Family edition

Seed Lab: Where Does a Plant Come From?

Ages 10-14 · about 45 minutes, in one sitting

Your child guesses where a plant's weight comes from, grows a bean in Seed Lab, and reads four jars that show where every gram came from.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from&ref=fam-seedlab-1. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from&ref=fam-seedlab-1. A short guide opens over the app. A bush bean is planted 2.5 cm deep in a pot with a glass front, outdoors, with the helper watering it.

1. **The guess.** Tap one or more of Soil, Water, Air, Sunlight. The guide moves on.
2. **Up.** Press `Next stage` a few times: the seed swells, the root comes out on Day 4, and a pale hook breaks the soil on Day 11.
3. **The ledger.** Press `Open the ledger`. The plant is 0.25 g, all of it from the seed, and the seed was 0.28 g.
4. **Sixty days.** Set "A day in 1 second" and run to about Day 60: 12 g dry, 11 g from the air, 0.70 g from water, 0.54 g from the soil, 0.17 g still from the seed. About 5.6 liters of water went in at the roots and out at the leaves.
5. **The scale.** Press `Weigh the soil`: 300.00 g when the pot was filled, about 299.47 g now.

> The moment that lands is the scale. Children who guessed soil expect the pot to be lighter by the weight of the plant.

The ideas, in plain words

A plant's dry mass is about 45% carbon, 45% oxygen, 6% hydrogen and about 4% nitrogen and minerals. The carbon and most of the oxygen come from carbon dioxide in the air, the hydrogen from water, and the minerals from the soil. Leaves use light to make sugar from carbon dioxide and water, and the plant builds itself from that sugar.

Almost 400 years ago, Jan van Helmont grew a 5 pound willow in 200 pounds of dried soil for five years. The tree gained about 164 pounds; the soil lost about 2 ounces. He thought it all came from water. A living tree is about half water, but even its dry wood came mostly from the air.

Common mistakes: the plant is made of soil; it is made of water; sunlight is what it is made of; fertilizer is plant food. Light is the energy, not the stuff. The app grows one model plant, the same way every time, so two children with the

same settings get the same numbers. Real plants vary from seed to seed; a real bean in a bag beside the app shows that.

Do it together

1. Open mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from&ref=fam-seedlab-1 together. A short guide opens over the app. Tap where you think the plant's weight will come from.

   > **You'll know it worked when:** The guide moves on.

2. Press `Next stage` until the shoot comes up, then press `Open the ledger`.

   > **You'll know it worked when:** Four jars appear. The plant weighs a little less than the seed did: it burned some of its stored food.

3. Set the speed to "A day in 1 second", press `Keep going`, and pause near Day 60.

   > **If you get stuck:** Press the green button under the stage; press it again to pause.
   >
   > **You'll know it worked when:** The air jar is by far the tallest: about 11 g of a 12 g plant.

4. Press `Weigh the soil`. Ask: how much did the soil lose, and how much did the plant gain?

   > **You'll know it worked when:** The soil lost about half a gram.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- Which jar is tallest on Day 60, and how many grams is in it?
- Why did the plant weigh less than the seed when it first came up?
- How much did the soil lose, and how does that compare with the soil jar?
- Where is the water that went in at the roots and out at the leaves in the jars?
- Is sunlight one of the jars? Why not?

> The third question is the real test: a child who matches the scale to the soil jar is using evidence, not just reading a number.

For younger and older kids

Younger: For a younger child, pick Grades 3 to 5 in the level menu: the jars show heights, no numbers.

Older: For a teenager, switch to High school and compare the two ways the ledger can count.

Keep going

- Switch to High school in the level menu and pick "by what goes in and out" under the ledger. Read the card: why does the water side look bigger now, and what stays the same?
- Grow the same bean on a north window. What happens to the air jar, and why?
- Open Puzzles and solve Beat the ledger.

Bring it into other subjects

- Math: what percent of the 12 g plant came from the soil? From the air?
- History: van Helmont's willow (published 1648). What did he get right, and what did he miss?
- English: write a letter to a child who thinks plants eat soil, using your numbers.
- Real plants: grow a bean in a bag beside the app (the Journal has a printable sheet) and record its height next to the model's.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Seed Lab: Where Does a Plant Come From?
SUBJECTS	Life science
TIME	45 minutes
WHAT WE DID	Predicted and then measured where a growing plant's mass comes from, and used a weighed pot of soil as evidence.
SKILLS PRACTICED	Photosynthesis; Using evidence; Reading data

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from

Essential question: A bean seed weighs less than a third of a gram. Where did the rest of the plant come from?

Warm-up: Before you grow it: where will the plant's weight come from? _____

1. **Vocabulary.** Dry mass, carbon dioxide, photosynthesis, minerals, respiration: write each in your own words.

2. **The ledger table.** Day 30 and Day 60: dry plant _____ g; from the seed _____; the air _____; the water _____; the soil _____. Weigh the soil: at the start _____ g, now _____ g.

1. Where did most of your plant's mass come from? Use the jars.

2. The soil lost about half a gram and the plant gained 12 g. What does that tell you?

Quick check

Name: _____

1. Most of a bean plant's dry mass came from (A) the soil (B) the water (C) carbon dioxide in the air

2. The pot of soil weighed 300.00 g at the start. After 60 days it weighs about (A) 288 g (B) 299.5 g (C) 300.00 g

3. Sunlight is not one of the jars. Explain what light does for the plant.

Answers

QUESTION	ANSWER	WHY
1	C	About 11 g of the 12 g plant came from carbon dioxide in the air.
2	B	It lost only about half a gram: the minerals the plant took from it.
3	Light is the energy	Leaves use light's energy to build sugar from carbon dioxide and water. Light is not stuff that ends up in the plant. "It helps it grow" alone is half.

If your state or umbrella school asks, this lesson covers NGSS 5-LS1-1, NGSS MS-LS1-6.

Terms of use

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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