

## Bean growing - Group experiment

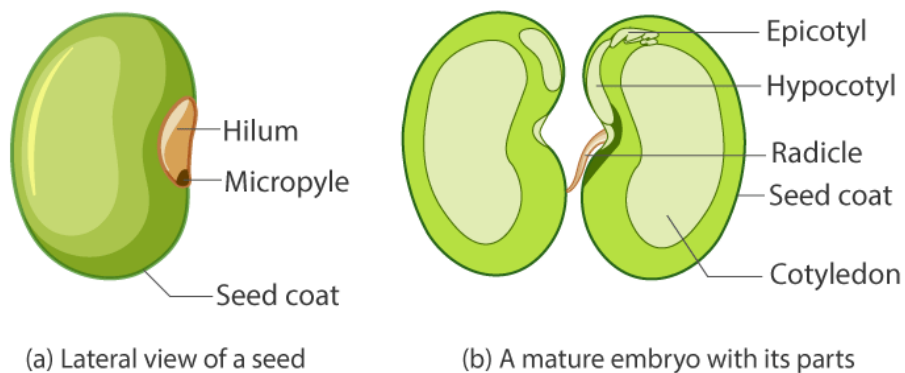
### Equipment

- 3 x glass lab / mason jars
- 1 x spray bottle
- 3 x paper towels
- 2 x calypso, teggia and french taylor beans (provided by us)

### Objectives

- Identify the basic parts of a seed and plant
- Observe the germination of a seed
- Identify what is needed to allow germination for a seed and growth for a plant

### Basic parts of a seed



(a) Lateral view of a seed

(b) A mature embryo with its parts

### Experiment steps

1. Soak all beans in water overnight beforehand  
*Soaking the beans breaks down their seed coat and boosts the germination process and you see roots in a day or two.*
2. Dampen paper towel with spray bottle
3. Line or fill each lab jar with the moist paper towels
4. Add the beans between the jar and the paper, roughly half way down the jar
5. Place the container near a south-facing window if possible

6. You should see roots in 1-2 days and within ten days the bean sprouts have a tall stem with leaves growing out of the top of the jar!



Observation points:

1. Try to observe where the root first emerges

There is a tiny bump on each bean right beside the 'belly button' (or hilum) which marks where the bean was attached to the pod. Next to it there is a tiny bump called the hypophysis, this is where the pollen would have entered the ovary and at germination it's where water enters the seed to trigger its growth.

That tiny hole must also make a convenient break in the tough bean skin, perfect for the tiny emerging root to escape.



2. [On page 5 of this document there is a sheet for students to sketch the plant daily and observe how it changes in more detail.]

## Talking points:

### 1. Can the Seeds Grow Without Soil?

We teach students that plants need water, air, sunlight and soil to grow. Some students may wonder how these seeds will grow without soil. It might be helpful to point out that you can germinate seeds, or help them start to grow, without soil. Why? It's because the food the seed needs to start growing is inside the seed. The seed provides food for a short time and then you must plant the seedling in soil for it to continue to grow.

### 2. How long does it take for the seed to sprout?

### 3. What part of the plant appears first?

### 4. How much does it grow each day?

### 5. Does your plant grow faster in a sunny spot or shady spot?

## Experiment Variations

Prepare a few extra jars with beans and alter some of their growing conditions. Observe what happens when:

- **No water:** Don't soak the beans in water overnight or wet the paper towels in the container.
- **No air:** Use a sandwich bag for this one. Use a straw to suck as much air from the bag as possible before zipping it shut.
- **No sunlight:** Place the jars away from windows or even in a dark space like a cabinet.
- **Not enough space:** Place seeds in a group touching each other.

## Bean growing - Individual paper pots

### Equipment

- 1 x piece of newspaper per student and a tin can (if making paper pots)
- OR 1 x paper cup per student (if not making paper pots)
- 1 x paper plate per student
- 1 x bag of potting soil
- 2 x bean of choice (calypso, teggia or french taylor beans) - *provided by us*

### Objectives

- Observe how this plant grows compared to those in the glass jar without soil
- Understand all components needed for plant growth

### Experiment steps

1. Soak all beans in water overnight beforehand  
*Soaking the beans breaks down their seed coat and boosts the germination process and you see roots in a day or two.*
2. Cut a full-length strip of newspaper (4 inches wide)
3. Using the tin, roll up the newspaper into a cylinder and secure it in place with paper tape. Fold the newspaper around the bottom of the tin and also tape this in place
4. Remove the tin and you are left with a paper pot!

**\* Skip to here if using paper cups**

5. Fill each pot with potting soil leaving maximum 1 inch at the top
6. Take 2 bean seeds (of choice) and press 1 inch into the soil, make sure the seed is covered fully
7. Gently add water to the soil, you want the soil to be damp but not saturated

#### Talking points

1. What do plants need to grow? How are your plants in soil growing differently to those in the jars without soil?

**Light energy** - is required for photosynthesis, in which plants make sugars in the leaves. Light also triggers changes, particularly flowering, in certain plants.

**Water** - is necessary to carry dissolved nutrients into the plant through the roots. It is one of the key ingredients in the process of photosynthesis, and helps the plant release energy from stored food when needed. Water transports nutrients and gasses into, around, and out of the plant. It is an important component in the cells of all living things.

**Air** - Plants use carbon dioxide to make food (photosynthesis), and they use oxygen, as do humans and other animals, to release the energy from that food (respiration).

**Mineral nutrients** are essential for growth, repair, and proper functioning. Minerals are formed by the breakdown of rocks and other materials in the earth, plants take these minerals from the soil (dissolved in water).

Although these minerals are important supplements for health and maintenance, they cannot replace the sugars produced in the leaves through photosynthesis, which can also be stored as carbohydrates, fats, and proteins.

Here is what my plant looks like:

Date:

Date:

Date:

Date:

Recording Sheet

Date:

Date:

Date:

Date: