

Some Background Concerning Life Science Content Standards for Fourth-Grade Teachers:

Pollination and Seed Dispersal

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Introduction

The background information for teachers in this document addresses the following life science content standards¹ for fourth-grade teachers:

- 3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:***
- c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.*

¹ As specified in *Science Framework for California Public Schools Kindergarten Through Grade Twelve*. Sacramento: California Department of Education, 2003, p 62.

Life Science Topic: Pollination and Seed Dispersal

Science Framework² for California Public Schools

Grade 4: Standard Set 3. Life Sciences: 3.c. *“Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.”*

“The idea of plants and animals being mutually dependent was a topic of discussion in grade one. The concept can now be discussed at a much deeper level because students will have an emerging grasp of ecology and natural history. Many plants depend on bees, birds, and bats to pollinate their flowers. The resulting seeds may be scattered away from the parent plant by becoming entangled in the fur of animals. Other seedpods are moved and stored by animals in seed caches; some are consumed and deposited (still fertile) in animal wastes. The fruits of some plants are attractive food sources for animals. Plants often provide shelter for animals, hiding them from predators.”

Background for Teachers

We all know that animals need plants (for food, shelter, and/or habitat); however, not everyone knows that some plants also need animals!

Because plants cannot walk, they require external assistance for reproduction (pollination and seed dispersal) either via wind, water, or animals.

**All animals need plants,
and
some plants need animals!**

Pollination

Pollination is how baby plants are made. Pollen (containing sperm) is transferred from the anthers in the flower of one plant to the pistil (containing eggs) in the flower of another plant. Figure 1 shows the pistil and anthers of a typical flower. Pollen can be carried either by the wind (as in grasses and pine trees), water (as in flowering tapegrass and eelgrass), or by animals (as in apple blossoms and pond lilies). Animals that carry pollen from one flower to another are insects, birds, and bats.

² As specified in *Science Framework for California Public Schools Kindergarten Through Grade Twelve*. Sacramento: California Department of Education, 2003, p. 62.

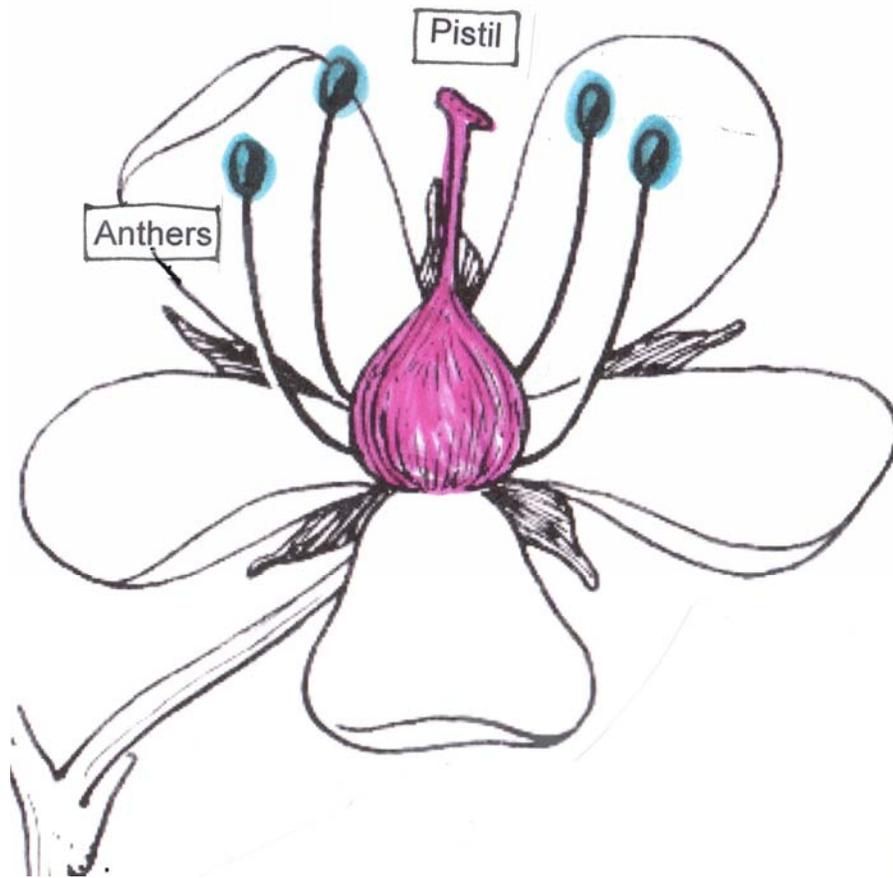


Figure 1. Diagram³ of flower: showing anthers (blue), which contain pollen (with sperm); and the pistil (pink), which contains eggs.⁴

The ultimate result of pollination is a seed. Inside every seed is a baby plant. Among flowering plants, the shape and coloration of the flower determines the vector⁵ of pollination. Flowers that use wind for pollination are small and do not have petals (such as, grass flowers); flowers that use animals for pollination are fragrant and have colorful petals, which attract animal pollinators -- especially the birds and the bees.

**“The birds and the bees”
carry out pollination
for most flowers.**

³ Diagram modified from: [http://commons.wikimedia.org/wiki/File:Corolla_2_\(PSF\).png](http://commons.wikimedia.org/wiki/File:Corolla_2_(PSF).png)

⁴ Technically speaking, plant eggs are inside ovules inside the ovary of the pistil. After pollination, the ovary becomes a fruit and the ovules become the seeds inside the fruit.

⁵ The vector of pollination is the carrier of the pollen (i.e., wind, water, animal).

Seed Dispersal

Dispersal is how a baby plant (still inside the seed) leaves its parent to live and grow outside of its parent's shadow – literally! A seed must be dispersed to a suitable location (with water and light) before it can germinate (open up and allow the new plant to grow). Seeds are dispersed by the wind (as in willows), water (as in coconuts), explosion (as in lupines), or animals (as in blackberries).

Figure 2 shows the flowers and seeds of the common dandelion, which uses one vector for pollination and another vector for seed dispersal. The flowers (colored yellow) are pollinated by insects; and the seeds (with parachute structures) are dispersed by the wind.



Figure 2. Photograph⁶ of flowers and seeds of dandelions. The yellow flowers are pollinated by insects; and the seeds (with parachute structures) are dispersed by the wind.

The ultimate result of seed dispersal is colonization of a new location. If the new location is suitable, the seed will germinate, and a new plant will grow and thrive.

Seed dispersal is how plants colonize new areas.

Seeds that are dispersed by animals have special structures to allow them to be dispersed; these external structures are easy and fun for students to observe and decipher.

⁶ Photograph from website: http://commons.wikimedia.org/wiki/File:Smetánka_lékařská_-_zralá_semena.jpg

For example, seeds with hooks and barbs (as in cockleburs and some grasses) can catch onto the fur of a mammal; be carried to a new location; and drop off when the animal cleans itself. Small seeds inside tasty fruits (as in blackberries and elderberries) can be eaten by birds, reptiles, and mammals; pass through the gut unharmed; and be released into a new location. Large seeds inside fruits (as in acorns and hazelnuts) can be collected and buried by animals; and then either eaten later, or forgotten about (to germinate in its new spot).

**Students enjoy exercising their skills in
empirical observation and *rational analysis*⁷
when looking at seeds
to determine the
method of seed dispersal.**

⁷ For additional information on empirical observation and rational analysis see “How We Know What We Know” in “Other Science Resources” (on this website); <http://www.lakesc.lake.k12.ca.us/resources.htm>

Websites

This British conservation and education website includes several pages of photographs about wind, water, and animal dispersal of seeds. Note that some of the common plant names are different than those in the U.S.:

http://www.countrysideinfo.co.uk/seed_dispersal

This website of the Missouri Botanical Gardens has a plant biology page with sections on seed dispersal, pollination, and plant adaptations:

<http://www.mbgnet.net/bioplants/seed.html>