

BASIS Lesson Plan

Lesson Name: Bee Diversity: What's the Buzz About?

Grade Level Connections:

Next Generation Science Standards: Grade 3, Life Science (3-LS4)

FOSS Next Generation Edition: Grade 3, Life Science (Structures of Life)

**Note to teachers: Detailed standards connections can be found at the end of this lesson plan.*

Teaser/Overview

There's more to bees than just honey. Bees are important because they pollinate plants that provide many of the fruits and vegetables we eat and even the clothing we wear. This hands-on lesson guides students to explore the incredible diversity of bees! Students will simulate a pollinator ecosystem where they will act out the role of different bee species that are gathering pollen from a variety of plant species. We will then repeat this simulation after the environment has undergone a drought period to see how these change affect the plants and, in turn, the pollinators. Bee ready to move and have fun in this lesson!

Lesson Objectives

- Students will discover that there are many types of bees besides honeybees
- Students will understand that some bee species visit only one kind of flower, but other bees visit several different species of flowers
- Students will visualize and compare their data, comparing it with their classmates, learning about the importance of how graphing can help us understand things we observe

Vocabulary Words

- **Pollen grain:** very small male reproductive part of a plant
- **Pollen:** the powdery substance that consists of pollen grains
- **Ovule:** the female reproductive part of a flower
- **Stigma:** part of a flower that leads to the ovule (the female reproductive part)
- **Anther:** part of a flower that produces pollen (the male reproductive part)

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- **Pollinator:** an animal that moves pollen from the anther of one flower to the stigma of another flower
- **Species:** a type of organism, one that can find other individuals that are the same and reproduce (have babies) (e.g. praying mantis or a ladybug or a honeybee)

Materials

Scientist Volunteers will bring:

- Images of honeybee
- Images of flower diagram
- Bee specimen in plastic container (32)
- Info sheets for bee species, laminated (32)
- Images of each bee species
- Plastic containers, large as flower model (8)
- Pom-pom pollen grain models, different colors (8 colors, 40 of each color)
- Plastic cups, for pollen grain collection (32)

Materials teachers should provide:

- Pens/pencils

Classroom Set-Up

Please have students grouped into table groups of 4 students. Each group should have a “station” consisting of a table or couple of desks pushed together. We will need access to a large amount of white board space. The activity will involve graphing using magnetic objects, so the white board needs to be magnetic for this activity. Nametags for students are always helpful.

Classroom Visit

1. Introduction (10 minutes)

Role Model Introduction:

Being a role model is an important part of being a BASIS volunteer! Begin your lesson by explaining who you are and what you do as a scientist. Feel free to tell your “story” as if giving an elevator pitch to elementary school students: Why did you become a scientist? What questions are you trying to figure out? What do you do in your job? Why should students relate to you? Feel free to bring in photos, specimens, and other props. Let your personality shine through!

**Topic Introduction:**

After you introduce yourselves as role models, take some time to introduce the topic of this lesson: *bee diversity and pollination*. It may be helpful to keep the suggested take-away in the back of your mind throughout the lesson: **There are many different types of bee species and maintaining that diversity is important for plants and other animals, including humans.**

Your topic introduction should introduce students to the phenomena they will explore and follow the outline below. As much as possible, try to frame this information as questions posed to the class, rather than as a lecture. This helps activate students' prior knowledge and facilitates student-guided conversation.

1. Introduce the phenomenon that the class will explore: the role of bees in pollination
 - Show students a picture of a honeybee. What is this? [a bee!]
 - What do you know about bees? [Think-Pair-Share] [Gather student ideas on the board. Students should hopefully mention their observation that bees visit flowers]
 - Does anyone know why bees visit flowers? What happens when a bee goes from flower to flower?
 - Bees visit flowers for a few reasons. One reason is to gather nectar, but another reason is to gather pollen. Does anyone know what **pollen** is? [Define, write on board]
 - So pollen is the male reproductive part of a plant. Pollen is found on the part of the flower called the **anther** [write on board]. That pollen needs to travel to other flowers of the same type so that the plant can reproduce, making more seeds of that type of plant.
 - How do you think that pollen gets around? Does it get up and walk to another flower?
 - The pollen is able to travel from flower to flower with some help from animals. We call those animals **pollinators**. [write on board]
 - Honeybees are pollinators. But do you think they're the only pollinators? Do all bees look like this honeybee? [No!] There are lots of different kinds of bees. We call those **species** [Define, write on board] [May want to relate this to something students already know – like species of big cats – lions, tigers, leopards]
 - But how many are there? What if I told you there are over 20 bee species! That's a lot, right? [Write 20 on the board] What if I told you there are over 200 bee species! [Add a 0 to your 20] What about 2,000 bee species?!? [Add another 0] Guess what?...I need to add another zero! There are actually over 20,000 bee species in the world!
 - Today we're going to learn about bee diversity and investigate how certain types of bees pollinate some plants, but not others. And also how a change in the environment might affect those bees!

Teaching Tip: Say, Write, Show

- Bring in photos and props to illustrate the topic intro
- Write new vocabulary words, key terms, and brainstorm lists on the board
- Refer back to the board to engage visual learners and English Language Learners

2. Learning Experience (40 minutes)

Students should be in table groups of four. Remember that all activities are designed to address the take-away in a particular way: **There are many different types of bee species and maintaining that diversity is important for plants and other animals, including humans.**

Activity 1: Just Bee Yourself

- Tell students that today they are going to pretend to be different species of bees. In a moment, we will pass out some bee specimens – one per student. That is your bee species for today's activity. With each type, or species, of bee you will also get a card that tells you about that bee and what kinds of flowers it likes to visit.
- Distribute bee specimens in plastic containers to table groups along with a laminated information card about that particular bee species. One specimen and one card per student.
- Give students a minute to examine their bee species, make some observations, and read the card to understand some of the plants/flowers that their particular bee species will visit.
- Students will then share what they learned about their bee species with everyone else at their table group. Have the students think about the following questions:
 - i. What is similar or different about how the bees look?
 - ii. Do bees all visit the same plants/flowers?
 - iii. How is your bee species unique compared to the others at your table?

Activity 2: Pollinator Simulation

- Set up different plant 'stations' around the room consisting of a large cup filled with a specific color of small pompom poofs and pictures/info of the plant species placed on the desk.
- Explain to students that in a moment they are going to simulate (or pretend) to be bees in their environment, visiting flowers, and gathering pollen.
- Rules of the simulation game:
 - i. You must go up to the flower and read the card next to it.
 - ii. If you are a bee species that visits the flower, then you take one pollen grain (one pompom)
 - iii. If you read the card and it is NOT a flower that your bee species visits, then do NOT take a pollen grain (pompom)



- iv. You will only have 3 minutes (?) to gather as much pollen as you can. You will start when we say the magic word ("Pollination"). When we say stop, you must immediately return to your seats.
- v. Students must walk, no running. If we see you running, you will be out of the game!
- Model the instructions of what the students should do during the game.
- Distribute one small cup to each student.
- The magic word is "Pollination" Go!
- After three minutes, students will go back to their seats. Then, one at a time, each table group will come up to the white board to add their pollen grain data points to a large graph that will be drawn beforehand.
- Once all students have contributed their data, engage students in a discussion about what the graph tells us about bees, bee diversity, and pollination.
 - i. What do they notice about the flowers that different bee species visit? Are they the same/different? Why or why not?
 - ii. What do you think would happen if one of the bees went extinct?
 - iii. What do you think would happen if one of the plants went extinct?

Activity 3: How Does Drought Affect Pollinators?

- The simulation will be repeated, but this time the simulation will take place after there has been a drought in the environment. What do we mean when we say drought? Has everyone heard of the drought in California? How do you think that might affect plants in the environment?
- Explain to students that in a moment they are going to simulate (or pretend) to be bees in their environment, visiting flowers, and gathering pollen. This is the same as before, but now some of the plants may not be flowering.
- The same rules apply as in the first round when we played the game.
- The magic word is "Pollination" Go!
- After three minutes, students will go back to their seats. Then, one at a time, each table group will come up to the white board to add their pollen grain data points to a large graph that will be drawn beforehand.

3. Wrap Up: Review and Discuss the Learning Experience (5 minutes)

*This is the "discussion and conclusions" part of the lesson

- Once all students have contributed their data, engage students in a discussion about what the graph tells us about bees, bee diversity, and pollination in this environment that has been affected by the drought.
 - i. What do they notice about the flowers that different bee species visit? Were there differences between the first and second simulation/round?
 - ii. What do you think would happen if one of the bees went extinct?
 - iii. What do you think would happen if one of the plants went extinct?

Contextualize the conclusion:

- Bees are important to us as humans because they pollinate plants that produce many of the fruits and vegetables we eat. Those plants also provide the materials that we use in making some of the clothes we wear or other things like band-aids!
- What other questions could we investigate about bees and pollination?

4. Connections & Close (5 minutes)

Wrap up as a role model by leaving a few minutes for students to ask questions about science, about being a scientist, and about becoming a scientist. Then, thanks and goodbye!

Follow Up: After the Presentation

Teachers who wish to extend the impact of this lesson may find the following CRS web pages useful:

- <http://www.crscience.org/educators/helpfulreports>
- <http://www.crscience.org/educators/treasuretrove>

Standards Connections

NGSS:

- Connections by topic
Life Science: 3. Interdependent Relationships in Ecosystems
- Connections by disciplinary core ideas
Life Science: 3-LS4 Biological Evolution: Unity and Diversity
- Connections by scientific & engineering practices
 - 2. Developing and using models
 - 4. Analyzing and interpreting data
- Connections by crosscutting concepts
 - 4. Systems and system models
 - 7. Stability and change
- Connections by performance expectation:
 - 3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there change.

FOSS Next Generation Edition: Grade 3 Life Science: Structures of Life Module