



Engineer a Bee

Authored by Conchita Newman Bees are vital to agriculture, pollinating over \$16 billion worth of crops just in the United States each year. What if there aren't enough bees to do the job?

Overview

 Grades 3-8

 30 min

Topics

Animal Science

Biology

Engineering

Environmental Science





About the Activity

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Bees are vital to agriculture, pollinating over \$16 billion worth of crops just in the United States each year. What if there aren't enough bees to do the job?

In this activity you'll learn why bees are important to agriculture, the unique anatomy of bees, and how bees work as pollinators.



Materials

- | | |
|--|--|
| <input type="checkbox"/> Pipe cleaners | <input type="checkbox"/> Tape |
| <input type="checkbox"/> Glue | <input type="checkbox"/> Paper |
| <input type="checkbox"/> Pen | <input type="checkbox"/> Scissors |
| <input type="checkbox"/> Cotton balls | <input type="checkbox"/> Broom |
| <input type="checkbox"/> Dustpan | <input type="checkbox"/> Bowls |
| <input type="checkbox"/> Salt | <input type="checkbox"/> Food coloring |



Activity Steps

True story: Bee colonies have been mysteriously collapsing over the last decade, putting farms—and global food production—at risk. The sudden collapse of bee colonies is worrying farmers and scientists. The decline of natural pollinators, specifically honeybees, has led to an intensified search for a solution to protect crop yields and solve the challenge facing farmers who need to grow more fruits while facing a shortage of beehives for pollinating their crops.

This problem must be solved to meet the food security needs of the world's growing population. As scientists grapple with this problem, agricultural, mechanical, and electrical engineers are designing mechanical and hand pollination systems that can pollinate plants when insects are scarce.

1 Sketch your bee

Now that you know why bees are so important to agriculture, it's time to build your own bee! To do this, you'll need to lay out your supplies and then sketch your own bee.



DID YOU KNOW?

Honey bees have 5 eyes. In fact, they have 2 different kinds of eyes – compound and simple eyes. The large compound eyes are actually thousands of tiny, independent eyes, all grouped together; and in bees, these compound eyes are also covered with hair.

Yep, bees have furry eyeballs! The hairs are very sensitive and help the bees navigate.



2 Identify bee parts

Which of the supplies will you use for the body, eyes, and legs? (Hint: the pipe cleaners would be particularly good at grabbing tiny particles!) Draw a sketch of your bee, then build it with your supplies.

**DID YOU KNOW?**

Bees have three pairs of legs, each of which are split into six flexible segments. The legs closest to the front are used to clean the bees' antennae, and the rear-most legs actually have a section devoted to capturing pollen, called the 'pollen basket.' This is a huge part of what makes bees such good pollinators!





3 Your Bee Takes Flight

First, put cotton balls into 3 or 4 bowls. Each cotton ball represents a flower, and each bowl represents a crop of flowers. Second, place the bowls around the room. Next, fill another bowl with some salt. The salt represents pollen. Then, set a timer for one minute. Finally, dip your bee in the salt, and fly to the other flowers. See how many flowers your bee can pollinate in that time.



4 How does your bee compare?

Now, compare your calculation to the number of flowers visited by real bees in the same time frame—which is 100! Now, that's a busy bee! How did your bee compare to the real thing?



**DID YOU KNOW?**

The abdomen of the honey bee contains major organs including stinger, the wax glands, the honey stomach, the respiratory system – instead of lungs bees of holes called spiracles that attach to tubes called tracheae that carry oxygen to the rest of the bee's body.





Test Your Knowledge

See how much you've learned about this theme

Question 1

What is the middle body section of a honey bee called?

- a. Antennae
- b. Wings
- c. Thorax
- d. Abdomen

Question 2

Which part of the bee includes the stinger?

- a. Antennae
- b. Abdomen
- c. Wings
- d. Hamuli

Question 3

What is the sensory organ located on the head of the bee called?

- a. Abdomen
- b. Wings
- c. Hamuli
- d. Antennae

Question 4

Where are the pollen baskets located?

- a. Eyes
- b. Abdomen
- c. Wings
- d. Legs

Question 5

How many wings does a honey bee have, and how do they hook together?

- a. 6 wings, hook together with hamuli
- b. 4 wings, hook together with hamuli
- c. 4 wings, hook together with antennae
- d. 6 wings, hook together with pollen basket

Note: Answers can be found on the last page of the PDF



Reflection Questions

1. What are some ways we can help bee colonies survive?
2. Are there other designs for engineering pollinators that could help pollinate crops?



Investigate and Explore



Bees play an important part in helping the trees, plants, and flowers where you live grow and spread. If you don't have much of that kind of greenery where you live, one small reason would be a lack of bees. Did you notice how many more flowers you were able to pollinate when there were more 'flowers,' and they were closer together? That's what can happen when bees spend more time pollinating and less time flying from place to place—and it's a great example of how planting gardens in your home or neighborhood can help the environment where you live. You can do this by yourself or with your family, and you can also do it by volunteering with organizations that do this kind of work—or through your local 4-H chapter!



Career Connections

Professional entomologists help our world by detecting the role of insects in the spread of disease and discovering ways of protecting food and fiber crops, and livestock from being damaged. They study the way beneficial insects—like bees! —contribute to the well-being of humans, animals, and plants. What careers are available in Entomology? Lots! The many, many careers available in entomology include: federal government agencies (EPA, USDA, APHIS) state departments of agriculture and ecology state agricultural research stations, university extension service, agrichemical company field representatives, research, and sales agricultural consulting firms; private agribusiness firms timber and seed production companies and international development agencies.



Test Your Knowledge answers

1) c. Thorax. 2) b. Abdomen. 3) d. Antennae. 4) d. Legs. 5) b. 4 wings, hook together with hamuli .

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