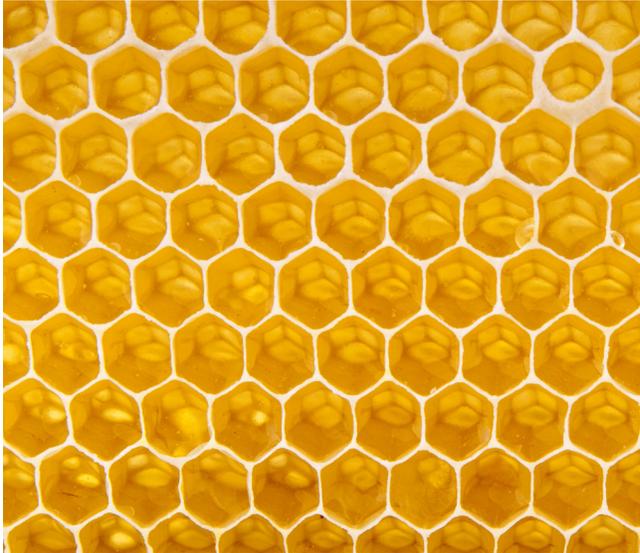


# SCIENCE FAIR CENTRAL

## Maker Corner Activity



## BEEHIVE BASICS

Grades 6-8

**MAKE. CREATE. EXPLORE.**

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## Mason bees help grow important flowers and crops in urban areas

### Overview

**Mason bees are some of nature's best pollinators.**

By collecting pollen on their hairy underbellies, these bees help to spread the growth of fruits and flowers. Mason bees are gentle and easy to maintain, even in urban environments.<sup>1</sup>

In this activity, students will build a beehive for mason bees that can be packaged and used in densely populated areas where there aren't as many pollinators. The colony of bees will help grow important flowers and crops in urban gardens.

**Note:** this activity is best conducted in early spring, which is prime season for mason bees!

**This activity focuses on** the "Designing Solutions" and "Creating or Prototyping" stages of the Engineering Design Cycle. Students will create a beehive that attracts mason bees to urban environments, where these major pollinators can help to grow healthy crops.

This activity focuses on the **Designing Solutions** and **Creating or Prototyping** stages of the Engineering Design Cycle.

#### Engineering Design Cycle

- Defining the Problem
- **Designing Solutions**
- **Creating or Prototyping**
- Refine or Improve
- Communicating Results

### Objectives

**Students will be able to:**

- **Understand** the habits and behaviors of mason bees and
- **Apply** that understanding to the construction of their very own hive to
- **Create** a colony of mason bees that will help to pollinate urban areas.



80% of all the United States' insect crops are pollinated by honeybees!

## Materials

- Beehive Build Station Signs
- (3) 4 ft. long bamboo poles
- (1) permanent marker
- (1) ruler
- (2) rolls of masking tape
- (1) 6-inch hacksaw
- (1) hot glue gun
- (1) package of hot glue sticks
- (1) package of coarse grit sandpaper
- (1) piece of 2 in. x 6 in. x 8 ft. pine lumber (have the store or an adult cut this into 3 pieces, each 18 in. long)
- (1) protractor
- (1) pencil
- (1) bottle of wood glue
- (1) package of 2 in. 18-gauge nails
- (1) hammer
- 8 oz. of waterproofing stain
- (1) paintbrush
- (1) drill with a  $\frac{3}{8}$ " drill bit
- (1) ft. long piece of rope or cord
- (1) butterfly bush



## Have you ever wondered . . .

### How to grow the fruits and vegetables we eat?

It all starts with pollination—the process by which plants reproduce. Honeybees are master pollinators, moving pollen from male plants to female plants in their search for food. 80 percent of all the United States' insect crops are pollinated by honeybees—that's over \$20 million dollars' worth of crops each year!<sup>2</sup>

### How you can help sustain our future food supply?

Honeybees pollinate a variety of crops, including flowers, fruits and nuts.<sup>2</sup> Human development and modern agriculture has threatened to wipe out honeybees. By building a hive for gentle mason bees, you'll help supplement the stressed honeybee population and enhance pollination for urban gardens, where crops can be grown to support communities in need.

Human development and modern agriculture has threatened to wipe out honeybees.

## Make connections!

### How does this connect to students?

All of the plant-based foods you eat rely on pollinators like bees to grow and reproduce. By creating a hive for mason bees, you are helping to sustain your food supply and the food supply of others around you.



### How does this connect to careers?

**Agricultural and food scientist**—Agricultural and food scientists research ways to keep our foods healthy and safe to eat.<sup>3</sup>

**Conservation scientist**—Conservation scientists manage the parks and wilderness in order to protect precious natural resources.<sup>4</sup>

**Zoologist**—Zoologists study animal behavior and the effects of humans on animals and their natural habitats.<sup>5</sup>

### How does this connect to our world?

Bees are an important part of our ecosystem. Without bees and other pollinators, we cannot grow the foods we need to survive. In this activity, you will learn how even a small activity like creating a mason beehive can have a big impact on our food resources.



## Blueprint for Discovery

**Before the activity:** Post the Beehive Build station signs, with the required tools, around your classroom or designated build-space.

### 1. Share the video [Land-Use Change Rapidly Reducing Critical Honey Bee Habitat](#).

After watching the video, ask students to discuss the following questions in small groups.

- How are humans impacting honeybee habitats?
- Why is pollination important?
- What would you want to learn about honeybees, after viewing the video?

**2. Invite groups to present answers to the questions.** Then, explain to students that they will be working as part of a team to build a beehive that that can be packaged and used in densely populated areas where there aren't as many pollinators. Bees are an important foundation to



what humans eat. They maintain our global food supply by pollinating vegetables, fruits, and nuts. They produce about a quarter of the food Americans consume. Over the last few years, bees are disappearing globally at an alarming rate. But no one knows exactly the cause.

### 3. Ask students to summarize the problem:

- What is the problem and/or the need that justifies the project?
- Who is the target population and who will benefit from the solution?
- How will the result of this solution impact people's lives and the world?

**4. Organize students into groups of 3-4.** Three suggested activities are provided below that small groups could work on independently while other groups are building their bee habitat. This enables a teacher to work with limited supplies and rotate groups through building stages. Students will use the directions at each station, working in order of the signs, to complete their build.

#### Curious Conundrum

Pose the following question, "where are all the honeybees going?" Invite students to [use the article](#) to gather evidence. Then, ask students to write a claim that answers the question.



#### Career Exploration

Guide students to research factors responsible for Colony Collapse Disorder. Ask students to select one of the careers below and determine that career's position about the causes and factors responsible. Students should cite at least three supporting pieces of evidence.

##### Agricultural and food scientist—

Agricultural and food scientists research ways to keep our foods healthy and safe to eat.

**Conservation scientist**—Conservation scientists manage the parks and wilderness in order to protect precious natural resources.

**Zoologist**—Zoologists study animal behavior and the effects of humans on animals and their natural habitats.

#### Citizen Science

Citizen science projects encourage students to collect data in their own backyard to contribute to larger research efforts. Encourage students to search for bee related projects in their area to participate in and plan out how they will help. <https://scistarter.com/finder?phrase=bee>



### 5. After students have built their beehives, they will need to decide where to start the colony.

Ask students to plan where they want to place or send their colony. Guide students to consider the following as they develop and execute their plan:

- Plant the butterfly bush near the home or building where you'd like to attract the mason bees. Butterfly bushes help to attract butterflies, bees and other pollinators to your area.

Bees are also attracted to flowers with single blooms, such as marigolds and daisies. Planting lots of flowers around your hive will keep your bees happy and healthy.

- Hang your beehive on a tree branch or hook as close as possible to the butterfly bush
- Make sure that your new beehive faces in the direction of the sunrise! This will help attract the mason bees.

## Take Action

Want to learn more about mason bees and beehive design?

Check out these resources:

- [New2Bees Mini Course: Guide to Raising Gentle, Solitary Bees](#)
- [Plant a bee garden—create an oasis for bees and other pollinators](#)
- [Create an edible schoolyard!](#)



# National Standards

## Science

[Next Generation Science Standards](#)

### **K-ESS3-3 Earth and Human Activity**

Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

### **HS-LS2-8 Ecosystems: Interactions, Energy, and Dynamics**

Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

### **K-ESS3-1 Earth and Human Activity**

Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

### **3-LS4-4 Biological Evolution: Unity and Diversity**

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.



### **HS-ESS3-4 Earth and Human Activity**

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

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## Technology Education

[International Technology and Engineering Educators Association](#)

**Students will develop an understanding of Design. This includes knowing about:**

- Engineering design
- The attributes of design
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving

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## Mathematical Practice

[Common Core](#)

**CCSS.MATH.PRACTICE.MP4 Model with mathematics.**



# Works Cited

\*\*Adapted from a mason bee house design on Parkseed.com: [http://parkseed.com/product.aspx?p=38766&utm\\_source=bing&utm\\_medium=cpc&utm\\_campaign=ppc\\_bing\\_pla&ef\\_id=WQILDAAABYx6D-5Bi:20170427151524:s](http://parkseed.com/product.aspx?p=38766&utm_source=bing&utm_medium=cpc&utm_campaign=ppc_bing_pla&ef_id=WQILDAAABYx6D-5Bi:20170427151524:s)\*\*

1. The Honeybee Conservancy. Mason Bees: Amazing and Gentle Pollinators. 2016. <http://thehoneybeeconservancy.org/mason-bees/>
2. Reilly, Lucas. "13 Fascinating Facts About Bees." Mental Floss. November 18, 2013. <http://mentalfloss.com/article/53691/13-fascinating-facts-about-bees>
3. U.S. Bureau of Labor Statistics. Occupational Outlook Handbook: Agricultural and Food Scientists. December 17, 2015. <https://www.bls.gov/ooh/life-physical-and-social-science/agricultural-and-food-scientists.htm>
4. U.S. Bureau of Labor Statistics. Occupational Outlook Handbook: Conservation Scientists. December 17, 2015. <https://www.bls.gov/ooh/life-physical-and-social-science/conservation-scientists.htm>
5. U.S. Bureau of Labor Statistics. Occupational Outlook Handbook: Zoologists and Wildlife Biologists. December 17, 2015. <https://www.bls.gov/ooh/life-physical-and-social-science/zoologists-and-wildlife-biologists.htm>

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## Beehive Build Station Signs



### Station #1—Measure and Cut

1. Assemble your materials (make sure that your piece of pine wood has been cut into three 18-inch pieces—you will have extra).
2. Build the frame for your beehive:
  - a. Using your protractor, measure a 33-degree angle on each end of your 3 18-inch pieces of wood. The direction of your measurements should move from the upper left corner to the lower right corner, making each piece of wood into a parallelogram shape. Mark the angles with your pencil.
  - b. With your hacksaw, carefully cut along your pencil markings.
  - c. Once you have sawed each piece of wood, shape them into a triangle to ensure that the pieces fit together.

### Station #2—Glue and Hammer

- d. Beginning at the top corner, apply wood glue to the joints of your triangle. Hold the joints together for 5-10 minutes as they dry.
- e. Hammer 2 nails into each joint of the triangular frame.



### Station #3—Drill

- f. When the glue has dried, set your triangular frame upright on a table. Measure 1.5 inches down from the top joint on either side of the frame. Mark these points with your pencil.
- g. Carefully drill a hole in each of the marked locations.

### Station #4—Thread

- h. Thread your rope or cord through the holes and tie the two ends in a knot.
- i. Sand your frame with the coarse sandpaper, making the wood smooth and removing any splinters.

### Station #5—Stain

- j. Once the frame has been sanded, stain the frame with the wood stain and paintbrush. Allow it to sit for 24 hours.

### Station #6—Nesting Area

- 3. Create the nesting area:
  - a. Measure 3-inch segments of the bamboo stalks with your ruler. Mark the measurements using the permanent marker.
  - b. Wrap a thick band of masking tape around each marking on the bamboo.
  - c. Using your saw, cut through the bamboo stalks at each masking tape measurement point. When you're finished, you should have 48 3-inch segments of bamboo.
  - d. Remove the masking tape from the ends of the bamboo segments.
  - e. Sand each end of the segments with the coarse sandpaper.

### Station #7—Hive Construction

- 4. Construct the hive:
  - a. Stand your triangular frame upright on a table so that the corner with the rope is at the top.
  - b. Starting at the bottom of the frame, hot glue a row of 3-inch bamboo segments to the wooden base.
  - c. Continue in this fashion, gluing the bamboo to the frame and surrounding segments, until your triangle frame is filled with bamboo.

