Basic Honeybee Anatomy

…and the anatomy of the hive!

Age group: This activity is best suited for children ages 8+

Timeframe: 15-20 min lesson, 30 min hands-on hive activity (can do one without the other if desired)

Nutshell: Students learn to identify different parts of a honeybee, and distinguish between different types of bees in the hive.

Supplies:

- Picture of honeybee with labeled body parts
- Pictures of worker bee, drone, and queen bee
- Model or "stuffed animal" bee (optional, to practice naming)
- Magnifiers (optional)
- Dead bees (optional)
- Bee suits, hive tools, and smoker, if working hands-on at the hive

Set-up:

- Prepare a learning area – indoors or out – to gather students away from the hive to learn about bee anatomy.
- Save and collect dead bees, if you wish students to observe under magnifiers

Activity Description: Gather students in a learning circle at a safe distance from the hive. Hand out bee diagrams and discuss the name and purpose of selected parts – whatever you choose. Then, have students practice naming parts using a diagram without labels, or model bee. (A fun extension could be to create a bee "costume" and dress a student up "like a bee.") Then have students observe dead bees using magnifiers and identify different parts. (You can skip this if you don't have magnifiers or dead bees.) Then, introduce the three different types of bees and their characteristics. You could get students to act these out, if you like. Show a picture of workers, drones, and the queen.

If you are able to take students over to the hive, have them look closely at bees, if they are comfortable, and see if they can identify the different types of bees, and some of the anatomy you just discussed. Look for bees with pollen on their legs, or bees using their proboscis! Alternatively, if bees are being calm, you can bring one frame of bees away from the hive to where students are sitting.

Questions and Teachable Moments:

- What are some of the different chores that have to be done in your house? What kinds of jobs do you think bees need to do to run their hive?

This lesson was developed at the Goodman Youth Farm, a program of Community GroundWorks in Madison, Wisconsin. For more information, visit www.communitygroundworks.org.

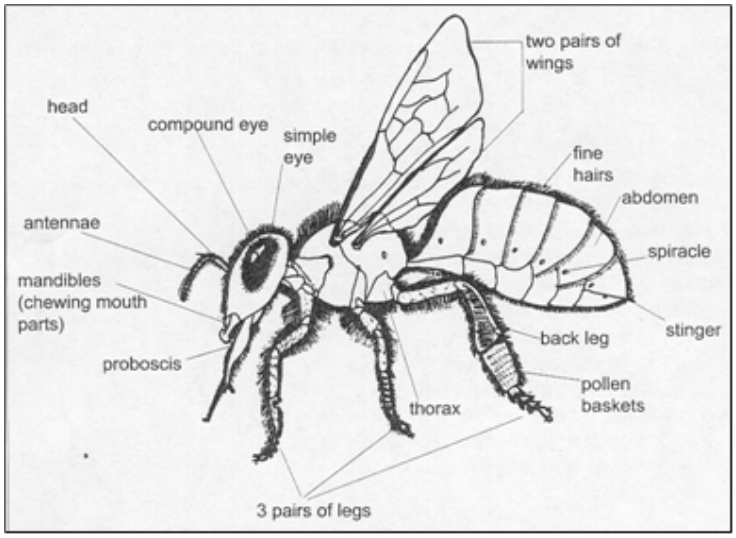
- Letting drones die before the winter comes seems "cruel" to us, but why do you think this would be beneficial to the whole hive?
- How can you distinguish a worker bee from a drone from the queen?
- Why do you think there is only one queen bee?
- Do you think one bee's job is more important than another? Why? What would happen to the hive if one job wasn't done?

Tips and Tricks:

- This activity is especially engaging if you are able to have students observe live bees!
- It is ok to allow students to try to get bees to crawl on their fingers (especially if wearing gloves) if they are comfortable. This is a great way for students to get used to bees and "bond" with them. Try laying the inner cover of the beehive on the ground for students to sit and observe. These bees are often particularly calm.

Anatomy of a Bee: *Apis mellifera*

Compound Eye: Use sun's UV rays to tell direction & color. Thousands of cells.
Simple Eyes (3): Amount of light in the environment.
Antennae: Smell (and direction of smell!). "Spedometer"
Mandible: Strong jaw: eating, shaping wax ("tool"), feed babies and queen ("bottle"), clean the hive ("broom"), clean themselves ("lufa"), fight ("brass knuckles")
Proboscis: Tongue. Food exchange.
Forewing: Pilot
Hindwing: Copilot. Air conditioner.
Sting: Strong muscles connected to venom in Abdomen.



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"Anatomy" of a honeybee hive:

Worker Bees (sterile female bees)

- Most hives have ~80,000 bees in the height of summer, and ~20,000 in winter. Most are worker bees.
- Worker bees only live for ~6 weeks in summer. They literally work themselves to death! Bees will live longer in winter- up to several months.
- In the absence of a queen, some worker bees can lay eggs (called a "laying worker"), but these eggs are sterile and will only produce drones. The hive cannot survive on these eggs.
- Roles of worker bees (one bee may move through several roles in her lifetime)
    - Attendants: Feed queen
    - Nurse: Care for larvae
    - Construction Worker: Build comb
    - Housekeeper: Clean the hive
    - Foragers: Collect nectar, pollen, & propolis
    - Cooks: Evaporate nectar
    - Guards: Defend entrance
    - Undertakers: clear away dead bees

Queen Bee:

- Lays all the eggs to produce new bees for the hive
- Can lay up to 2,000 eggs per day in spring and summer, and up to 1 million eggs in her lifetime!
- Usually will live for 2-3 years, in a healthy hive
- Bees can replace an old queen by feeding one egg a special diet of "Royal Jelly," a high-protein food – this process is called Supercedure
- If a queen senses her hive is getting too strong/crowded, she will signal the hive to "swarm," meaning she will leave with about half of the worker bees to seek out a new home. The remainder of the bees stay behind and raise a new queen. Beekeepers try to prevent their bees from swarming by always giving the queen room to swarm

Drones (male bees):

- Drones are larger than worker bees – you will notice them! Some people confuse drones for the queen, but the queen's abdomen is much longer than the drone's.
- Drone cells (pupae) look like small "bubbles."
- The Varroa mite prefers to inhabit drone cells more than worker cells, because they are larger. Some beekeepers use a special "drone frame" to try to concentrate mites in one area. They will then freeze the drone frame to kill the mites (and the drones, unfortunately).

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- The drone's main role is to mate with a virgin queen from another hive during the queen's mating flight. This is an important role to ensure genetic diversity among hives. After mating, the drone dies. Drones do not do any other jobs in the hive.
- In the late fall when bees are preparing for winter, worker bees will allow any remaining drones to starve to death; while this seems "cruel" by human standards, drones' services are not needed in winter when queens are not mating, and they would only drain limited food resources in winter. This adaptation gives the entire hive a better chance of survival.

Hives can make "collective decisions", usually following pheromone signals from the queen

Bees are very good "housekeepers." They will organize their hive into a brood chamber, as well as pollen and honey areas. They will also clean their hive of dead bees, mold and fungi (to a certain extent), and other pests. (Some pests, most notably the Varroa mite, can overwhelm a hive despite bees' best efforts.) One sign of a "sick" hive is a hive that is dirty or disorganized.

There are surely more facts you could share with students about worker bees, drones, and the queen – these are just the basics!