

Culminating Activity: Germination Experiment

The unique feature that sets science apart from all other areas of study is the experiment. Experimentation is the method of operation for science as it extends science from conjecture to verification. In this culminating activity you will design, conduct and report on an experiment dealing with the germination of bean seedlings. Germination is the process by which a seed becomes a new plant.

Part A. Experimental Design

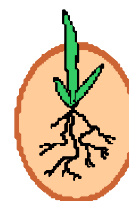
1. Determine **ONE** area of interest that you would like to explore. Some possibilities include:

- Genetics
- Light
- Gravity
- Flooding
- Growth Regulators
- Temperature
- Density
- Soil Type
- Gases
- Pollution
- Imbibition (initiation)
- Soil Compaction
- Water Amounts
- Nutrition
- Frost Shock
- pH



2. Once you have established your area of interest, you need to decide what you will study in regard to germination. You must measure **TWO** different aspects of growth. Some possibilities include:

- Time for Emergence (first sign of germination: you will have to check this one each day)
- Total Root (or Shoot or Both) Length At The End of The Growth Period
- Number of Secondary Roots Off The Main Root At The End of The Growth Period
- Total Wet (not dried) Mass of Roots (or Shoots or Both) At The End of The Growth Period
- Total Dry Mass of Roots (or Shoots or Both) At The End of The Growth Period



3. Your next step is to design a complete hypothesis which includes a prediction of the outcome of your experiment. For example, if my experiment was on the colour of bean seeds (not really relevant) my hypothesis could be: If the colour of bean seeds determines the length of the root growth and dry mass of roots then redder bean seeds will have the longest roots with the greatest dry mass of roots.

Thus your hypothesis has one part that identifies that factor you will study and a second part that predicts the outcome of the experiment.

4. Now you will need to design your experiment. There are some key points:

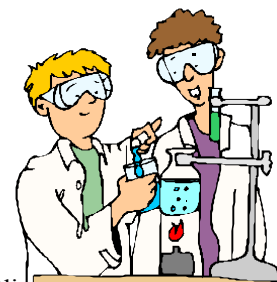
- Determine how much water is appropriate to last 2 days.
- Set up a control (lack the factor being tested) and 3 treatments (varying degrees of the factor being tested).
- Ensure that you have enough trials (repetitions: at most 3 bean seeds per container) to allow averaging of the results for the controls and treatments.
- Be consistent with your set up/handling of the control and treatments throughout the duration of the experiment.
- Keep accurate tables to record your data.



5. Now you can conduct design and conduct your experiment.

Part B. The Write-Up (one per group)

1. Include a relevant title page.
2. The report begins with an appropriate title which is centred and underlined.
3. The body of the report begins with the full hypothesis (includes a prediction).
4. The Apparatus and Procedure follows in its own section of the report. Make sure to outline how you set up your control, treatments and trials, what you measured and what you did with the data.
5. The Results section contains two parts: a data table with individual data, averages and qualitative observations and an appropriate graph of your data. Include underlined detailed titles for the table and the graph.
6. The Conclusion section contains the following: support or rejection of your hypothesis, an explanation of why you came to that conclusion, errors or areas for improvement and identification of the next experiment that should be done to further your research.



Part C. Marks

1. A marker will be provided online at our class web site.

