Family edition

Seed Lab: Which Way Is Up?

Ages 8-11 · about 45 minutes, in one sitting

Your child plants a bean upside down in the dark in Seed Lab, watches it find which way is up, and tips the pot over to see it turn again.

What you need

- A computer or Chromebook with a current browser.
- The lesson link: mytekdev.com/try/seedlab?lesson=which-way-is-up&ref=fam-seedlab-3. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/seedlab?lesson=which-way-is-up&ref=fam-seedlab-3. A short guide opens over the app. A bean is planted upside down, 2.5 cm deep, in a closet: the stage is dark.

1. **The root.** Press `Next stage`: the first root comes out on Day 4 going up, and curves around to grow down.
2. **Up in the dark.** Keep pressing: the shoot comes up on Day 11, pale yellow with its hook still bent. The guide asks for light.
3. **Light.** Pick `South window` and run to about Day 20: the seed leaves open green, the first leaves open, and the stem leans toward the window.
4. **Tipped over.** Press `Lay it on its side` and run one day: the top curves up. `Stand it up`: the bend stays. Then `Turn the pot`: over a few days the new growth bends back toward the window.

> The moment that lands is the root curving around. Children expect an upside-down seed to grow upside down.

The ideas, in plain words

Roots grow toward gravity and shoots away from it, sensed by tiny grains in the root tip and the stem. Shoots also bend toward light: the shaded side grows more, so the stem leans to the bright side. Only the young growing part near each tip bends; older stem stays where it grew.

A seed needs water, warmth and air to sprout, not light. In the dark, a bean seedling grows tall and pale on the food stored in its seed, with its hook still bent, and dies when that food runs out (about Day 19). Given light, it opens green leaves and makes its own food.

Common mistakes: seeds need light to sprout; a root grows whichever way the seed points; plants cannot move. 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=which-way-is-up&ref=fam-seedlab-3 together. A short guide opens over the app. Press `Next stage` and watch the root.

   > **You'll know it worked when:** The root comes out going up, then curves around and grows down.

2. Keep pressing `Next stage`. Ask: will it come up in the dark?

   > **You'll know it worked when:** It comes up on Day 11, pale and hooked.

3. Pick `South window`, set "A day in 1 second", and run to about Day 20.

   > **You'll know it worked when:** Green leaves, leaning toward the window.

4. Press `Lay it on its side` and run one more day. Ask: which way is it growing now?

   > **If you get stuck:** Press the green button under the stage, then pause after about a day.
   >
   > **You'll know it worked when:** The top has curved up.

Talk about it

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

- Which way did the root first come out, and which way did it end up?
- Did the seed need light to sprout? How do you know?
- Why was the seedling pale in the closet?
- What happened to the top when you laid the pot on its side?
- How does growing down help a root? Growing up help a shoot?

> The second question is the real test: a child who uses the closet seedling as evidence has the idea.

For younger and older kids

Younger: For a younger child, stop after it comes up in the dark and talk about which way the root went.

Older: For an older child, find out what happens to a bean left in the closet.

Keep going

- Leave a second bean in the closet. What happens to it by Day 19, and why? (Read the card.)
- Try a pea, which leaves its seed below the soil. How is its seedling different?
- Grow a sunflower outdoors and pause on Day 40 in the morning and the evening. Which way does its bud lean?

Bring it into other subjects

- Real plants: tape bean seeds to a damp paper towel in a clear CD case, stand it up, and turn it a quarter turn after the roots show.
- Art: draw the upside-down seed's root as a comic strip, one frame a day.
- English: explain to a younger child how a plant knows which way is up.
- Math: how many hours did it take the top to turn up after the pot was laid down?

For your records

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

LESSON	Seed Lab: Which Way Is Up?
SUBJECTS	Life science
TIME	45 minutes
WHAT WE DID	Observed how a bean's root and shoot respond to gravity and light, and tested it by tipping the pot.
SKILLS PRACTICED	Plant responses; Observing and drawing; Making predictions

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/seedlab?lesson=which-way-is-up

Essential question: How does a plant know which way is up?

Warm-up: If you plant a seed upside down, which way will its root grow? _____

1. **Vocabulary.** Gravity, respond, shoot, root, sprout: write each in your own words.

2. **The drawing table.** Draw the plant: upside down when the root first shows; up in the dark; after a few days in the light; laid on its side for a day. Add an arrow for which way it grew.

1. Did the seed need light to sprout? What is your evidence?

2. How do roots growing down and shoots growing up help a plant survive?

Quick check

Name: _____

1. A bean seed is planted upside down. Its root will grow (A) up, the way it points (B) down, toward gravity (C) sideways

2. A seed in a dark closet (A) never sprouts (B) sprouts and comes up pale (C) comes up green

3. A potted plant is laid on its side. Describe what its top does over the next day, and why.

Answers

QUESTION	ANSWER	WHY
1	B	The root turns down whichever way it starts, following gravity.
2	B	Seeds do not need light to sprout. The seedling is pale because it has no light yet.
3	It curves up	The growing tip bends away from gravity, so the top turns up. "It moves" alone is half.

If your state or umbrella school asks, this lesson covers NGSS 4-LS1-1, Florida SC.3.L.14.2.

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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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