

Beehive Structure

STEM Challenge



Have you ever looked closely at a beehive? If you have, you've probably noticed that every cell in a hive is the same shape, hexagons!

Build your own 3-D models of beehive cells below, and explore the structure of a beehive!

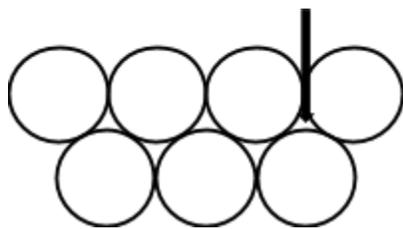
Key Words

Hexagon- a six sided shape, each side is the same length

Efficient- capable of producing desired results, with little or no waste in regard to effort or materials

Background

Beehives are made out of a hard, waxy, compound called beeswax, which bees make from honey. Inside worker bees, special glands convert sugar from honey into wax, which flows through small pores, or holes in the bees abdomen. This is where the wax stays until the bees have chewed it into a soft, moldable material that they can use to build the hive. In order to make one ounce of beeswax a bee must consume eight ounces of honey; that's a lot of honey! So, when building their hive, bees want to use the least amount of wax possible in order to make their hive in the most efficient manner. Why, then, would bees always use the hexagon shape as the skeleton for their hive? Why not a circle, square, or triangle?



If bees were to use circles for the shape of the beehive cells, there would be space in between the edges of the circle, that they would need to fill with wax.

You might say, squares and triangles fit together with no spaces! This is true. Squares, triangles, and hexagons are the different types of polygons that fit together with no space in between.



However, the hexagon shape uses wax efficiently. The hexagon provides the most strength to the hive, and holds the most honey, while using the least amount of wax per cell. Saving time and energy from making wax allows bees more energy to find food, clean the hive, and care for the growing bees.

Beehive Structure

STEM Challenge



Activity

Can you create a 3-D model of a beehive cell?

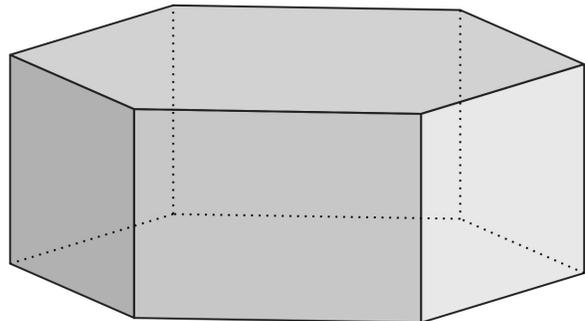
Materials

A pack of toothpicks

A bag of mini marshmallows

Procedure

1. Using your toothpicks as the edges of the shape, and the marshmallows to hold them together, try to build your 3-D beehive cell model. It should look something like the example photo.
2. As you build, write down each step exactly as you did it, as if you were telling somebody how to build the model.
3. Give the instructions to a parent, adult, sibling, or other family member/friend and see if they can replicate your model!
 - a. You may have to rewrite your instructions a few times to make them easy to follow. Be sure to be as detailed as possible.



Guiding Questions

1. The base of the 3-D beehive cell is a hexagon, but the sides are all squares. Would the shape work if all sides were hexagons?
2. How many toothpicks did it take to make one 3-D model? How many marshmallows?
3. Try adding some light weight on top of your completed 3-D cell, was it strong enough to hold it? If so, what was the maximum weight that your structure could hold?
4. What other 3-D shapes could you create with the same materials?

Extension

If you have extra toothpicks and marshmallows, try to link multiple hexagons together, building a 3-D model of a beehive! Remember, every cell must have the same amount of sides! Once again, try adding some weight to your model. Was your multi celled structure stronger than the single cell? How many cells were you able to link together?