Honeybees

Incredible Journey

Grade Levels: 6-8

Key Vocabulary:

- **Colony**
- **Classification**
- **Phylum**
- **Genus**

Related Literature:

Bees
Rudolph Steiner

The Beekeeper's Bible
Richard A. Jones

Bee
Rose-Lynn Fisher

Keeping Bees
Ashley English

Objective:

1. Students will understand the characteristics of honeybees and the relationship to the environment.
2. Students will be able to identify the parts of the bee, life cycle and organization of the bee colony.

Performance Objectives:

Grade 6: SS Strand 4 – Life Science PO6
Grade 7: SS Strand 4 - Life Science, Concept 3 PO1, 2, 5 and 6.
Grade 8: SS Strand 1- Concept 3 PO 1 - 2 Concept 4 PO 2
NGSS MS – LS1: LS1. B. CCSS: WHST. 5 & 6

Background Information:

Honeybees are one of the most important insects to life on Earth. As much as one third of the food we eat is related to honeybees and their ability to pollinate plants and produce honey. While some people might see bees as "pesky" little creatures, others know the true value of busy little bees who spend their life carrying pollen from plant to plant and making sweet honey that adds so much to the food supply on Earth. Bees are responsible for the pollination of farm fields and orchards. Just think: bees help produce apples, cherries, plums, tomatoes and all types of plant-based foods. These bees are called "pollinators" and are a vital part of food production and sustaining life on the planet. Honeybees, like the ones at **Butterfly Wonderland**, are generally so busy that they have no time to be anything but gentle insects that mind their own business. However, if the honeybee feels that the hive is in danger, look out. These little

creatures can be fierce protectors. Honeybees live in hives or colonies which can have from 20,000 up to 100,000 members. Each colony has a queen bee, worker bees and drones. Each member of the colony has a specific job to do in keeping the hive safe, clean and productive. Honeybees are considered to be a highly social and organized society. The queen bee can live for several years while the workers and drones have a much shorter life depending on their specific job and position in the hive.

Honeybees are scientifically classified in the same manner as other living creatures. Honeybees are in the kingdom Animalia, the phylum Arthropoda, the class Insecta, the order Hymenoptera and the family Apidae. The genus is Apis and the species is Apis Mellifera. There are over 10,000 species of bees including many wasp-like and fly-like bees. What makes bees unique is that they provide their young with pollen and honey to eat.

Honeybees are about ¾ of an inch long. While they are small in size, they make up for it in versatility and value to the community. Honeybees have six jointed legs, a three-part body, a pair of antennae, compound eyes and a hard exoskeleton. Bees have thick, pale hairs on their thorax (middle section of the body) that helps to collect pollen as they dive deep into the flowers in search of nectar. Honeybees have an area on their back legs called a "pollen basket." The female bees also have a stinger that contains bee venom. Bees have two sensory antennae on their heads and two compound eyes. The compound eyes are made of many small, repeating eye parts that allow the bees to detect polarized light.

Bees also have a complex mouth that allows the bee to eat and drink. The proboscis extends downward from the jaws (mandibles) and is used as the tube for collecting nectar. Bees have two sets of wings: They have two forewings and two hind wings. The wings are very thin pieces of the bee's skeleton. They are connected together by small hooks that allow the wings to move together when the bee is flying.

A single bee may visit from 50 to 100 flowers in one single trip out of the hive. The bee has such a precise sense of smell that they can determine if a flower has pollen or nectar from great distances away. Honey bees will travel approximately three miles away from the hive in search of pollen and nectar. The distance may vary due to weather and drought conditions. Flowers and other blossoming plants produce sugary nectar that is sucked up by the bee, stored in the bee's honey stomach and then returned to the hive. Back at the hive the returning bee transfers the nectar to a worker bee who prepares the liquid for storage as nectar. Once the

water from the nectar evaporates to less than 18%, the nectar then becomes thickened honey and the worker bees cap the cell with a thin layer of wax.

Honey is the only food that includes all of the substances that are needed to sustain life. Vitamins, enzymes, minerals and water all work in unison along with the antioxidants in honey to nourish the body, and some scientists think, to improve brain functions. Many beekeepers have found that the average bee produces about $1/12^{th}$ teaspoon of honey in her lifetime.

The bee colony is made up of bees with specific duties. The queen bee is responsible for laying eggs to make more bees for the hive. The queen is the largest bee and may lay as many as 2,000 eggs in a single day. The queen can live the longest, but her ability to lay an abundance of eggs is limited in time. The queen and the larva are fed a substance called "royal jelly" that is produced by worker bees specifically for that purpose. The worker bees are all females. They have the tireless job of maintaining the hive, protecting the hive, gathering nectar and pollen, tending to the young and feeding the queen. The younger workers are "house" bees while the mature workers are "field" bees. The workers have a critical job to do and a short life span. Finally, there are the drones. The drones are all male bees. Their sole job is to mate with the queen to keep the hive growing in numbers. Once a drone has mated, it will die. They have the shortest life span, which is about 8 weeks.

The life cycle of the honeybee is in four stages: The eggs are laid, stage one, and they hatch in about three days into larva; during the larva stage, they are fed all day by the worker bees; after about six days, the egg cells are capped and the larva spins a cocoon around their body. A pupa is formed and begins to prepare for the journey into an adult bee; in about 10 days the adult bee emerges. Life in the hive continues with the production of more bees.

Bee eggs and larva

Pupa

Sources: Nova – Tales from the Hive (1998); University of Arkansas Division of Agriculture; University of Michigan; Arizona Department of Agriculture; Back Yard Beekeepers Association.

Procedures and Pre-Activities:

1. State the learning objective.
2. Introduce students to the scientific classification of insects.
3. Read, in class, one of the suggested books or another book related to honeybees.
4. Discuss the natural habitat of honeybees and their importance to the environment.
5. Call on students to give examples of foods produced or enhanced by honeybees.
6. Have students study the body parts of the honeybee. The labeling of the honeybee can be a pre or post assessment activity.
7. Present the background information related to honeybees.

Reflections and Assessment:

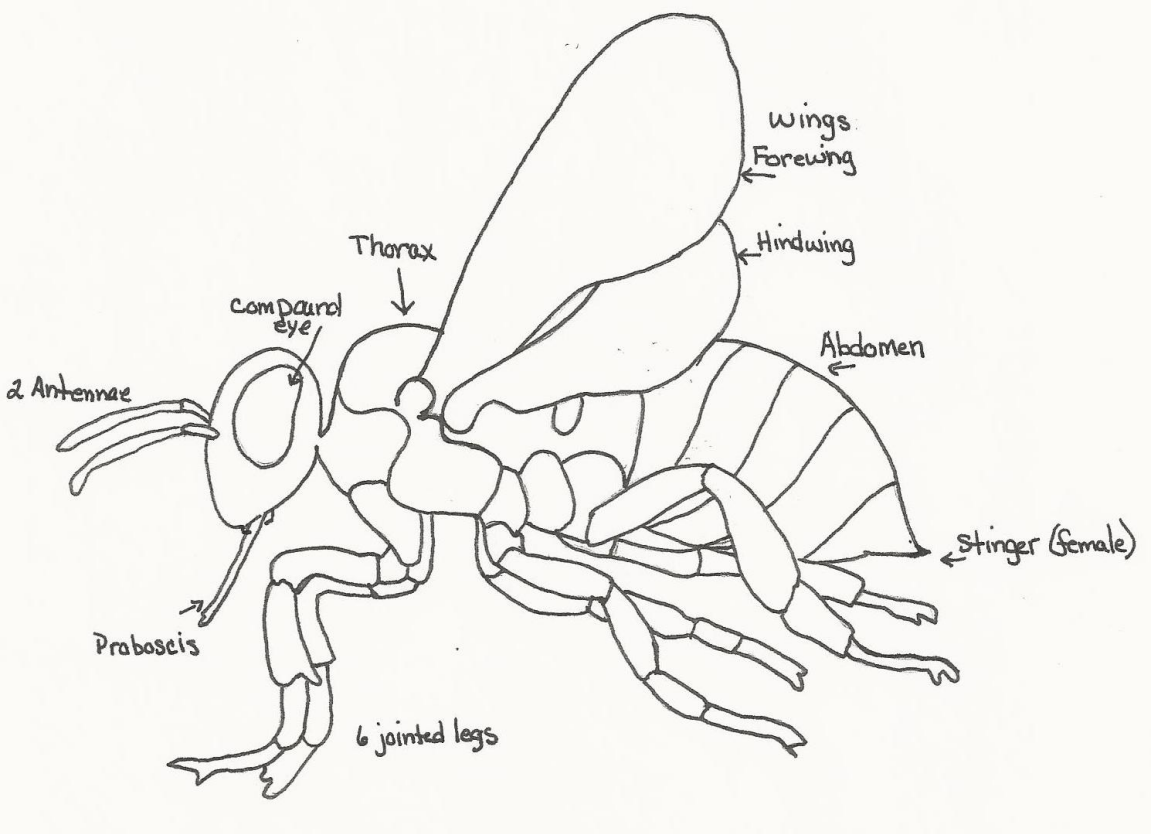
After visiting **Butterfly Wonderland**, discuss the experience and the honeybee colony. Review the facts about honeybees and the unique traits of honeybees. The map activity is one that the students can enjoy as well as use mathematics to complete the activity. Hand out the information sheet to students.

Draw and calculate the flight pattern of the honeybee.
Materials Needed:
Map of the local area and print map in lesson
Pencils (optional colored pencils)
Rulers
Protractors or something to draw a circular pattern
Writing paper
Calculator

Writing Assignment:

Write an expository essay describing the flight of the honeybee. Include as much information as you can on the structure of the bee, the need for finding pollen and nectar and the flight pattern you were able to draw on the map. You may also include any of the calculations you have done on the range and distance the bee can fly. Explain the impact honeybees have on the environment and what might happen if honeybees were to become extinct. Consider the information you have learned about the contribution honeybees make to the food source and life on Earth.

Parts of the Honeybee



How far do bees fly?

From the background information, we know that bees must locate many flowering plants in each hour of the day that they are at flight. Bees work during the light of day, so we have to set a starting and ending time for the bees to go in search of pollen and nectar. We also know that bees generally go as far as 3 miles from the hive. However, if the weather conditions are not suitable, the bees will not go that far. For example, if it starts raining, the bees will seek shelter as rain makes them heavy and impacts their ability to fly. Further, if there has been a drought, bees may have to go a greater distance to find enough flowering plants to meet the needs of the hive.

To plot the flight pattern for the bees, consider the location of the hive, **Butterfly Wonderland**, and the area that is around the location. A desert location presents several potential obstacles in the bee's search for food. When plotting the flight pattern of the bees, begin at the hive and measure outward from that location. As you measure, use a scale of 1 inch = 3.5 miles. Measuring out from the hive, draw a dotted circle around the area that you feel the bees would visit during their search for food. Look at the areas on the map to see where the bees will visit and what is located in that area.

To further calculate, find out how many acres of land the bees will cover in their search. You can also estimate the number of flowering plants the bee must locate in each day if they visit 50 to 100 flowering plants in each trip out of the hive. Use the following data to make your calculations:

If bees fly 100 yards, that is equal to 6.5 acres of land.

100 yards = 6.5 acres

½ mile = 540 acres

1 mile = 2,000+ acres

2 miles = 8,658 acres

4 miles = 32,166 acres

Label the parts of the honeybee

Parts:

1. Antennae
2. Compound eye
3. Thorax
4. Proboscis
5. Jointed legs
6. Forewings
7. Hindwings
8. Abdomen
9. Stinger

WRITING AN EXPOSITORY ESSAY

Name: _____ Date: _____

Paragraph #1 – Introduction

Topic Sentence: _____

_____

_____

Major Idea #1: _____

Major Idea #2: _____

Major Idea #3: _____

Closing Sentence: _____

_____

_____

Paragraph #2 – Major Idea #1 is discussed completely and with evidence

Topic Sentence: _____

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Major Idea #1: _____

Major Idea #2: _____

Major Idea #3: _____

Closing Sentence: _____

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Paragraph #3 – Major Idea #2 is discussed completely and with evidence

Topic Sentence: _____

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Major Idea #1: _____

Major Idea #2: _____

Major Idea #3: _____

Closing Sentence: _____

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Draw the flight of the honeybee.