

'Bee' a Hive

"The lovely flowers embarrass me,
They make me regret I am not a bee."

–Emily Dickinson

Background Information:

Bin Information

This lesson is the first in a series of lessons about pollinators. The goal of this lesson is to introduce students to the concept of pollination while building empathy with an often-feared insect. This lesson is followed by the 'Butterfly' effect, where students learn about another specific pollinator, the monarch butterfly, and its journey and life cycle. The third lesson in the bin is 'Planting' for the Future, where students will learn more about the dependence that humans have on pollinators and design a pollinator garden.

Information for Instructors

Importance of Pollinators: Almost all of the seed plants, including about 80% of crop plants, in the world require pollination in order to reproduce. Some pollination occurs via wind or larger animals brushing against plants, but the majority occurs when key pollinators who feed from flowers pick up and drop off pollen when traveling from flower to flower. Many insects, like butterflies, as well as some birds and bats, are butterflies, but our most important pollinators are bees.

Pollination from bees results in more flavorful fruits and higher crop yields. The service of pollination that bees provide each year in the US is worth 10 billion dollars.

Minnesota Bees: Minnesota has far more variety in types of bees than many people realize. There are at least 455 species of bees that have been documented in Minnesota, belonging to six different families. Most of the bees that people are most familiar with, such as honeybees and bumble bees come from the Apidae family which is the largest family and contains the social bees. Honey bees, while present in Minnesota and important for the production of honey and pollination, are actually a species introduced from Europe and are not native to the area.

For this lesson the focus will be on bumble bees. Minnesota has 23 species of bumblebees out of the 48 bumble bees that are present throughout North America. Of those, five species are currently in decline.

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Themes:

Bumblebees, Pollinators, Empathy

Audience Identified:

K-2nd

Location:

Open area outdoors

Pollinator garden or area to observe bees (preferred, not required)

Goal:

Students will act as bumblebees in order to learn more about their life cycles and foster empathy with bees and other pollinators.

Objectives:

Students will be able to list and explain the three roles of bumblebees, as queen, worker, or drone.

Students will define what a pollinator is.

Students will be able to identify key characteristics of a bumblebee.

Bumblebee Lifecycle: Bumblebee queens spend the winter as adults and are the first to wake up in the spring from winter hibernation. Early spring flowers are very important because they must gather as much nectar as they can as quickly as they can to acquire energy after their long sleep.

With that energy, the queens will look for places to nest, collect some pollen, and get ready to lay the first eggs of the season. From her body she will create a mound made from pollen and wax to lay the eggs, and make a pot from wax to fill with nectar that she will sip on after laying the eggs. When the eggs are laid, the queen will spend the next several days at the nest keeping the eggs warm by vibrating her body and using the nectar pot for energy. Little larva will emerge from the eggs, and she will collect pollen and nectar to feed them. After about two weeks, the larva will spin a cocoon and emerge as adult bees. This group of bees is a colony.

The first eggs will all hatch into female worker bees, who will take over the jobs of collecting nectar and pollen, guarding, and cleaning. After this, the queen will stay in the nest and lay eggs. Most will be workers, but in late summer, she will lay eggs that will become male bees and new queens. The males will leave and not return after they finish growing. Very few of them will even mate in their life. The new queens will leave during the day to mate with the drones, but will return to the nest at night. After mating, they will start eating heavily to accumulate fat for energy over the winter. At the end of summer, all of the workers, drones, and old queens will come to the end of their life. Only the new queens will hibernate underground ready to start the cycle again the next spring.

Fear of Bees: Many children are afraid of bees and wasps for the fear of being stung. For some this is from experiences of being stung, for others it might be learned behavior, especially from adults in their life who are afraid or anxious around bees. For children with a bee allergy, it can be a very rational fear.

A fear of bees and wasps in an extreme form is called melissophobia and can result in freezing up around bees or when thinking about them, crying, throwing a tantrum, or shutting down. If this is true for any students in your group, they will need a very gentle introduction, but acting as bees in an abstract concept can be a helpful way to start thinking of bees in a positive light and building empathy with them.

For all children who are frightened of being stung, some of the best things that an instructor can do are model positive behavior around bees, not showing fear themselves, being receptive to a child's fear and helping them work through it, not being dismissive, and praise positive progress. Instructors can also help talk about some practical ways to not be stung without trying to avoid bees and wasps entirely, or eliminate them. This can include avoiding wearing strong scents or bright colors when around bees, practicing standing still or slow deliberate movements if a bee is flying around you, and recognizing places where lots of bees congregate, to take care around. Helping children to see bees and wasps as fascinating, valuable, and empathizing with them early on will help greatly in creating adults who don't seek to eliminate bees and wasps.

Vocab

Pollen: a powdery substance found on plants that help fertilize the plants so new ones can grow

Pollination: the act of transferring pollen grains from one flower to another

Pollinator: a species that pollinates

Materials and Set-Up:

This kit includes:

- Flowers stations (5)
- Pollen tokens
- Cones (4)
- Pollen basket
- Queen bee crowns (2)
- Bumblebee flashcards

Set-Up:

- Prepare all materials for setting up the bumblebee nest, making sure that they are ready and accessible. The actual setting up of this station will be performed while miming the actions of a queen bee with the students.
- Set up the pollination station by putting the flowers in place in the ground and a small container of tokens for each one.

Introduction:

Estimated Duration: 5 minutes

Attention Getter

Any established group or classroom attention-getters can be used to regain the attention of the students when giving directions for transitioning activities. If you choose to use an attention-getter personalized to this lesson, introduce the following before introducing the lesson:

- The instructor calls out “bees”
- The students respond with a buzzing noise

Warm Up

Gather students and tell them that today, you will be talking about bees. Call on a few students to share things that they know about bees to warm up and assess prior knowledge. Students will likely share some information that is about honeybees. If that happens, tell them that they are right for that type of bee, but today you will be learning about a special kind of bee; bumblebees. Pass around some pictures of Minnesota’s bumblebees.

Content and Methods:

Estimated Duration: 30 minutes

For this activity, the instructor will take on the role of queen bee and the students will be workers. If there is another adult present, they can take on a role of supervising the Pollination Station, but if not, then make sure that it is near enough that it can be easily supervised from the hive station.

Start of Spring:

The activity begins with the queen bumblebee emerging from her hibernation over the winter. For this section, the instructor will act out the following events while explaining what is happening to the students.

- The queen wakes up from her hibernation and is very hungry. She visits as many flowers as she can to restore her strength after sleeping so long.
- The queen gets ready to lay her eggs by making a little pile of wax and a wax pot to fill with pollen and nectar. The instructor can lay out the blanket from the kit, or another way to mark a nest spot.
- She sits on the eggs for a few days and uses her wax pot for energy so she can stay with her eggs and keep them warm. Then they hatch into larvae.
- Have the students wiggle around to show that they are larvae. The larvae are fed and grow and after about two weeks spin little cocoons to transform into adult bees.
- The new worker bees are all ready to hatch into grown up bees. When they do so, walk the students through putting on a 'bee' suit. Have them imagine having all of the following parts:
 - Bees are insects, so they have six legs, three body parts (head, thorax, abdomen), wings and antennae.
 - Bumblebees are fuzzy.
 - Bumblebees *usually* are black and yellow and have stripping.
- After the new 'worker bees' have hatched, the instructor will continue their role as queen by giving instructions on what to do. Students will travel back and forth between the nest station and the pollination station at-will, following specific instructions from the queen when given. The instructor can direct students to keep about half of the students at each station at a time, and to make sure students experience a variety of roles.

Nest Station:

- After the nest has been established through the start of spring, it is where the instructor will remain as the queen to give orders to the worker bees.
- At the nest, there are a few different jobs that students can go through:
- **Guard:** workers can take turn being at the guards at the point of entry to the nest. They should make sure that all entering bees are a part of the colony. They would be the first defense if the colony would be attacked. Unlike honeybees, bumblebees do not die if they sting.
- **Nurse:** The nurse bees can help raise new larvae (students can take turns being new larvae as well).
- **Housekeeping:** Bumblebees do not have hives the same as honeybees, and usually nest closely to the ground. Workers for this job are not necessarily constructing but are just working to keep the nest tidy.

Pollination Station:

- At the pollination station, students will travel from flower to flower to collect pollen and nectar. This station will also introduce the concept of pollination. If there is a second adult available for the group, have them set up at the pollination station to help explain this step. If not, then have the instructor explain before sending students.

- For each flower that students will visit, they will pick up two tokens and drop off one from a previous flower. Explain that because bumblebees have fuzzy bodies, when they rub against the flowers, they pick up pollen and drop some off as well.
- When students have a small handful of tokens, they should return to the nest to drop them off. Then they can either switch jobs or return for another pollen run.

Conclusion:

Estimated Duration: 5 minutes

End of Summer:

As the activity draws to a close, gather all of the students back and tell them that the bees did such an amazing job this summer, and helped a lot of flowers. Tell the students that at the end of the summer the queen lays some new eggs that are different than the workers before. This is where the new queens and drones come from.

- Choose one student to be a new queen. Give them a crown and have them mime eating a lot of food to store energy for the winter.
- Choose 2-3 students to be drones. Tell the rest of the students that this is also when the male bees are born. The new queen will find one before the summer ends so that she will be able to lay eggs in the spring.
- Explain that like how the whole story started with one queen laying eggs in the spring, next year, the new queen will start her own colony in a new cycle. The fact that the rest of the bees will die before winter can be addressed or glossed over depending on the group.

Reflection and Evaluation:

Estimated Duration: 5 minutes

Reflection

Have students circle up and call on a few to answer the following questions:

- What were some different types of bumblebees and their jobs? (prompt if need by asking, what type of a bee was I? What did I do? What type of bee were you? Etc.)
- If you see a bee, how can you tell if it's a bumblebee?
- What was the special word for when you dropped off pollen at different flowers?

Evaluation

Evaluation for this lesson takes place during the contents and reflection. Students are successful if they participate in the play and understand that their roles are parallel to the bees. Check in with students during this to verify their understanding. Some evaluation will also take place based on the answers to the reflection questions.

Extensions:

Accessibility and Accommodation

Gendered Terminology: Biologically, bumblebees are very divided in their roles in life by sex; workers and queens are female, and drones are male. This fact does not need to be hidden but may need to be addressed differently for different groups. Some examples of what this could look like include:

- Consider a disclaimer for the beginning of the lesson “We can all grow up to do any job or be whatever we want to be, but bumblebees are different; there are three different kind of bees that are all born to do different jobs.”
- Focus on the three types of bees, queens, workers, and drones to intentionally step away from the idea of a gender binary and so that the role is what’s highlighted.

STEM

This lesson can be used in connection with The Best of Bugs: Designing Hand Pollinators lesson by EiE taught in Lakeville elementary STEM classes in first grade. <https://www.eie.org/eie-curriculum/curriculum-units/best-bugs-designing-hand-pollinators>

Observation

If this lesson is being taught at a time of year when bees are active, devote at least 15 minutes whether before or after the activity to sit in a spot near a pollinator garden or other flowering plants and spend the time just observing the bees. Use the flashcards to identify different types of bumblebees.

Reference Materials:

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