EXTENSION

EC3053

# Little Wings

## Pollinator Science Explorations

UNIVERSITY of NEBRASKA–LINCOLN

# Bee Bombs

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Conservation Biologist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Discuss the relationship between pollinating **insects** transferring pollen between flowering plants to produce seeds
- Explore ways to help **pollinators**, such as providing more flowers through seed bombs
- Construct a seed bomb
- Describe and predict plant development from seed germination

## Educational Standards Supported

(Nebraska Early Learning Guidelines)
- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

- Native wildflower seeds (pollinator attracting)
- Air dry clay
- Garden soil (or dirt from yard)
- Water
- Surface that you don't mind getting dirty
- Clothes that you don't mind getting dirty
- Large bowl

# Lesson

## Introduction

Bees are important creatures that pollinate many of the fruits, vegetables, and nuts that we eat. There are over 4,000 different species of bees in North America. While they are different sizes and colors, all bees have 4 wings to fly, chewing and lapping mouthparts to eat **pollen** (protein) and **nectar** (sugar), and big eyes to see flowers and other bees. Bees also go through complete **metamorphosis** with a lifecycle that begins with an **egg**, the **larva stage**, **pupa** s stage, and finally, development into the adult stage. Bees have evolved with plants to have special abilities to transport pollen from one flower to the next. This pollen contains part of the instructions for producing the next generation of plants (the seeds). Pollinated plants produce seed and the surrounding fruit. Some bees work together in colonies to forage for food and nectar while many other types of bees live as single bees or as small family units. Many types of bees are declining in population (becoming rarer). Planting blooming flowers provide more food for bees which helps many species of pollinating insects.

## Opening Questions

- *What kinds of animals are pollinators? Where do they get their food?*
- *Why do we need pollinators?*
- *How does pollination work?*

## Activity #1: Bee Bombs

1. Start by mixing approximately 5 parts clay to 2 parts dirt in a large bowl.
2. Add seeds and a small amount of water (around ¼ cup) and mix together with hands. Water can always be added later, so start with a small amount.

**Glossary words:**

**Egg –** an oval or round thing from which a snake, frog, insect, etc., is born

**Larva -** a very young form of an insect

**Insect -** a small animal that has six legs and a body formed of three parts and an exoskeleton

**Metamorphosis -** a major change in the form or structure of some animals or insects that happens as the animal or insect becomes an adult

**Nectar -** a sweet liquid produced by plants and used by bees in making honey; source of sugar

3. Keep mixing with hands and break up any clumps of clay or dirt. If the mixture is too wet, add dirt. If the mixture is too dry, add water. The mixture should be the consistency of cookie dough.

4. Grab small handfuls and roll into balls. Balls should be 1 ½ inch in diameter. ***Place bee bombs on wax paper to dry overnight***

Bee bombs can be thrown into wild areas and right of ways with permission from property owners. Alternatively, bee bombs can be planted no deeper than the top part of the bomb touching the surface of the ground.

If bee bombs are planted in the spring, expect the first flowers to grow within 4 weeks. If flowers are established well, other plants may grow in the following years. A good stand of flowers will produce between 2 and 6 plants per bomb yearly. Children can count the number of flowers that grow from the bee bombs over time and observe the number of bees, butterflies, or other insects visiting the flowers growing from these plants.

## *Activity #2: Ultimate Bee Bombs*

For a more advanced lesson, have students bury their bee bombs just below the soil surface and 3 feet apart in an undisturbed area. You may mark the location of burial with flags. Monitor this area at 4-week intervals for plant development. Determine which plant species are growing from the bee bombs. Record the number of flowering and developing plants for each bee bomb. Create a graph with the total number of plants at each point for the bee bombs. Bar charts are great for illustrating diversity of species for each collection point. You can also modify this lesson to include other variables including planting the seeds in different conditions such as various soil types, sun exposure, or the addition of fertilizer.

Once bee bomb plants flower, children can observe which insects visit the plants. Depending on which plants grow, children can expect to see bees, butterflies, flies, and flower wasps visiting these plants to feed on nectar and pollen. Record the insects that visit each flower. Chart the numbers and diversity of insect species for each flower. Which flower attracts the most pollinators? Which flowers have the most diverse group of insects visiting?

**Pollen -** the very fine usually yellow dust that is produced by a plant and that is carried to other plants of the same kind usually by wind or insects so that the plants can produce seeds; protein source; contains genetic code of plant

**Pollination -** to give (a plant) pollen from another plant of the same kind so that seeds will be produced

**Pollinator –** animals that help pollinate flowers and plants

**Pupa -** an insect that is in the stage of development between larva and adult

**Tip:** To keep track of where you planted the bee bombs, use small flags placed next to each bee bomb. Keep seed packets handy to look for growing flower species. A quick web-search will provide mature plant pictures of each species.

**Note:** Bees and other stinging insects feeding on flowers have no instinct to sting you. Insect stinging behavior only happens near bee or wasp nests. Some bees and wasps will sting in order to protect their "babies" and/or their food sources. Bees and wasps can also sting when touched. Observing insects on flowers presents a very low risk of negative interaction with bees and wasps.

## *Elaborate/Extend*

*Ask children to photograph or draw pictures of the insects visiting the flowers. Children can label the parts of the insects relative to the importance of its role in nectar and pollen collection (e.g. eyes for seeing flowers; wings for flight from flower to flower; hairy bodies to aid in pollen collection; pollen baskets on honey and bumble bees, etc.).*

## *Evaluate/Reflect*

- *Why do we need pollinators?*
- *What special body parts do pollinators have to help them collect nectar and pollen?*
- *Why do we need flowers?*
- *What is the connection between pollinators and flowers?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of youth participating in the lesson.

Connect

**County Fair Project:**
Document your project with photos or videos. Compile photos in book or scrapbook to take to your local county fair under wildlife or pollinators. Take an example Bee Bomb as a display.

**References/Resources:**

- www.fws.gov/pollinators
- Learner's Dictionary - http://learnersdictionary.com/
- https://www.npwrc.usgs.gov/pollinator/home
- Xerces Society - https://xerces.org/

**Suggested Children's Books:**

- Gibbons, Gail. (1997).*The Honey Makers.* Singapore: Tien Wah Press.
- Allen, J. (2000). *Are you a bee?* Boston, MA: Kingfisher.
- Barton, B. (2017). *Give bees a chance.* New York, NY: Viking.
- Milner, C. (2018). *The bee book*. New York, NY: DK Publishing.
- Slade, S. (2010). *What if there were no bees*. Mankato, MN: Picture Window Books.

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*Last Updated by authors on October 27, 2020*

# Bee Hotels

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Conservation Biologist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Discuss how pollinating insects transfer pollen between flowering plants to produce seeds
- Compare honey bees to solitary bees
- Explore ways to help pollinators (e.g. providing homes for solitary bees)
- Construct a bee hotel
- Describe and predict what kinds of bees will use the bee hotel

## Educational Standards Supported
### (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Bee Hotels

- Sticks
- Leaves
- Pinecones
- 16 or 20 oz plastic water or soda bottle (cut in half and cleaned) – enough for one half per child
- String or yarn

### Advanced Bee Hotels

- Drill
- Locally-sourced hollow plant stems 6 inches long (Activity 1).
- Locally sourced wood least 6 inches in depth (Activity 2)
- Blue acrylic paint
- Yellow acrylic paint

# Lesson

## Introduction

Bees are important insects that pollinate many of the fruits, vegetables, and nuts that we eat. There are over 4,000 different species of bees in North America. While honey bees are typically the most familiar types of bees, there are thousands of **native** and **non-native** solitary bee species that also pollinate plants. **Solitary** bees do not live in a hive, but instead make their nests in natural or **man-made** holes and **cavities**.

## Opening Questions

- *What kinds of animals are pollinators? Where do they live?*
- *Why do we need pollinators?*
- *What are the differences between solitary and honey bees?*

## Activity #1: Bee Hotels

1. Start by cutting plastic water or soda bottles in half. Each child should have their own half of a bottle.
2. Have sticks, leaves, pinecones, and other nature artifacts available for children to stuff neatly inside the bottle half. These materials will be used by bees and other beneficial insects for nest spaces and shelter during poor weather.
3. After the bottle half is full of tightly stuffed items, tie a piece of string or yarn around the middle of bottle in order to hang it from a tree outdoors at least three feet off the ground. The opening of the bottle where solitary bees nest should be facing East or South in order to receive some sun exposure. Bees will begin using man-made nests during the spring and early summer months. You will know

**Glossary words:**

**Cavities –** an empty space within a solid object

**Man-made –** created by people

**Native –** Species, including bees that have existed in an area for thousands of years.

**Non-native –** Species that have been introduced to a location purposefully or accidentally by human activity.

**Solitary –** Bees that do not live in colonies or share in raising developing bees.

when bees are using these nests when you see adult bees coming and going. You may also notice mud or plant material sealing stems. This indicates that adult bees have laid eggs in the stem. These bees will emerge approximately twelve months after they are sealed.

4. Replace materials after all developing bees have emerged from the sealed tubes. This will help prevent bee diseases from spreading. You can safely observe the bees that are using your bee hotel from a couple of feet away, as solitary bees do not defend their nests like colony nesting bees.

## *Activity #2: Advanced Bee Hotels*

For a more advanced lesson, fancy bee hotels can be made by drilling holes in locally-sourced wood or lumber. Holes should be drilled at least five inches deep into the wood to ensure bee eggs will be laid in the holes. Holes should be facing outwards so bees can enter them. Wood can be used inside of the soda bottle containers or alone if the hole entrances are protected from rain.

Try painting the area around the entrance to your bee hotel with bright yellow or “electric” blue acrylic paint. Some species of bees are attracted to yellow or blue. Leave some holes unpainted. During the next year, observe if bees nest more often in unpainted or painted nest cavities.

**Note:** Bees and other stinging insects feeding on flowers have no instinct to sting you while away from their nests. Insect stinging behavior typically happens near bee or wasp nests. Some bees and wasps will sting in order to protect their babies and/or their food sources inside their nests. Solitary bees do not

protect their nests, making them especially safe to observe around their nets. However, solitary bees may sting if handled.

## *Elaborate/Extend*

*Have children take photos or draw pictures of the insects visiting the hotels. Children can label the parts of the insects relative to the importance of its role in maintaining the pollinator home (e.g. Worker bee; queen, etc).*

## *Evaluate/Reflect*

- *Why do we need pollinators?*
- *Are solitary bees as important as honey bees?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of youth participating in the lesson.


**County Fair Project:**
Document your project with photos or videos. Compile photos in book or scrapbook to take to your local county fair under wildlife or pollinators. Take your Bee Hotel (if empty) to display at the fair. Check with your local Extension Office for details on how to exhibit.

**References/Resources:**

- www.fws.gov/pollinators
- Learner's Dictionary - http://learnersdictionary.com/
- https://www.npwrc.usgs.gov/pollinator/home
- Xerces Society - https://xerces.org/
- Creating a solitary bee hotel NebGuide

**Suggested Children's Books:**

- Allen, J. (2000). *Are you a bee?* Boston, MA: Kingfisher.
- Chrustowski, R. (2015). *Bee dance.* New York, NY: Henry & Holt Company, LLC.
- Milner, C. (2018). *The bee book.* New York, NY: DK Publishing.

- Teckentrup, B. (2010). *Bee: A peek-through picture book.* Mankato, MN: Doubleday Books for Young Readers.

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*Last Updated by authors on October 27, 2020*

# Butterflies & Moths

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Conservation Biologist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Observe butterflies and moths in their natural habitat
- Observe and describe the lifecycle of a butterfly or moth

## Educational Standards Supported
### (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Activity #1: Butterfly Life Cycle

- Caterpillars
- Butterfly cage
- Caterpillar food/diet
- Paper
- Pencils

### Activity #2: Pasta Lifecycle

- Popcorn seeds or rice
- Rotini pasta
- Shell pasta
- Bowtie pasta

- Paper towel rolls
- Construction paper
- Pipe cleaners
- Crayons/markers
- Glue
- Pictures of butterfly lifecycle stages

***Activity #3: Planting a Butterfly Garden***

- Flower seeds
- Seedlings
- Water
- Soil
- Space
- Data Sheet
- Garden tools

# Lesson

## *Introduction*

Butterflies and moths undergo a complete lifecycle – egg, **larva**, pupa, and adult stages. Their mothers lay eggs on the plant that they like to eat. They hatch on the plant and eat the leaves and/or stems of the plant. Most butterflies have 4 larval stages. In the first **stage** after they hatch from the egg, they are very small. They molt or shed their outside skin to advance to the next stage. In the fourth and last larval stage, they are at their largest size. They eat a lot in this stage. It is at the end of this stage that butterfly larvae wander and, depending on the type of butterfly, will form a **chrysalis** on the plant that they were eating or in the ground for protection. The chrysalis is a protective case in which the butterfly will spend time developing into an adult. You might think of the chrysalis stage (also known as the pupal stage) as a time where the butterfly is like a human teenager. After a period of time, an adult butterfly will emerge from the chrysalis. They will spend an hour or two fluffing up their body and wings to prepare to fly away. As an adult, a butterfly's mission is to fly,

**Glossary words:**

**Annual Plant –** plants that die off after one year of growth and need to be replanted each year

**Chrysalis –** a hard case that protects a moth or butterfly as they go from caterpillars to adults

eat, and mate. Female adults also look for the right plant to lay their eggs on to start the next generation of butterflies.

Butterfly larvae are picky eaters. They usually only eat a group of closely related plants. Some species, like the Monarch butterfly, only eat a few species of milkweed. Butterfly mothers need to find the right plant to lay their eggs on, so that when their larval babies hatch they have the correct food to eat.

Butterfly adults eat **nectar**. Nectar is found in the sweet, water-producing part of the plants known as nectaries. Nectaries are usually found in the middle of the flower to attract butterflies and other insects to the plant for pollination. Plants that attract butterflies usually have brightly colored flowers and make lots of nectar. The flowers are like a big sign (without words) that shows the butterflies where the good food is. To stay healthy, butterflies need a variety of nectar from different flowers. Planting a variety of flowers that bloom throughout the year helps butterflies and other pollinators stay healthy.

## *Opening Questions*

- *Why are pollinators important to us?*
- *Why is it important to plant a garden for pollinators?*

## *Activity #1: Butterfly Lifecycle*

1. Obtain butterfly caterpillars (Painted Lady caterpillars work well) from a science material distributor (i.e. Carolina Biological).
2. Follow directions to raise butterflies.
3. Observe and record changes as they occur (caterpillar growth, chrysalis development, etc.).

## *Activity #2: Pasta Lifecycle* *(adapted from Insect Life Cycle lesson by the UNL Entomology Department)*

1. Talk about the four stages of a butterfly/moth lifecycle including the egg, larva, pupa, and adult butterfly.
2. Section off the paper towel roll into 4 parts with marker or crayon.

**Germinate –** beginning to grow, when plants are started from seeds.

**Larva –** the young form of an insect, often a caterpillar

**Metamorphosis –** a major change in the structure of certain animals and insects as they become adults

**Nectar –** sugary water that plants make

**Perennial Plant –** plants that return each year and do not need replanting

**Stage –** a point in the development or growth of something

3. Glue popcorn seeds or rice onto one section and label as “eggs”.
4. Glue rotini pasta on next section and label as “caterpillar” or “larva.”
5. Glue shell pasta on next section and label as “pupa” or “chrysalis.”
6. Glue bowtie pasta on final section and label as “adult butterfly.”
7. Using construction or tissue paper, make wings to attach to paper towel roll (butterfly body). Use pipe cleaners for antennae.
8. Display your pasta life cycle.


## *Activity #3: Planting a Butterfly Garden*

Many butterfly and moth larvae eat plants. The larval stage is the part of the lifecycle (after being an egg) where butterflies and moths are wormlike. In this stage they eat only one type of plant. For example, monarch butterfly caterpillars eat only milkweed.

Plant a butterfly garden and observe the insect visitors on different plants. Plants can be planted into the ground as seeds or seedlings, or kept in small pots. Many butterfly food source plants have a butterfly symbol on the plant pot indicating their attractiveness to pollinators. Plant a variety of larval and adult food plants.

**Planting and Maintenance:**

1. After the last frost date, begin planting potted and seedling pollinator plants. Seeds can be planted in the fall and winter before you hope to see pollinators. Seeds can also be planted in the spring, but some plants may not come out the first year as many butterfly

plant seeds need to go through several freeze and thaw cycles to germinate. Seeded plants can be grown indoors in 12oz cup-sized soil containers. After the seeds sprout, the plants will need a good source of light for 12 hours daily for the seedlings to be healthy. Seeded plant containers need drainage, but also need the soil to remain moist.

2. After planting outside, seedlings and potted plants should be mulched with wood mulch. Mulch will help the plants retain water and keep out weeds.
3. Weeds will need to be pulled on a weekly basis to keep the butterfly garden clean.
4. Plants will need to be watered frequently in warm weather the first year.
5. Plant two to three times as many perennial plant seedlings as you will eventually want in your garden space. You will have some plants that naturally don't survive the first season or two. Annual plants will need to be replanted each year. Most of these plants are sold as seed.

**Planting an Herb Garden:**

You can provide food for some butterflies and moths in your garden, landscape, or in pots.

Plant an herb garden that attracts adult butterflies to lay eggs.

Herbs are plants that add flavor to your food. Many herbs are also food for larval butterflies.

1. Prepare your garden space by adding potting soil or preparing 8 inches of soil by working it up with a rake. This space can be very small from 2' x 2' or much larger. Potted plants should be at least 8 inches deep and wide. The larger the pot, the easier it will be to maintain moisture levels in the soil.
2. Select a variety of common herbs to plant. Plant dill, fennel, parsley, and anise to attract black swallowtail butterflies and plant mints to attract gray hairstreak butterflies. These herbs should be planted in the spring a week or so before the frost-free date. Herb seeds can be started indoors and placed outside after **germination**, after the frost-free date.
3. Once the plant has sprouted, continue to water soil lightly throughout the next few weeks. Swallowtail and hairstreaks should begin laying their eggs in early summer. Eggs and the first two larval stages of butterflies are very small. Look for missing leaves on your herbs for signs of early feeding. As the larvae get bigger, you should see large and wormlike green, yellow, and black swallowtail larvae feeding on eating their host plants. Gray hairstreak larvae are more oval in shape and green or dull brown in color. .
4. Have students record their observations when they see any adult butterflies near the herbs (they might be laying eggs), when they notice feeding, and when they see any eggs or larvae.
   - Write down on a notebook page what is observed.
   - Record the day of the week and the date.
   - Record the weather: sunny, cloudy, rainy, or windy.
   - Draw a picture of what is noticed during observation.

5. Have students record their observations once a week as throughout the spring and summer months.

6. Encourage students to share their results with classmates.

**Observing Butterfly Visitors:**

1. Allow students to spend 15 minutes weekly visiting the butterfly garden to observe the visitors to plants.

2. Check leaves on plants for butterflies or moths feeding on the plants. They often resemble worms.

3. Observe the flowers for the number of adult butterflies and their types (species).

4. Have students record their observations on the data sheet.

**Tips on Designing Garden Spaces:**

- Don't go too big. For example, a 4' x 10' space doesn't look big, but maintaining such a space is a lot of work. We suggest a space of 4' x 6' as a good starting point.
- Divide your space into larval habitat and adult butterfly habitat.
- Many herb plants are larval pollinator plants. Many herbs are also **annuals**. These larval habitat sections can be reseeded each year and look better as a wild space. Adult butterfly food plants are often larger **perennial** plants.
- Allow space to walk between your plants for students to move between plants and observe butterflies visiting their plants.
- Plan ahead. Perennial pollinator plants take 2-3 years to reach their full size and beauty. You may not see a lot of blooming flowers your first year after planting your pollinator garden.

## *Elaborate/Extend*

*Parent Activity: iNaturalist Butterfly Scavenger Hunt*

## *Evaluate/Reflect*

- *Why do we need pollinators?*
- *Why is pollination important to us?*
- *What kinds of things do you want to do in your garden or with the flowers you planted?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of children participating in the lesson.


**County Fair Project:**
Document your project/activity with photos or videos. Compile photos in a book or scrapbook to take to your local county fair under wildlife or pollinators. Check with your local Extension Office for details on how to exhibit.

**References/Resources:**

- www.fws.gov/pollinators
- Learner's Dictionary - http://learnersdictionary.com/
- https://www.npwrc.usgs.gov/pollinator/home
- Xerces Society - https://xerces.org/
- https://entomology.unl.edu/scilit/Insect%20Life%20Cycle1.pdf

**Suggested Children's Books:**

- Allen, J. (2003). *Are you a butterfly?* Boston, MA: Kingfisher.
- Davidson, L. (2019). *The backyard bug book for kids: Storybook, insect facts, and activities.* Emeryville, CA: Rockridge Press.
- Milner, C. (2018). *The bee book.* New York, NY: DK Publishing.
- Slade, S. (2010). *What if there were no bees.* Mankato, MN: Picture Window Books.

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*Last Updated by authors on October 27, 2020*

# Design a Pollinator

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Biologist
- Engineer

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Explain pollinators' basic body structures and how the structure aids in feeding on flowers and collecting and transferring pollen
- Design and construct a pollinator to practice pollination

## Educational Standards Supported (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Build Your Own Bug

- Nature artifacts (e.g. leaves, pinecones, rocks, etc.)
- Recyclable materials (e.g. paper towel/toilet paper rolls, cardboard)
- Construction paper/white paper
- Craft supplies (e.g. pipe cleaners, clay, paint, etc.)
- Books with pictures of a variety of pollinators

# Lesson

## Introduction

Pollinators impact us every day. One third of the food we eat is a product of insect-pollination, and bees are the most significant pollinators. Many of the fruits, vegetables, and nuts that we eat are only possible as a result of bee pollination. Indirectly, bee pollination also affects many other foods. Bee-pollinated alfalfa plants fuel the alfalfa-fed livestock industry that provide us with meat and dairy products. In addition to our food supply, bees pollinate flowering plants that beautify our landscape and provide food and shelter for wildlife. Without pollination, many flowering plants and the animals that depend on them, would perish.

**Pollen** is a powdery substance that is composed of many individual grains. Pollen is the male **gamete** (male genetic information) of plants. Pollen can be carried by an insect or through the air to another flower with female parts, pollinating plants. Some plants self-pollinate too. The product of pollination is the production of seed to produce new plants and the fruit or vegetable surrounding the seed. Some plants use flowers to "advertise" to pollinators with color, aroma, and ultra-violet nectar guides and by offering **protein** (pollen) and **carbohydrate** (nectar). In turn, pollinators, like bees accidentally pick up pollen on their body, and incidentally transfer pollen to another flower when looking for more nectar. Pollination can only occur between plants of the same species.

## Opening Questions

- *How do bees pollinate flowers and plants?*
- *What would happen without pollination?*

## Activity #1: Build Your Own Bug

1. Give children time to view and research a variety of insects using books, magazines, and technology.
2. Have children draw out a plan of their designed bug before building.
3. Provide a variety of materials (see materials list) for children to explore and use to create their bugs

**Glossary words:**

**Carbohydrate –** substance in food that provide living things with heat and energy

**Gamete –** cells that join together to begin making a creature

**Pollen –** the very fine, usually yellow dust, produced by a plant and that is carried to other plants of the same kind usually by wind or insects so that the plants can produce seeds

**Protein –** substance found in food that is an important part of many animals' diet

4. Have each child build an insect that has the best parts and structures for navigating to flowers, picking up pollen, and carrying it to other flowers.

## *Tips*

- *Discuss with students that all insects have 6 legs, 3 body segments (a head, thorax, and abdomen), and an exoskeleton. Require that their bug designs have these characteristics.*

## *Activity #2: Pollination Contest*

1. Make a male flower (anther) with a pipe cleaner.
2. Make a female flower (stamen) with a pipe cleaner.
3. Cover each part of the "flower" with "pollen" using Cheeto cheese dust or powdered cheese dust from a macaroni and cheese box.
4. Using their bugs, have children move pollen back and forth (at least three visits) between the male and female flower. If their bug has wings, they may "fly" or walk to each flower. If their bug does not have wings, they should crawl to each flower.
5. Ask children to reflect on why the winning bug was able to transfer the most pollen.

## *Elaborate/Extend*

*After discussion of which aspects of the designs are best at transferring pollen. Students can modify their bugs with the goal of increasing pollen collection and transfer.*

## Evaluate/Reflect

- *Which bug transferred the most pollen?*
- *What things make one pollinator transfer more pollen than another?*

**We want to hear from you!**

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**County Fair Project:**
Document your project/activity with photos or videos. Compile photos in a book or scrapbook to take to your local county fair under wildlife or pollinators. Check with your local Extension Office for details on how to exhibit your project.

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- https://www.npwrc.usgs.gov/pollinator/home
- Xerces Society - https://xerces.org/
- Creating a solitary bee hotel NebGuide

**Suggested Children's Books:**

- Allen, J. (2000). *Are you a bee?* Boston, MA: Kingfisher.
- Barton, B. (2017). *Give bees a chance.* New York, NY: Viking.
- Smith van Frankenhuyzen, R. (2020). *H is for honey bee: A beekeeping alphabet.* Ann Arbor, MI: Sleeping Bear Press.
- Socha, P. (2017). *Bees: A honeyed history. Minneapolis, MN: Adams Publishing.*

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*Last Updated by authors on October 27, 2020*

# Other Pollinators

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Biologist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can also be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Identify a variety of pollinators
- Describe the relationship between bees and other pollinators

## Educational Standards Supported (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Tongues

- Markers/crayons
- Construction paper
- Pipe cleaners
- Feathers
- Sequins
- Glue
- Scissors
- Additional art supplies as needed

### Mimicry

- Mimicry PowerPoint

- Optional: Smart phone or tablet
- iNaturalist app

***Bees & Look-Alikes***

- Data sheet
- Pencils/crayons
- Clipboards
- Outdoor space for observation

# Lesson

## *Introduction*

Along with a variety of insects, many other animals are considered pollinators. They help maintain a healthy population of plants for many different species. Sometimes, however, these other pollinators may be mistaken for other animals.

Many animals look similar in color, shape, size, and appearance. Animals with defensive traits, like stingers, fangs, and toxins often have bright color patterns (e.g. either yellow, red, orange, or black markings) on their hair, fur, or skin. These markings are warnings to other creatures that they may have a defense mechanism to protect themselves. Animals that live in the same area have similar defenses and often have similar color patterns. For example, in the Midwest, many **venomous** and **poisonous** animals have yellow and black color patterns on their skin or hair. This type of **mimicry** is called **Mullerian mimicry**. It is believed these patterns evolved similarly in different species because if predatory animals learn to recognize the color patterns of one animal, they will apply it to other **noxious** species with the same color pattern. Another type of mimicry is **Batesian mimicry** where non-noxious animals (without defense mechanisms) mimic the coloration of defensive animals. This type of mimicry protects animals that do not have a defense as predatory animals often avoid animals with striking color patterns. In the insect world, Batesian mimicry is common. For example, most people and animals learn from a young age that brightly colored yellow and black bees can sting. Many flies that do not have stingers mimic

**Glossary words:**

**Batesian Mimicry -** non-harmful animals using mimicry

**Exoskeleton –** hard, outer covering of some types of animals

**Mimicry -** copying the behavior or physical appearance of something else, usually for protection in the natural world

**Mullerian Mimicry -** harmful animals using mimicry

**Noxious -** harmful

**Poisonous –** harmful substance that is

bees in color and shape with yellow and black hairs and **exoskeletons**. Identifying which insects have a defensive trait (like bees) from those that do not (like flies) can be hard as they often look very similar.

Note: It is important to understand that mimicry is an evolved feature over thousands of generations of offspring. Predators learn (often through being stung or poisoned) that animals with these patterns are dangerous.

## *Opening Questions*

- *Why do you think we need other animals besides bees to pollinate plants?*
- *Why do other insects mimic bees?*

## *Activity #1: Pollinator Tongues*

1. Read a book about animal tongues, such as *Animal Tongues* by Dawn Cusick, *What If You Had an Animal Tongue* by Sandra Markle, or *Terrific Tongues* by Maria Gianferrari.
2. Discuss what animals in each book might be a pollinator (e.g. bats, birds, insects, etc).
3. Choose an animal tongue that you would like to have.
4. Using your materials, construct a model or picture of yourself with the animal tongue of your choice.
5. Bring children together to talk about why they chose each tongue.
6. Older children may write an explanation about why they chose each tongue and what animal it came from. They may do additional research on their animal of choice to extend the learning.

## *Activity #2: Mimicry – Bees & Flies*

There are many insects that look similar. There are some insects that have evolved to look like other insects. Sometimes these insects look like insects that have defensive behaviors like bees and wasps.

ingested or that comes into contact with skin

**Venomous –** harmful substance injected through fangs, stingers

Many flies, beetles, and moths look similar to bees. This exercise covers how to identify bees and tell them apart from other, similar insects.

1. Go through the PowerPoint file (Mimicry_Bees_Flies) with children. Advance through the slides and discuss the different characteristics of bees and mimics. The examples show a variety of mimics. Test your knowledge at the end of the PowerPoint.
2. Go outside and look at insects on flowers. See if you can identify bees from other look-alikes.
3. Advanced Option: Using a smart phone, download the iNaturalist app. You can take photos of insects and upload them to iNaturalist. Experts and naturalists from around the world can help you identify the insects that you see.
4. Discuss the types of insects that you see and how they are similar or different than bees. Discuss with students how they might know an insect is a bee or look-alike insect.

## *Activity #3: Bees & Look-alikes*

In this activity, children will observe insects on flowers and determine if they are bees, non-bee look-alikes, or something else.

1. Print one Bees and Look-Alikes Data sheet for each child.
2. Observe blooming flowers to observe the insects that frequently visit.
    a. Give each student a linear section of flowers to observe (ex. 3 feet section of flowers).
    b. Set a length of time for students to observe flowers (we suggest a minute per age of child)*.
3. Using the data sheet, students will color in a square for each insect of that type that they observe on flowers. Older children may also take notes on which colors of flowers they see either bees or look-alikes visiting flowers.
4. When the observation period ends, return to the classroom and share results. Data sheets can be turned to portrait view (to look like a bar graph) and placed on a white board for comparison and discussion of results.

Guiding Questions:

1. What insects appear to be the most abundant in your observations?
2. Can you see any patterns in the insects by flower color or shape?
3. Why were there differences in what some people observed?
4. How could you change the way that you observe insects to make this activity better?
    a. How would this change the insects that you observe?
    b. How would this change your data collection?

*Note: To increase the data set, observe the same set of flowers across different days, using a new data sheet for each day. Alternatively, make multiple observations of the same flowers over one day. Many flowers only produce nectar for a short window daily. Based on the abundance of bees on flowers, students can figure out when the nectar producing time of each flower type is.

## Elaborate/Extend

*Parent Activity: Use your own backyard to observe insects and pollinators. What kinds of species do you see?*

## Evaluate/Reflect

- *Why do we need pollinators?*
- *Why is pollination important to us?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of children participating in the lesson.


**County Fair Project:**
Document your project/activity with photos or videos. Compile photos in book or scrapbook to take to your local county fair under wildlife or pollinators. Check with your local Extension Office for details on how to exhibit.

**References/Resources:**

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- https://www.npwrc.usgs.gov/pollinator/home
- Xerces Society - https://xerces.org/

**Suggested Children's Books:**

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- Cannon, J. (1993). *Stellaluna.* New York, NY: Harcourt, Inc.
- Markle, S. (2020). *What if you had an animal tongue?* New York, NY: Scholastic Press.
- Slade, S. (2010). *What if there were no bees.* Mankato, MN: Picture Window Books.

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*Last Updated by authors on October 27, 2020*

# Pollination Invitations

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Pollination Biologist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can also be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Discuss the basic structures of pollinators that aid in them feeding on flowers and collecting and transferring pollen.

## Educational Standards Supported (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Cheese Puff Experiment

- Large container (deep enough for children to put their whole hand in) such as large cheese puff plastic container
- Cheese puff snack crackers
- Starburst candy (8-10 still in wrapper)
- White paper towels (cut in the shape of a flower – 1 for each child)

### Scent Activity

- Index cards or sticky notes (1 for each child)
- Essential oils, food flavorings (e.g. peppermint, vanilla, etc.)
- Paper (one piece per scent)
- Ziploc bags (same number as pieces of paper)

- Rubber or latex gloves

### *Taste Activity*

- Cotton swabs
- Salt
- Sugar
- Water
- Red plastic cups
- Trash can

# Lesson

## *Introduction*

Bees are important creatures that pollinate many of the fruits, vegetables, and nuts that we eat. Pollination is the transfer of pollen from the **anther** (male part of the flower) to the **stigma** (female part of the flower) to produce seed and any fruit that may surround the seed. Many plants must have pollinators aid in pollination in order to produce fruits, vegetables, nuts, and seeds while many other plants produce more or better quality seed and fruit as a result of pollination. While honey bees are typically thought of as the primary insect pollinator of plants in the United States, there are thousands of native and non-native solitary bee species that also help pollinate plants around us. Other insects, like some species of flies, beetles, wasps, butterflies, and moths, are also important pollinators. In some areas, bats, birds, and other small mammals pollinate plants.

Insect pollinators like bees have important structures that help them feed on and collect nectar and pollen. Bees have specialized tongues for lapping plant nectar and chewing jaws for manipulating and eating plant pollen. Bees also have branched hairs that aid in collecting as the sticky pollen becomes caught in the many branches of their hairs. Similarly, butterflies and moths are able to effectively drink nectar by having long, tube-like mouthparts called a **proboscis that enables them to reach pollen deep into flowers**. Most pollinating insects have wings that allow them to efficiently and quickly fly from flower bloom to bloom in order to feed on nectar and pollen. Plants have evolved to provide just a taste of nectar at any one time so that pollinators

**Glossary words:**

**Anther –** male part of the flower

**Stigma –** female part of the flower

**Proboscis –** tube-like mouthparts similar to a tongue

do not become full during one flower visit. Giving just a taste requires that pollinators go to the next plant, and as a result, spread pollen from flower to flower. Pollinators do not know that they are pollinating plants. Pollination is the unintentional result of pollinators moving from flower to flower transferring sticky pollen from the anthers of one flower to the stigma of other flowers.

Bees feed on both nectar (carbohydrate) and pollen (protein). They intentionally collect nectar to feed adult bees, while collecting pollen to feed growing bee larvae.

## *Opening Questions*

- *Do you think bees talk to each other? If so, how?*
- *Do bees need to smell? Why do they need to smell? Do bees have noses? If not, how do they smell?*
- *What do bees eat?*
- *Why do some plants produce fruit, vegetables, and seed?*

## *Activity #1: Cheese Puff Experiment*

1. Place Starburst candies at the bottom of a large container. The Starbursts represent the nectar found in flowers.
2. Fill container with Cheetos, cheese puffs, or other snack crackers covered in cheese dust. The cheese dust represents the pollen.
3. Allow each child to reach into the container to grab a Starburst.
4. Once they remove their hands, have them “pollinate” their paper towel flower by wiping their hands on it.

## *Activity #2: Scent Activity*

1. Distribute index cards (or sticky notes) to each child.
2. Gather unique scents (e.g. food flavoring (non-food allergens), perfume, essential oils) equaling a quarter of the number of children in the class or group.
3. Place a drop of each scent on four pieces of paper. Place scented paper in sealed Ziploc bags until use (one scent in each bag).
4. Divide students into two groups. One group will represent bee pollinators. The second group will represent flowers.
5. Using gloves to prevent contamination of scents, give two children in each flower and bee group one scented piece of paper from the bag. Only give children one piece of paper. Each group should have two children (two bees and two flowers) that have a matching scented paper. Additionally, one member of the matching flower scents will be given two pieces of paper with matching codes to represent the pollen unique for that plant species.
6. The two groups should be separated and placed on opposite sides of the room. Members of the flower group should be spread apart.
7. Bees will be directed to smell their cards to memorize the scent, and be instructed to visit the flowers. When visiting the flowers, they will smell the flower's card. If they smell a different smell than what is on their card, the bees will move to the next flower repeating the process until they find the first flower that matches their scent. Once they find the scent they are looking for on the flower, they will take a pollen from that flower (if the flower has it). They will then search for the next flower that matches their scent. Once they find that flower, they will give their pollen piece to that flower. Once children find both flowers that they are looking for, they will return to their side of the room.

8. The movement is complete when all children find both flowers.

9. Flowers will be instructed to visually share their pollen pieces with the class. If it is done correctly, the correct pollen pieces will be shared with one or both flowers. It is likely that at least one pair of pieces will be mismatched with the incorrect flower. If this happens, like in nature, that flower will not produce fruit or seed (it will not be pollinated).

## *Activity #3: Taste*

Pollinators, like bees, are attracted to flowering plants to feed on nectar (sugar) and to collect pollen (protein) for eating and feeding immature insects. Honey bees send foragers out to scout for quality sources of pollen and nectar. These scout bees come back and give their sister foragers a taste of the nectar that they collect to share information about the quality of the nectar. Then, they communicate the direction of the flowering nectar source using a waggle dance. This figure-eight patterned dance communicates the flowers' approximate location in relation to the angle of the sun and the distance to that location. They do this all in the dark! In this activity students will take the role of forager bees being recruited by scout bees to the correct flower.

1. Prep before class: Collect 6 times the amount of cotton swabs as there are students in the class. Divide these into three groups. Dip 40% of the cotton swabs in a 1:9 salt to water solution. Dip another 40% in a 1:1 sugar water solution. The last 20% will be untreated.

2. Divide each of the treated cotton swabs (salt, sugar) into two halves and place these in "red style" plastic cups. You want the non-treated end to be standing up so students can grab it.

3. Place the untreated cotton swabs in another cup. There should be 3 cups, 1 containing only sugar (nectar) swabs, one containing water (neutral) swabs, and 1 containing salt (protein) swabs.

4. Create a flower station for each of the sugar (nectar), salt (protein), and water (neutral). Place the cups on the flower.

5. Divide the class up into 2 halves. Select one student from each group. This will be the scout bee.
6. Ask the class to turn their backs from the flowers so they cannot see them.
7. Send the scout bees to select one “flower” in which to select and taste the swab from. The scout bees are to keep the taste and the location of the stick they chose a secret (ask students to not react to the taste of the swab).
8. The scout bees then return to their group. Once at their group, they must use a dance to show the other bees in their group where the location of the flower is without pointing or using their voice (similar to charades). They can also use facial expressions to demonstrate the taste of the swab (i.e. salty, sweet, or neutral.).
9. After the charades dance, small groups of bees from each group can go and search for the correct flower by going to the cup and selecting one swab to taste.

Teacher Tips and Helpful Hints:

- Teacher should keep track of the original flower selected by scout bees to determine how many bees from each group went to the correct flower.
- The lesson should be completed with a discussion about what went well in regards to expressing where to find the flowers and the taste of each swab. Discuss how bees might use their dances to send other bees to chosen flowers.
- Have a trash can near the flowers for used swabs.
- You can do multiple rounds of scout bees (prepare more swabs to accommodate this).
- This activity can also be done outdoors.

## *Elaborate/Extend*

*Try the cheese puff experiment using other types of food items (e.g. Doritos, goldfish, and sprinkles). Which types of food “pollinate” the best? You had the chance to practice*

*pollination and learning how bees pollinate plants. Why is it important for bees to pollinate? How do bees "talk" to each other?*

## *Evaluate/Reflect*

- *Why do we need pollinators?*
- *Why is pollination important to us?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of children participating in the lesson.

**County Fair Project:**
Document your project/activity with photos or videos. Compile photos in book or scrapbook to take to your local county fair under wildlife or pollinators. Check with your local Extension Office for details on how to your project.

**References/Resources:**

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**Suggested Children's Books:**

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- Milner, C. (2018). *The bee book.* New York, NY: DK Publishing.
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# Pollinators and People

## Pollinators

**Grade Level**
Preschool – 3rd Grade

**Lesson Length**
20 min. – 1 hour (depending on activity choice)

**STEM Careers**
- Entomologist
- Teacher
- Zoologist
- Horticulturalist

*This lesson is part of the Little Wings – Pollinator Science Explorations. These lessons can also be adapted for use with a variety of ages.*

## Learning Objectives

By the end of the lesson, students should be able to:
- Discuss the importance of pollinators and their effects on people
- Categorize food items based on whether or not they are pollinated by bees

## Educational Standards Supported (Nebraska Early Learning Guidelines)

- Child demonstrates a basic awareness and use of scientific concepts
- Child develops foundational skills in learning and understanding about the world through exploration and investigation

## Materials List

### Kids as Scientists

- "Kids as Scientists" Observation worksheet
- Tablet or smart phone
- iNaturalist app
- Markers/crayons

### Planting for Pollinators

- Seed packets
- Plastic cups
- Scissors
- Potting soil

- Water
- Crayons/markers/colored pencils
- Paper

***Flower Pollination***

- Tomato or squash seedlings
- Garden space or 5-gallon buckets
- Water
- Net-style bags
- String
- Markers/crayons/colored pencils
- Paper

# Lesson

## Introduction

Pollinators impact us every day. One third of the food we eat is derived from insect-pollinated plants with the most significant pollinators being bees. Many of the fruits, vegetables, and nuts that we eat are a result of bee pollination. **Commercially-reared** bumble bees are especially important for pollination of greenhouse grown tomatoes, sweet peppers, and strawberries. Indirectly, bee pollination also affects many other foods. Bee-pollinated alfalfa plants fuel the alfalfa-fed livestock industry that provides us with meat and dairy products. In addition to our food supply, bees pollinate flowering plants that beautify our landscape and provide food and shelter for wildlife.

Several bee species are considered **keystone species**, since they are the sole or primary pollinators for plant species on which other organisms depend. Without pollination, many flowering plants, and the animals that depend on them, would **perish**.

## Opening Questions

- *Why are pollinators important to us?*

## Activity #1: Kids as Scientists

**Glossary words:**

**Commercially–reared – bees raised for the purpose of research and/or sale**

**Keystone Species - a species on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would change drastically**

**Perish – die or be killed**

**Petiole – stalk that joins the leaf to the stem**

1. Find a place outdoors with a variety of plants and flowers.
2. Using the "Kids as Scientists" Observation worksheet, divide children into groups of 2 or 3. Allow children to observe plants and tally the different insects they find using different color markers/crayons for each insect.
3. Optional iNaturalist app: During outdoor observation, allow children to use tablet or iPhone to take pictures of insects found using the iNaturalist app. Post on the app for help identifying insects.

## *Activity #2: Planting for Pollinators*

1. Purchase small flowering plant seed packets from a local nursery or garden center. Try to acquire seed mixes native to your area – available at most lawn and garden centers.
2. Get medium-sized plastic cups and poke 2-3 small holes in the bottom of each cup for drainage.
3. Add 4 inches of potting soil in the cup. Pack the soil into the cup so that it is moderately tight.
4. Place 4-6 seeds in the cup. Cover the seeds with 1/8$^{th}$ inch of soil.
5. Put seed cups on a tray and water so that the soil stays moist.
6. Wait 2 weeks to a month for the seeds to sprout.
7. Place **seedlings** in a warm window space.
8. Have children draw seedlings as they develop.
9. Once the plants are 4-6 inches tall, prepare a place in your landscape where you can plant the seedlings.
10. Arrange the seedlings in an area where the plants are 6-8 inches apart.
11. Put mulch around the seedlings and carefully water and weed for the next month as plants establish.
12. Consider caging the plants with hardware cloth or putting a rabbit-proof fence around the plants to protect them from animal feeding.

**Seedlings – a young plant that is grown from a seed**

13. Watch the plant develop at least once every month.
14. Draw the plants and observe the different pollinators as they visit blooming plants. Record your observations through drawings.

**Questions to ask: How did the plants change as they grew? What things did we have to do to help the plants be healthy before and after planting? What animals visited the plants before and after they had flowers? What were they doing during these visits?**

## *Activity #3: Flower Pollination (Advanced)*

1. Purchase tomato or squash seedlings from your local nursery.
2. Plant your seedlings in a garden space or in large containers (5-gallon buckets with 2-3 drainage holes with soil ¾ the way to the top).
3. Water and weed as the plants grow.
4. Once buds form (and before they bloom), cover 4-6 buds on the plant with pollination exclusion bags. (This is to keep pollinators off the flowers in order to compare plants at the end of activity). Net-style bags can be made or purchased from many online retailers. Secure the end of the pollinator exclusion bag over the bloom and the **petiole**.
5. Identify 4-6 buds (pre-blooms) that you will not bag by loosely tying a string on the petiole near the bloom.
6. As the buds open, observe and record the bee visitors that visit the unbagged and bagged flowers.
7. Over the next month, observe the development of the fruit on the bagged and unbagged flowers.
8. Record your observations via notes and drawings.
9. Discuss the results.

**Questions to ask: What were some of the differences we saw in the bagged flowers vs. the unbagged flowers? What would happen if we did not have pollinators to pollinate? Do all flowering plants need pollinators? Did the fruit of the plants look different from the bagged and unbagged flowers?**

## Elaborate/Extend

*Parent Activity: Grocery Store Scavenger Hunt*

- *Use scavenger hunt sheet to find various food items that are available to us because of pollinators. What other foods do you think we have because of pollinators?*

## Evaluate/Reflect

- *Why do we need pollinators?*
- *Why is pollination important to us?*

**We want to hear from you!**

Let us know what you thought of the lesson or send us a picture of children participating in the lesson.


**County Fair Project:**
Document your project/activity with photos or videos. Compile photos in book or scrapbook to take to your local county fair under wildlife or pollinators.

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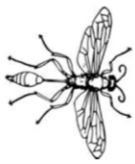
Kid as Scientists Observations

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Number of Pollinators Observed |
|---|---|---|---|---|---|---|---|---|
| butterfly  | | | | | | | | |
| moth  | | | | | | | | |
| bee  | | | | | | | | |
| fly  | | | | | | | | |
| beetle  | | | | | | | | |
| wasp  | | | | | | | | |
| Spider  | | | | | | | | |
| other | | | | | | | | |

1. Put a checkmark to the right for each creature that you see on flowers.
2. When done observing, color in the boxes with checks for each insect. Use a different color for each insect.
3. Now you have a bar chart that tells you which creatures you observed the most and which you observed the least.

Clipart from: https://publicdomainvectors.org/, pixy.org, and ClipArt ETC

# POLLINATOR

## GROCERY LIST

- [ ] AVOCADO
- [ ] CASHEW
- [ ] PEAR
- [ ] TOMATO
- [ ] COFFEE
- [ ] KIWIFRUIT
- [ ] BANANA