

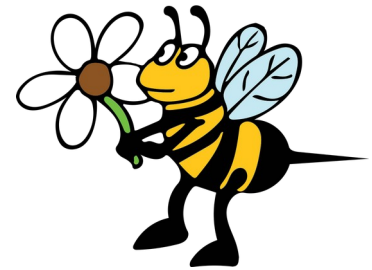
Bees – The Great Pollinators

OVERVIEW: Students play a game in which they pretend to be honey bees and flowers. In the process, they learn about plant pollination.

GRADES: 3-5

OBJECTIVES: The student will be able to:

- Define pollination and pollinators.
- Describe the important role of bees in pollination.



MATERIALS: (for a class of 25)

mini (5mm) orange pompoms (about 100)	16 large (1") yellow pompoms
16 small paper or plastic cups	Yarn
16 drinking straws	16 jewelry or snack ziplock bags

Preparation: Punch a hole in each bag in the middle above the zip lock. Cut 16 pieces of yarn long enough for a necklace. Thread the yarn through the hole in the ziplock bag. Tie the ends of the yarn together to make a necklace.

Optional

32 black chenille stems	Construction paper, 25 pieces
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INTRODUCTION: Most plants need to be pollinated to produce seeds or fruits. Pollination happens when pollen grains in flowers are transferred from the stamen (male part) to the pistil (female part). Without pollination, plants will not produce fruit or seeds. Many plants are pollinated by insects such as bees, ants, flies, butterflies, and wasps. Bats and birds such as hummingbirds also can pollinate flowers. The insects and animals usually have wings and fly quickly from flower to flower. The pollen of one flower sticks to their hairs, feathers, or scales. Then when the insect or animal flies to another flower, the pollen falls off, causing pollination.

BACKGROUND INFORMATION: Honey bees are extremely important pollinators. They collect pollen and nectar from flowering trees and plants and transfer pollen from flower to flower. Bees pollinate 95 different crops, helping to create nearly one-third of the world's food supply.

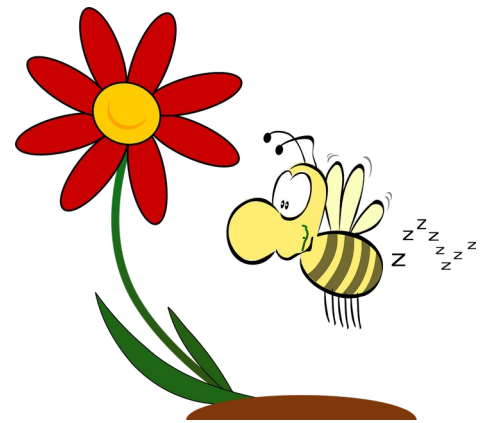
When bees visit flowers, they are mostly looking to collect nectar, not pollen. Nectar is a very sweet liquid made by flowers to attract pollinating insects. Flowers produce nectar in a part called the *nectary*, which is located inside and at the bottom of the petals. When gathering the nectar, pollinators brush against the stamen and the pistil, the parts of the flower that are used for reproduction. When pollen is transferred from the stamen to the pistil, fertilization takes place and the flower can make seeds.

Honey bees use the nectar they gather from flowers to make honey. Honey is made from nectar, not pollen. Honey is the only commercial food produced by insects that is normally eaten by humans.

Honey bees do collect some pollen, which they mix with nectar in the hive to make *bee bread*. Bee bread is fed to the hive's newborn larva to help them develop into bees. Pollen is also mixed into food called *royal jelly* that is fed to larva that will turn in to queen bees.

PROCEDURE: Ask students what they know about bees and why bees are important to people. Ask:

- Why do bees visit flowers? What do they get from a flower?
- What is nectar?
- What does a bee get on its legs and body hair when it flies into a flower to get its nectar?
- What happens to the pollen collected on a bee's body when it flies into another flower?
- What happens when a flower is pollinated?
- What would happen if the flower was not pollinated?



Tell students they are going to play a game to dramatize how flowers are pollinated. For a class of 25 students, choose 8 students to represent flowers, 16 students to represent worker bees, and 1 student to represent the queen bee. The numbers of flowers and worker bees may vary according to class sizes. Extra students can also represent the worker bees and drones that remain in the hive.

OPTIONAL: Students can create construction paper headbands to differentiate flowers, worker bees, and the queen bee. Draw and cut out flowers to glue onto the flower headbands. Create antennae using chenille stems to staple onto the worker bee headbands. Cut out a crown-shaped headband for the queen bee.

Choose a large area, preferably outdoors, to serve as the “garden” and a smaller area to the side of the garden to serve as the “beehive.”

Each flower will hold one container of mini pompoms to represent pollen and one small paper cup of water to represent nectar. The flowers will choose a location inside the garden in which to stand. Ask each flower to count and record the number of mini-pom poms before the game starts.

Each worker bee will carry one large yellow pompom to represent the bee's hairy body. Each worker bee will wear one small ziplock bag tied with yarn and worn as a necklace to represent the honey sac. (To make playing the game easier, the students should unzip the bag before the game starts.) The worker will carry one straw to represent the *proboscis*, the bee's long, narrow mouthpart.

The worker bees will begin at the beehive with the queen, drones, and other workers whose duties require them to work inside the hive. When the queen bee gives the command, the worker bees will leave the hive in search of nectar from flowers.

When worker bees find a flower, they will land their large yellow pompoms into the container of mini pompoms. The workers will then simulate gathering nectar with their proboscises by filling a straw with a little water, using their finger to create a vacuum. They will deposit this water into the ziplock bag. When the worker removes the large pompom from the container, the tiny pompoms will stick to the larger pompom much the same way pollen sticks to the hairs of a bee when it visits a flower.

After collecting nectar and pollen from one flower, the worker will find a new flower to visit. Here, the workers will brush off some of the pollen collected from the previous flower into the new flower's container. They will then collect more nectar and pollen before visiting another flower.

Once the worker bee has filled their honey sac with nectar, they will return to the hive with the sac and the pollen that remains stuck to their bee body

For the purpose of this simulation, the worker bee must collect nectar and pollen from each flower before visiting a flower a second time, and only two bees may visit the same flower at once. Trade roles and repeat the simulation so everyone has a turn to be a bee.

EVALUATION:

Ask students to draw a sequence story of the bee game, including how plants are pollinated.

Ask students to write a paragraph or essay describing why bees are important in the pollination process.

Ask students to research what conditions could impact pollination such as cold, drought, or rainy weather, or a disease in the hive.

EXTENSIONS: Read books about bees, such as:

The Beeman, by Laurie Krebs and Valeria Cis

The Honeybee Man, by Lela Nargi and Kyrsten Brooker

The Honeymakers, by Gail Gibbons

Give Bees A Chance, by Bethany Barton



New Jersey Learning Standards

Science: 3:LS1.B 4:LS1.A 5:LS1.C

English Language Arts: 3:W.3.2.A-D, W.3.4,8 4:W.4.2.A-E, W.4.4,8
5: W.5.2.A-E; W.5.4,8

Lesson courtesy of National Agriculture in the Classroom

The Buzz About Honey Bees

Honey bees live in large groups called colonies. There are three types, or castes, of honey bees: queen, worker, and drone.

The queen bee is a female that lays eggs. Each colony has only one queen bee. The queen can live up to four years and can lay over one million eggs in her lifetime. She can lay close to one egg per minute and between 1,000-2,000 eggs a day.

Worker bees are female bees who perform many of the jobs for the colony, including feeding the larvae, cleaning the hive, creating wax and using it to make new cells, grooming and feeding the queen, guarding and protecting the hive, and leaving the hive to collect pollen, nectar, and water. Worker bees live for about six weeks in the summer and longer in the winter months when they are less active.

Drones are male bees responsible only for mating with the queen. They do not work. There are about 100 drones in each colony. They live for about eight weeks in the summer and are then expelled from the colony and die in the fall.

Honey bees have four distinct life stages: egg, larva, pupa, and adult. Complete metamorphosis takes between 16 and 24 days. The queen bee lays each egg into a different cell of the honeycomb. It is her job to determine whether the egg will grow into a male or female bee. Fertilized eggs will become female workers and unfertilized eggs will become male drones.

After three days, the egg hatches and a worm-like creature, called *larva* emerges. Worker bees feed the larva *bee bread* - a milky, yellow syrup secreted from a gland in the worker bee's head. As it grows, the larva sheds its skin four or five times. On about day nine, the larva spins itself a cocoon. A worker bee seals the cocoon into the cell with wax.

Inside the cocoon, the larva transforms into a *pupa* - developing eyes, legs, and wings. When the bee is fully grown, it chews its way out of the cell and emerges as an *adult* bee.

