

## Science: Soil Free Planter!

Hello everyone. This is Bill from the Okanagan Regional Library System. Welcome to the fun and inventive world of making STEAM projects in your own home. Each month, I will share a fun and interesting project that you can make using materials commonly found in your own home.

Even though we can't be together right now, we can still learn how to make exciting projects each month!

This month's project: How to Make a Soil Free Planter.

### Soil Free Planter



How would you grow plants if you were on a long space mission, and your ship had no room for a garden? You would use a technique called hydroponics, in which plants grow without any soil. Here are the steps for you to try it yourself.

This soil free planter is easy to make, and it can be constructed mostly from simple household items. The bean seeds you plant will take a few days to germinate (begin sprouting roots and a shoot), and a week or two to grow into small plants.

## Materials Needed:

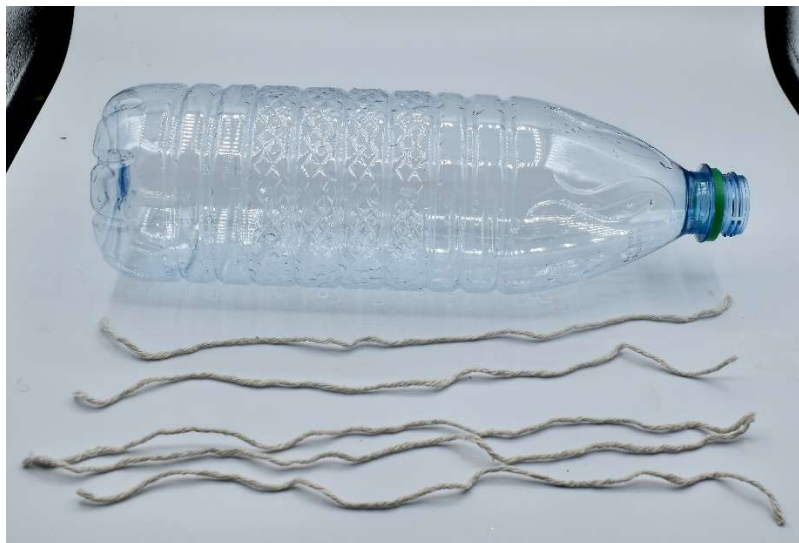
- Modeling Clay
- String
- Large 2-liter plastic bottle
- Cotton Balls
- 3 - Wooden Skewers
- Scissors / Xacto Knife
- Bean Seeds
- Water
- Masking Tape



**Time:** 30 minutes plus time for the seeds to grow.

## Steps:

1. Cut five pieces of string about as long as the bottle. Four will soak up water to feed the plants and one will tie the wood skewers together to make a tripod to support the growing plants.



2. Use the scissors carefully to cut a 5 cm section from the middle of the bottle. Keep the top and bottom part, and recycle the middle section. Cover the cut, sharp rims of the bottle with tape to protect from cutting yourself.



3. Place the top section upside down in the base section. This provides a platform for the seeds, and it stops the water from evaporating.



4. Pour water into the planter so it fills the bottom almost up to the bottles neck. The water should be about 10 cm deep.



5. Cut a 5 cm section off one of the skewers. Tie four pieces of the string to the middle of the skewer. Feed four of the pieces of string down through the opening of the bottle, but leave the skewer end in the top of the bottle.



- Put several cotton balls into the top of the bottle, underneath the tied skewer to hold it in place. Drop a few bean seeds onto the cotton balls.



- To make a tripod that will support the stems of the plants as they grow, cut the three skewers so that they are the same length (approximately 20 cm long). Put a blob of modeling clay on the pointed end of each wood skewer. Use the final piece of string to tie them together, to make a tripod.



8. Place the tripod on top of the cotton balls, and put the planter in a bright place.



9. The seeds should germinate after a few days. After a few weeks, transfer your plants to a pot with soil or add fertilizer to the water so the plants can flourish.

## The Science behind your Soil Free Planter

Water from the bottom of the planter soaks up through the strings and wets the cotton balls. The seeds grow roots and a shoot when they absorb water. Water, air, and light are all a plant needs to start growing. This is why the plant can grow without any soil. A special chemical in the roots called auxin, helps direct them downward so that they grow towards the water. Auxin makes a root grow more slowly on one side, causing it to bend in the direction of the force of gravity, in this case down towards the water.

## Real World Science – Aquaponics



Some plants are grown in hydroponic tanks. There they are fed water containing nutrients, normally found in soil, that they need to grow quickly and healthily. Aquaponics, a type of hydroponics, feeds plants with nutrients from the waste products of fish kept in tanks. The fish provide food for the plants, and the plants filter the water for the fish.

## STEAM

This activity includes everything you need for a comprehensive STEAM project.

**Science:** Understanding how plants can grow without soil.

**Technology:** Understanding how the structure of the planter enables the plant to grow and thrive.

**Engineering and Art:** Constructing and completing the soil free planter.

**Math:** Tracking the amount of water needed for the seeds to sprout and grow. Measuring and charting the amount of time needed for the plants to grow.