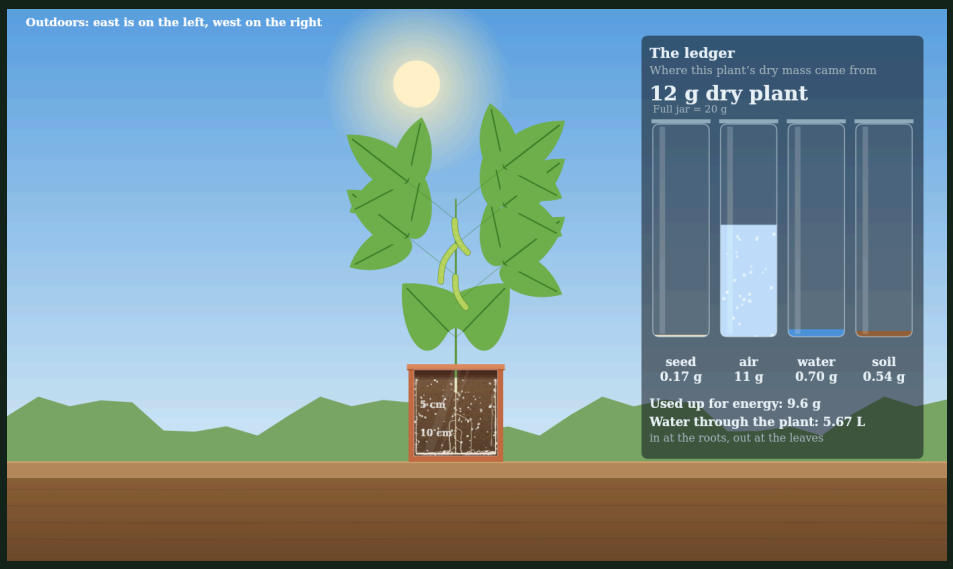
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# Seed Lab: Where Does a Plant Come From?

## Grades 5-8 · 45 minutes

Life science




**Slides, rubric and answer key** **Print and go** **No student accounts**

**Chromebook friendly**

**What's included**

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a ledger table
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 3 and 4 and in high school biology
- Standards: NGSS

# Seed Lab: Where Does a Plant Come From?

Grades 5-8 · 45 minutes · Life science

Students guess where a growing plant's weight comes from: soil, water, air or sunlight. Then they grow a bush bean outdoors and read the ledger, four jars that keep the books on its dry mass. By Day 60 the plant is 12 g dry: 11 g came from carbon dioxide in the air, 0.70 g from water, 0.54 g from the soil. They weigh the dried soil, which lost only about half a gram, and meet van Helmont, who grew a willow in a pot for five years.

## At a glance

### ESSENTIAL QUESTION

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

### OBJECTIVES

Students will be able to:

- make and record a prediction about where a plant's mass comes from
- read the ledger and say how much of a plant's dry mass came from the air, the water and the soil
- use the weighed soil as evidence that very little of the plant came from it
- explain that most of a plant's mass is built from carbon dioxide and water, using light

### VOCABULARY

Dry mass, Carbon dioxide, Photosynthesis, Minerals, Respiration

### STANDARDS

5-LS1-1, MS-LS1-6

### TIME AND MATERIALS

45 minutes, grades 5-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

### PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from&ref=tpt-seedlab-1 once on a student computer: a bean is planted in a pot outdoors, and checks that your school's filter allows the app. Run it yourself, about ten minutes: guess, press Next stage until it is up (Day 11; the dry plant is 0.25 g, less than the 0.28 g seed), open the ledger, then at a day a second run to about Day 60 and press Weigh the soil.

### ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

### TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

## Lesson sequence

| MINUTES | STAGE | WHAT YOU DO | WHAT STUDENTS DO |
|---|---|---|---|
| 0 to 5 | **Warm-up**<br>Hook | Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: where does a plant's stuff come from? Write every answer on the board. | Answer the warm-up on the worksheet. |
| 5 to 12 | **Direct instruction (I do)**<br>Model it | Project the app with the starter open. Tap a guess, press Next stage until the shoot is up (Day 11), and open the ledger: the plant is 0.25 g, less than the 0.28 g seed, because the seedling burned some of its stored food. Show the ledger slide.<br><br>> **It's working when:** The ledger counts dry mass. A living plant is mostly water; that water is not part of the jars. The line under the jars counts the water that went in at the roots and out at the leaves. | Watch, and fill in the vocabulary on the worksheet. |
| 12 to 22 | **Guided practice (We do)**<br>Grow it together | Students open the link or scan the QR code. A short guide walks them through the guess, the first stages and the ledger. Then everyone sets a day a second and runs to about Day 30.<br><br>> **Watch for:** Students who skip the guess. The guess is the point: ask them to write it before they read a jar. | Record the four jars on Day 30 in the ledger table (about 4.0 g dry: 3.4 g air, 0.23 g water, 0.16 g soil). |
| 22 to 38 | **Independent practice (You do)**<br>Weigh the evidence | Students run to about Day 60, read the jars again and press Weigh the soil. Walk the room with the What to look for questions.<br><br>> **If they ask:** "The soil started at 300.00 g. What does it weigh now, and how much did the plant take from it?" The scale | Fill in the ledger table for Day 60 and the scale, and answer the questions. |
| 38 to 45 | **Closure**<br>Showcase and exit ticket | Show the Showcase slide. Two students explain where the 12 g came from, then go back to the warm-up answers on the board. Tell van Helmont's story. Hand out the exit ticket. | Answer the exit ticket. |

## Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/seedlab?lesson=where-does-a-plant-come-from&ref=tpt-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. Students who guessed soil expect the pot to be lighter by the weight of the plant.

## Background for the teacher

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 students 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.

## What to look for

Ask these while students work. A student who has understood the lesson 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 student who matches the scale to the soil jar is using evidence, not just reading a number.

## Cross-curricular extensions

- 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 student 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.

## Vocabulary

| | |
|---|---|
| **Dry mass** | What a plant weighs with all its water dried out. |
| **Carbon dioxide** | A gas in the air. Plants take it in through their leaves. |
| **Photosynthesis** | How a plant uses light to make sugar from carbon dioxide and water. |
| **Minerals** | Small amounts of things like nitrogen and potassium that a plant takes from the soil. |
| **Respiration** | Burning sugar for energy. Plants do it day and night. |

## Differentiation

#### ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the screen as you say each word: the jars, the roots and the stage chips carry the meaning.
- Pair each learner with a partner; the jars show the answer as heights before anyone reads a number.
- Accept the ledger table as numbers only.

#### STUDENTS WITH IEPS OR 504 PLANS

- Pair students for the independent part, one at the app and one filling in the table.
- Zoom the browser to 125%; the jars and the card stay readable.
- Allow the table for Day 60 only, where the IEP allows a modified assignment.

#### STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "Most of my plant came from ___, because the ___ jar was the tallest."
- A check-in after the guide: every student has the ledger open before anyone moves on.
- Ask only: which jar is tallest, and which is shortest?

#### STUDENTS READY FOR MORE

- 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.

### Adapting for other grades

**Younger students:** In grades 3 and 4, pick Grades 3 to 5 in the level menu: the jars show no numbers, only heights. Ask which jar is tallest and which is smallest, and skip the scale. Total 8, and 6 meets the objectives if you drop the third rubric row.

**Older students:** In high school, pick High school: the card shows degree days, and the ledger can count "by what goes in and out", where the oxygen the leaves give off is charged to the air. Students compare both ways of keeping

the books and explain why the soil's share is about 4 grams in every 100 either way (HS-LS1-5).

# Student worksheet

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?

Seed Lab: Where Does a Plant Come From?

## Exit ticket

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.

Seed Lab: Where Does a Plant Come From?

## Exit ticket

Name: _____

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

# Answer key: exit ticket

| 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. |

## Rubric

Score each row from 1 to 4.

Name: _____

| CRITERIA | 4 EXCEEDS | 3 MEETS | 2 APPROACHING | 1 BEGINNING |
|---|---|---|---|---|
| **The ledger table** | Day 30 and Day 60, all four jars, the scale before and after, and the guess. | Day 60 with all four jars and the scale. | Some jars recorded. | Nothing recorded. |
| **Using the evidence** | Uses the jars and the scale together: the soil lost about as much as the soil jar holds, far less than the plant gained. | Names the air as the biggest source, with a number. | Names the air as the biggest source, no number. | No answer, or says the soil. |
| **Explaining it** | Explains that leaves use light to build sugar from carbon dioxide and water, and the plant is built from that sugar plus a few minerals. | Says the plant is built from carbon dioxide and water using light. | Says the plant uses sunlight to grow, with no materials named. | No answer. |

Total: ____ / 12. A score of 9 or more meets the objectives.

## Standards

The lesson is built for 5-LS1-1, whose emphasis is that plant matter comes mostly from air and water, not from the soil, and for MS-LS1-6, tracing matter in and out of a plant.

| FRAMEWORK | CODE | GRADES | STANDARD | HOW THE LESSON MEETS IT |
|---|---|---|---|---|
| NGSS | **5-LS1-1** | 5 | Support an argument that plants get the materials they need for growth chiefly from air and water. | The ledger and the weighed soil are the evidence for the argument. |
| NGSS | **MS-LS1-6** | 6-8 | Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. | Students trace carbon dioxide and water into the plant's dry mass, and sugar burned for energy back out. |

Checked November 2026 against: NGSS 5-LS1-1, From Molecules to Organisms, NGSS MS-LS1-6, From Molecules to Organisms.

## Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/seed-lab/lessons/where-does-a-plant-come-from/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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