

Hexagon Hives

Standards of Learning

Science LS.8, LS.12

Mathematics 6.9, 7.9

Objective

Students will:

- Explain the advantage of the use of hexagon celled hives by honeybees
- Develop polygon models which demonstrate the strength and structural advantages of hexagon hive cells

Materials

- Tape
- Paper clips
- 2" x 9" strips of construction paper
- Ruler
- Balloons

Background Knowledge

Consider a bee hive. What does one look like? How does the structure provide a safe environment for the colony? Why do bees use a hexagon shape for the cells of the hive? Each question encourages the development of a hypothesis and proving a theory.

Whether naturally occurring or in manmade frames bees create cells within the honey comb in a hexagon shape. The hexagon shape provides a sturdy structure by using an irregular interlocking pattern with no space between cells. These cells are used as a place for bee larva to grow into adult productive members of the colony and to store food. One queen bee is in charge of the hive and lays up to 3000 eggs per day. The worker bees are responsible for collection of food, caring for the queen, tending a nursery full of larva, and keeping the hive.

Modern manmade beehives consist of wooden box-like sections stacked on top of each other. Each box (or super) holds 8-10 wooden frames, each containing a thin sheet of wax foundation. The bees build their combs on these foundations provided by the beekeepers, and therefore save time and effort in honey making. Honey is stored in the combs in the upper parts of the hive. When the bees have filled the combs in this upper section with honey and covered them with wax caps, the beekeeper takes them away to extract the honey and sell the wax for many products.

Bee facts:

Weight of average worker bee: 80 milligrams

Amount of nectar the honey sac can hold: 70 milligrams

Amount of pollen a worker can carry in the pollen baskets: 20 milligrams

Maximum number of eggs laid daily by the queen: 3,000

Average number of trips a worker bee makes outside the hive each day: 10 trips

Average speed of a worker bee in flight: 15 miles per hour

Average distance from hive a worker bee travels in one trip: 1-1/2 miles

Average life of a worker bee in the summer: 45 days



Procedure

1. Ask students to define polygon.
2. Provide examples of polygons including the number of sides for each.
3. For this example the length of all sides will total 9 inches.
4. Give each student at least 5 strips of construction paper.
5. Instruct the student to properly measure the dimensions listed on the chalkboard for each type of polygon and to fold each strip on the measurement lines in order to form the polygon. Students can use tape to connect the ends of the strip to complete the polygon.
6. Have the students construct their triangles as you demonstrate the measuring, folding, and taping of a triangle.
7. Have the students construct the four remaining polygons on their own. Have plenty of extra paper strips on hand for mistakes.
8. Once everyone has completed all the polygons, put students in groups of four to five to build structures of like polygons.
9. Give each group a few balloons to blow up to diameters of approximately 1", 1.5" and 2" to represent developing bees. Students should then see how balloons fit inside each polygon.
10. Have groups discuss the benefits or drawback of each structure in terms of how they fit together, strength of structure, if there is any wasted space between the polygons, if there is any wasted space within the polygon when the balloon is inserted, ect.
11. Come together as a class to discuss group findings.

Extension

- Create a model of a manmade hive to include outer and inner covers, honey super, frame, brood chamber, and bottom board.

References

This lesson was adapted from The Honey Files: A Bee's Life by Alyssa Boettcher
www.honey.com

