



# BEE PATROL

Grades 4-8: Day 4

## EXPLORE BEE FLIGHT

### WELCOME

(5 min)

Welcome your students. Be friendly.

Say: **Bees are phenomenal. They help pollinate the plants that give us food and flowers. Bees' flight paths are so efficient that scientists and engineers have studied bee flight to design drones and flying robots!**

### GAME TIME

(20 - 30 min)

#### Materials:

- Soft ball/group
- Tape or chalk to mark zones



### BEE BOUNCE

Say: **Today, you're going to act like busy bees! Bees transfer pollen from flower to flower to help plants grow. You'll work with your team to throw the ball and 'land' it on the flowers! The better your bounce, the more pollen you deliver. Let's see how many flower zones you reach!**

**Prep beforehand:** Set up three to five "Flower Zones" in a large grassy area. Use cones, mats, or tape to mark the flower zones. Mark a throw line.

#### What you'll do:

1. Students work in groups. Each group will need one ball.
2. Players line up behind behind the throwing line. Students can throw, bounce or roll the ball trying to land it in a Flower Zone. If the ball stays in the flower zone, they get a point. If you set up a flower zone farther away it can be worth two points or three points.
3. Students can recover the ball and throw again.
4. After a set time or when all members have gotten a turn, add up the points and compare. The team with the most points wins.

### STEM SNACK

(30 min)

#### Materials:

- Lemonade packet
- Dehydrated honey
- Cups



### LEMONADE TIME!

Say: **Bees make honey by collecting sweet nectar from flowers. Then, they drink it as their food! Today, we're honey to make lemonade! Yum!**

Each students mixes their lemonade in a dixie cup.

**Please encourage students to experiment to make a recipe. Ideally they will add a little bit of lemon and honey powder at a time instead of just adding them in all at once.**

#### Give each student:

- One lemonade packet
- Two dehydrated honey packets
- Add water to taste



## READING TIME

(30 - 40 min)



## STEM CRAFT

(30 min)

### Materials:

- Large butcher paper
- Coloring utensils



## DISCUSSION

(30 min)



## Read “Hawaii Has Unique Plants and Animals”

Say: **Flight isn't just about getting from one place to another. Often, flight is important for the survival of plants and entire ecosystems where plants and animals are all interconnected.**

1. Students read the informational text about various plants and animals in Hawaii.
2. Pause at the Think, Pair, Share prompts, talk about the pictures and discuss students' learnings, especially with a special focus on the Hawaiian yellow-faced bee, Nalo meli maoli. Ask: **What were some of the important ways flying helps various Hawaiian species survive?** (Example: **Yellow faced bees fly to pollinate the Ohelo plant, Hoary bats fly to roost in Koa trees and keep insect populations down, and different species of honeycreepers have evolved to pollinate specific species of flowers.**) Ask: **What makes Hawaii's wildlife especially interconnected?** Example: **The plant and animal species of Hawaii have evolved together in a remote location and depend on each other to survive.**

## DESIGN A BUZZ-WORTHY POSTER!

Watch this short documentary about restoration projects to save the Hawaiian Yellow Faced Bee.

### Saving the Hawaiian Yellow Faced Bee

<https://www.youtube.com/watch?v=uFr4eSOnSiU&t=10s>

Say: **Imagine it is your job to come up with a restoration plan to help the Yellow Faced Bee. Work in your groups to create an awareness poster. Here are some ideas to get you started.**

- How could you make a bee home and where will it go?
- What plants will you grow?
- How will you keep out harmful bugs or animals?
- What tools will you need?

Students discuss, collaborate, and create a poster. Have students share their work with the class.

## LEARN ABOUT BEE ROBOTICS (WATCH AND DISCUSS)

Say: **Bees have inspired flight and innovation in robotics and drones. Today, we'll learn about two ways scientists are taking inspiration from bees and bee flight. Mimicking the fuzzy, electrostatically charged bodies of real bees, researchers developed drones with horsehair and sticky gel to transfer pollen between flowers.**

### Flight of the RoboBees | Explorers in the Field

<https://www.youtube.com/watch?v=9JWGiy9FcE>

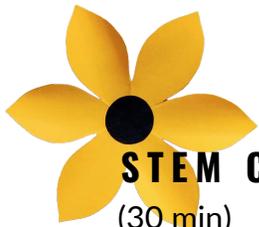
### Robotic bee pollinates flowers

<https://www.youtube.com/watch?v=GN3ZNe1aaoA&t=14s>



## ENGINEERING DISCUSSION

(Continued)



### STEM CRAFT

(30 min)

#### Materials:

- Colored paper
- Coloring utensils
- Scissors

## DRONE TIME!

(60 min)

- Paper flowers
- Tape
- Mini-Flier



## LEARN ABOUT BEE ROBOTICS (CONTINUED)

Say: **While these robo-bees show promise, some critics argue that the drones, while innovative, have damaged delicate orchids during tests, or that robotic bees are unsustainable, expensive and have short battery life. We'd like to hear from you—how can you improve upon this idea?**

Students work in groups to brainstorm how they would make these models better. Here are some discussion questions you can write or display on the board to get them started.

- How did scientists design the drones to mimic bees, and what materials did they use? What changes would you make?
- What makes real bees more efficient than robot bees at pollinating plants?
- Why are some people worried about relying on robots instead of bees?
- What are some ways we can help protect real bee populations in our environment?

## MAKE PAPER FLOWERS (FOR POLLINATION)

**Objective:** Students make paper flowers for a drone pollination activity. Follow the instructions to make flowers:



**Very Easy Paper Flower Craft | Paper Flower Making Step By Step**  
<https://www.youtube.com/watch?v=LcRE4pxf5E1>

## ROBO-BEE MISSION

**Objective:** Students will model how pollinators move from flower to flower by creating paper flowers and using a mini-flier to “visit” them. Through this hands-on activity, students will explore how pollination works.

#### What you'll do:

1. Students make paper flowers and secure them to the ground with tape. This is the pollination course.
2. Students take turns tossing their mini-flier to “land on” or hit flowers. One student tosses the mini-flier drone to land on a flower then another student takes a turn tossing it.



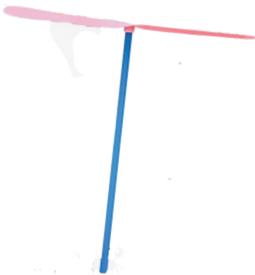
## DRONE TIME! (CONTINUED)

### EXPLORE

(20 min)

#### Materials:

- Straw propellers
- Scissors
- Paper clips or something to use as a weight



## ROBO-BEE MISSION (CONTINUED)

3. The next student then pilots the drone to land on another flower. Drone pilots continue to switch roles until all the flowers have been touched by their drone.

All teams can fly in the same area in the same course like bees in a field to race each other to complete the pollination course.

### DOES WING WEIGHT MATTER?

#### Objective:

Students work pairs. Each pair gets one Twisty Toy Straw Propellor and a piece of string. Students attach the string to their propeller toy and attach a weight to it. Students experiment with adding more weight to they spiny toy to answer the question: How much weight can the spiny toy carry and still fly?

Say: **Scientists once thought bees shouldn't be able to fly. Their wings are too small compared to their heavy bodies—by airplane rules, it made no sense! But bees don't follow airplane rules.**

Watch this short video and discuss with your class:

**Bees should \*NOT\* be able to fly – BBC World Service**

[https://www.youtube.com/shorts/HY\\_h6-1EfuQ](https://www.youtube.com/shorts/HY_h6-1EfuQ)

#### What you'll do:

1. Students attach the string to their propeller toy.
2. They attach a weight to the string. They can use objects for weight such as paper clips, coins pencil erasers, pebbles, small pieces of wood or sticks, or paper wads.
3. Students experiment with adding more weight to they spiny toy to answer the question: How much weight can the spinny toy carry and still fly?



**READING TIME  
+ CRAFT**

**STEM MEDIA +  
ENGINEERING  
DISCUSSION**

**POLLINATION  
MISSION**

**STRAW  
PROPELLOR  
EXPERIMENT**

## **METRICS**

### **5-LS2-1.**

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Students explore how plants and animals in Hawaii depend on each other.)

### **3-LS4-3.**

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. (Students focus on Hawaii as a unique habitat and explore how its species have adapted to survive.)

### **3-5-ETS1-1.**

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

### **3-LS1-1.**

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

### **3-PS2-1.**

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

### **3-PS2-2.**

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

