

READY, SET, GROW!

Exploring Seed Germination and Plant Emergence Lesson Plan

Objectives:

1. Students will gain knowledge of seed germination after observing and handling germinating lima beans.
2. Students will be able to determine the sequence of plant emergence.

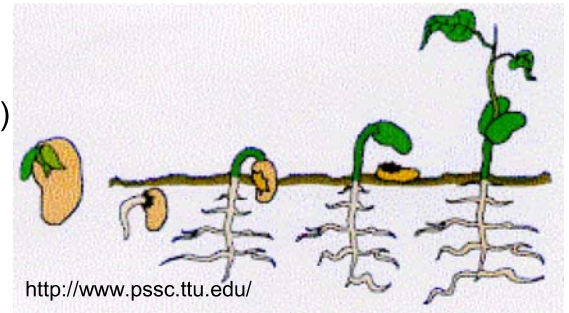
Preparation Time: 5–10 minutes one day prior to the lesson; 5–10 minutes on the day of the lesson

Teaching Time: 30–45 minutes

Clean-up Time: 10–15 minutes

Materials:

- 1 bag of lima beans (3 total lima beans per student)
- Plastic container for soaking lima beans
- Water
- Bean Venn Diagrams
- Pencils
- 1 clear plastic cup per student
- 1-2 c. moist potting soil per student



Methods:

- I. One day prior to the lesson, soak two-thirds of the lima beans in water.
- II. Where do seeds come from? Plant flowers produce seeds...think of a sunflower.
- III. Give each student an unsoaked lima bean, and have them describe the lima bean (size, color, texture, hardness/softness, etc.).
- IV. What is inside of a seed? Is it alive?
- V. Give each student a soaked lima bean, and explain that it came from the same bag of lima beans, but was soaked in water overnight. (A good comparison is a student soaking in a bathtub for a long time and getting “pruned.”)
- VI. Have the students compare the outsides of the unsoaked lima bean to the soaked lima bean.
- VII. Have the students fill in the Venn Diagram to compare and contrast the lima beans.
- VIII. Discuss the students’ observations. The soaked lima beans should be much larger, and the seed coat should be soft allowing a plant to emerge from the soaked seed.
- IX. Why does soaking a seed cause it to change? Seeds absorb water when soaked, and the water causes chemical changes inside of the seed.
- X. Have the students split both of their seeds in half and examine the interior of the seeds. (The unsoaked seeds may be more difficult to split open.)
- XI. What do you notice on the inside of the seeds? The cotyledon (the majority of the seed interior) is swollen, and there may be evidence of the embryo and first

leaves which will eventually break through the seed coat and turn into green leaves above the ground.

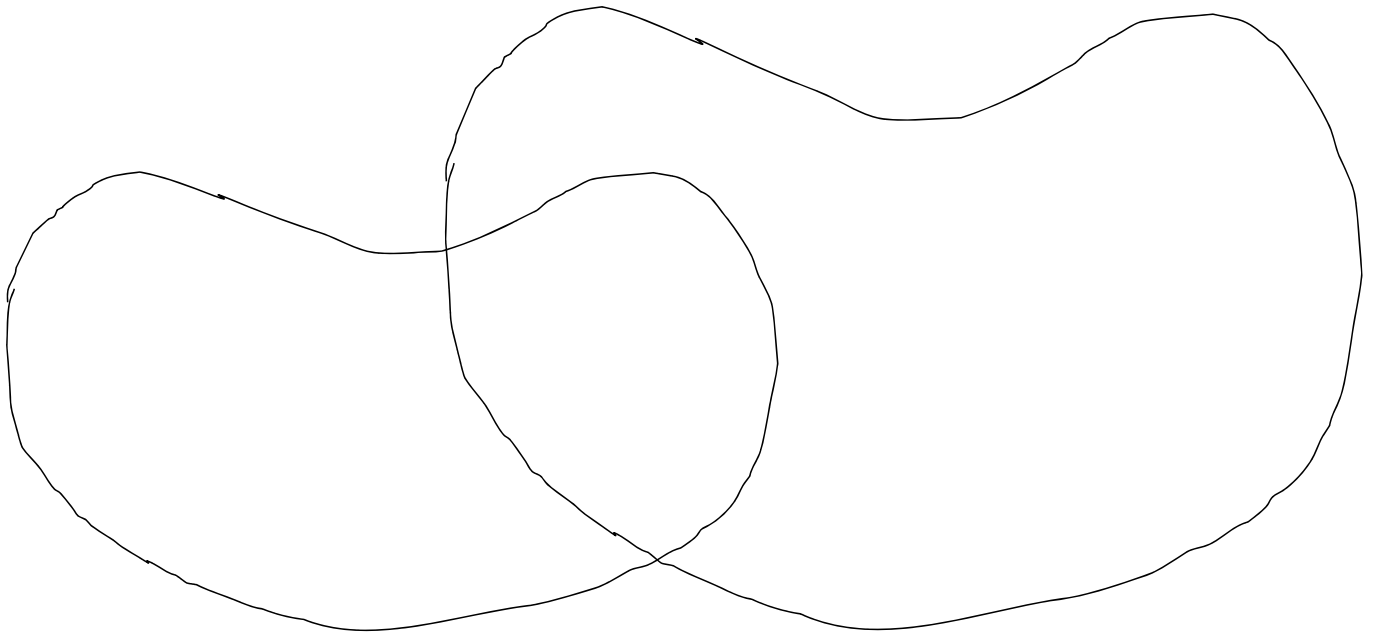
- XII. Explain that the embryo is the part of the plant which matures into a stem and leaves. The cotyledons are the food sources for embryos (This is much like bears hibernating in the winter; they store a great deal of energy in food prior to going into hibernation. The food is slowly depleted as the bear approaches the time when he comes out of hibernation, just as an embryo emerges from its seed coat.). The seed coat protects the embryo and its food source before the seed is planted in the ground.
- XIII. Ask again, do you think seeds are alive? The students should be able to understand the seeds are living things because there is evidence of a plant ready to emerge from the embryo.
- XIV. Have the students plant lima beans and watch them grow.
- Give each student a clear plastic cup and fill the cups with moist potting soil.
 - Give each student a new soaked lima bean, and using their finger, have them push the lima bean about $\frac{1}{2}$ " into the potting soil.
 - Have each student lightly water their cup of potting soil.
 - Allow the students to take their cups home at the end of the lesson, but first instruct them that the beans must be lightly watered every few days, they should be near a sunny window, and they must have patience.
- XV. What will happen to your seed as it rests in the potting soil? Seed germination and plant emergence
- The cotyledons will absorb more water.
 - Small roots will begin to grow down in the soil to hold the seed in place.
 - The embryo and the cotyledons will climb to the soil surface to reach the sunlight.
 - The plant will start to turn green and leaves will grow on the stem.

Evaluation Questions:

1. What happens when seeds absorb water?
2. What part of the seed turns into a stem and leaves?
3. How do we know seeds are living things?
4. What are the main steps in seed germination and plant emergence?

LIMA BEAN COMPARISON

Name: _____



Unsoaked Lima Bean

Soaked Lima Bean