



How to Grow Beans in Plastic Bags

Written by GEF Staff

Grades: PreK-2

Subject: Science, Language Arts, Math

Time: 30- 40 minutes along with daily evaluation of bean seeds



***Standards:** Students will...

Science Standard 5: Understand the structure and function of cells and organisms.

Benchmark # 1: Know the basic needs of plants and animals (e.g., air, water, nutrients, sunlight, food, shelter).

Science Standard 12: Understand the nature of scientific inquiry.

Benchmark # 1: Know learning can come from careful observation and simple experiments.

Benchmark # 2: Know that tools (e.g., rulers) can be used to gather information and extend the senses.

Mathematics Standard 4: Understand and apply the basic and advanced properties of the concepts of measurement.

Benchmark # 1: Understand the basic measure of length and height.

Benchmark # 3: Know the process for measuring length and height.

Language Arts Standard 7: Use reading skills and strategies to understand and interpret a variety of informational text.

Benchmark # 1: Use reading skills and strategies to understand informational books.

Benchmark # 4: Relate new information to prior knowledge and experience.

Objectives: Students will be able to...

- Identify and describe the germination process of a bean plant.
- Conduct a simple science experiment and observe and record the outcome.
- Identify the basic needs of bean seeds in order to germinate.
- Measure the growth of a bean plant using standard measurement.
- Recognize that tools (rulers,...) have specific functions (to assist in measuring, ...) to make tasks easier.

Materials:

- "One Bean" by Anne Rockwell
- Bean Seeds
- Paper Towels
- Plastic Bags (Perhaps snack bags could be washed and recycled.)
- Ruler
- Water
- Observation Sheet Included



Overview: Beans are a global crop, cultivated worldwide. Native to six of the seven continents, beans grow quickly, adapt easily, are versatile, and are highly nutritious. They are an inexpensive and healthier food alternative. They are low in fat, and high in protein and fiber. They are rich in calcium, potassium, iron and magnesium.

All beans are part of a class of vegetables known as legumes. They are annual plants that grow either as vines or as bushes. While the physical characteristics of the bean plants and seeds vary according to species, they all share two common features: a). The fertilized flowers of bean plants grow into seedpods. Both the pods and the beans that form inside them are edible and may be consumed. b). Beans are also capable of making their own fertilizer. They have nodules on their roots that contain colonies of helpful bacteria. Using a process called nitrogen fixation the bacteria convert nitrogen from the air to solid forms of nitrogen they deposit in the soil, in which the bean plant grows. Therefore, bean crops enrich and improve the quality of soil, and are often rotated with other crops that typically remove nitrogen from the soil, such as corn.

Inside every bean is a tiny plant embryo waiting for the right time and conditions to emerge. During the process of germination this tiny plant finds its way out of the bean seed to start the process of growth and transformation. Bean seeds in their dormant stage appear lifeless. They have three needs that must be met in order for the process to be successful: water, a growing medium (soil, seed starter, cotton, paper towelling,) and warmth/light. The outside covering, the seed coat, is in place to protect the tiny plant within from parasites, temperature changes and injury. During the first stage of germination, when all three needs have been provided, the seed begins to absorb the water. This water activates an enzyme that causes the embryo to grow. The food (endosperm) inside the seed feeds the embryo during this phase. When it reaches a stage where it is too large to be contained inside the seed any longer the seed coat bursts and a root shoot (hypocotyls) pops out. This root is followed by a shoot that eventually becomes the stem and leaves of the bean plant. Once leaves form the seedling begins the process of photosynthesis and no longer relies on the seed for its food. When the seedling forms two to three leaves it is mature enough to be transplanted in its garden home.

Kid's Speak: Beans are grown all over the world. They are quick to grow, cost very little to buy and are very healthy for us to eat, which makes them an important crop to almost everyone. When a bean seed starts to grow, we say it germinates. In order for a seed to germinate it needs water, a material to grow in, and warmth from sunlight. When all these needs have been met the seed soaks up the water through the seed coat. The tiny plant inside the seed starts to grow larger and larger. Once it is too big for the seed the seed coat breaks open. First a root pops out and after a while the shoot that contains the stem and leaves. When there are two or three leaves the plant is ready to make its own food and to be planted in the garden.

Eco-Fact: In agriculture and gardening, germination rate is often used to measure the number of seeds of a specific plant species that are likely to germinate. Germination rate can be expressed as a percentage, and is helpful in calculating seed requirements for a given area or desired number of plants.

**Procedure:****Before Growing the Beans in Plastic Bags:**

- Read "One Bean" by Anne Rockwell.
- Discuss the process of germination. Explain the process.
- Discuss the importance of beans with the class. Try to identify different types of beans, different recipes that contain beans and their country of origin.

Procedure for Growing the Beans in Plastic Bags:

1. Place a moist paper towel in a clear, clean plastic bag. Then place the bean seeds between the bag and the moist towel.
2. Place the plastic bag near a window or on a clothesline outside. The bean seeds must receive sunlight for the germination process to occur.
3. Observe the germination process over several days.

Growing the Beans:

- Students can use the attached chart to record changes in the bean plant.
- Write observations describing changes.
- Use a ruler to measure the growth of the bean seeds.
- Draw a picture to show changes in the bean plant.

After Observing the Germination Process:

- Discuss the changes in the bean seeds. Which appears first: the root or the shoot?

Adaptations:

- Students can substitute the bean seeds with different types of seeds, including corn kernels and sunflower seeds.
- Students can try growing the bean seeds during the fall season. Since the ideal time to grow bean seeds is in the spring and summer seasons, students will have to monitor the temperature of their environment closely to make sure the bean seeds do not remain dormant.
- Older students can track the germination rate. Each student can track the germination rate of his or her own bean seeds. The entire class can determine the total germination rate of all students' bean seeds as well.

Extensions:

- Students can plant beans in outdoor garden.
- Students can make a list of products from their homes that contain beans.
- Students can study cookbooks and recipe books to find different recipes that contain beans and the countries from which they originated. They can try to find a bean recipe that represents all six continents.

GEF Community: Join the GEF Community online. It only takes a minute. Students can share pictures of their bean plants with the GEF Community and join the Green Thumb Challenge.



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* All lessons listed on the GEF website have been aligned with the McREL Compendium of Standards and Benchmarks for K-12 Education. GEF curriculum has been developed in accordance with the McREL standards in order to reflect nationwide guidelines for learning, teaching, and assessment, and to provide continuity in the integrity of GEF curricular content from state to state. The decision to utilize McREL's standards was based upon their rigorous and extensive research, as well as their review of standards documents from a variety of professional subject matter organizations in fourteen content areas. Their result is a comprehensive database that represents what many educational institutions and departments believe to be the best standards research accomplished to date. To access the McREL standards database, or for additional information regarding the supporting documentation used in its development, please visit <http://www.mcrel.org>.