Teacher Guide: Flower Pollination

Learning Objectives

Students will:

- Identify the parts of a flower and explain their functions.
- Describe the steps of plant reproduction.
- Explain the function of a fruit.
- Explain how pollen can get from one flower to another. (Extension)

Vocabulary

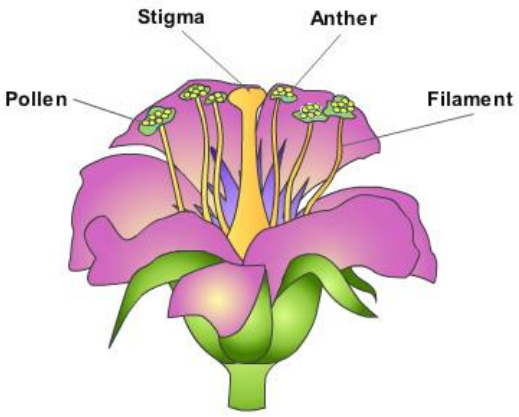
anther, cross-pollination, filament, fruit, ovary, ovules, petal, pistil, pollen, pollination, pollen tube, self-pollination, sepal, stamen, stigma, style

Lesson Overview

The *Flower Pollination* Gizmo™ allows students to examine the processes of self-pollination and cross-pollination in flowering plants. Students discover the parts of the flower that are involved in reproduction as well as the role that each plays in the process.

The Student Exploration contains 2 activities.

- Activity A – Students engage in a participatory simulation demonstrating the processes of self-pollination and cross-pollination.
- Activity B – Students match the flowers parts with their functions and consider the benefits of the flower's structure.



Reproductive organs of a flower

Suggested Lesson Sequence

1. **Pre-Gizmo activity** **(5 – 10 minutes)**
   A good way to introduce this Gizmo is to bring in flowers for students to examine. Tulips and lilies are commonly available and are good choices because they have easily identifiable stamens and pistils.

2. **Prior to using the Gizmo** **(10 – 15 minutes)**
   Before students are at the computers, pass out the Student Explorations and ask students to complete the Prior Knowledge Questions. Discuss student answers as a class, but do not provide correct answers yet. Afterwards, if possible, use a projector to introduce the Gizmo and demonstrate its basic operations.

3. **Gizmo activities** **(10 – 15 minutes per activity)**
   Assign students to computers. Students can work individually or in small groups. Have them work through the Student Exploration with the help of the Gizmo. Walk around to

check student progress and answer questions as students work. Alternatively, you can use a projector and do the Exploration as a teacher-led activity.

4. **Discussion questions** **(5 – 15 minutes)**
   As students are working or just after they are done, discuss the following questions:
   - How is plant reproduction similar to animal reproduction? How are they different?
   - What part do insects play in pollination?
   - The stigma is sticky on top. How does that help in pollination?
   - How does a fruit help to spread seeds around?
   - In what ways do flowers' structures help with pollination and spreading seeds?

5. **Follow-up activity: Observe reproduction in real plants!** **(8 – 10 weeks)**
   Students can grow flowering plants and observe the emergence of flowers and the transition from flower to fruit. Many varieties of peppers lend themselves well to being grown in pots and produce distinctive flowers and fruits. Check with a local gardening center for information regarding what varieties would be appropriate for your area.

Scientific Background

One of the largest and most successful groups of plants is the angiosperms, or flowering plants. (For purposes of contrast, examples of plants that do NOT fall into this group include conifers, mosses, ferns, and lichens.) Like animals, flowering plants reproduce sexually by producing sperm and egg cells. The male structures of the plant are collectively called the stamen and the female structures the pistil. Depending on the species of plant, flowers may include only male structures, only female structures, or both. The flowers shown in the examples in the pollination Gizmo contain both the male and female structures in a single flower.

The vast majority of flowering plants cross-pollinate, usually relying upon an animal pollinator to deliver pollen between plants. Many of these pollinators are insects, like butterflies and bees, but birds, bats, and even lizards can fill the role. The benefit for the pollinator is often a meal in the form of nutritious nectar contained deep within the flower. The insect first gets dusted with pollen while diving for the nectar on one plant, then deposits the pollen on the sticky stigma of a second plant while looking for a meal there.

Plants have evolved a variety of adaptations to attract pollinators. While the patterns on a flower's petals can invoke the perception of beauty in human observers, to an insect those patterns often map the route leading to a good meal. Insects are far more perceptive of UV (ultraviolet) light than humans are, and the appearance of a flower can be quite different when photographed using UV technologies. A flower's distinctive scent might also help to attract potential pollinators.

Historical Connection

Gregor Mendel is famed as the founder of modern genetics. His work was built upon a series of experiments involving cross-pollination in pea plants. To carry out his experiments, Mendel had to control each cross.

Mendel carefully snipped the anthers from each female parent, and used a tiny paintbrush to collect pollen from the male parents to transfer to the female parents. In doing so, Mendel was essentially playing the role of an insect in the pollination process. To prevent contamination of his crosses, Mendel wrapped each flower in a small sack.

Environmental Connection

The United States is currently experiencing an alarming decline in both its wild and its commercial honey bee population. This is a serious problem because honey bees are responsible for pollinating up to 30% of the nation's food supply. Crops that depend on the honey bees include apples, peaches, soy beans, carrots, broccoli, almonds, and many others. California almond growers, responsible for 80% of the world's almond supply, have taken to trucking bees in from other areas.

There appear to be several reasons for the decline in honey bee populations—among them a parasitic mite and the use of pesticides on crops. Unfortunately, the same pesticides that can reduce the damage caused to plants by insects can also impact insects that are critical for the plants' pollination.

Selected Web Resources

Interactive site on all aspects of plant life: http://www.urbanext.uiuc.edu/gpe/index.html
Flower dissection lab: http://www.middleschoolscience.com/flower.pdf
Gardening with kids: http://www.kidsgardening.com/
Growing peppers: http://www.flower-and-garden-tips.com/growingpeppers.html
Plant biology: http://www.mbgnet.net/bioplants/main.html
Animals as pollinators:
http://www.smithsonianeducation.org/educators/lesson_plans/partners_in_pollination/index.html
Plant photos in visible and UV light: http://www.naturfotograf.com/UV_flowers_list.html
Comprehensive site on Gregor Mendel: http://www.mendelweb.org/
Bee population decline: http://www.npr.org/templates/story/story.php?storyId=6299480