



**Science Unit: *Growing Plants***

**Lesson 2: *Designing a Germination Experiment – Part 1***

School Year: 2007/2008  
Developed for: Charles Dickens Elementary School, Vancouver School District  
Developed by: Shona Ellis (scientist), Paula Naylor and Susan Garber (teachers)  
Grade level: Presented to grades 3, 4, 5; appropriate for grades 2 – 7 with age appropriate modifications.  
Duration of lesson: 2 hours  
Notes: This is a multi-part lesson

**Objectives** (Objectives refer to the science topic and/or the process of science.)

1. To review the structure of a seed and plant embryo.
2. To introduce the process of germination.
3. To examine a seedling and be able to identify the embryonic structures that gave rise to the seedling's organs.
4. To identify the key elements of science and experimentation.
5. To emphasize the importance of observation in science and experimental design.

**Background Information**

Seeds are juvenile plants housed in little packages. The young plant is provided with nutrients (either in the embryo itself or in fleshy embryonic leaves called cotyledons) and energy to begin growth. If other conditions are right then the seed will germinate. Seeds have various requirements for germination depending on species. Most require the basics: water, oxygen, appropriate temperature and substrate. Others have very specific requirements such as the seed coat may have to rupture or it may require a period of cold.

**Vocabulary**

hypothesis In science, a prediction for the outcome of an experiment or an explanation to a question.  
germination The sprouting of a seed (or spore).  
seed coat The protective outer layer of a seed.  
cotyledon The first leaves developed in an embryo.  
radicle Embryonic root.

**Materials**

- flipchart
- pens
- sunflowers
- sunflower seeds
- beans (soaked and not)
- seeds to dissect
- corn
- mimosa seeds



- handlenses
- mimosa plant

## **In the Classroom**

### **Introductory Discussion**

1. Discuss the bean seeds that were set up to germinate last day.
  - Ask students about their seeds (beans). What had to happen before they would germinate? Did they predict that would happen?
  - Did all of the seeds germinate? Why did some not germinate? Discuss variation.
  - Revisit diagram of the seed from last day and discuss what parts of the embryo developed into their bean seedlings (radicle → root, epicotyl → shoot, etc)
2. Where do seeds come from?

### **Science Activities**

Activity Title: The Role of Observation in Science

Purposes of Activity:

- a. To review and re-enforce the idea that flowers give rise to fruits
- b. To understand the basic structure of a seed
- c. To understand the role of experimentation in science.
- d. To design an experiment using knowledge gained through observation and previous experience.

Methods and Instructions:

Set-up prior to lesson:

Purchase sunflowers/mimosa plants

Buy whole sunflower seeds (such as “Spitz”).

Soak growing sunflower seeds in wet paper towel for 4 days (they will sprout)

Part 1 – Review what we learned last day about plant reproduction (as a class)

- What is the function of a flower? Flowers are reproductive structures
- Pollen is produced by stamen
- Eggs are housed in ovules in the ovary
- Ovaries develop into fruit, ovules into seeds

Part 2 – Sunflower and Seed Dissection and Germination (in small groups at desks)

- (Activity Sheets)
- Students will examine the sunflower (has disc and ray florets – review from last day) using handlenses.
- Draw disc flower – interpret structures (hint: sepals are small)
- What part of the flower develops into the fruit? Sunflower ‘seed’!



## SCIENTIST IN RESIDENCE PROGRAM

- Sunflower seed is actually a fruit! Dissect the Spitz first and extract the embryo; draw and identify all of the parts (cotyledons should be obvious). Dissect the germinating seeds (handlenses come in handy).

### Part 3 – Discussion on what is science (as a class)

Discussion Points:

- What is science?
- How do we DO science? – make predictions! Hypothesize. Experiments to test hypothesis.

### Part 4 – Experimental Design (as a class)

Discussion Points:

- What do we know about our seeds? We know they have a high germination rate.
- What do we want to know? What types of things can we test?
  - Nutrient requirements
  - Light requirements
  - Temperature requirements
- We will concentrate on light vs dark germination.
- Hypothesis: Seeds need light to germinate.

How do we test this hypothesis?

### **Closure Discussion**

Discuss designing the experiment with sunflower:

- Seeds are to be germinated in the dark and in the light.
- Are we going to germinate one seed in each condition? Is this enough?
- How many would be good? Each group of two would germinate
- Where are we going to do the experiment?...in the lab next session!

### **References**

<http://www.kidsgardening.com/onlinecourse/Part15.htm> From Seed to Seed: □ Plant Science for K-8 Educators Accessed Aug. 18, 2008

## LESSON 2 – ACTIVITY SHEET

**Name the different parts of a flower:**

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**Draw a disk flower and label with the different floral parts.**

**Draw and label a sunflower “seed”:**

**What does the ovary of the disk flower become?**

**Questions I have:**