

TINY BUG HUGE ROLE

POLLINATION



Essential Question:

HOW DO HONEY BEES COLLECTIVELY AFFECT THEIR COMMUNITY, ECOSYSTEM, AND THE WORLD?

LEARNING OBJECTIVES

- Investigate and infer the function of basic adaptations.
- Describe why certain communities exist in given habitats.

RESOURCES

- *Communication Challenge Cards*
- *Reading, Honey Bee Dances*
- *Video, Honey Bee Dance*
- *Image, Bee Covered in Pollen*
- *Reading, Pollination*
- *Assessment, Pollination Diagrams*

MATERIALS

- Journals, Paper, or Digital Notebooks
- Writing Utensils

OVERVIEW OF LESSON / BACKGROUND

Honey bees are astoundingly good communicators. They need to coordinate their activities according to very specific needs and time-frames. In order to keep the hive functioning, they must all know whether the queen is healthy, what work needs to be done, and where to find sources of pollen and nectar. One of the ways they communicate critical information is through specialized, message-infused movements, commonly referred to as dances. There are three distinct dances, each with its own message. The waggle dance is performed in the hive, near the entrance/exit, by a bee that has discovered a good source of nectar a certain distance from the hive. The waggle dance has amazing mathematical detail, conveying the distance and direction of the source using precise angles related to the location of the sun.



Honey bees are not just honey producers, collecting nectar and pollen and converting it to sweet nourishment; honey bee activity is required for some types of pollination. Although some pollination occurs naturally via spores being carried from plant to plant on the wind, much of it occurs from bees accidentally moving pollen from plant to plant as they travel around collecting nectar. Bees are an essential part of the pollination process, significantly contributing to our food supply.

This lesson encourages a review of the food web and provides specific information about the pollination process. Students will learn about the basic structures of flowering plants and the methods by which pollinators play a role in their reproduction. Students will finish this lesson with a better understanding of the role of the honey bee—and the importance of pollination—in the food web we all dip into every day.

LESSON ACTIVITY

INTRODUCTION

SILENT COMMUNICATION

1. Tell the class that they will be facing a series of challenges that require total silence. If they can meet all the challenges successfully, provide a reward suitable for your class (e.g., extra flex time to read/research/chat, class time outdoors, a round of a game they particularly enjoy).
2. Organize the activity using the **Communication Challenge Cards**. For each of the three challenges, assign a different leader (the student who gets to read the challenge card to him/herself and attempt to get the group to complete the challenge without using any words).
3. Provide enough time and space for the students to complete the challenges. Create additional challenges, if you like, and/or allow the students to create some. You could establish a bank of challenges that could be revisited for rainy recesses.
4. Tell students that bees communicate complicated messages without using words and you will be studying how they do that.



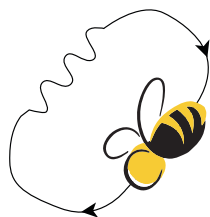
READING

1. Draw a hive on the board and a flower some distance from it. Ask students to think about the communication activity they just completed and apply their experience to this question:
What two things would a bee need to know to get from the hive to a flower without a map?
(Answer: direction and distance.)
2. Distribute the reading **Honey Bee Dances**.
3. Have the students get up with the reading and attempt to recreate the diagram steps with their own steps. (Some students may want to walk the steps and some may want to waggle, either is encouraged.) Each student should do this on his or her own.
4. When all students have completed the reading, show the video **Honey Bee Dance**.

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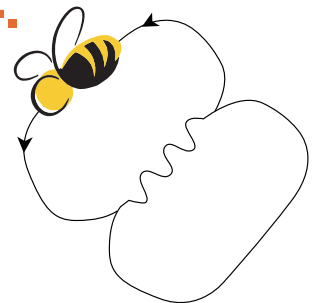
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ACTIVITY

1. Divide students into three groups. Assign one of the following to each group: fruits, vegetables, nuts. Challenge each group to come up with a list of every item they can think of in their category. Recognize the group that comes up with the longest list.
 2. Have groups rotate the lists once or twice to see if other groups can expand the lists.
 3. Lead a discussion about the food web. Explain that many of the fruits, vegetables, and nuts on the lists the students just created require pollination by bees. Without the contribution of bee pollination, these food items could not reproduce.
 4. Pollination by honey bees is not only necessary to the food web, but fascinating in its own right. Tell students they will be learning about the pollination process and how honey bees store and use the pollen they collect for their own use.
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READING

1. Let the students know that the success of the bees on their journeys from the hive is critical to making sure pollination takes place and then distribute the reading ***Pollination***.
2. For the first reading, have the students highlight or underline the main idea in each paragraph. When they are done, encourage them to read all the main idea sentences together, without the supporting details.
3. For the second reading, have the students write a one-sentence summary of each paragraph. Provide some time for students to compare their summaries.



GAME

POLLINATE!

Use this game to reinforce the two types of pollination the students just learned about. Round 1 simulates wind pollination and round 2 simulates pollinators. Both versions will allow students to get some questions answered. Debrief by discussing which method was better at transferring pollen.

ROUND 1

- Have students write a question about honey bee dances or pollination on a piece of paper and then ball it up.
- Tell students that, on the count of three, they should toss their paper to someone in the circle but, if the paper is not caught, it is to stay on the ground.
- Papers that are caught should be answered by the student who caught them and/or by discussion and consensus.

ROUND 2

- Have students write another question about honey bee dances or pollination on a piece of paper and then ball it up.
- Tell students that, on the count of three, they can run around the room and find one person to exchange papers with... and then run around again and exchange papers with a second person. Then, they should return to their spot in the circle.
- All papers can now be read and the questions answered. (Note: Establish a guideline that repeats are fine but don't need to be answered twice.)

ASSESSMENT

Mastering a knowledge of pollination requires spatial understanding, so the assessment in this lesson is a diagram to be labeled and explained. Distribute the **Pollination Diagrams** and have students complete the assessment.

EXIT CARD

On the board, a sticky note, or a slip of paper, have students write one way they communicate without words each day. (You may give an example, such as raising their hands in class to communicate that they'd like to talk. *Possible answers: pointing, waving, raising eyebrows....*)

DIFFERENTIATION

SUPPORTS

- Provide pre-highlighted **Pollination** readings.
- Read **Pollination** readings out loud or have students read in pairs/groups.
- Allow students to communicate about answers to the questions in the **Pollination** game.

EXTENSIONS

- Encourage students to create a variety of movements or dances for things they want to communicate with each other (e.g., "It's time for lunch," "I need to borrow a pencil," etc.)
- Have students investigate methods of pollination that do not involve honey bees.

Virginia Standards of Learning (SOL)

SCIENCE

- 4.5 The student will investigate and understand how plants and animals, including humans, in an ecosystem interact with one another and with the nonliving components in the ecosystem.
- Within a community, organisms are dependent on the survival of other organisms. Energy is passed from one organism to another.
 - A niche is the function that an organism performs in the food web of that community. A niche also includes everything else the organism does and needs in its environment. No two types of organisms occupy exactly the same niche in a community.

READING

- 4.6: The student will read and demonstrate comprehension of nonfiction texts.
- d) Identify the main idea.
 - f) Draw conclusions and make simple inferences using textual information as support.

WRITING

- 4.7: The student will write cohesively for a variety of purposes.
- e) Recognize different modes of writing have different patterns of organization.



Get all the students in class to line up alphabetically by first name.



Get all the students in class to form a standing square with four straight sides and clear, sharp corners.



Get all the students wearing shoes with laces to sit down in their seats.



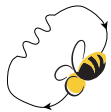
When a honey bee dances, she's not just shaking a leg or twisting the night away, she's probably telling the other bees something very important. Honey bees perform different dances to communicate. They perform the round dance and the waggle dance to tell the other bees where to find nectar. When a good source of nectar is found far from the hive, a scout bee performs the waggle dance. She is telling the other bees exactly where to go to find the nectar.

Read the steps of the waggle dance below and then use the diagram to see what the dance pattern looks like.

1. The scout bee flies from the hive to find a good source of nectar.
2. The scout bee locates a good source of nectar, such as a field of flowers, and collects some nectar and pollen while she's there. She also leaves a scent on the flowers to help her fellow bees find the flowers again.
3. The scout bee returns to the hive and—after she gets past the guards!—goes into the hive to tell the other foraging bees where to find the nectar.
4. The scout bee orients herself along the middle line of the hive. (Hives hang vertically, and the imaginary line that runs from top to bottom tell the bees about direction in relation to the sun: if the bee moves towards the top of the hive, she communicates towards the sun; if she moves towards the bottom of the hive, she means away from the sun.)
5. The scout bee begins her dance as the other bees watch and feel the vibrations.



6. First, the scout bee waggles by shaking her abdomen back and forth as she moves along the line. How fast she shakes her abdomen tells the bees something about how good the nectar source is. The faster the shake, the better the nectar. The length of the line she waggles also tells other bees about distance. The longer the line, the farther the source.



7. Next, she circles back around to the beginning of the waggle line. The angles she draws by her dance tells the other bees what direction, in relation to the sun, to go to find the nectar source.



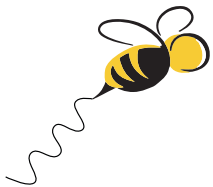
8. Then, she dances the waggle along the middle line again.



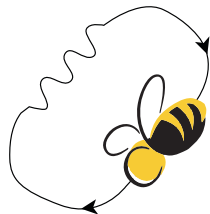
9. Finally, she circles around the other side and back to the beginning of the waggle line, completing a figure eight.

10. The scout bee may continue dancing this pattern for a short time or a long time. The longer the she dances the better the quality of the source and the more foraging bees can see the dance, take the directions, and fly off to gather nectar.

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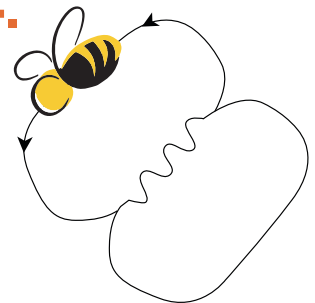
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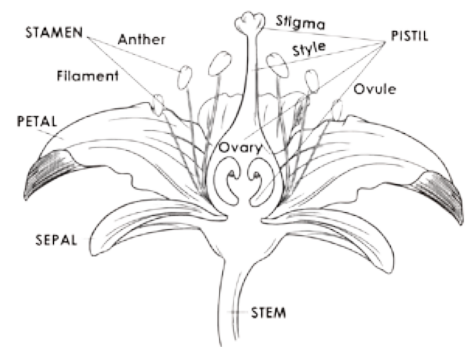
FLOWERS NEED POLLINATORS

On the Sweet Virginia farm, like everywhere else in the world, flowering plants rely on pollinators to help them reproduce. Some plants can catch pollen from the wind, most flowering plants need a bee, hummingbird, bat, or other pollinator to bring pollen to them from another plant of the same species. Many of our fruits and vegetables are flowering plants that require pollination to grow. About 1/3 of our food supply relies on pollination by honey bees. Foods like apples, cherries, cucumbers, carrots, and almonds all need honey bees. Let's take a look at how flowers are built and why they need pollinators.

Flowers are made up of specific male and female parts that allow them to reproduce. The male part of a flower is called the stamen and includes the anther and the filament. The anther is the part that produces pollen and the filament supports the anther. The female part of the flower is called the pistil and includes the stigma, the style, and the ovary and ovule. The stigma attracts sticky pollen, the style allows pollen to travel to the ovary, and the ovary holds the ovule (or egg).

In addition to these reproductive parts, the flower has other parts. The stem supports the whole flower, the petals attract pollinators with their bright colors, and the sepals are coverings that protect the flowers before they open.

Take a moment to color code the drawing. Color the male parts yellow and the female parts green.



HONEY BEES ARE POLLINATORS

The worker bees at Sweet Virginia spend most of their time collecting nectar and pollen from flowers. They need to bring both food sources back to the hive to make honey and feed the brood. An interesting and important thing happens when bees visit many flowers to collect nectar and pollen: they also move pollen from flower to flower. The transfer of pollen as honey bees are flying around to many flowers allows the flowering plants to reproduce.



A honey bee is a hairy creature. And, its hairs are electrostatic! When the bee lands on a flower and begins to drink nectar, a lot of pollen gets stuck to the bee. The bee needs pollen to take back to the hive, so she begins to pack pollen in her pollen baskets. She uses her legs to scrape the pollen off of her body and into the pollen baskets. But, she doesn't get all the pollen off her body.

When the honey bee visits the next flower, there is still some pollen stuck to her body. As she works to collect nectar and pollen from this second flower, some of the old pollen rubs off onto this new flower. Pollination occurs! And on, and on, and on, through all the flowers of the field.

RESOURCE

BEE COVERED IN POLLEN

**Hive Alive!**
Experience the Wonder



RESOURCE ASSESSMENT

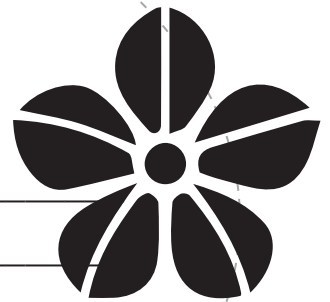
This is a diagram of a bee hive on a flower farm. Please label the following parts.

1. Draw the bee traveling from hive to flower to flower and back.
2. Complete the sentence starters on the diagram below: what would be happening at each flower and at the hive?
3. Extra credit for any extra drawing or labeling of the parts of the flower or parts of the bee.

At this hive box...



At this flower...



At this flower...