

# Activity 2: Sprouting Bean Experiment

In this activity, learners will investigate what plants need to survive by sprouting their own beans. They will make predictions, measure growth, and hypothesize how space conditions might be challenging for plant growth. *\*Background information can be found at the end of this activity guide\**

## Activity

It won't come as much of a surprise to hear that growing food in space will be challenging. Both The Moon and Mars have vastly different environments than here on Earth. Plants that are adapted to survive within Earth's conditions might not do so well in foreign environments. In order to investigate what resources plants need to grow, our project continues with an experiment on sprouting beans!

1. Gather your learners and the materials needed!
2. Begin with a discussion, using some of the questions below:
  - a. What do plants need to grow?
  - b. What about Earth makes it so special for growing plants?
  - c. Do you think a plant could survive without water, air, sun, or soil?
3. Give everyone a plastic bag and label them with a permanent marker.
4. Fill a bowl with water. Dip a few cotton balls or paper towels into the water and place them into the plastic bag.
5. Next, add 2-3 beans into each bag. Be careful not to overfill the bag!
6. Tape the bag up on a window, or a place with plenty of light.
7. **Optional:** give each learner 2-3 bags and allow them to create variable conditions. Add extra water, or none. Place one in a dimly lit corner, rather than on the window. Test two different types of beans in the same conditions. Or come up with your own variation to test!
8. Together, make some predictions about the beans:
  - a. How long do you think it will take for them to start growing?
  - b. Do you think they will all grow the same rate, size, etc.?



## Suggested Materials

- [Data Sheet \(printable version\)](#)
- Bean seeds: lima beans, pinto beans, lentil beans, or mung beans work well\*
- Cotton Balls or Paper Towels
- Plastic Bags (small-medium)
- Water
- Bowl for water
- Tape
- Window (or place with good lighting)
- Marker
- Writing utensil
- Ruler (optional)

### \*Safety\*

Adult supervision is recommended throughout this experiment. Bean seeds are small and easy to swallow.

- c. **Optional:** Out of the variable conditions, which do you think will grow the fastest?
9. Each day for the next 7-10 days, check on the beans. Record observations and track their growth using the data sheet. Ask some of the following questions:
  - a. What do you notice about the beans?
  - b. What do you notice about the environment inside the bag?
  - c. Are they all growing the same? Which beans are growing more, or less, and why do you think that is?
10. Determine what plants need to survive based on the results of your experiment. Discuss some of the following ideas to expand further:
  - a. How do you think the beans grow without soil?
  - b. What are some of the differences between Earth and The Moon? Or Mars?
  - c. What resources might be missing on The Moon or Mars?

Water, air, sunlight, and soil are some of the main ingredients needed to grow healthy crops. As astronauts plan missions to The Moon and Mars, they must think about how to provide plants with these vital resources when there are none. Both of these environments have new, unexpected, and unexperienced challenges for plant growth. Experiments like this explore other ways to grow plants that might be helpful in overcoming those challenges!

## Background

### **How can seeds grow without soil?**

Seeds in this experiment are undergoing an early stage of plant growth called germination: when seeds soak up water, softens its outer shell, and sprouts out. Eventually, the sprouts will need to be transplanted into soil, which provides essential nutrients for continued growth.

### **What about Earth makes it so special for growing plants?**

Earth is unique because it has the conditions needed to support life: air, water, and sunlight (temperature). Earth's atmosphere has Carbon Dioxide gas; which plants rely on for photosynthesis. The water cycle provides freshwater for plants via rainfall, lakes, and groundwater. The planet's approximate distance from the sun provides energy and comfortable temperatures for plants to thrive in as well.

### **What would be missing on The Moon or Mars?**

The Moon has no atmosphere, which means it is exposed to the extreme conditions of space. There is no air, no liquid water, and unreliable temperatures. The soil is mostly rock and dust, which provides little to no nutrients for healthy plant growth.

Mars has an atmosphere but it is very different from Earth's, with 96% being Carbon Dioxide gas. The average temperature on Mars is  $-81^{\circ}\text{F}$ , which is too cold for plants and there is no liquid water that we know of. Its soil is rich in iron-oxides which gives the planet its rusty, red color, but missing many of the essential minerals and nutrients required for plant growth.

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How long do you think it will take for the beans to start growing? How might they differ?

**I think...**



**Measure and sketch your bean's growth over the next few days:**

<b>DAY 1</b>	<b>DAY ____</b>	<b>DAY ____</b>
Sketch:	Sketch:	Sketch:
Height*:	Height:	Height:

  

<b>DAY ____</b>	<b>DAY ____</b>	<b>DAY ____</b>
Sketch:	Sketch:	Sketch:
Height:	Height:	Height:

*\*Height can be measured in Inches, Centimeters, or estimated.*

What do you notice about the beans? About the environment of the bag?

**I observed...**

What do you think plants need to grow?

**I think...**

