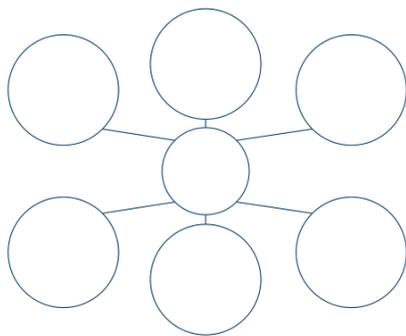


Objective

To understand the pollination process and different kinds of pollinators.

Lesson 1

Read the book *Insects As Producers*. This is a book featuring several insects that help pollinate flowers such as bees, flies, moths, and butterflies. Stop during each insect segment and ask students if they have had any experience seeing these insects at work? What do they see when these insects are outside? What are they doing? Then raise the question, what would happen if the world didn't have bees? What if we didn't have butterflies or moths? What would happen to our flowers and crops? Have students think-pair-share and discuss their theories. After students discuss for one to two minutes have them return to their seats and pass out the bubble map sheet.



Have students put an insect of choice (bee, butterfly, moth, or fly) in the center bubble. Then instruct students to come up with three ways their insect helps the world and our plants; note these in the top three bubbles. In the bottom three bubbles have them write what the world would be like without that insect. Once all students have completed this activity, draw this bubble map on the board and call for student volunteers to come up and write some of their responses for why these insects are important and what would happen if we did not have them.

Grade Level: 2

Subject Area: Literacy / Science / Social Studies / Technology

Materials:

- Insects As Producers* by Annette Whipple
- Bubble map sheet
- Quad mini drone(s)
- 2 iPads
- iPad app for drone
- Tea bags
- Brown sugar
- Cardboard flower cutout or actual flowers from the school garden
- Small, wrapped candy pieces (Bit-O-Honey works well)
- Bowl
- Cheese puffs
- Paper towel
- Marker

Standards:

- 2.L.1.1 Summarize the life cycle of plants
- 2.L.1.2 Compare life cycles of different insects such as bees, butterflies and moths
- 2.G.2.2 Explain how people positively and negatively affect the environment.
- 2.G.2.1 Give examples of ways in which people depend on the physical environment and natural resources to meet basic needs.
- 2.W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

Collaborators:

- Ashlyn Cagle
- Sharon Ferguson

Lesson 2

Students will begin a bee pollination science experiment. You will need wrapped candy pieces, bowls, cheese puffs, paper towels, and markers.

1. Students will use a marker to draw flowers on a paper towel.
2. Then have students place the candy in the bowl.
3. Fill the bowl with cheese puffs.
4. Using hands only, have students dig through the cheese puffs to get a piece of candy.
5. After retrieving the candy, students should wipe their hand on the paper towel.
6. Repeat steps four and five until all of the candy is gone.
7. Ask students, how do the bowl, candy, cheese puffs, cheese powder, and paper towel represent parts of the pollination process? How did the pollen/cheese powder spread? At the end of the experiment, share some or all of these facts:

What is Pollination?

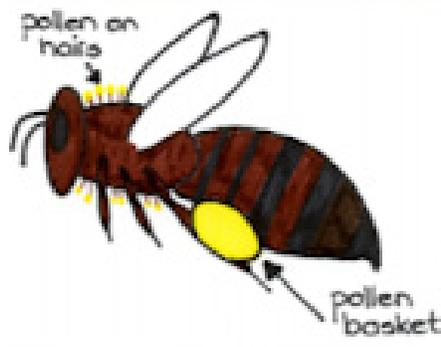
- If no pollination occurs, then plants will not be able to grow seeds, and no other plants will be made.
- Flower pollen is produced and released from an anther.
- Pollen is moved to another flower by the wind or animals.
- Pollination takes place when pollen lands on the stigma of a plant.
- The pollen travels down to the ovary and fertilizes ovules. Seeds will be formed.
- Mostly, plants rely on insects, such as bees, to take the pollen from the anthers of one flower to the stigma of another flower.



Pollination by Honey Bees

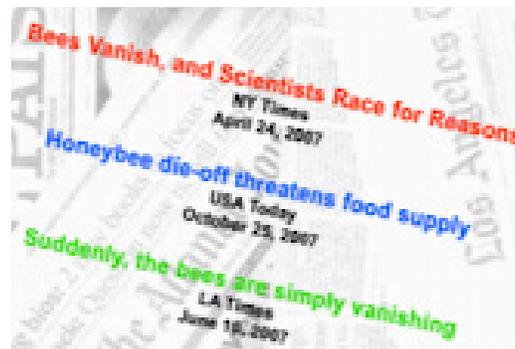
Honey bees are very important insect pollinators. Most of the time, both the bees and plants they visit are benefited. The honey bee gets some food and the plant gets pollinated.

When a honey bee is collecting pollen from the anthers of a flower, it puts the pollen in a special pollen basket on its hind legs. All that pollen will be taken back to the hive. The honey bee is a messy gatherer of food, and some pollen gets stuck on the hairs of its body.



When the bee visits the next flower, some of the pollen brushes off onto the flower and if it sticks to the stigma of the flower, pollination will take place. The bee does not make any effort to put the pollen in the right place.

Why should we care about pollinators?



Headlines like these are becoming more common.

- Honey bees are leaving their hives and never returning.
- Native pollinators such as bats, hummingbirds, and solitary bees are disappearing.

Why?

Scientists are racing against the clock to find out. Here are four good reasons we should all care:

1. One out of every three bites of food we eat is courtesy of a pollinator.
2. Pollinators keep plant communities healthy and able to reproduce.
3. Birds and other animals are even more dependent upon fruits and seeds than we are.
4. Pollinator-supported plant communities bind the soil, helping to prevent erosion.

Ask students what fact surprised them most? Why did it surprise them? Is the disappearance of bees a problem that can be fixed? Have students think-pair-share and think of possible solutions for how humans can either protect and aid bees or what we could use if they all disappeared.

Lesson 3

During this lesson students will be placed into small groups. Students will be given a mini drone such as the Parrot Mambo. This small and compact quad drone is great for indoor use and also comes with virtual reality goggles.

Show groups the current objective: There will be four pods/landing stations laid out in the room. You could also do this outside in the garden area for a real experience. Students will install the grabber component of the drone and use it to represent the bee's legs. At each pod will be a standing flower and a tea bag filled lightly with brown sugar or powdered pollen, if available. Students will need to fly the drone from station to station, visiting the flower, and having them "obtain pollen" (the tea bag of sugar from the flower and move it from one station to the next. If students pick up the tea bag from one station, they will drop it off at the next flower. That second station will have a separate tea bag that is pollen from that plant. Students will need to open the grabber and obtain the next pollen bag and move onto the next flower/station.

This will demonstrate how bees travel to various sources of pollen and how important it is for the bee to not only help the pollen travel, but to help keep the pollen on its body and not fly away in the wind. Ask students if drones could completely replace bees? Would it be a solution to the rapidly decreasing bee population? Why or why not? What could we do to make this process better and more efficient?

Your Notes & Ideas

Bubble Map

Name: _____

Write an insect of choice (bee, butterfly, moth, or fly) in the center bubble.

Think of three ways that the insect helps the world and our plants and write these in the top three bubbles.

In the bottom three bubbles, write what the world would be like without the insect.

