

Theme: Pollination

Big Ideas:

- A Pollination is a process in the plant life cycle. It takes place in flowers and is needed for many plants to produce new seeds and fruit.**
- B Many living things have food supplies that depend on pollination, including humans. If there was no pollination, there would be no fruit.**
- C Pollination involves the interdependent relationships of plants and animals. Animals that help to transport pollen are called pollinators.**

Expanded Content:

D Mechanics of Pollination

1. Pollination is the process by which pollen is transferred within or between flowers. This process fertilizes seeds and is the first step in plants producing fruit. (This adaptation has allowed plants to increase genetic diversity.)
2. The purpose of flowers is to produce seeds. Because flowers are designed to attract pollinators, they are often colorful and scented.
3. Pollen is produced within the male part of the flower. During pollination, this pollen is transferred to the female part of the flower. Sometimes these parts are on the same flower (a perfect flower) and sometimes they are located in different male and female flowers.
4. Once a flower is pollinated, a fruit begins to grow from the ovary, where the seed is fertilized. If a flower is not pollinated, no fruit is produced.
5. Every seed inside a pumpkin or watermelon requires its own grain of pollen. Some fruits may be partially pollinated (think of a strawberry that is partially shriveled on one side).
6. Nectar is not directly part of the fertilization process; it is produced by flowers to lure pollinators.

E. Honeybees as pollinators

1. Honeybees are critical pollinators in modern agriculture. One out of every three bites of food we eat has been pollinated by a honey bee. (McGregor, 1976)
2. Unlike other bees, honeybees choose a single crop and stick to it, ensuring that the pollen is spread among the flowers of the same plant (necessary for pollination, especially when many plants of the same species are grown together).

3. Bees transport pollen (their protein food) on their legs.
4. On large-scale farms, honeybees are trucked in at peak bloom. Our agricultural production depends on this system, but many bees are suffering from colony collapse. These bees have a weakened immune system due to their diet (corn syrup), exposure to pesticides, and exposure to disease.

F. The life of a honeybee

1. Honeybees get everything they need to live from flowers, consuming pollen (for protein) and nectar (for energy). They are often confused with yellow-jackets, which hunt other insects for food.
2. When a honeybee stings it dies because the stinger is barbed and therefore gets stuck and rips off the honeybee's body. Yellow jackets and other wasps have straight stingers that do not get stuck. This is why wasps can sting repeatedly.
3. The three members of the honeybee family are the queen (only one in a hive, mother of all the bees, can lay about 2,000 eggs a day) the drone (male bee, without a stinger, kicked out in the fall), and the worker bee (female bee who performs all the work inside the hive and collecting nectar and pollen).

G. Honey

1. Honey is concentrated nectar. It takes 12 honeybees their whole lives to make 1 teaspoon of honey.
2. Honey from different places and different tastes different because of differences in the flowers blooming when the nectar was collected.
3. During the spring and summer honeybees eat nectar for most of their food. The reason honey bees make honey is to have food for their sisters to eat in the winter.
4. Most insects, including native bees, have significant die-off in the cold season. Honeybees have adapted to survive in large numbers through the winter, largely because of this stored food.
5. Because honey allows this large family to survive through the winter, honeybees are available in large numbers in the spring when flowering trees like cherry trees (and other plants) require pollinators. Native bees take time to rebuild their population over the season.

H. Butterflies

1. Butterfly gardens are designed to attract and sustain butterflies by planting flowers and host plants.
2. Adult butterflies depend on the nectar in flowers for food. They drink this nectar through their proboscis (straw-like tongue).

3. Female butterflies will only lay eggs on particular plants, known as host plants. The leaves of these plants will be the food for their young caterpillars once they hatch.

I. Other types of pollination

1. Some plants (mostly grasses and some trees) are pollinated by wind. Almost all pollens that are allergens are from self-pollinating plants. These plants do not develop scented flowers or nectar because they do not need to attract pollinators. One example is corn.

2. Some legumes, such as peanuts, are self-pollinating.

J. Other pollinators

1. Insects: moths, beetles, flies

2. Vertebrates: birds (hummingbirds), bats, other small mammals and lizards in specific cases

3. Humans: when other effective pollinators are not present, humans can hand-pollinate some varieties of plants to ensure fertilization

Garden elements and activities:

Garden element or activity	Description	Age-level appropriate content suggestions			
		K-2	3-5	6-8	9-12
Pollination Intro	For younger kids: make flowers with arms, narrate "drama" of pollination.	A, D1-D2	A, D1-D2	A, D	A, D
Garden tour and harvest	Through a guided tour, students will discover a variety of fruits and vegetables. When possible, stop to taste samples. Harvest and taste a fruit, reinforcing that fruit are possible because of pollination. Ask students to raise their hands if they like various fruits. Explain that these fruits would not exist if there were no pollination.	B	B, D5	B, D5	B, D5
Crop Observation	Choose a specific crop to observe/imitate pollination process. For younger students, pollinate with	A	D, I, J	D, I, J	D, I, J

	finger on flowers (strawberry). Older students observe okra, tomatoes, peppers, or corn.				
Herb garden and sensory garden	Engage students by observing flowers and encouraging exploration using all of their senses. These gardens are ideal for observing butterflies, bees and hummingbirds at work.	C	C	C	C, D
Butterfly garden tour/observation	Take time to observe pollinators at work. If the right time of year, look for butterfly eggs on the underside of leaves. If young, flap your wings like butterflies through this garden, make a big tongue with arm and pretend to suck up nectar.	C, H	H, D2, D6	H, D2, D6	H, D2, D6
Bee hive observation	Sing the honeybee song to diffuse fear. Choose basic content to explain and answer questions based on interest. Observe the bees up close, especially looking for the pollen they carry home on their legs. Taste honey and clarify that honey is a product made from nectar. (Time permitting, set out bee insect case on table to observe bee bodies.)	C, F	C, E1-E3, F, G	E1-E3, F, G	E, F, G
Bee relay-race game	Break group into two groups and line up behind baskets. Reinforce pollination topics and demonstrate the relay race rules (no hands!).	A, B, C, E3	A, B, C, D1, D5, E3	D, E	N/A
Read a book	Options: The Reason for a Flower	Varies			

Materials List:

Pollination game

- 4 Harvest baskets with flowers taped to sides
- Yellow balls split between 2 baskets

Sensory garden, bees

- Sunflower seeds
- Bowl for cotton seeds
- Honey in easy-squeeze bottle

Harvesting

- Pre-set harvest baskets
- Compost bucket next to washing stations

In-garden tasting station

- Small table
- Knife
- Cutting board
- Bowl of water

Book

- Set out book in Butterfly Garden, picnic table or NEC