

BE THE BEE:

A Hive to Table Experience Field Trip Educator's Guide



MATERIALS & RESOURCES:

- Computer with digital projection ability for whole-class viewing OR iPad for individual viewing or re-watching
- **KWL Chart**
- [Be The Bee A Hive to Table Experience](#) video link for students
- Card Work Materials -- instructions below
- [Book Creator](#) App for iPad
- [You Wouldn't Want to Live Without Bees](#) by Alex Woolf and David Antram -- [Read Aloud](#) (optional as a resource for the classroom)
- [A Day In the Life of a Worker Bee](#) -- Supplementary Website
- [What Are Centrifugal and Centripetal Forces](#) -- an article for Educator
- [How To Harvest Honey Tutorial Using a Centrifuge](#) -- video link for students
- [Force - BrainPOP](#) -- video link for students (accessible through CLEVER)
- Clear Balloons -- one per student
- Pennies -- one per student
- [Spinning Penny Balloons](#) -- video link for educator
- [How to Store and Filter Honey](#) -- video link for students
- [Mixture Facts for Kids](#) -- an article for students
- Tools and Ingredients for **Mixture and Solution Experiment** *see Part Three for details



SUMMARY/BIG IDEA:

The first purpose of this virtual field trip is to demonstrate to the students how a bee makes honey. The second purpose is to teach the students that honey is extracted from the frames by the use of an extractor. Centrifugal and centripetal forces are present when removing the honey from the combs. The final purpose is to teach the students that honey contains wax and bee body parts that can be removed through the process of straining. The content in this guide can be shared in a face-to-face learning environment or a digital classroom environment.

CARD WORK INSTRUCTIONS

- Color print onto cardstock and laminate the Card Work documents
- Cut the cards horizontally, there are 3 cards per page
- Each of the 7 steps and its picture will be on 7 separate cards

STEPS:

PART ONE:

1. Begin part one with a class discussion using the **KWL Chart**, encouraging students to explain what they know about how bees make honey as well as what they wonder. Students can fill in their own chart or it can be done as a whole class through a digital platform or face-to-face on large chart paper.
2. Let the students know that they are going to take a virtual field trip to a beehive in Savannah, Georgia with the help of the National Honey Board.
3. Explain that they will learn how bees make honey in the digital field trip. They will then use the card work material to demonstrate an understanding of the order of the steps.

BE THE BEE: A VIRTUAL FIELD TRIP

4. The students will use Book Creator, a free app, to make their own digital book about the process in the same order as the card work. This app can be used on an iPad or computer.
5. Watch [Be The Bee A Hive to Table Experience](#) video link
6. Show the students the cards, discuss the basic steps of honey making, and allow them to place the cards in order. *You Wouldn't Want to Live Without Bees* is an optional book resource for students.
7. **Assessment** -- Allow the students to work in pairs or individually to create their own [Book Creator](#) book about the process of honey making. The students should use their own words to describe the process. The website and app have instructions for the educator.



PART TWO:

1. Prior to this lesson, the educator should read the article from LiveScience.com entitled [What Are Centrifugal and Centripetal Forces](#) to prepare for this lesson and follow up experiment.
2. The students will need to understand centrifugal force, centripetal force, and gravity.
3. Begin part two with a continuation of the **KWL Chart** conversation expanding on what the students may still wonder and what they have learned about honey making.
4. Tell the students that the class will revisit the portion of the Be the Bee Virtual Field Trip where they discuss extracting the honey from the honeycombs. (At time marker 2:32)
5. Point out the spinning centrifuge that is used in collecting the honey from the frames of the hive. The force that is used is both centrifugal and centripetal depending on the frame of reference or point of view
 - “Centripetal force and centrifugal force are really the exact same force, just in opposite directions because they’re experienced from different frames of reference.” Andrew A. Ganse, a research physicist at the University of Washington
 - As we watch the extractor rotate we observe an inward **centripetal force** on the honey as it rotates.

- However, as the honey is part of the rotating system, it experiences a **centrifugal force** as it is being pushed outward from the center.
6. Watch [How To Harvest Honey Tutorial Using a Centrifuge](#) and discuss how each of the forces is working during the spinning of the extractor.
 7. For more information about forces, the educator can also share [Forces - BrainPOP](#) video link for students which is accessible through CLEVER.
 8. **Experiment** -- Give each student an uninflated balloon and a penny. The student should put the penny into the uninflated balloon. Have the students blow up the balloon with the penny inside and tie a knot in the balloon. Tell the students to hold the balloon horizontally in front of their bodies. While holding it firmly, rotate in a rather quick, circular motion. The penny will begin to stand on the edge and race around inside of the balloon, demonstrating both centrifugal and centripetal force. *see [Spinning Penny Balloons](#) -- video link for educator
 9. **Assessment** -- Have the students describe both frames of reference of the two forces as they demonstrate their penny rotating within the balloon. Will this experiment work if you spin the balloon slowly? Why or why not? What other forces are at work on the penny? What happens when you stop rotating the balloon and why?

PART THREE:

1. Begin part three with **KWL Chart**, adding information from the conversation with the students.
2. Ask the students why honey would need to be strained? What kinds of materials could be used to strain the honey? What do you think would be the most effective material for straining the honey? How does gravity affect the process of straining honey?
3. Tell the students that the class will revisit the portion of the Be the Bee Virtual Field Trip where they discuss straining the honey before bottling. Minute 2:49
4. Explain to the students that there are parts that are found naturally in the honey that are unwanted when people eat it, including wax, excess pollen, and bee body parts. Honey is strained to get the unwanted bits out before jarring it.
5. Watch [How to Store and Filter Honey](#)
6. Tell the students that they will simulate straining honey to remove the “unwanted” parts and can enjoy a sweet treat at the conclusion of the experiment!
7. **Mixture and Solution Experiment** -- This experiment is to demonstrate that extracted honey is a **mixture** and honey used in a recipe will dissolve creating a **solution**.
8. Prior to the experiment, the educator should review the article [Mixture Facts for Kids](#) with the students to be sure they understand the difference between a **mixture** and a **solution**.

- **Supplies needed for one student (adjust as needed for the size of the group)**
 - Mug
 - Spoon for stirring
 - Tablespoon
 - ½ teaspoon
 - Small bowl
 - Small strainer
 - 1 tablespoon of honey
 - 6-7 mini-marshmallows
 - ½ teaspoon of chocolate sprinkles
 - 1 tablespoon of unsweetened cocoa powder
 - ½ teaspoon of vanilla extract
 - Enough milk to fill your mug



- Mix the honey, mini marshmallows, and chocolate sprinkles into a small dish, stirring with a spoon. This is a mixture, three simple solids that are not chemically combined. The mini marshmallows represent the wax and the chocolate sprinkles represent the bee body parts.



- Put the **mixture** into the small strainer. Because the solids are not chemically combined, the honey will go through the strainer leaving the mini marshmallows and chocolate sprinkles in the strainer. What forces are at work on the mixture? What is your evidence?



- As the **mixture** continues to separate, begin making the **solution**. Warm milk in the microwave for 30 seconds to 1 minute. Be careful as the mug will be hot.
- Add ½teaspoon of vanilla extract, 1 tablespoon of unsweetened cocoa powder, and stir carefully. This is a **solution** because one substance dissolves in the other. *Hint - it can take a few extra minutes for the cocoa powder to dissolve completely in the milk.



- Mix the honey, mini marshmallows, and chocolate sprinkles into a small dish, stirring with a spoon. This is a mixture, three simple solids that are not chemically combined. The mini marshmallows represent the wax and the chocolate sprinkles represent the bee body parts.



- Add the honey, mini marshmallows, and chocolate sprinkles to the solution and watch as they dissolve into the milk. Enjoy your **solution!**
- What evidence of **energy** caused the honey, mini marshmallows, and chocolate sprinkles to melt into the milk and make a **solution?** Heat!



JOURNAL PROMPTS AND RESEARCH TOPICS

- Pick one of the items from your KWL Chart that you wondered that was not covered. Research that topic and write a few sentences to share with the class.
- Research more recipes that have honey as the sweetener. Write at least one recipe that you can share with your classmates. If you make the recipe, be sure to include your rating and if you would recommend it to a friend.

- Did you know that honey bees are the only insect that makes something that humans eat? What are some other insects that help humans in different ways? Research, write and share what you learned.
- Use Book Creator to tell us something else you learned about honey bees and share with the class.

DISCUSSION QUESTIONS

- How do you think that honey bees benefit from living in a hive? Give evidence to support your answer.
- Predict what would happen if honey bees stopped doing their jobs. How would that affect the plants?
- Explain how honey bees rely on one another for survival.
- Why is the honey sac so important to the survival of the honey bee?
- Why is honey so important to the honey bees?
- Describe the transference of energy starting with the sun, to the bee, to humans.

ANSWER KEY

- Honey bees benefit from living in a hive because they have shelter, food, protection, help to find food sources, other bees who have jobs that support the lives of the bees.
- If honey bees stopped doing their individual jobs the hive would collapse, every bee relies on every other bee to complete the tasks for survival.
- The queen must lay the eggs to keep the hive running. The nurse bees must clean the hive and care for the baby bees. The guard bees must protect the hive from intruders. The forager bees must collect the nectar and bring back to the hive. The house bees must help make the honey and cap it. The drones bees must mate with queens from other hives.
- The honey sac provides a place for the forager bees to collect nectar to bring back to the hive. It is not her stomach, therefore allowing the forager bee to regurgitate the nectar into the mouth of the house bee.
- Honey is the bee's main source of fuel, it would take one ounce of honey to fuel a bee's flight around the world and back.
- Energy from the sun causes plants to grow and flower, the honey bee takes the nectar from the flower to her hive, the bees make honey, the honey provides energy for the honey bee, the honey can also provide energy for humans when they eat it.

BE THE BEE: A HIVE TO TABLE EXPERIENCE VIRTUAL FIELD LESSON STANDARDS

NEXT GENERATION SCIENCE

3-LS3-1; 3-LS3-2; 3-LS4-3; 3-ESS2-1; 3-ESS2-2;

4-PS3-1; 4-PS3-2; 4-LS1-1; 4-LS1-2; 4-ESS3-1

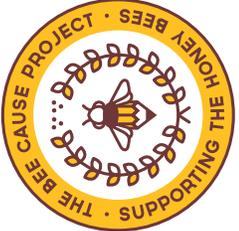
5-PS1-1; 5-PS1-2; 5-PS1-4; 5-PS2-1; 5-PS3-1; 5-LS2-1

ELA COMMON CORE

W.3.2; W.3.6; W.3.7; W.3.8

W.4.2; W.4.6; W.4.7; W.4.8

W.5.2; W.5.3; W.5.7; W.5.8



Name: _____

KWL CHART FOR BE THE BEE VIRTUAL FIELD TRIP

KNOW What do you know about how bees make honey?	WONDER What do you wonder about how bees make honey.	LEARN What did you learn about how bees make honey?

STEP 1

A forager bee collects nectar by drinking it through a proboscis. She stores it in a honey sac.

Photo Credit: "Pinocchio" by Daniele Nicolucci photography is licensed under CC BY-NC-ND 2.0

THE BEE CAUSE
PROJECT



STEP 2

After she has gotten enough nectar, she returns to the hive.

Photo Credit: "We have bees!" by Julie (thanks for 10 million views) is licensed under CC BY-NC-SA 2.0

THE BEE CAUSE
PROJECT



STEP 3

She regurgitates the nectar into the mouth of a house bee.

Photo Credit: "Many probosci make light work" by Max xx is licensed under CC BY-NC-SA 2.0

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PROJECT



STEP 4

The house bees pass the nectar back and forth chewing it to remove the water.

Photo Credit: "In the hive 2" by Max xx is licensed under CC BY-NC-SA 2.0

**THE BEE CAUSE
PROJECT**



STEP 5

The house bees spit the honey into the honeycombs.

Photo Credit: "Profusion of nectar" by Max xx is licensed under CC BY-NC-SA 2.0

**THE BEE CAUSE
PROJECT**



STEP 6

The house bees fan the honey to remove more water from it.

Photo Credit: "Honey cells" by MarkGregory007 is licensed under CC BY-NC-SA 2.0

**THE BEE CAUSE
PROJECT**



STEP 10

The house bees cap the comb with wax to keep the honey clean.

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**THE BEE CAUSE
PROJECT**

