

Beehive Lesson 4:

Anatomy



Students compare characteristics common to all insects with a honeybee's anatomy before using this information to design and build their own bees.

Guiding Ideas

This project was developed with the American Beekeeping Federation's Kids and Bees program. Explore a new Minecraft world, created by Lifeboat, and use new lessons to introduce students to bees' dynamic and fascinating roles in their own hives and in broader ecosystems. Anatomy is Lesson 4 of 5 for the Beehive.

Learning Objectives

- ⬡ NGSS Crosscutting Concepts: Patterns, Structure and Function
- ⬡ NGSS Practices of Science and Engineering: Designing Solutions
- ⬡ NGSS Disciplinary Core Ideas: ETS1.B: Developing Possible Solutions; ETS1.C: Optimizing the Design Solution; LS4.A: Evidence of Common Ancestry and Diversity
- ⬡ Recognize characteristics shared by all insects, and those unique to honeybees
- ⬡ Practice and reflect on iterative design

Performance Expectations

This lesson will enable students to:

- ⬡ List the characteristics that are shared by all insects
- ⬡ Identify body parts that are unique to bees, and describe those parts' specialized functions
- ⬡ Practice and reflect on an iterative design process

Skills

Collaboration, Creativity

Total time needed

55-80 minutes

Materials needed for classroom activities

A wide selection of craft materials, such as pipe cleaners, egg cartons, tp and paper towel rolls, buttons, googly eyes, construction paper, tissue paper, wire, tape, glue, etcetera, enough for students to build bees in pairs

Projected or printed Bee Anatomy information

One printed copy for each student of the Bee Anatomy Comparison Table

One printed copy for each student of the Honey Bee Body worksheet

One blank piece of paper for each pair of students (or use the back side of one of the other handouts)

Introductory questions

- ⬡ What characteristics make a mammal a mammal? (vertebrates, hair/fur, live birth, warm blooded, produce milk for young)
- ⬡ Think of an insect, like a bee, fly, grasshopper, ladybug, or butterfly. What characteristics do all insects share? (invertebrates, exoskeleton, head/thorax/abdomen, antennae, three pairs of legs, two pairs of wings)

Student Activities

Introduction (whole class) 15-25 minutes

Using the Introductory Questions above, focus students' attention on characteristics that define different classes of animals. Write insect characteristics on the board so students can refer back to them. Remind students that although each class of animals shares certain characteristics, animals in those classes also have features unique to their own order, family, genus, and/or species.

Project or pass out printed copies of [this Bee Anatomy chart](#) along with one copy per student of the [Bee Anatomy Comparison Table](#). Explain that in the first column, students should write down the characteristics that bees share with all insects; in the second column, they should write down the parts that they think are unique to bees; and in the third column, they should write down body parts that they're not sure if they're bee-specific or not. Let students know that it's okay if they're not sure of their answers – that's part of being a scientist! This task can be completed individually or in pairs or small groups.

When the students have finished, ask for a few students to share some of the characteristics they thought are unique to bees, and to defend why they thought that. Encourage others in the class to agree or disagree, using their own arguments. Let students know that in the Beehive world, they will find out which body parts are unique to bees and what bees use those parts for.

Minecraft Beehive (explore as individuals) 10 minutes

Students will meet a scientist in a lab outside of the beehive. The scientist will instruct the students to gather a bee costume, a camera, and a quill and paper from the chest. Students will transport to the hive and meet the NPC Bee Girl outside the hive and receive a welcome and introduction to the beehive. Ask the students to fly to the top of the hive and explore the "Anatomy Section" to review what you just discussed.

They may want to use their cameras and notepads to take a few notes, and amend their worksheets.

Please note that other bee NPCs exist in the Beehive; students will interact with them in other lessons. Also note that many of the NPCs have videos to share, so make sure students have headphones. If the students are having difficulty finding the sections of the hive, they can just ask the queen to send them to where they need to go!

In-Class Exercise and Discussion (whole class and partners) 30-45 minutes

Before class begins, lay out materials for students to use to create their own bees, such as pipe cleaners, egg cartons, tp and paper towel rolls, buttons, googly eyes, construction paper, tissue paper, wire, tape, glue, etcetera.

After students have visited the Anatomy section of Beehive World, hand out a copy of the National Honey Board's "[The Honey Bee Body](#)" worksheet to each student and ask them to work in pairs to fill them in.

Then, ask students to work with their partner to design their own bee that includes, at the least, the basic bee parts: head, thorax, abdomen, wings, legs, eyes, and antennae. Direct students to look at the available materials first, then, on a blank piece of paper, make a sketch of their bee (including labels that identify the bee parts and which materials they plan to use). Circulate and check on the first draft sketches, ask clarifying questions if necessary, and then invite students to begin building.

With 10-15 minutes remaining in the lesson, ask students to tidy their workspaces: return unused items to the materials table, check under tables and chairs for scraps, etcetera. Ask students to look back at their initial bee draft and make notes about what changed as they went through the building process. Then ask pairs to pair up, and in these groups of four, ask students to share their bees, including explaining the functions of the parts they created and describing how and why their bee-building process changed as they completed the task.

External Resources

[Minecraft Beehive File](#) - Download Beehive and open with Minecraft: Education Edition. You'll find this resource in your Templates, under Create New.

[Ask a Biologist: Bee Anatomy](#) - This resource from Arizona State University describes and charts a honeybee's external and internal body parts.

[Bee Anatomy Comparison Table](#) - This worksheet asks students to compare honeybee anatomy with the anatomy of other insects.

[The Honey Bee Body](#) - This worksheet asks students to label internal and external parts of the honeybee's body.

Vocabulary

Head - the section of the bee's body with the brain, mouthparts, antennae, etc.

Thorax - the mid-section of a bee's body, containing the wings, flight muscles and legs

Abdomen - largest section of the body of a bee containing the stinger, honey crop, digestive system, etc.

Antenna - a sensory organ attached to a bee's head which lets it smell and taste

Compound Eye - An eye made up of thousands of tiny lenses that allow a honey bee to see ultraviolet lights, with is invisible to the human eye, as well as visible lights (except for red)

Ocelli - Simple eye with a thick lens that can sense changes in the brightness of daylight

Proboscis - the tongue of a bee that acts as a straw

Legs - a honey bee has three pairs of segmented legs used not only for walking but also to dust off antennae, brush pollen out of the thousands of branched hairs that cover the body, and to store pollen

Pollen basket (also called corbicula) - a section of a worker honey bee's hind leg that carries pollen on stiff hairs

Midgut - the stomach section in the abdomen which digests food.

Honey crop - a storage organ in honey bees' abdomen used for carrying nectar, honey, or water

Fore and hind wings - the honey bee has two sets of flat, thin, membranous wings, strengthened by various veins, the forewings are larger than the hindwings.

Wax glands - glands that secrete beeswax scales

Stinger - the bee's method of defense, housed in the abdomen

Further Study

[Honey Bee Biology and Beekeeping](#)