



Science Unit: *Plants*

Lesson 1: *Seed Structure and Seed Dispersal*

School year: 2004/2005
Developed for: Queen Alexandra Elementary School, Vancouver School District
Developed by: Paige Axelrood (scientist) and Janet Vesterback (teacher)
Grade level: Presented to grade 3; appropriate for grades 2 – 5 with age appropriate modifications
Duration of lesson: 1 hour and 20 minutes

Objectives

1. Introduce the life cycle of a plant starting and ending with a seed.
2. Discover the similarities and differences of dry seeds and seeds soaked overnight in water.
3. Practice observation skills.
4. Learn the parts of a seed and the function of the seed parts.
5. Learn that seeds are dispersed by a variety of mechanisms including forcible discharge by the plant and by gravity, wind, water, animals, and people.

Background Information

Seeds provide plants with a method of reproduction and a germinating seed begins the life cycle of a plant. Seeds are produced by flowering plants (angiosperms) inside an ovary that generally develops into a fruit. Seeds are also produced inside cones by non-flowering plants called gymnosperms (such as conifers). A seed contains the embryo, a source of food, and a protective seed coat. A seed, containing a living embryo, will germinate into a plant with an adequate amount of water, oxygen, and the proper environment, including a favorable temperature. Seeds are dispersed by a variety of mechanisms including forcible discharge by the plant and by gravity, wind, water, animals, and people. Fruits often play a role in seed dispersal. Plants that forcefully propel their seeds from fruits include *Oxalis* and *Impatiens*. Gravity is an important mechanism to disperse the seeds of conifers growing in mountainous regions. Some seeds are very small and light in weight and they can travel by wind or water (e.g. Foxglove). Wind dispersal is also important for seeds attached to silky tufts (e.g. Dandelion and *Clematis*) or to wing-like structures that spin through the air like helicopters (e.g. Maple). Other seeds attach to animal fur or clothing with barbs or hooks (e.g. Cocklebur) or are eaten by animals and dispersed in feces (e.g. fleshy fruits). It is important for seeds to travel away from the mother plant to help minimize competition for space and sunlight.

Vocabulary

Seed: The part of a plant that contains a protective covering, stored food, and the embryo.

Seed coat: Protective outside layer of the seed that helps prevent: (i) injury to the inside contents of the seed; (ii) the seed from completely drying out; and (iii) microorganisms from entering the seed.

Plant embryo: A miniature, undeveloped plant at a very early stage of development inside a seed; the parts of an embryo are a tiny root and shoot.



SCIENTIST IN RESIDENCE PROGRAM

- Cotyledons or endosperm: The food source inside the seed.
- Dissect: To separate into parts.
- Disperse: To break up, spread, or scatter in different directions.

Materials

- large lima bean seeds
- strainer to rinse seeds
- 12 plastic containers, 6 for soaking seeds in water and 6 for holding dry seeds
- paper towels
- magnifying glasses

In the Classroom

Introductory Discussion

1. Introduce a plant life cycle using sunflower as an example and start and end with a seed. An enlarged color photocopy of the sunflower lifecycle from the book Usborne First Nature, Flowers can be used to help explain the life cycle.
 - What is a seed?
 - Where can you find seeds?
 - Why are seeds important?
 - What are the parts of a seed?
 - Review vocabulary.
2. Describe and demonstrate how to dissect a lima bean seed and what students will do for the science activity.
3. Safety rules: Do not eat raw lima bean seeds--they must be cooked before they are eaten. Uncooked, raw lima bean seeds contain a chemical that can be harmful if eaten. Wash hands at the end of the activity.

Science Activity/Experiment

Students will be divided into 6 groups of 3-4 students per group.

The night before the lesson:

1. Rinse lima bean seeds under running water.
2. Place approximately 30 seeds in each of 6 plastic containers and add 1 cup of water per container. Soak seeds overnight.

The next morning:

1. Rinse seeds.
2. Place a moist paper towel in the bottom of each container and place the rinsed seeds on top of the towel. Cover the containers and bring them to the classroom.
3. Place dry lima bean seeds in each of 6 containers.
4. Students will dissect the soaked lima bean seeds. Students will gently use their fingernail to peel away the seed coat, split the seed open, and find the embryo. Students will examine the parts of the



SCIENTIST IN RESIDENCE PROGRAM

seed with a magnifying glass, locate the embryo and find the shoot (immature leaves), the root, and the area in between the shoot and root that will become the stem.

5. Science Journal: Students will label the seed parts on an activity sheet with a drawing of a cross section of a lima bean seed (see BC Agriculture in the Classroom reference). Students will outline the size of a dry lima bean seed and a lima bean seed soaked in water overnight, and use a Venn Diagram to record the characteristics of dry seeds and seeds soaked in water, noting how they are the same and different.

Closure Discussion

Review the parts of a seed, how a seed provides protection for the embryo, what the seed provides for the embryo to grow. Discuss the similarities and differences between dry seeds and seeds soaked in water.

References

1. Ardley, Neil. 1991. The Science Book of Things That Grow. Pp 10-11, Seed Needs (what a seed needs to germinate). Harcourt Brace Jovanovich, Publishers.
2. BC Agriculture in the Classroom Foundation. 1993. Beans and Their Buddies, An Integrated Primary Science Resource. Seed Dissection, pp. 35-38. Pacific Edge Publishing.
3. Cox, Rosamund Kidman and Cork, Barbara. 1980. Usborne First Nature, Flowers. Sunflower life cycle, pp. 18-19. EDC Publishing, USA.
4. e.encyclopedia Science, Google. 2004. Seed Plants, pp. 262-263. DK Publishing Inc.
5. <http://www.urbanext.uiuc.edu/gpe/case3/c3facts2.html> University of Illinois Extension, [Seed structure].
6. <http://www.urbanext.uiuc.edu/gpe/case3/c3facts3.html> University of Illinois Extension, [Seed germination].
7. <http://www.cas.vanderbilt.edu/bioimages/pages/fruit-seed-dispersal.htm> Department of Biological Sciences, Vanderbilt University, Images copyright 2002 Steve Baskauf, [Fruit and seed dispersal, includes photo images].
8. http://en.wikipedia.org/wiki/Biological_dispersal Wikipedia, the free encyclopedia, [Biological dispersal].

Teacher Assessment of Learning

1. How well did the student participate in the discussions, hands-on activities and written work? During lessons, was the student focused and cooperative? Did the student successfully complete all parts of the assignment?
2. Does student behavior reflect a good understanding of the different parts of a lima bean seed and their functions? Is the student able to identify similarities and differences between soaked and dry lima beans? Does the student demonstrate an understanding of the life cycle of a plant, beginning and ending with a seed?
3. Can the student respond knowledgeably to the general questions about seeds that were posed at the beginning, or that might have arisen from further study and extensions to learning: What is a seed? Where can they be found? Why are they important? How are they dispersed? Is the student able to classify different types of seeds? (This list can be altered depending on the extensions to the lesson that are pursued.)



Extension of Lesson Plan

1. Classify different types of seeds.
2. Learn how seeds are dispersed.
3. Take a field trip to attend a program on Travelling Seeds at the VanDusen Botanical Garden, 5251 Oak Street (37th & Oak St.), Vancouver, British Columbia, <http://www.vandusengarden.org>.

Name of Scientist: _____

Date: _____

Compare Dry Lima Bean Seeds to Lima Bean Seeds Soaked in Water Overnight

Dry Lima Bean Seeds		Lima Bean Seeds Soaked in Water Overnight
Outline the size of a dry seed.		Outline the size of a seed soaked in water.
How are DRY SEEDS <u>DIFFERENT</u> than seeds soaked in water?	How are DRY SEEDS AND SEEDS SOAKED IN WATER <u>THE SAME</u>?	How are SEEDS SOAKED IN WATER <u>DIFFERENT</u> than dry seeds?