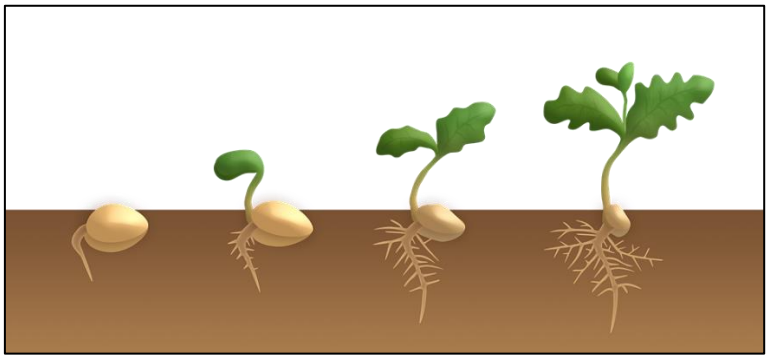
THE GERMINATOR

Watch plants grow inside a CD case!



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.

Curriculum topics

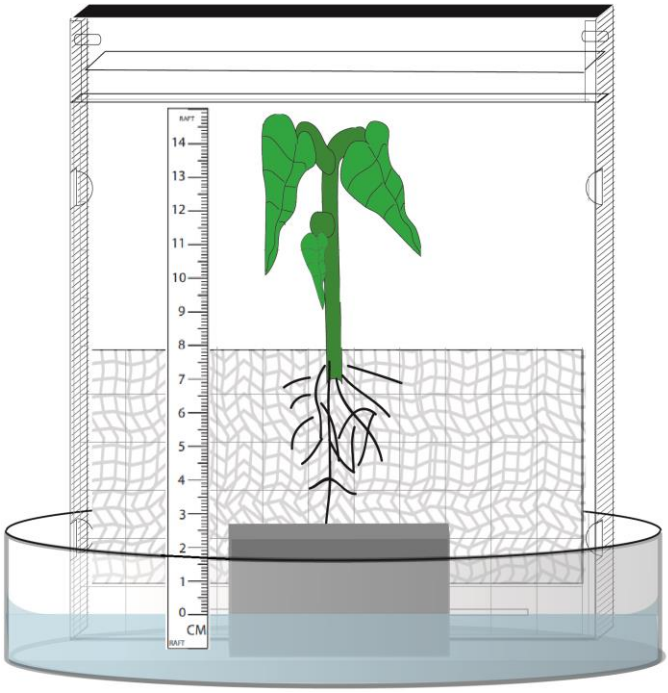
- Biodiversity
- Botany
- Measurement
- Structure and Function

Subjects

- Life Science
- Mathematics

Grade range: K – 8

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



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http://bit.ly/RAFTkitsurvey

Materials

Use the following items to assemble each project:

- CD jewel case, clear (1)
- Plastic tray (1)
- Foam block (1)
- Ruler cut-out, transparent (1), visit http://bit.ly/RAFTrulers
- Seeds, 2-5 day germination time
- **Not included:** Tape, water

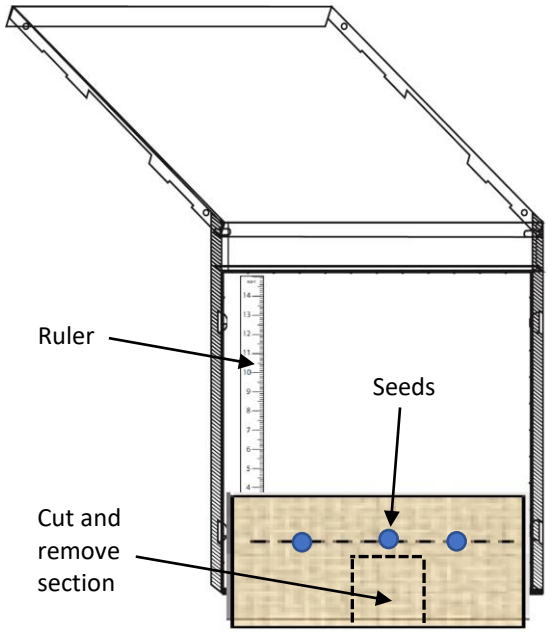
WARNING: CHOKING HAZARD – Small parts not for children under 3 yrs.

To Do and Notice

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. Let the end stick out 1"-2" beyond the bottom of CD case.

3 Place 3-4 seeds, equally spaced, in a line (see right). Gently close the CD case lid and securely trap the seeds between the paper and the lid. Adjust the paper towel as needed to keep seeds in place.



4 Cut and remove a section from the paper towel end protruding from the CD case. Insert that end of the CD case into the slot on the foam block. Put the whole set-up into the tray. Refer to the assembly video for support: http://bit.ly/GerminatorVid

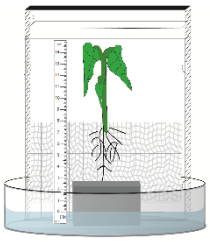
5 Add about ½" of water to the tray. Be sure not to submerge the CD case. The paper towel ends should absorb the water and draw it upward to moisten the seeds. Refill the tray over time as needed.

6 Measure overall root and shoot length in each day. Observe the growth over a period of 1-2 weeks.

7 Repeat the setup using different kinds of seeds. Compare their growth and make hypotheses about competition for resources such as water, light, and space.

8 **For older students:** Count the number of primary and secondary leaves and roots at different stages of development. What patterns in the numbers do you notice? Test different variables such as salinity, acidity, nutrient levels, lighting, and temperature and their effects on plant growth.

9 **Share** student learning with RAFT! Submit photos/video via email at education@raft.net or on social media (Facebook, Twitter, Instagram).



Core Content Skills:

Science & Engineering (NGSS)

Developing and Using Models, Planning and Conducting Investigations, Organization of Matter, Energy Flow, Relationships in Ecosystems, Variation of Traits, Adaptations, Structure and Function

CCSS Mathematics

Measurement & Data, Graphing Data with Single-Unit Scales

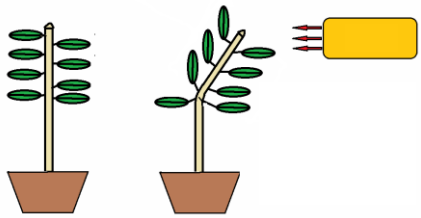
Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Content 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 (show at right). 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 in the direction of the force of gravity while stems grow away from it. Like 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.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: http://bit.ly/RAFTkitsurvey. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit https://raft.net to view related activities!

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

Resources

- Germinator assembly video - http://bit.ly/GerminatorVid
- YouTube video (2:28), Bean Germination - http://bit.ly/BeanGerm