

Elementary Science: Pollination



A collection of hands-on lessons and activities for the elementary classroom that explore the process and importance of pollination and pollinators.



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Bee Life Cycle

Standards of Learning

Science: K.9, 2.4, 3.8, 4.4

Objective

The student will be able to:

- correctly order the steps in a bee's life
- understand the importance of bees in plant pollination

Materials

- yellow, black, and white construction paper
- markers/crayons
- scissors
- bee template, attached
- life cycle cards, attached
- Down on the Farm: Bees by Sally Morgan (*you may substitute another book on bees*)

Background Knowledge

A bee's life cycle has several distinct stages. Three days after the queen lays her eggs in the hive, the egg hatches into a larva. The larva is fed "bee bread," a mixture of honey and pollen. Next, the larva spins a cocoon in the hive. Within the cocoon the larva turns into a pupa, this takes four days. Lastly, the bee grows into an adult and leaves the comb.

Pollination is the transfer of pollen from the male flower part to the female flower part. The male part is called the anther and contains the pollen grains. The female part is called the pistil and contains the stigma, which is sticky to collect the pollen grains. Pollination must occur in order for flowering plants to reproduce. Pollen grains can be transferred by wind, water, bees, butterflies, other insects, birds, and bats. Bees are attracted to fragrant flowers and the nectar and pollen in these flowers. The bee stops at a flower to suck the nectar and the pollen grains get stuck to the bee's body. Then, when the bee moves to another flower, the pollen grains are transferred from the first flower to the second. The second flower is then pollinated.

Insects are needed to pollinate a variety of fruits, vegetables, and legumes. Common products include tomatoes, onions, blueberries, cherries, pears, sunflowers, pumpkins, broccoli, carrots, squash, cucumbers, lettuce, potatoes, oranges, lemons, limes, mustard seed, vanilla, sugar, almonds, watermelon, and apples. In fact, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. About 80% of these are pollinated by bees. Within Virginia about 80 of Virginia's most popular crops, valued at about \$80 million, rely on pollinators.

Procedure

1. Begin by asking students what bees have to do with food? Point out that bees play an important role in the pollination of many fruits and vegetables that they like to eat.
2. Next, read aloud Down on the Farm: Bees. Note how the bee changes at different points in its life cycle.
3. Pass out a sheet of yellow construction paper, template, and scissors to each student.
4. Fold yellow construction paper vertically.
5. Use solid line on template to line it up with the folded paper. Cut along dotted lines.
6. Use a black marker to add stripes, eye, and mouth.



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7. Cut wing from white construction paper and glue onto bee's body.
8. Next, hand out life cycle cards. Review each stage of the bee's life and have students draw a picture in each box to represent the stages. Cut the cards out.
9. Cut a piece of black construction paper in half vertically. Each student needs just one half.
10. Glue the life cycle cards onto the black paper in the correct order.
11. Fold the black paper like an accordion.
12. Glue onto the inside of the bee. When the bee is opened it's "story" will tumble out.
13. Finish by having students complete the following prompt: "I think bees are important because..." They may write this on the inside of the bee. Encourage students to share their responses.

Extension

Create a bee buffet! Have students design picnic collages with pictures of foods that are pollinated by bees.



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Bee Life Cycle Sequencing Cards

The queen lays eggs in the comb.



The egg hatches into larva and spins a cocoon.



In the cocoon, the larva turns into a pupa.



The bee completes its metamorphosis and leaves comb.



The worker bee pollinates crops.



A Bee's Life

Standards of Learning

Science: 2.4, 3.8, 4.4

Objective

The student will be able to:

- correctly order the steps in a bee's life
- demonstrate understanding of new vocabulary
- understand the importance of bees in plant pollination

Materials

- yellow construction paper
- life cycle cards, attached
- scissors
- glue sticks
- black markers
- Down on the Farm: Bees by Sally Morgan (*you may substitute another book on bees*)

Background Knowledge

A bee's life cycle has several distinct stages. Three days after the queen lays her eggs in the hive, the egg hatches into a larva. The larva is fed "bee bread," a mixture of honey and pollen. Next, the larva spins a cocoon in the hive. Within the cocoon the larva turns into a pupa, this takes four days. Lastly, the bee grows into an adult and leaves the comb.

Pollination is the transfer of pollen from the male flower part to the female flower part. The male part is called the anther and contains the pollen grains. The female part is called the pistil and contains the stigma, which is sticky to collect the pollen grains. Pollination must occur in order for flowering plants to reproduce. Pollen grains can be transferred by wind, water, bees, butterflies, other insects, birds, and bats. Bees are attracted to fragrant flowers and the nectar and pollen in these flowers. The bee stops at a flower to suck the nectar and the pollen grains get stuck to the bee's body. Then, when the bee moves to another flower, the pollen grains are transferred from the first flower to the second. The second flower is then pollinated.

Insects are needed to pollinate a variety of fruits, vegetables, and legumes. Common products include tomatoes, onions, blueberries, cherries, pears, sunflowers, pumpkins, broccoli, carrots, squash, cucumbers, lettuce, potatoes, oranges, lemons, limes, mustard seed, vanilla, sugar, almonds, watermelon, and apples. In fact, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. About 80% of these are pollinated by bees. Within Virginia about 80 of Virginia's most popular crops, valued at about \$80 million, rely on pollinators.

Procedure

1. Begin by asking students what bees have to do with food? Point out that bees play an important role in the pollination of many fruits and vegetables that they like to eat.
2. Next, read aloud Down on the Farm: Bees. Note how the bee changes at different points in its life cycle. This is called a "metamorphosis."
3. Give each student a piece of yellow construction paper. Fold it in half vertically (hotdog style) and cut out the shape of a bee.



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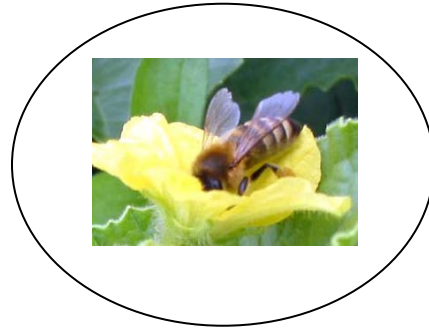
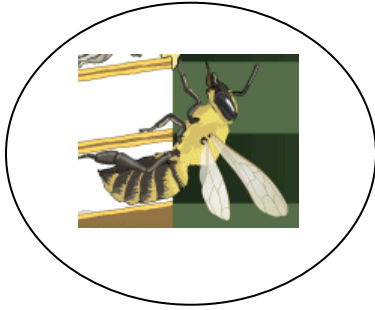
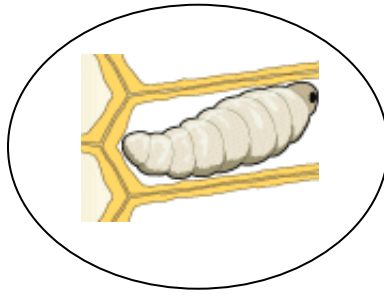
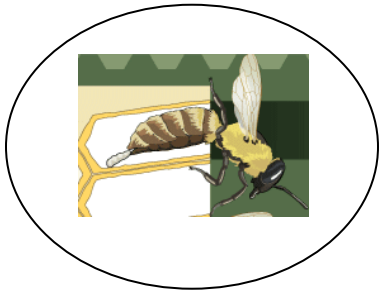
4. Pass out life cycle steps, have students cut them out and sequence them in the correct order and glue to the inside of the bee.
5. Write the following vocabulary words on the board: "egg, larva, pupa, bee, pollinate." Have them write the correct vocabulary word underneath each stage.
6. Above the circles, have them write the word "metamorphosis."
7. Use the left-over white paper to cut out a wing to glue on the bee.
8. You can also use a black pipe cleaner for the antenna.

Extension

Create a bee buffet! Have students design picnic collages with pictures of foods that are pollinated by bees.



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Use this space to draw and cut out your bee's wing.



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Busy, Buzzy, Bees

Standards of Learning

Science: 4.4

Objective

Students will:

- Understand the importance of bees in plant reproduction
- Demonstrate the interdependence between plants and animals

Materials

- Construction paper strips
- Paper bags

Background Knowledge

Bees play a very important role in plant reproduction, and thus, in agriculture. Insects such as bees are needed to pollinate a variety of fruits, vegetables, and legumes. Common products include tomatoes, onions, blueberries, cherries, pears, sunflowers, pumpkins, broccoli, carrots, squash, cucumbers, lettuce, oranges, lemons, limes, mustard seed, vanilla, sugar, almonds, watermelon, and apples. In fact, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. About 80% of these are pollinated by bees. Within Virginia, about 80 of Virginia's most popular crops, valued at about \$80 million, rely on pollinators. Without pollinators, these plants would not bear fruit.

While honeybees are not the only animal pollinators, they are the most efficient. As they collect nectar from different flowers they transfer the pollen which fertilizes the flower allowing it to bear fruit. One forager bee can visit as many as 10,000 flowers a day, but all the nectar she collects in her entire life makes only about one teaspoon of honey.

In this lesson students will simulate the pollination of fruit trees (apple and/or peach). Many Virginia orchardists place beehives on their farms to pollinate their fruit trees. Across the state, as many as 15,000 colonies are used each year to pollinate crops.

Procedure

1. Review the process of pollination by asking students to explain why bees are important to their food.
2. Divide students into 3 groups: fruit trees, bees, and farmers. Partner each farmer with a fruit tree. You may choose to have students wear the attached placards to identify their roles.
3. Each fruit tree begins by holding 30 strips of colored paper. The strips represent their blossoms' pollen. They also need to hold the paper lunch bag.
4. At the beginning of the "growing season," the bees will visit a tree, pick a strip of paper and fly to the next tree. There, they drop their strip of paper in the bag and grab another.
5. Allow one minute for the "growing season." During this time bees should try to visit as many trees as possible.
6. When the minute is up have the bees return to the hive. The farmer then counts the number of strips in their tree's bag. This represents the amount of fruit that they can grow on their tree this season.
7. Tally the amounts and record using a graph on the board.

References

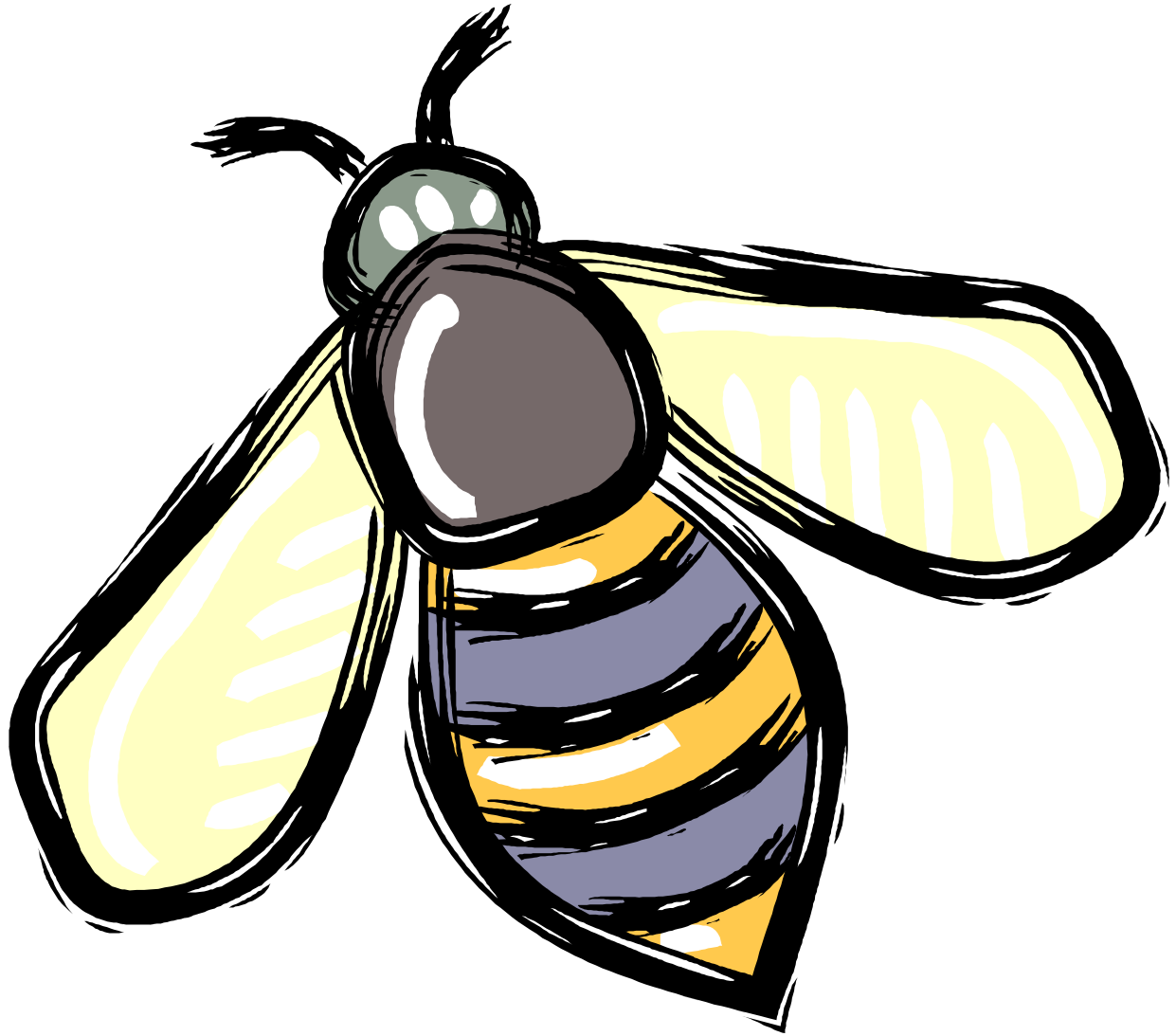


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Lesson adapted from Montana Agriculture in the Classroom.

Role Placards

Bee



Farmer



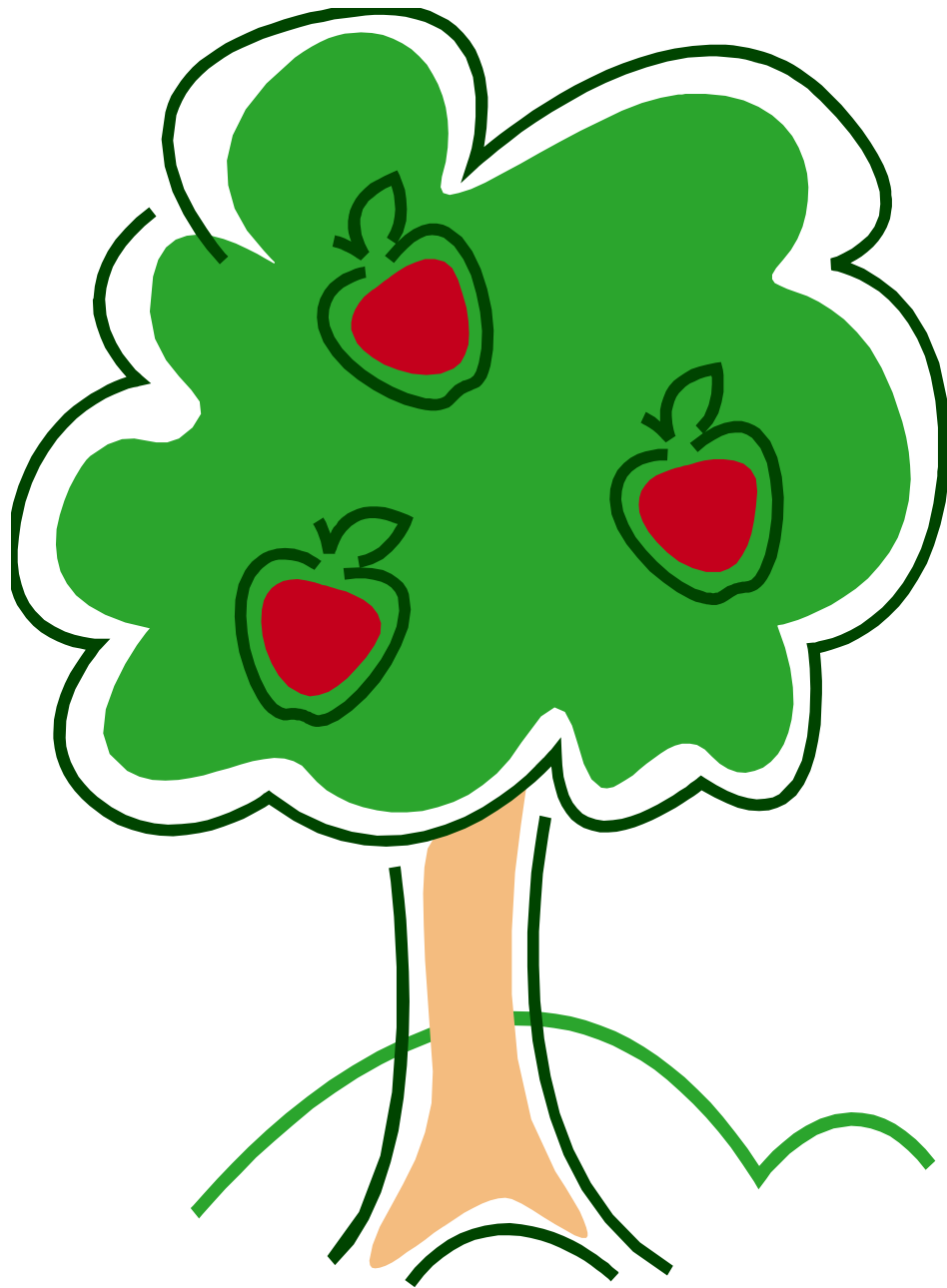
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Tree



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Let's Have a Bee-B-Q!

Standards of Learning

Science: 4.4

Objective

Students will:

- Understand the importance of bees in plant reproduction
- Identify plants that are pollinated by bees

Materials

- Poster board
- Construction paper
- Adhesive

Background Knowledge

Bees play a very important role in plant reproduction, and thus, in agriculture. Insects such as bees are needed to pollinate a variety of fruits, vegetables, and legumes. Common products include tomatoes, onions, blueberries, cherries, pears, sunflowers, pumpkins, broccoli, carrots, squash, cucumbers, lettuce, oranges, lemons, limes, mustard seed, vanilla, sugar, almonds, watermelon, and apples. In fact, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. About 80% of these are pollinated by bees. Within Virginia, about 80 of Virginia's most popular crops, valued at about \$80 million, rely on pollinators. Without pollinators, these plants would not bear fruit.

Preparing for the lesson: Use poster board to create a BBQ/picnic background. Next cut out images of foods that you might be serving (most can be found in clip art): lemonade, strawberry milkshake, potato chips, salad, French fries, watermelon, ketchup, mustard, and a burger with cheese, lettuce, onion, tomato, and pickles (create each of these as a separate piece on the burger). Also cut out several bees. Attach these items to your poster board using reusable adhesive.

In the course of the lesson, students will discover that when you remove the food items that rely on bees (or other insects) for pollination, all that you are left with is the burger, bun, and cheese. Each of the other food items relies on a pollinator. While potatoes are tubers and not the fruit of the plant (the fruit produced by the flower on a potato plant is actually poisonous!), the oil needed to fry them into potato chips and French fries relies on pollination. This lesson serves as an excellent introduction to bees and pollination.

Procedure

1. Tell students that they are going to join you for a cook-out. Tell them that you have picked out some of your favorite items for the barbeque.
2. Place the full poster on the board and identify each of the items that you will be "serving."
3. Now ask students if they would like to have bees at their cook-out. When students respond "no," remove the bees but then tell them that you will now have to make some changes to the cookout.
4. Ask for volunteers to come up and remove items that they believe are pollinated by bees.
5. With your help, at the end you will be left with a plain cheeseburger on a bun. Explain how the other plant items rely on bees to reproduce. Explain that you still have the bun



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because wheat is a grass, which is pollinated by wind.

6. Have students write a descriptive paragraph in which they describe the rather limited food options that they would have without bees or other insect pollinators.

References

Lesson adapted from Smithsonian Education (www.smithsonianeducation.org)

Sample



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Pollination Pizzazz

Standards of Learning

Science 4.4

Objective

Students will:

- Discuss the role of bees in the pollination process

Materials

- How Groundhog's Garden Grew, by Lynne Cherry
- Construction paper
- Paper plates
- Colored sand
- Scissors
- Glue
- Large cotton balls
- Crayons/markers
- Spray bottle of water

Background Knowledge

This lesson is designed to show the role of bees in the pollination process and provides students with a visual representation of this event. Pollination is the transfer of pollen from the male flower part to the female flower part. The male part is called the anther and contains the pollen grains. The female part is called the pistil and contains the stigma, which is sticky to collect the pollen grains. Pollination must occur in order for flowering plants to reproduce. Pollen grains can be transferred by wind, water, bees, butterflies, other insects, birds, and bats. Bees are attracted to fragrant flowers and the nectar and pollen in these flowers. The bee stops at a flower to suck the nectar and the pollen grains get stuck to the bee's body. Then, when the bee moves to another flower, the pollen grains are transferred from the first flower to the second. The second flower is then pollinated.

Prior to beginning this lesson, you should use construction paper and paper plates to design flowers by attaching paper petals to the plates. Fill the center of each flower with a different color of sand. Make at least three flowers with different colors of sand. While the pollen of each flower will be a different color, all the flowers should be the same because pollen from one flower species will not pollinate another flower species.

Procedure

1. Read How Groundhog's Garden Grew to the students. Pause on the pages that discuss pollination and discuss as a class.
2. Ask the students the following questions:
 - What is pollination?
 - Why is pollination such an important process?
3. Tell the students that bees are one of the ways pollen is transferred from one flower to another. Other ways include flies, butterflies, and wind.
4. Tell the students that when bees stop at a flower to suck the nectar, the pollen grains get stuck to the bee's body. Then, when the bee moves to another flower, the pollen grains are transferred from the first flower to the second.



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5. Tell the students that they will be making their own bees today.
6. Put out the construction paper, glue, and scissors for students to design their bees.
7. As students are working, set up your constructed flowers on a front table or on the floor.
8. After the students have completed their bees, hand out one large cotton ball to each student and tell them to glue it to the bottom of their bee.
9. As the students take turns coming forward to do the activity, spray a small amount of water to the attached cotton balls.
10. Tell the students to land their bee on one flower to collect the “pollen”, then land on a second flower, and finally land on a third.
11. As the bee lands, point out to the students how the colored pollen from the first flower is transferred to the second and then those two colors are transferred to the third flower.
12. Tell the students that this is a representation of how a bee transfers pollen from one flower to the next, which pollinates the flowers.
13. Ask students what they think would happen if the bee population suddenly dropped.

Extension

Discuss how bees often face a negative reputation. Challenge students to change this public perception by creating posters, which advertise the positive role bees play in pollination (thus allowing fruits and vegetables to grow).

References

Massachusetts Agriculture in the Classroom. (Spring 2004). Pollination. *The Newsletter of Massachusetts Agriculture in the Classroom*, p. 3-6.

National Honey Board. (2001). *The Honey Flies: A Bee's Life*. Colorado: National Honey Board.



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