



Project 7.3.3 Needs of Seeds

Purpose

When conducting research, a scientist must determine the best strategies to test and measure the effects that different treatments have on a variable. Through this project, you will use scientific problem solving to design, construct, and implement an experiment examining different treatments applied to germinating seeds. From the data you and your partner collect, draw conclusions to test the optimal germination conditions for seeds and determine the range of acceptable variation from the optimal condition.

Materials

Per pair of students:

- Seeds
- Plug trays
- Plug tray flats
- Germination media
- Labels
- Humidity domes
- Watering device
- Temperature control system
- Light control system
- Sponges
- Oxygen chamber
- 20cc syringes
- Rulers
- Plant propagation textbooks
- Computer with Internet access

Per student:

- Pencil
- *Agriscience Notebook*
- *Lab Report Template*
- *Lab Report Evaluation Rubric*

Procedure

You and a partner will conduct an experiment to demonstrate the effect that one environmental factor has on germination rate. You will determine the best way to measure the effects of different levels of treatment for your environmental factor and compare different treatments to the optimal germination requirements.

Your teacher will determine the species of seed you will investigate. You will research the species and conduct an experiment in order to determine the specific requirements related to the environmental factor you are examining. You will submit a written lab report and present your findings to the class.

Part One – Background Research and Experiment Design

You will need to know the germination requirements for the seed you will be using. Even though you are testing just one factor, you will need to meet the other environmental factors at a constant rate. The control measures will help you to determine if the alterations you make to the independent variable of seed germination are the reason for the outcome.

1. You will draw one environmental growth factor from your teacher. **Note:** more than one pair of students may be researching the same environmental factor. The possible growth factors that could be chosen are listed below:
 - Light
 - Oxygen
 - Temperature
 - Depth of seed
 - Water

2. Use the Internet and plant propagation book to research the germination requirements for the type of seed your teacher has selected to use in the experiment. Complete Table 1 with the requested information.
 - Ball Seed culture information URL: http://www.ballseed.com/Growers/seed_culture.aspx.
 - Plant Propagation Textbook: Toogood, A. R. (Ed.). (1999). *American Horticultural Society plant propagation: The fully illustrated plant-by-plant manual of practical techniques*. New York, NY: Dorling Kindersley.

Table 1. Germination Requirements

Species of Seed:	
Requirement	Optimal Range
Days to Germinate	
Light	
Moisture	
Oxygen	
Planting Depth	
Temperature	

3. Discuss with your partner the possible hypotheses that you could test in relation to the environmental factor your group selected. Write problem and hypothesis statements in the table below.

Problem
Hypothesis

- Design an experiment to test your hypothesis. You will need to discuss with your teacher what resources are available to meet the needs of your experiment. Remember, you are only testing one variable, so be thinking of ways to control (provide optimal growing conditions) all of the other variables while changing only the one you have chosen.

Experimental Specifications:

- Test only one factor
 - Must have a “control”
 - The test must include a minimum of three variations of treatments
 - Must plant 20 seeds for each test
- Record all materials you will need under the Materials section of the *Lab Report Template*.
 - Write out step-by-step procedures you will follow under the Procedure Section of the *Lab Report Template*. Make sure the procedure is stated clearly enough that another person would be able to perform your investigation. You must use each step of the scientific method and record all necessary information throughout the experiment and completion of this project.
 - Have your teacher review and sign off on the step-by-step procedures for the experiment.

Part Two – Conduct Experiment

- Collect necessary supplies and assemble your testing station(s).
- Prepare a data table to record your observations and place under the Data Collection Section of the *Lab Report Template*.
- Carry out your experiment.
- Monitor your experiment every day to ensure the testing variables are consistent.

Part Three – Analyze Results

- After sufficient time for germination to occur analyze your results.
- List the conclusions you have determined and the evidence to support your conclusions.

12. Complete a written report using the *Lab Report Template* that includes your problem, hypothesis, materials, procedure, data collected, analysis, and conclusions. Your teacher will evaluate your lab report using the *Lab Report Evaluation Rubric*.

Conclusion

1. Explain the scientific process you used to determine how the environment affects the germination rate of seeds.

The scientific process we used was creating a control and then choosing the two extremes of that condition to test in order to compare.

13. What was the control for the experiment that you conducted in this project and why was it necessary for the experiment?

The control for this experiment is the bottle with 4 inches of water. It provides a happy medium for seeds.

14. What have you learned about germination from this project?

Germination is influenced by many different factors and different varieties of seeds needs different ideal requirements