

Sprout your own sprouts!

Name: Teacher Guide

Date: _____

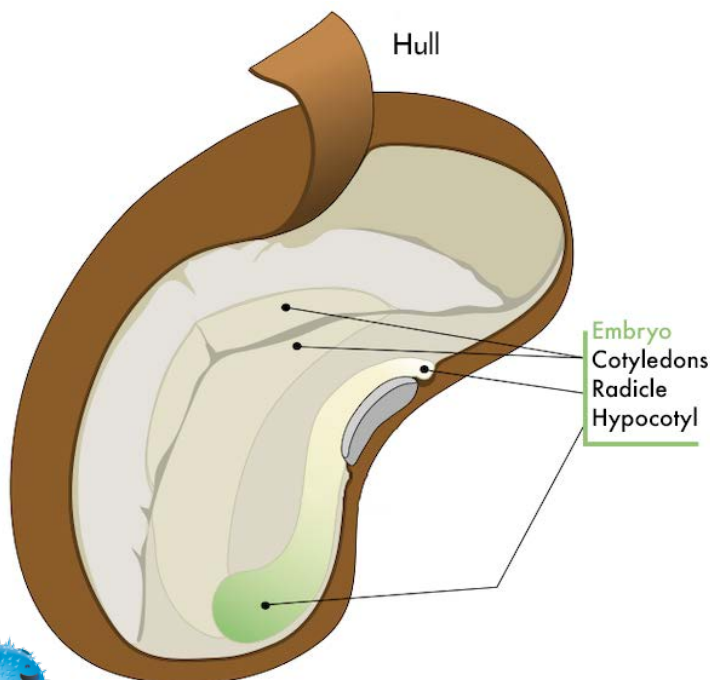
Instructions:

1. Gather your materials to build your experiment:
 - a. Glass Jar (or clear plastic), mesh or sprouting screen (e.g. reusable produce bags, cheese cloth), rubber band, Water, drying rack or container to catch water (so you can place your jar with the cloth upside down to drain), sprout Seeds (e.g. lentils or alfalfa seeds)
2. Read the background information to learn about seeds:

Background on Seeds

A seed is a ready-packed suitcase of nutrition (Fig. 5). Inside is a dormant **embryo** that can eventually grow into a plant. The **hull** is a protective coating to keep the embryo safe. In order to start **germination**, we add water to activate the seed. The water opens up the hull and allows the embryo to use the nutrients inside the seed to fuel the plant's growth. In addition to water, the seed needs oxygen to start growing.

As the seed sprouts and starts to grow into a plant, roots will develop to collect nutrients and water. Eventually, leaves will grow to absorb sunlight and carbon dioxide (CO₂) from the air, which the plant will use to **photosynthesize**. (Note: plants also absorb oxygen from the air for **respiration**. This is especially evident at night when there is no sunlight for photosynthesis.)



- **Embryo:** the part of a seed which develops into a plant. It consists of a plumule and hypocotyl (primary stem), a radicle (primary root), and one or two cotyledons (primary leaves).
- **Germination:** the process by which an organism grows from a seed or similar structure.
- **Hull:** the outer covering of a fruit or seed, especially the pod of peas and beans, or the husk of grain.
- **Photosynthesis:** the process by which plants use energy from sunlight to grow. Photosynthesis uses carbon dioxide and water and releases oxygen.
- **Respiration:** the process of breaking down food to usable energy inside a cell. Aerobic respiration uses oxygen and releases carbon dioxide and water.

Activate your seeds:

3. Measure out the desired amount of seeds into the jar. If you are using more than one type of seed, label your jars. *Note: 1/4 cup of alfalfa seeds create over 2 cups of sprouts - a little bit goes a long way!*
4. Add enough water so all seeds are covered.
5. Cover the jar with the mesh, securing with a rubber band.
6. Soak your seeds overnight.
7. After soaking, rinse and drain your seeds **thoroughly**. *Note: a bowl or dish is also needed to catch water when the jar is upside down (and tilted at an angle to let air in).*
8. Secure the mesh in place, and leave the jar tilted upside down so water can continue to drain freely. *Note: sprouts need oxygen, so be sure to find a place (such as a drying rack) that can allow air flow while seeds are growing.*

Daily care of your seeds:

9. Your seeds need to be rinsed and drained at least once per day (more if you can!).
 - a. Turn the jar upright, and fill with enough water to cover the seeds. Gently shake the seeds in the jar.
 - b. Drain again **thoroughly**.
10. Draw a picture of one of your sprouts (choose one that represents average growth).
11. Resecure the mesh, and leave the jar tilted upside down so water can continue to drain freely.
12. Repeat steps 9-11 one or two times a day for the next few days.
13. Sprouts are packed with nutrition and can be eaten as they grow! Try eating a sprout each day to see how the flavor changes!



Draw your sprouts as they grow: Label each drawing with the date.



A sprouting lentil seed



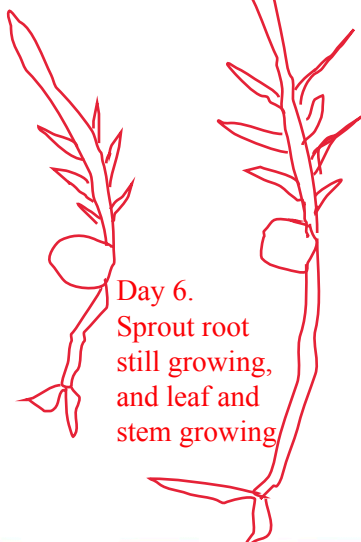
Day 2.
Sprout developing a root



Day 3.
Sprout root growing. Seed coat came off.

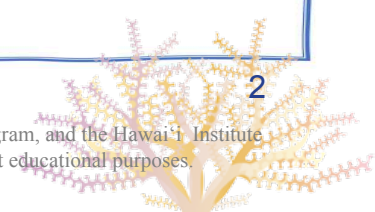


Day 4.
Sprout root still growing, and leaf developing



Day 6.
Sprout root still growing, and leaf and stem growing

Day 8.
Long roots and stem. Seed is still present; it tastes sweet and crunchy. The leafy part of the sprout is slightly spicy.



Activity Questions

Answers will vary. We have provided suggested responses and thinking to look for.

1. Describe what your seeds looked like as they began to sprout. After soaking, the seeds will get larger and change color. Next, the roots will begin to stick out. Next, the leaves begin to come out. As the roots and leaves grow, the seed coat may fall off (but in some cases, the seed coat will not come off until the stem grows longer, at which point it is often stuck on the leaves!). The roots will then become longer with secondary root structures, and the stems and leaves will also grow. With large seeds (like lentils), the seed will stick around for more than a week, but with smaller seeds, the seed will be "used up" more quickly.

2. What did you do each day to help your seeds sprout and grow?

I rinsed them to wash away seed coats and any bacteria that might be starting to grow in the nutrient rich water coming off the soaking seeds. I left my seeds/sprouts with fresh water that was draining off (because I placed the jar upside down at an angle where water could get out and fresh air could come inside the jar). I also placed my sprout jar on the counter where there was indirect sunlight (so that there was enough sun for photosynthesis but not so much sun that the jar got too hot).

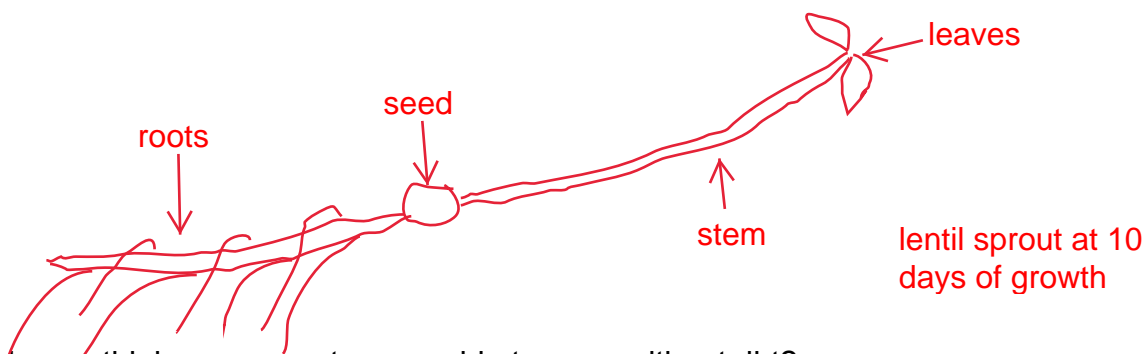
3. What happened to your sprouts as time went on?

Some of my sprouts got mushy and did not really grow well. I rinsed these away. The other sprouts continued to grow longer roots and longer stems. The ones I left for more than a week started to get different shaped leaves at the end of the stems. The stems and roots stayed pretty white, but the leaves were quite green. The larger seeds (lentils) kept their seeds, but the smaller sprouts (like fennel) used up the seed nutrition as they grew.

4. Did you notice your sprouts growing in a particular direction? Describe.

Oh yes! During the day, the sprouts would grow toward the light, so that one side of the jar would be green and the other side white. But, then after I rinsed and shook them, the sprouts would be all unorganized again... until the next day when they would orient toward the light again. This was really neat to watch happen over and over again!

5. Draw a picture of one of your finished sprouts. Label the leaves, stem, and roots. If your sprout still has some of the seed, label that also.



6. Why do you think your sprouts were able to grow without dirt?

The sprouts were able to grow without dirt because I regularly gave them water, and the jar and cloth mesh gave the sprouts some structure to rest on. The seeds provided nutrients to start with, and there were also some nutrients also in the tap water I used.

7. Based on your investigation of sprouts, what are the key ingredients that a seed needs to grow?

Water to start with, then sunlight to keep going, and then some nutrients when it runs out of its seed.

