

INSECT EXPERIMENTS FOR THE CLASSROOM
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***POLLINATION OF
FLOWERS BY MOTHS***

BACKGROUND:

Insects, and some other animals, regularly visit flowers for the sugary nectar and protein-rich pollen they produce. During these visits, a vital service is performed for the plant as the visitors transfer pollen from the male part of the flower (anthers) to the female part of the flower (stigma). This act of pollination is the first step in fruit and seed production.

Many insects, birds, and bats act as pollinators. Both the plants and their animal pollinators have developed unique relationships and structures that allow them to successfully interact. For example, the long tongue (proboscis) of moths and butterflies allows them to reach nectar produced deep inside of flowers. In many cases both the animal and the plant benefits from this interaction as the animal obtains food and the plant is pollinated. However, some animals may steal nectar or pollen without pollinating the plant, and some plants can trap and kill pollinators.

Without the services of pollinators, the plants that animals depend on for food, shelter, or nest sites would not exist. Humans also are dependent on insect-pollinated plants for foods, medicines and clothing. Worldwide three-fourths of all food and feed crops require pollinators to reproduce. We can even thank a species of fly for pollinating the cocoa plant that we use to make chocolate!

Successful pollination depends on pollinators finding the right flowers at the right time. Pollinators locate appropriate flowers by visual and chemical cues. Since the structure of the mouthparts of pollinators differ greatly as do flower structures, the pollinator also has to locate the right type of flower.

Objective

In this activity, students will become hawkmoths and attempt to collect nectar and pollen from flowers while avoiding becoming prey to the predators lurking in the garden. They will investigate the proboscis of the moth as an adaptation allowing it to feed and survive. They also will investigate ways living things interact with each other in the nocturnal garden.

SC Science Standards covered in this activity

Grade 1 - II. A.2

Grade 2 - II. A.2 II. C.1

Grade 3 - II. A.1,2 II. C.1

Grade 4 - II. A.1,2

Grade 5 - II. B.1,2,3

Grade 6 - II. C.1

Materials

Non-noise-making party blowers to make the proboscis of the hawkmoth - 1 per student

Double-sided sticky tape to attach to the tip of the blower

8 oz. White plastic drinking cup - 15 per class

White poster paper - 1 sheet

Small (1/4 inch) yellow pom-poms - 10 per cup for hawkmoth feeding

If you also want to look at pollination of the flowers you will need about 20 pompoms of another color.

Small sticky notepad

String

Glue gun

Hole punch

Procedure

In this activity, students will become hawkmoths and attempt to collect pollen from the moonflower. While feeding, they also must avoid being eaten by the bats and other predators in the garden.

- Construct moonflowers before doing the activity. Use the white cups for the moonflower. Use a hole punch to punch 2 holes in the side of the cup so that you can put a string through the holes and hang the flower from a string tied across the classroom between 2 chairs. Cut flower shapes from white poster paper, and cut a hole the size of the top of the cup in the center of the flower. Place a bead of hot glue around the entire cup just under the lip of the opening and quickly insert cup into the flower opening. You can add heart-shaped dark green leaves to make it look more like a moonflower vine. Put 10 pom-poms in each cup (the pollen). If you want to include flower pollination, add 4 pom-poms of another color to 5 of the cups.
- Cut strips of sticky tape large enough to cover ½ to 1 inch of both surfaces of the party blower tips. This will allow them to pick up pollen using their proboscis.
- Assign 4 students as predators, 2 should be bats while the other 2 can select the type of predator they would like to be. While the hawkmoths are feeding the bats should fly around in the vine, quietly clicking their tongues to simulate a bat's echolocation sounds. The bats must move slowly using a heel-to-toe step. When a hawkmoth hears a bat approaching it can avoid being eaten by sitting down until the bat passes. If a bat tags a standing hawkmoth, it is eaten. When this happened the bat should put a sticky note on the hawkmoth and the moth must leave the garden

area. The other predators are ambush predators and should choose a location to sit near the vines. These predators can not move, but if a feeding hawkmoth comes too close they tag them and they are also out of the activity.

- All other students in the class are hawkmoths who will feed on the moonflowers. The moths will try to obtain nectar (yellow pom-poms) found in the flowers. While getting nectar, they also collect pollen (other color pom-poms) that is transferred to flowers that only have yellow pom-poms. The moths eat some of the pollen but help the moonflowers by pollinating some of them. Students acting as moths can not use their hands to steady the moonflowers. They have to use the party blowers as their proboscis and blow it to straighten it out, insert it into a flower and collect some pollen. The pollen will stick to the tape. If they get the other color pom-pom on their proboscis and go to a flower that only has yellow, they should pick the pom-pom off of the proboscis and drop it into the flower. If a proboscis is broken it should not be replaced, and that moth has been injured and dies.
- Allow the students to feed for about 2 minutes and then have them sit down on the floor. They should then count the number of pollen grains each collected. They must have collected at least 5 pollen grains to have obtained enough food to survive
- Students experience competition for the food and the threat of a predator.

POLLINATION WEB SITES:

Further information on plants and insect pollinators can be found at the web sites listed below.

<http://www.isis.ut.edu/~fanjun/text/poll.html>

<http://koning.ecsu.edu./plants-Human/pollenadapt.html>

<http://bluehen.ags.udel.edu/decas/beekeeping/pollination.htm>

<http://desertmuseum.org>

For students aged 9 to 12 you may want to read the book *The Moonflower* by Peter & Jean Loewer (ISBN 156145138x).

The idea for this version of the pollination activity came from Pat Bobbit at Powdersville Elementary School and was based on a similar activity on pollination in *Lantana* developed by Marriah Schwallier.

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Pollination Activity [4]

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