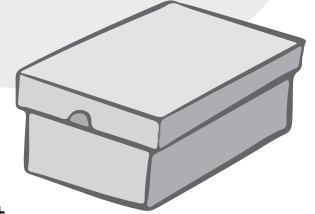


Plant Light Shoebox Maze Experiment

Grades: K - 7

Set up: 45 mins ; Growing time: 3-4 weeks, depending on seed variety



Lesson summary:

An experiment to test if a plant can find its way through a box maze towards light.

What's the big idea?



- Will the sprout go around obstacles in the box to find its way out of the maze?

Outcomes or purpose:

- Explain that plants move toward the light, and why
- Prove that plants move toward the light

Teacher background:

The word phototropism is a mouthful! It's made up of two parts: photo which means light and tropism which comes from the Greek word tropos meaning to turn.

To grow tall and strong, plants use energy from light to make food in a process called photosynthesis. We think of plants as being stuck in one place, but they can move their stems to grow towards light. This movement is called phototropism: where plants turn or orient towards a source of light. This happens in plants and even some fungi.

Here's how it works:

Plants use many hormones to grow. One hormone in particular called auxin, tells individual cells to grow longer. It's one of the ways that plants grow taller. Normally, plants growing with an unshaded light source will grow straight up towards the sun because auxin is evenly distributed all around the shoot.

But when something blocks or shades the sun like a tree or other plants, something interesting happens. Auxin starts to concentrate on the shaded side of the plant instead, and as a result, the cells on the sunny side stay the same size but the cells on the shaded side grow longer. This causes the plant to turn or bend towards the light.

Phototropism is an evolutionary adaptation that helps plants to move access light needed for photosynthesis.

Plant Light Shoebox Maze Experiment

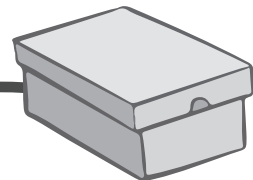
Materials needed: For the plant, (one per shoebox maze)

- Small plastic plant container about 7 - 10 cm high (or recycled paper cups with a drainage hole in the bottom)
- Potting soil (soilless medium)
- 2 - 3 pole bean seeds per plant container (ensure that you use pole bean seeds which grow long and tall, not bush beans which are short)



Materials needed: For the shoebox maze

- Shoebox with lid
- Scraps of light cardboard
- Scissors
- Duct tape or masking tape
- Ruler
- Pencil
- Science journal to record observations



Step by step instructions: Growing the plant(s)

1. Fill each container with soilless medium to about 1 cm below the top.
2. Press 2 or 3 seeds about 2 cm deep into the soilless medium.
3. Water the container and set under grow lights or in a sunny window. Water daily or as needed.
4. Once the plants have sprouted and are about 5 - 10 cm tall, they are ready for the experiment. This will take from 3 to 7 days, depending on the seeds used.

Step by step instructions: Making the shoebox maze

1. Hold the shoebox up to the light. If there are gaps, cover them with masking tape.
2. Cut one 8 to 10 cm square hole at the small end of the shoebox.
3. Measure the depth of the shoebox. Now measure the width of the shoebox and divide that by half. Cut two pieces of light cardboard into rectangles using these measurements.
4. Measure the length of the shoebox and divide by three. Make two marks inside the shoebox, dividing it into three compartments.
5. Tape one cardboard piece on the left side of the box at the one-third mark, lining up the side that is equal to the height of the box.
6. Tape the other cardboard piece on the right side of the box at the two-thirds mark.

How Does Water Move Through A Plant?

7.

Place the bean sprout in the bottom section of the cardboard box.

8.

Close the lid. You may have to use tape to keep it in place.

9.

Set the box in a sunny window.

10.

The bean sprout should make its way to the top over the course of a few weeks. Open the lid and check on it every few days to see the sprout move towards the light. Do not expose it to the outside light too much when you check on the sprout.

Discussion questions

- Before you begin, this is a good time to review LAWNS: Light, Air, Water, Nutrients, Space. You can find this here:

<https://portal.littlegreenthumbs.org/teaching-garden/teaching-timeline#tab-3>

Do you think the plant will grow with minimal light?

- Why do you think plants would need to use this in a natural environment?

Expand the learning:

- How large of a maze would it have to be for the plant not to grow? (testing the limits of phototropism)

