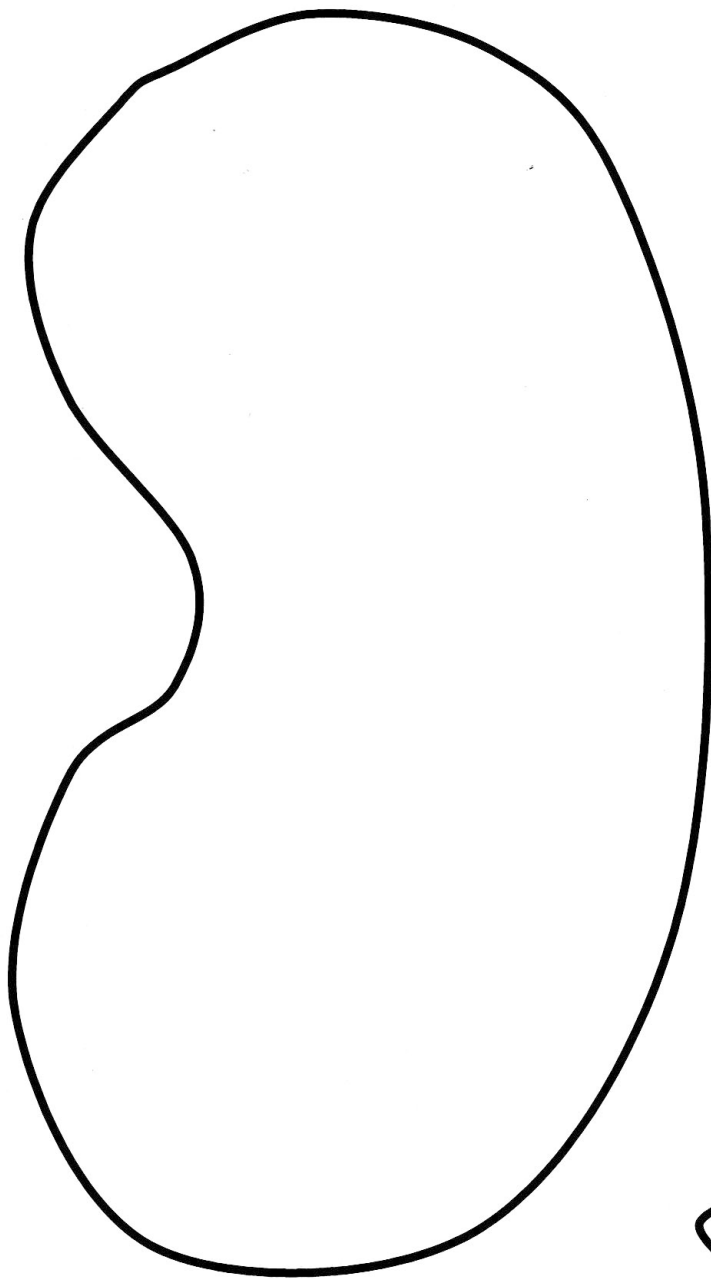
<sup>1</sup> Seeds can die, though, for a variety of reasons. They may die if exposed to heat or other environmental extremes, or simply if they have been dormant too long.

## IX. Extension Activities

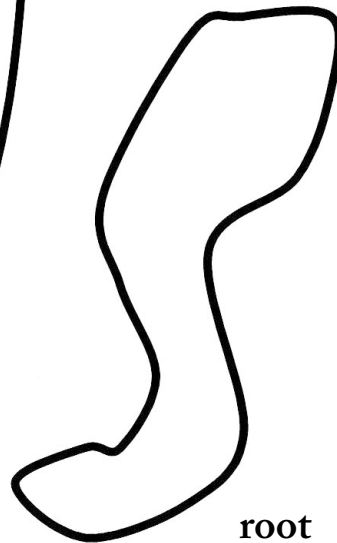
1. Create pictures or mosaics with seeds. Students may use the seeds that have already been sorted by size or color from Part I of the above lesson. Student may also write their name, or work on writing numbers, using seed and glue.
2. Picture frames (either purchased or cut from patterns) can be decorated with seeds.
3. Sprout and eat seeds. Radish, alfalfa, pea, and lentil seeds can all be sprouted by soaking in a jar for 4-8 hours, then rinsing with water twice daily and propping on an angle until sprouts are at an edible size.
4. Seeds can be used to make "rain sticks". A paper towel roll must be prepared beforehand for younger grades by pushing through pushpins or small nails at intervals for the length of the tube. Then tape over each spot. Then student can decorate their rain sticks, and fill them with a variety of seeds or grains. The ends can then be taped over or capped in other ways.
5. As a class, list the items eaten for breakfast or lunch. How many are seeds? Any grain cereal (oats, rice, wheat, corn); wheat buns or bread; corn; peas; corn syrup, etc.
6. Read *A Bad Case of Stripes* by David Shannon, in which a girl is scared to admit she likes lima beans because of what others might think of her.

## BEAN MODEL TEMPLATE

Stored food (x2)



Leaf (x2)



root

## VOCABULARY

Absorb	<i>to take in</i>
Germinate	<i>to start developing; sprout</i>
Leaf	<i>the part of the plant that grows from a stem, usually flat and green; where plants make food from light and air</i>
Root	<i>part of the plant that normally grows underground; anchors the plant and absorbs water and minerals</i>
Seed	<i>the part of a (flowering) plant that may grow into a new plant</i>
Seed coat	<i>the outside layer of a seed, often thin and papery</i>
Stem	<i>the part of the plant connects roots to leaves; transports water and food</i>