

Lesson Plan: Busy Bees

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Target Grade: 2nd

Teacher Prep Time: Part 0: 10 minutes, Part 1: 15 minutes, Part 2: 20 minutes Part 3: 5 minutes

*Times assume that you have supplies purchased, powders made, and film canisters drilled.

Lesson Time: 2 hours and 50 minutes - 3 hours and 10 minutes with art extension (We recommend doing this lesson over three days [four if you want to do the art extension].)

- Part 0:
 - 20 min – Art Extension
- Part 1:
 - 40 min – Exploring a Bee's Habitat
 - 20 min – Flower Life Cycle
- Part 2:
 - 20 min – Bee Structure
 - 10 min – Flower Structure 1 (pollen size)
 - 10 min – Flower Structure 2 (nectar amount)
 - 10 min – Flower Structure 3 (color)
 - 15 min – Flower Structure 4 (scent)
- Part 3:
 - 20 min – Pollinators and Flowers
 - 25 min – Review

Lesson Overview:

In this lesson students will explore the relationship between bees and flowers and learn that both organisms need the other to survive. Students will examine structures on both the bee and the flower to learn how these aid in getting the bee food and pollinating the flower.

Learning Objectives:

- Students will know that bees help pollinate flowers as they collect food for themselves.
- Students will be able to analyze data to determine the function of different flower parts in attracting bees to the flower.

NGSS:

2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

- **Science and Engineering Practice**
 - #4 Analyze and Interpret Data
 - Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
 - Record information (observations, thought, and ideas).
 - Use and share pictures, drawings, and/or writing of observations.
 - Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

- **Disciplinary Core Idea**
 - LS2.A Interdependent Relationships in Ecosystems
 - Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around.
- **Cross Cutting Concept**
 - #6 Structure and Function
 - In grades K-2, students observe the shape and stability of structures of natural and designed objects are related to their function(s).

Where This Lesson Fits in:

This activity is intended to go at the beginning of a life science unit on plant life cycles. After finishing “Busy Bees” lesson, students can complete the activity “[Hitchhiking Seeds](https://rb.gy/jzd8gx)” (<https://rb.gy/jzd8gx>) in which they learn about seed dispersal mechanisms.

Materials Needed:

- Busy Bees worksheet (1 per student)
- Flower (1 per student) made as part of the art extension
- Colored powder (used for fun runs and color festivals) (suggested colors: yellow, green, blue, and orange, but any colors will work as long as they are not too similar) Amazon
- Colored powder (small, medium, large) any color
- Crayons (1 set per student)
- Pony bead or something the size of pony beads, like buttons, to serve as nectar (~50)
- Plastic gloves (~5 gloves)
- 20 mm diameter velcro pieces with adhesive (only use the loops, softer part of the velcro) (~10) Amazon
- ½” Diameter clear glass marbles (~500) Amazon
- ½” Diameter fancy marbles (~50) Amazon
- Film canister with caps for 35 mm film (black) (~60) Amazon
 - Flower Stickers (optional)
- Cotton balls (~25)
- Mint extract (or another scent that does not stay around very long but is strong enough to smell)
 - Optional: Dropper to dispense mint extract
- Timer
- Masking tape
- Device that has access to the internet and can be projected
- Document camera (to model work for students)

Art Extension

- Flower patterns (1 per student)
- Crayons (1 set per student)
- Paper lunch bags (1 per student)
- Scissors

Teacher Prep:

- Colored Powder (small, medium, and large)
 - Take ~½ cup of powder and spread it out evenly in a jelly roll pan (picture 1 below). Use a spray bottle to wet the powder (picture 2 below). Let the powder dry. To dry

faster (~ 6 hours) put the power out in the sun and stir it every hour. Once the power is dry it will form larger pieces (picture 3 below). Pour the powder through a fine colander to remove any dust that is left. The power that you just made will be the large powder. The powder that was never wet is your small powder. To make the medium powder, put the large powder in a plastic bag and smoosh it with your hands so that it is halfway between the small and large powder sizes.



- Film Canisters
 - Put a flower sticker on the lid of the canister (optional). Then drill 11/64 inch holes in the canister lids.



- Part 0:
 - Print out flowers for students to color.
 - Have scissors, crayons, and paper bags ready for students.
- Part 1:
 - Print out worksheets.
 - Assign students to groups of 4.
 - Add “nectar” and “pollen” to the flowers. Add 4 pony beads “nectar” and ~2 tablespoons of one color of powder “pollen” to the “flowers” (bags that students made on Day 0), so that within one group you have 1 student with each color as seen below.
 - Student 1: Green
 - Student 2: Purple
 - Student 3: Orange
 - Student 4: Yellow
 - Have flowers (with pollen and nectar) and crayons ready for students.
 - Have the video, [Life Cycle of a Flower](https://www.youtube.com/watch?v=CIZyJZ_YSjE), ready to play (https://www.youtube.com/watch?v=CIZyJZ_YSjE).
 - If you are planning on doing the “Hitchhiking Seeds” lesson next, it is suggested that you stop the video at 1 minute 15 seconds.
- Part 2:
 - Bee Structure (Hair): Have a bowl with one tablespoon of powder (any color) for each table. The bowl should have enough nectar (pony beads) so that each student can grab one. Have gloves and velcro pieces ready to hand out.
 - Flower 1 Structure (Pollen Size): For each group, have three bowls with one tablespoon of the different powdered sizes (small, medium, and large). Have two drops of nectar (pony beads) in each bowl.

- Flower 2 Structure (Nectar Amount): Have 5 flowers (bags) with the given number of pieces of nectar (pony beads) seen below. Make sure to number the flowers. You do not need to have pollen in these flowers.

- Bag 1: 0
- Bag 2: 2
- Bag 3: 3
- Bag 4: 10
- Bag 5: 15




- Flower 3 Structure (Color): Have a bowl with marbles in it (~500 clear and ~50 fancy).



- Flower 4 Structure (Scent): Place a cotton ball in half of the film canisters. Then add two drops of mint extract on the cotton ball. Put nectar (pony bead) in canisters with scented cotton balls. You should not do this more than 24 hours in advance.
- Part 3:
 - Have a flower that was made in the Day 0 art extension (no bag attached).
 - Have tape and a timer ready for students.

Lesson Sequence:

*For this activity we recommend students work in groups of 4.

Part 0:	
20 minutes	<p>Art Extension</p> <ul style="list-style-type: none"> • Pass out flowers. • Allow students to color in flowers. • Have students fold on the dotted line, and cut around the semicircle in the middle of the flower. • Then unfold, and have students cut around the rest of the flower. • Have students insert the flower over a paper lunch bag as seen below. 

Part 1:

40
minutes

Exploring a Bee's Habitat

- Ask students to draw a picture of a bee in its habitat, a magnified picture of a bee, and a magnified picture of something in a bee's habitat.
- Allow students to share out what they drew, and if a student drew a flower as part of the habitat, make sure to allow that student to share.
- Write the question: "What do bees need to survive?" on the board. Allow students to share answers and record student responses under the question.
 - Expected Student Response: food, water, home
- Give four bags (each with a different color "pollen") to each table group and explain to students that their hand will act as the bee.
- As a class, fill out the first box of question 4 on page 2 "Beginning of Day." For this picture students should color in the center of the flower with the color of pollen that is in their bag, but their hand should be bare.



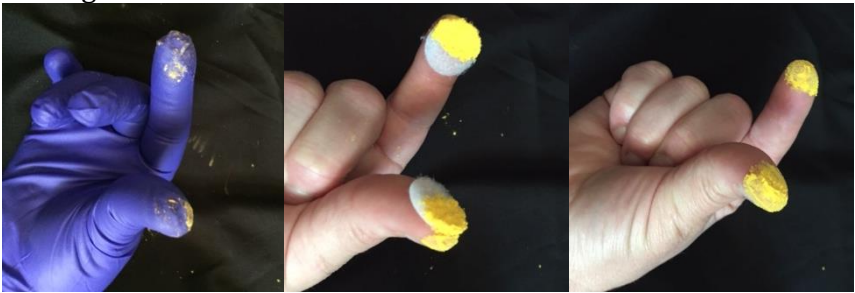
- Students will need to do the remaining three visits without recording their results. If they record their results, they will lose the pollen on their hands. Therefore, the teacher records one example of student data and then has students go back at the end of the activity and record their findings.
- Tell students to reach into their bag to collect one nectar. Discuss with the class what happened while the teacher records mock student data. The flower should not have changed, but they will see that they now have pollen on their hand.






- Ask students, "Did the bee get nectar?" Yes.
- Have students pass their bag to the right, so now the flower in front of them is a different color.
- Tell students to reach into their new bag to collect one nectar. Have students observe both their original flower and their hand. Discuss with the class what happened while the teacher records mock student data. The flower will now have the original color and a small amount of whatever color the student had on their fingers when they reached into the bag. In addition, the student should see two colors on his/her hand.

	<div data-bbox="485 157 1252 447" data-label="Image"> </div> <ul style="list-style-type: none"> • Ask students, “Did the bee get nectar?” Yes. • Have students pass their bag to the right again, so now the flower in front of them is an even different color and repeat the process. <div data-bbox="485 554 1252 842" data-label="Image"> </div> <ul style="list-style-type: none"> • Have students wipe off their hands and fill in the rest of page 2. • Together, go over questions 5-7 on page 3 in the packet. <ul style="list-style-type: none"> ○ What type of data did you collect in your experiment? Observations ○ Did the bee get nectar? Yes ○ What happened to the flower? Its pollen got taken to other flowers, and pollen from other flowers got put on it.
20 minutes	Flower Life Cycle <ul style="list-style-type: none"> • Watch plant life cycle video, Life Cycle of a Plant, with the class. (https://www.youtube.com/watch?v=CIZyIZ_YSjE) <ul style="list-style-type: none"> ○ If you are planning on doing the Hitchhiking Seeds lesson stop video at 1:15. • Have students discuss what occurs during a plant's life cycle. • Walk students through question 8 and have them fill in the missing words and draw pictures. <ul style="list-style-type: none"> ○ Plants start off as <u>seeds</u>. <ul style="list-style-type: none"> ▪ Students draw a picture of a seed. ○ If they are watered, they <u>grow</u>. <ul style="list-style-type: none"> ▪ Students draw a picture of a growing plant. ○ With time, water, and sunlight, they <u>flower</u>. <ul style="list-style-type: none"> ▪ Students draw a picture of a flowering plant. ○ If the flowers are <u>pollinated</u>, they will produce seeds. <ul style="list-style-type: none"> ▪ Students draw a picture of a flower with seeds. ○ Seeds can grow into new plants. • Discuss the question, “Why is this important?” Guide them to understand, “If plants don’t have legs, how can they get pollinated, so that they can make more plants?”

Part 2:

20 minutes	Bee Structure <ul style="list-style-type: none">• Put colored/enlarged pictures of the bees up for students to see.• Have students look at the pictures and compare similarities and differences between the bees. Make sure that they notice that the bees have different amounts of hair on their legs.• Tell students we will now explore how the hair on a bee's leg affects how much pollen it collects.• Assign each student either a glove, velcro pieces, or their bare hand. Review that the velcro represents a bee with lots of hair on its legs and the glove represents a bee with little hair on its legs. They will then reach into a flower (bowl) and get 1 drop of nectar (pony bead). They will then look at the amount of pollen on their hand and record it.<ul style="list-style-type: none">◦ Within one group (4 students), you should have at least one of each type of bee leg. Therefore, two people in the group will be assigned the same thing (Ex: 1 glove, 1 velcro, and 2 hands).• Have students carry out the experiment and record their results in question 9. They should get results similar to what is seen below.  <ul style="list-style-type: none">• Together go over questions 10 through 12.<ul style="list-style-type: none">◦ What type of data did you collect in your experiment? Observation◦ Which method had the most pollen stick to the bee? Velcro "Most hairy bee"◦ Which method had the least pollen stick to the bee? Glove "Least hairy bee"• Have students draw a picture of a bee that would collect a lot of pollen and a picture of a bee that would collect a little pollen (question 13). Then have them share their pictures with the group.
10 minutes	Flower Structure 1 (Pollen Size) <ul style="list-style-type: none">• Ask students, "What do you notice about pollen?" Make sure pollen size comes up in your discussion.• Ask students, "Why do you think that pollen is not bigger?" Listen to their ideas, and then tell them that we will test what would happen if pollen was bigger.• Tell students that they will be assigned either a small, medium, or large pollen. They will then reach into a flower (bowl) and get 1 drop of nectar (pony bead) from the flower with the correct pollen size. They will then look at the amount of pollen on their hand and record it.

	<ul style="list-style-type: none"> ○ Within one group, you should have students test at least one of each pollen size. Therefore, two people in the group will be assigned the same thing (Ex: 1 small, 1 medium, and 2 large). • Have students carry out the experiment and record their results in question 14. They should get results similar to what is seen below (small, medium, large).  <ul style="list-style-type: none"> • Together go over questions 15 through 17. <ul style="list-style-type: none"> ○ What type of data did you collect in your experiment? Observation ○ What was the property of the flower where the bee collected the most pollen? Smallest piece size ○ What did you learn about pollen? The smaller the piece size, the more pollen that sticks to the bee.
10 minutes	<p>Flower Structure 2 (Nectar Amount)</p> <ul style="list-style-type: none"> • Tell students that each student will get to perform an experiment for one other factor, but we will start with one student from each group. • Have one student, from each group, come to the front of the class. • Place a numbered flower on each table (flower 1: 0 nectar, flower 2: 2 nectar, flower 3: 3 nectar, flower 4: 10 nectar, flower 5: 15 nectar). Have the students that are not bees look into the flower and count the number of nectars, but do not say it out loud. They will need to remember this number to tell you at the end of the activity. • Tell students that the bees need to collect as much nectar as possible to feed their bee families. Tell bees (students) that they will get to leave their hive (front of the class) 5 times. Each time they leave, they can visit one flower. If they would like they can visit the same flower multiple times. On each visit they can reach their hand into a flower and collect up to 1 nectar (pony bead). If the flower does not have nectar, it is still considered a visit. Have the first bee go and visit a flower. Record a tally mark for the flower number on the chart (question 18), then allow them to visit another flower and repeat the process. Once the first bee is done, repeat the process with the other bees. • For the property in question 18, record “Nectar Amount.” Then have each group tell the number of nectars that they started with and record this. • Have the bees discuss why they visited some flowers more than others. • Together go over questions 19 through 21. <ul style="list-style-type: none"> ○ What type of data did you collect in your experiment? Counting ○ Put the flowers in order from most visited to least visited. 5, 4, 3, 2, 1 ○ What is the function of this structure? To attract bees

<p>10 minutes</p>	<p>Flower Structure 3 (Color)</p> <ul style="list-style-type: none"> • Have another student from each group come to the front of the room. • Tell them that they are bees and now the marbles are flowers. They will get to select 5 flowers to visit, which could be the same color. • Allow each bee to select 5 marbles, (which represent 5 different flowers visited) and then have the class put tally marks for the color of each marble that they selected. <ul style="list-style-type: none"> ◦ Some of the marbles have multiple colors; put a tally mark under the color that is most prevalent in the marble. ◦ Consider pink marbles as red. • Repeat the process for the other bees. • Have the bees discuss why they did not pick many clear marbles. Lead them to understand that bees are attracted to colorful flowers. • Together go over questions 23 through 25. <ul style="list-style-type: none"> ◦ What type of data did you collect in your experiment? Counting ◦ What is common about the structures of the flowers that were visited? They were colorful and stood out. ◦ What is the function of this structure? To attract bees
<p>10 minutes</p>	<p>Flower Structure 4 (Scent)</p> <ul style="list-style-type: none"> • Have another student from each group come to the front of the room. • Tell them that they are bees and now the film canisters are flowers. • Give them two film canisters, one with scent and one without, and have them explore them with senses other than touch (smell). Have bees state how the flowers are different. Then record this for the property for question 26. • Allow bees to open canisters and see what is inside. The canister with the scent will have nectar and the one without will not.  <ul style="list-style-type: none"> • Take back the canisters from the bees and put them in the “flower garden” (back with all the other canisters in a central area).  <ul style="list-style-type: none"> • Tell the bees they need to collect as much nectar for their family as possible, and they will get to visit 5 flowers. Set the tray of canisters out and let each bee pick 5 flowers to bring back to their table. Then have them open them up to see the amount of nectar they collected. Have each group share out the

	<p>number of scented vs unscented flowers they visited and record in question 26. Then total the amounts as a class.</p> <ul style="list-style-type: none"> • Have the bees discuss why they picked the flowers they did to visit. Lead them to understand that bees are attracted to scents. • Together go over questions 27 through 28. <ul style="list-style-type: none"> ○ What type of data did you collect in your experiment? Counting ○ What type of flowers did bees go to more often? The flowers that were scented ○ What is the function of this structure? To attract bees
Part 3:	
20 minutes	<p>Pollinators and Flowers</p> <ul style="list-style-type: none"> • Have students fill in question 30 with what flowers can do to attract pollinators. • Select two students to be bees. • Have both bees leave the room. • “Hide” the flower in the room so that only the bee does not know where it is. The flower should be in plain sight. You most likely will need tape to keep the flower in place. <div data-bbox="722 911 1015 1295" data-label="Image"> A photograph of a red wooden door set against a light green wall. A small, white, five-petaled flower sticker is affixed to the upper right portion of the door. </div> <ul style="list-style-type: none"> • Have one of the bees come back into the room and find the flower. Time how long it takes, and record the time in question 31. • Have the bee leave the room and rehide the flower. • Repeat the process with the other bee. • Have the bees come back into the classroom. • Teach students the bee dance. Have them wiggle around, keeping their elbows in, and moving their thumbs from the upright position to point at the flower and then repeating the process with their thumbs. This process is like repeating the three pictures below multiple times. Tell students that they cannot move from the spots they can only wiggle and move their thumbs.



- Have them practice the bee dance a few times pointing out different objects in the room.
- Tell students they are going to use the bee dance to help the bee find the flower.
- Have bee 1 leave the room.
- “Hide” the flower in the location that bee 2 found the flower before.
- Have the students use the bee dance when the bee comes back into the room to help them find the flower. Time how long it takes, and record the time in question 31.
- Have bee 2 leave the room.
- “Hide” the flower in the location that bee 1 found the flower the first time.
- Repeat the process with bee 2.
- Have students discuss why bees might do the bee dance and lead them to understand that it helps them find flowers easier.
- Together go over questions 32 through 34.
 - What type of data did you collect in your experiment? Measurement
 - What did you notice about the times? It was smaller with the bee dance.
 - What is the function of this structure? To help bees find the flower quicker

25
minutes

Review

- Have students fill out questions 35 and 36 where they write what they learned about pollinators.
- Then allow them to share their answers with the rest of the class.

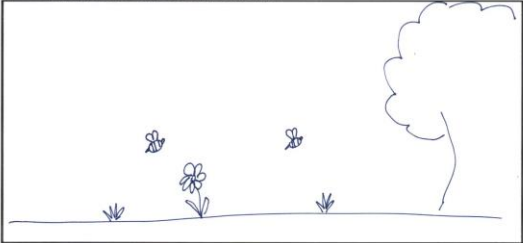
Example Student Work:

Name: _____


Busy Bees

Part 1:
Exploring a Bee's Habitat

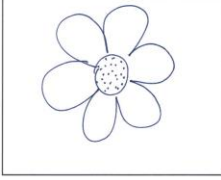
1) Draw a picture of a bee in its habitat.



2) Draw a magnified picture of a bee.



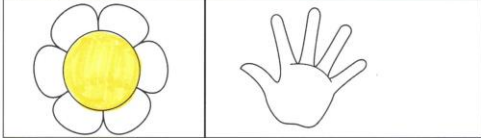
3) Draw a magnified picture of something in a bee's habitat.



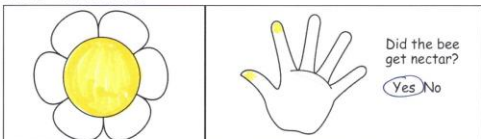
Discuss with the class:
What do bees need to survive?

1

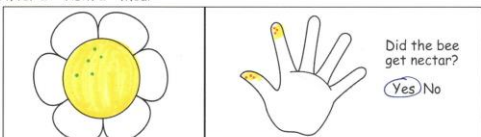
4) What happens to your flower and the bee as it collects food? Look at the flower and the bee (hand). Color the pollen that you see with the correct color at each time during the day.
Beginning of Day



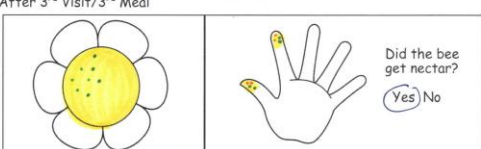
After 1st Visit/1st Meal



After 2nd Visit/2nd Meal



After 3rd Visit/3rd Meal



2

5) What type of data did you collect in your experiment? (circle one)

Observations Measurements Counting

1 2

Let's Analyze Our Data

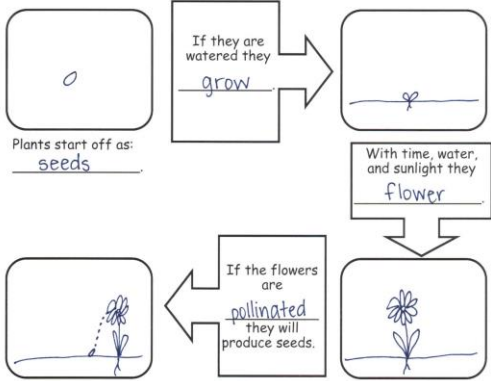
6) Did the bee get nectar? Yes No

7) What happened to the flower? The flower got pollen from other flowers.

Flower Life Cycle

Watch life cycle video with class

8) Why is this important?

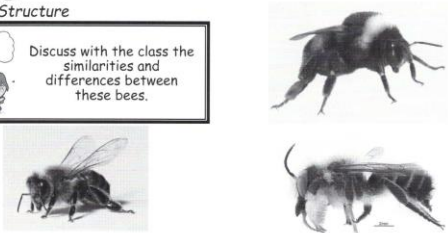


Seeds can grow into new plants.




3

Part 2:
Bee Structure

Discuss with the class the similarities and differences between these bees.



9) Which bee collected the most pollen?

	Plastic Glove	Velcro	Hand
Color the correct amount of pollen on each hand.			


10) What type of data did you collect in your experiment? (circle one)

Observations Measurements Counting


1 2

Let's Analyze Our Data

11) Which method had the **most** pollen stick to each bee?



12) Which method had the **least** pollen stick to each bee?



4

- 13) Draw two pictures, one of a bee that has a structure that will collect a lot of pollen, and one that will collect very little pollen.

Collects a lot of pollen.



Collects a little pollen.



Flower Structure 1

- 14) Which bee collected the most pollen?

	Flower 1	Flower 2	Flower 3
Property:	small pollen	medium pollen	large pollen
Color the correct amount of pollen on each hand.			

- 15) What type of data did you collect in your experiment? (circle one)



Let's Analyze Our Data

- 16) What was the property of the flower where the bee collected the most pollen? It had the smallest pollen size.

- 17) What did you learn about pollen? If the pollen is smaller, it will stick better to bees.

5

Flower Structure 2

- 18) Which flower was visited the most?

	Flower 1	Flower 2	Flower 3	Flower 4	Flower 5
Number of bees that visited flower.	1	III	III	III 1	III III
Property: amount of nectar	0	2	3	10	15

- 19) What type of data did you collect in your experiment? (circle one)

Observations

Measurements

Counting



Let's Analyze Our Data

- 20) Put the flowers in order from most visited to least visited.

5 4 3 2 1

- 21) What is the function of nectar this structure to attract bees



6

Flower Structure 3

- 22) Which color flower did bees go to the most?

	Red Flower	Orange Flower	Yellow Flower	Green Flower	Blue Flower	Purple Flower	White Flower	Clear Flower
Bee 1	1				III		1	
Bee 2		1		1	III			
Bee 3	1				III			
Bee 4				II	III			
Bee 5		1	II		1		1	
Total	2	2	2	4	13	0	2	0

- 23) What type of data did you collect in your experiment? (circle one)



Let's Analyze Our Data

- 24) What is common about the structure of the flowers that were visited? They were colorful and stood out

- 25) What is the function of color this structure to attract bees



7

Flower Structure 4

- 26) What type of flower did bees visit the most?

	Property of Type 1 Flower	Property of Type 2 Flower
	<u>smell</u>	<u>do not smell</u>
Bee 1	5	0
Bee 2	3	2
Bee 3	4	1
Bee 4	5	0
Bee 5	3	2
Total	20	5

- 27) What type of data did you collect in your experiment? (circle one)

Observations

Measurements

Counting



Let's Analyze Our Data

- 28) What type of flowers did bees go to more often?

the flowers that smelled

- 29) What is the function of smell this structure to attract bees

Part 3:

Pollinators and Flowers

- 30) What can flowers do to attract pollinators?

have nectar
be colorful
smell






8

31) How can bees find their favorite flower?

	Time to Find Flower with No Help	Time to Find Flower with Help
Bee 1	1 min 41s	45s
Bee 2	2 min 05s	39s


32) What type of data did you collect in your experiment? (circle one)

Observations  Measurements  Counting 

Let's Analyze Our Data

33) What do you notice about the times? It was smaller with the bee dance

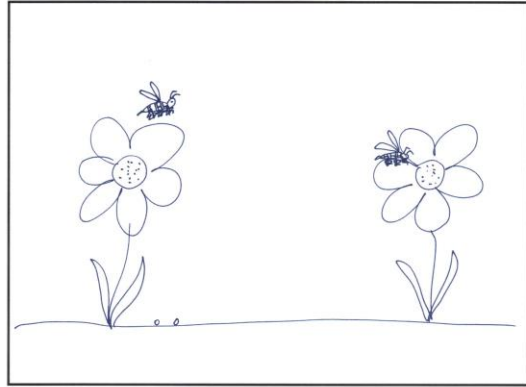
34) What is the function of the bee dance this structure ?
to help the bees find the flower faster



9

Review

35) Draw a picture of what you learned about flowers and pollinators.



36) I learned that when bees travel from flower to flower, they spread pollen, which helps the flower make seeds. The bees eat the nectar.

10

Teachers Notes:

- Some flowers can self-pollinate and therefore, do not need pollinators. At the 2nd grade level this can be left out.
- When flowers get pollinated they are pollinated by plants of the same or closely related species. Typically these plants have the same color pollen. For this activity we used different colored pollen so that students could see the pollen spread.