

THE GERMINATOR

Watch plants grow inside a CD case!

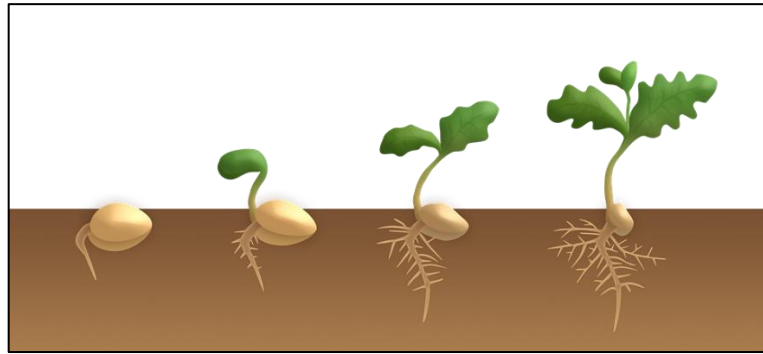
Curriculum topics:

- Biodiversity
- Botany
- Measurement
- Plant Growth
- Scientific Method

Subject:

**Life Science,
Mathematics**

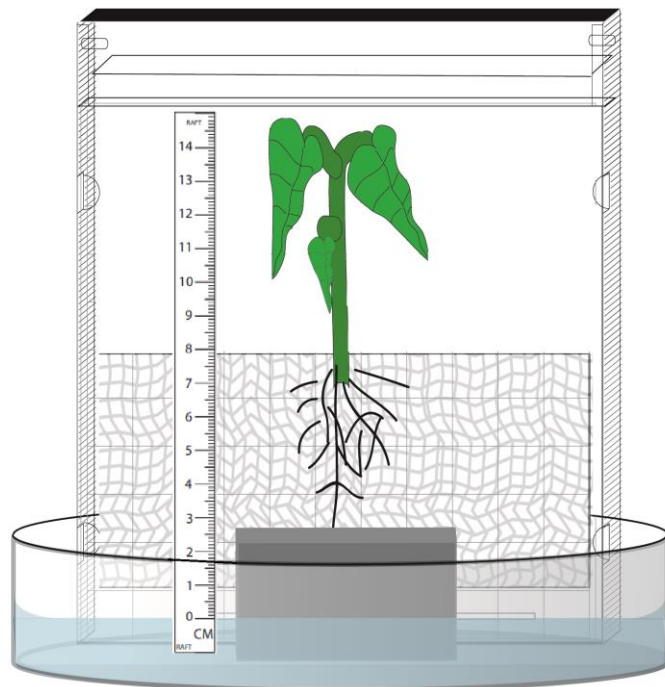
Grade range: K – 8



Observe plant growth in a CD jewel case! Create a reusable germinator that gives you an unobstructed view of sprouting seeds. Graph the data, test environmental variables, or simply “enjoy the magic” as the seeds transform into growing plants.

Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.



For more ideas visit
<https://raft.net/resources-2/>

Materials required

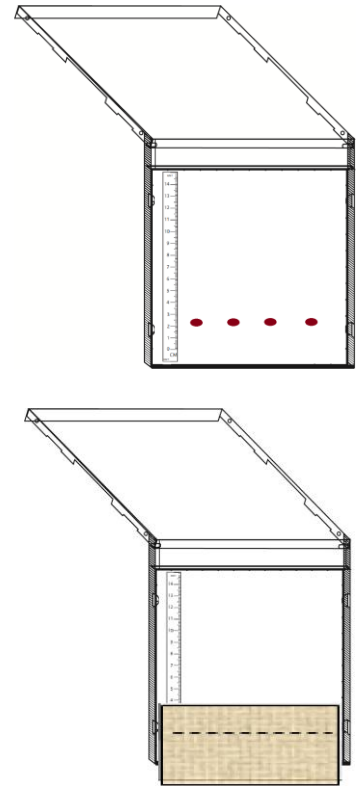
- CD jewel case (x1)
- Plastic tray (x1)
- Paper towels (x2)
- Foam block (x1)
- Tape or equivalent, not included
- Ruler, printed and cut from transparency (x1), visit <http://bit.ly/RAFTrulers>

- Water

WARNING: CHOKING HAZARD – Small parts not for children under 3 yrs. Adult supervision required.

Set-Up

- 1** Open a CD case and lay it down such that the gap is at the top. Tape a precut transparent ruler on the inside with “0” at the bottom, as shown. Cut off part of the ruler if it is too long to fit in the case.
- 2** Fold a paper towel “accordion style” five or more times.
- 3** Place 3-4 seeds, equally spaced, along a line on the ruler (shown at right).
- 4** Place the thickest part of the folded paper towel over the seeds. Gently close the CD case lid and securely trap the seeds between the paper and the lid.
- 5** Put the CD case with the paper towel at the bottom into the slot on the foam block. Slit the paper towel on both sides of the block. Put the set-up in the tray (see title page).
- 6** Add about ½” water to the tray to and mark the outside of the tray at the water line. Refill tray to the water line as needed.



To do and notice

- 1** Create a data table to record plant growth over time. Measure overall root and shoot length in centimeters each day. Observe the growth over a period of one week.
- 2** Count the number of primary and secondary leaves and roots at different stages of development.
- 3** Compare the ratio of number of leaves or roots to centimeters of growth for each plant. Think about a possible relationship between these characteristics.
- 4** Repeat the setup using different kinds of seeds. Compare their growth and make hypotheses about competition for resources such as water, light, and space.
- 5** Test environmental variables such as salinity (use 1 gm salt), acidity (use 3 ml vinegar), nutrient levels (vitamin B1, plant food), lighting, and temperature and the effects on plant growth.

Content Standards:

NGSS

Organization of Matter,
Energy Flow:

[K-LS1-1](#)

[5-LS1-1](#)

[MS-PS2-3](#)

Relationships in
Ecosystems:

[2-LS2-1](#)

Variation of Traits:

[3-LS3-2](#)

Adaptations, Structure
& Function:

[3-LS4-3](#)

[4-LS1-1](#)

CCSS Math

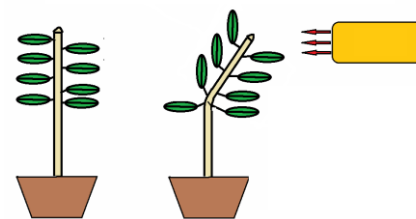
Measurement & Data:

[2.MD.D.10](#)

The science behind the activity

Plants produce seeds that remain **dormant** (inactive) until growing conditions are favorable. When moisture, temperature, and light levels are sufficient, the seeds will germinate. **Germination** is the process by which a seed becomes a young plant. During germination, the plant **embryo** contained in a seed uses stored **nutrients** to grow into a **seedling**. The seed contains enough nutrients to sustain growth until the plant can begin to produce its own nutrients via **photosynthesis**.

Phototropism is growth towards or away from light. Most plant stems grow toward light, while roots grow away from it (see above and below). A hormone called auxin causes cells on the dark side of the plant stem to get longer. When this happens, the plant bends toward the light. Different plants exhibit different degrees of bending.



Geotropism is growth in response to gravity. Roots generally grow toward the force of gravity while stems grow away from it. Similar to phototropism, geotropism involves auxins. When a seedling is turned on its side, the lower side of the shoot builds up a high concentration of auxin. This stimulates the growth of the lower side and bends the shoot up. Root cells have an opposite reaction to auxin, causing them to bend toward the earth.

Learn more

- Study a root by cutting a piece off and looking at it under a microscope
- Transplant the seedlings into soil and make continued observations of plant growth and flowering
- Research the growth rates for plants in different ecosystems and compare to observed growth rates in The Germinator
- Design a self-sustaining plant watering system
- Design and build a larger Germinator to accommodate plants that grow in the 1-meter range, such as corn and common landscape plants

Visit <https://raft.net/resources-2/> to view the following related activities!

Grow It and Wear It
Seed Ease
Capillary Capers
Newspaper Planting Pots
Plant Cell Models

Resources

See these websites for more information on the following topics:

- Germinator assembly video - <http://bit.ly/GerminatorVid>
- YouTube (2:28), bean germination - <http://bit.ly/BeanGerm>