

A Seedling's Needs Experiment

What do young plants need to be healthy?



Duration: 45 minutes (plus ongoing observation)

Grade Level: Pre K-3rd

Location:

In class: Intro & Conclusion

Outside (or in class): Seedling observations

Recommended Seed Books:

-*What Does A Seed Need?* by Liz Goulet Dubois

-*Little Seeds* by Charles Chinga

-[Plant a Little Seed](#) by Bonnie Christensen

-[A Seed in Need](#) by Sam Godwin

-[The Needs of a Plant song](#)

Materials:

-[Data Collection Sheet](#)

-Seedlings of easy-growing plants in pots of equal size (preferably planted all at the same time a week or so before the experiment, so students are testing on a young seedling)

-Recommended fast-growing seeds: radishes, beans/peas, sunflowers, kale, mustard greens

-Magnifying lenses

-Ruler, scale, other data collection tools (optional)

Theme: Plants need all the “ingredients for life” to grow strong and healthy.

Goals: Students understand key things that plants need to grow: water, air, sunlight, nutrients, space, and love! By designing an experiment to measure the growth of a seedling and observing seedling health and vigor, students discover how changing the growing conditions (the variable) can affect plant health. Students hypothesize how a farmer or gardener can help their plants have all they need to grow, even in difficult conditions.

Introduction (20 mins): *Read a favorite book about plants/seeds*

Draw on the class’s existing knowledge and what you read in your book of choice to identify everything a plant needs to grow- the “ingredients for life” (Optional: sing a [song](#)). Record their list of ideas and identify which things a plant might be able to find or gather on its own (air, sunlight) and what things people (farmers, gardeners, scientists) might need to give the plant to help it thrive (water, nutrients, space, love).

Discuss examples: farmers can’t control if it is sunny or not, but can a farmer help a plant get more or less sunlight? If so, how? What about nutrients? Would it be easier for the plant to find the things it needs if it is planted outdoors or indoors; directly in the soil or in a container? How can people help plants get all they need to grow?

Activity (20 mins):

After listing the “ingredients for life” ask the students what they predict might happen if a plant doesn’t get all those things. What if it gets all *except one*? Decide as a class (or in small groups/individually) which ingredient(s) to test. Set up a trial with one seedling receiving *all* the ingredients for life (the control) and other seedling(s) receiving all they need *except* for one ingredient (the treatment). The variable in this experiment will be the ingredient we choose to test! Discuss how to care for the “control” and “treatments” seedlings during the experiment: are there any other things we should keep consistent to make sure the plants are getting the same treatment with the exception of the one variable we are testing? (Container size, planted on the same date, same type of plant, same ages of seeds, etc.) Why is important to control those variables?

Examples of possible treatments by variable:

- **Light:** Keep test seedling in a permanently dark area or only provide artificial lamp light, give control plant plenty of natural sun light.
- **Water:** Regularly water control seedling but withhold water or only offer another liquid (milk, soda, saltwater) to the test seedling.
- **Nutrients:** Mix compost into the soil when potting up (or transplanting) the control but not the test plant.
- **Air:** Put test seedling in a small plastic bag and tie it shut to restrict air flow as much as possible, let control have free flowing air.
- **Space:** Keep a few test seedlings very close to one another in a tiny pot. Allow the control seedling(s) plenty of room to stretch their leaves & roots.
- **Love:** Gently interact with the control seedling- stroke the leaves, whisper positive affirmations and sing to it, read books to it and treat it nicely. Treat the test plant in a negative manner, saying things like “you’ll never grow”, “you can’t do it!”, or simply ignore the seedling as much as possible, keeping it in a quiet, low to no-traffic area but otherwise receiving the same water, sun, airflow, and nutrients as the well-loved plant.

Once the experiment is set up, check on the seedlings daily (or every other day/weekly depending on how quickly you notice changes and how much time you have for the experiment), have students make observations individually and then share as a group, record measurements and observations and draw the control and test plants in a science journal or using the My Seedling Experiment data sheet provided.

General plant care: If plants are started from seed, water often (keeping soil damp) for the first week. Then water every other day, a consistent amount of water for each of the plants (unless water is the variable you are testing!). As students visit plants, help guide their observations with inquiry questions. Encourage them to make ongoing predictions for their next observation session. Use measuring tools including rulers to measure plant height and leaf size, measuring cups for watering, and magnifying lenses whenever feasible.

Inquiry Q's:

- What do you see/feel/smell? (Practice sensory observation)
- How can we tell if this plant is healthy or not?
- What can we measure to tell us how well the plants are growing? (height, weight, growth rate, leaf color & number, eventually flower/fruit vigor, number of flowers/fruits, etc.)
- Do you notice any differences between our control and test seedlings so far? How quickly did these differences appear? What do you think will happen next?
- Does it seem like some ingredients for life are more important than others for our seedling?
- Would this experiment work if we tried testing two different types of plants rather than using the same kind of plan for the control & variable? Do different plant varieties have different needs?

Conclusion (5 mins):

After a week or so of observations (depending on class schedule and plant growth rate), have students share their recorded data and any new questions they may have through a partner or whole group discussion, repeat weekly (or more often!) for duration of experiment:

- What differences do you notice between the control and the trial(s) after one week? After two weeks? A month? What do you predict will happen if we continue this experiment for a whole year?
- Were your predictions correct? Did you observe anything surprising?
- What could we do to help the ailing plants come back to health?
- What natural or human-caused scenarios may cause a seedling to lack one (or more) of the “ingredients”? (i.e. flood/drought, erosion of topsoil, larger plants shading seedlings, improper spacing when planting)
- How can farmers/gardeners ensure their plants have all the “ingredients for life” despite these challenges? What technologies can help plants survive?

As an added challenge after the experiment, try modifying your treatments to bring the test plants back to full health!

NGSS 3-Dimensions Connections:

Dimensions from Framework	What students are doing
<p>Science and Engineering Practices (SEP)</p> <ul style="list-style-type: none"> -Planning and Carrying Out Investigations -Analyzing and Interpreting Data -Constructing Explanations -Engaging in Argument from Evidence 	<ul style="list-style-type: none"> -students choose a variable to test and conduct a scientific investigation with “test” and “control” seedlings receiving specific treatments while otherwise controlling other variables -students collect and analyze data on their seedling’s growth and vigor over time, as an indicator of plant health -based on their experimental results, students explain how their test plant was impacted by changing the variable and what treatment might be given to improve/restore plant health -based on their experimental results, students reflect on how changing the ingredients the seedling receives impacted its growth, and what farmers can do to grow healthy plants
<p>Disciplinary Core Ideas (DCI)</p> <ul style="list-style-type: none"> -LS1-1 From Molecules to Organisms: Structures & Processes -LS2-1 Ecosystems: Interactions, Energy, and Dynamics 	<ul style="list-style-type: none"> -students test how depriving a seedling of a certain “ingredient for life” impacts its growth, and observe & describe the effects -students plan and conduct an investigation into a seedling’s needs, observing how changing growing conditions effects the plant’s ability to create energy and grow, hypothesizing how a plant’s specific growing conditions might be affected by the greater environment
<p>Crosscutting Concepts (CC)</p> <ul style="list-style-type: none"> - Cause and Effect 	<ul style="list-style-type: none"> -students explore the effects of changing a seedling’s growing environment and hypothesize why this might happen and how to improve conditions for growth
<p>Performance Expectation (P.E.) supported:</p> <p>K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.</p> <p>2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.</p>	