littleBits
BUSY BEES

DESIGN CHALLENGE
Design your own robotic Beebot that can transfer pollen from one flower to another.

EXPLORE

WRITE
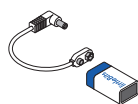
• Complete Writing Box #1 in your guided handout.

CREATE
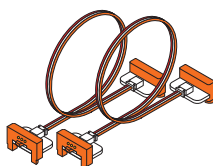
CREATE

Creating the Beebot

1. Gather your invention tools.

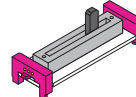|					
a1 battery & cable	p4 power	w1 wire (x2)	i3 button	i5 slide dimmer	o25 DC motor (x2)
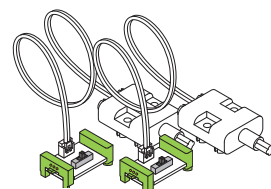
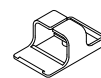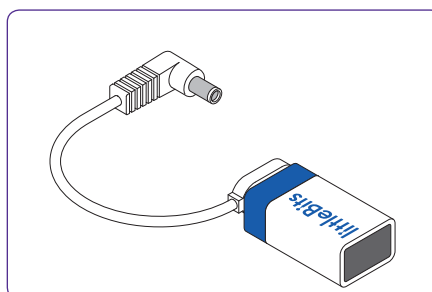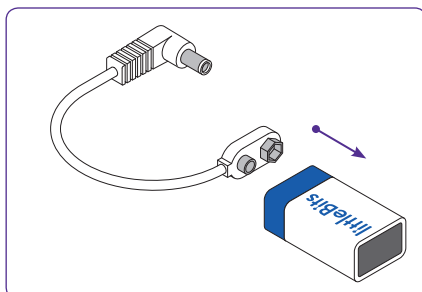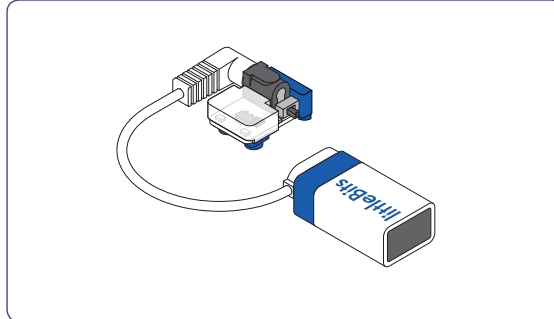|				
a5 magnetic shoes (x2)	a13 mechanical arm	a25 wheels (x2)	a30 mounting board	a31 battery clip
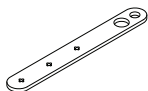
Other materials:
• Bar magnet, 3-inch
• Twist tie
• Small paper clips (6–8)
• Paper, cut to appx. 5" x 7"
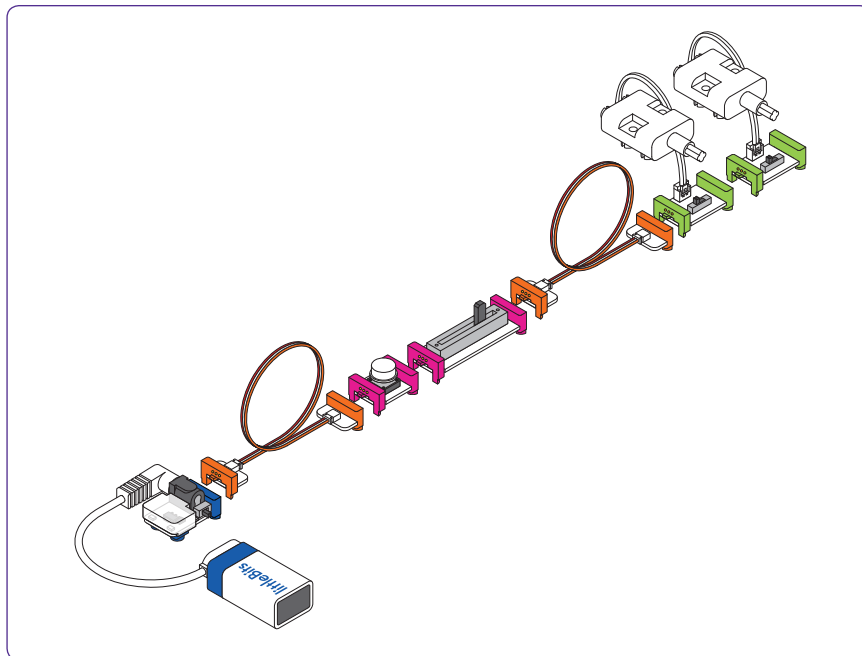• Colored markers
• Tape

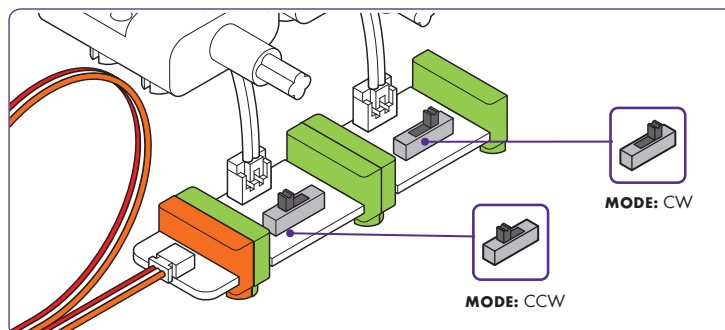**2.** Attach the battery cable to the battery.

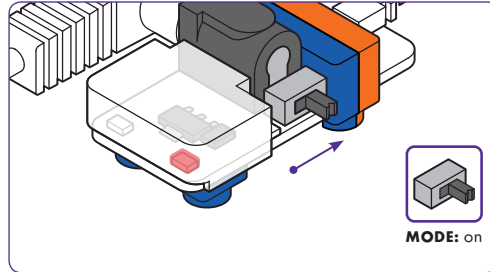**3.** Attach the power Bit to the battery cable assembly.

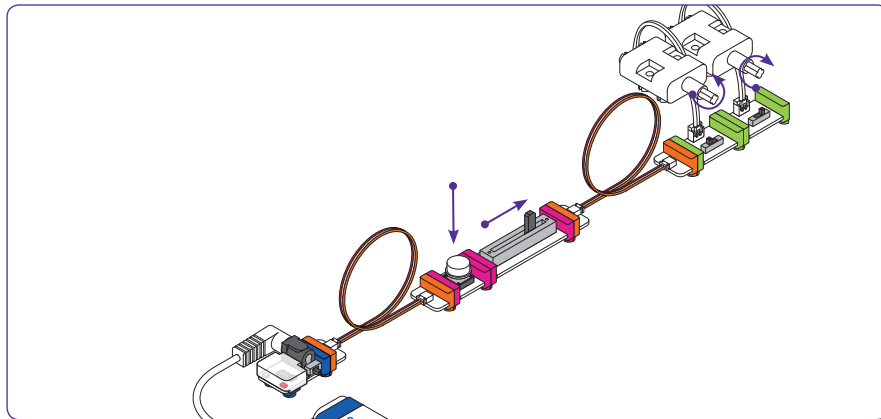**4.** Snap your circuit together (power + wire + button + slide dimmer + wire + DC motor + DC motor).

5. Set the first DC motor to CCW (counterclockwise) and the second DC motor to CW (clockwise).

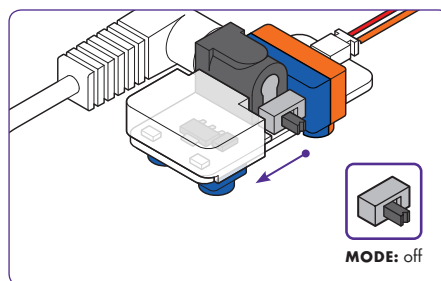

MODE: CW

MODE: CCW

6. Let's test that your circuit works! Power on your circuit.
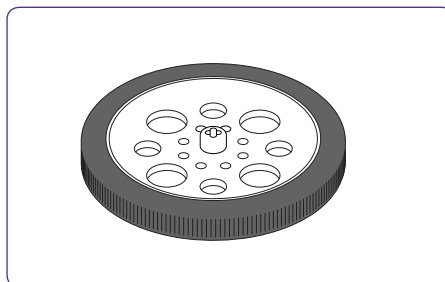

MODE: on

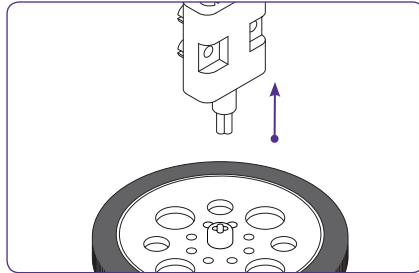**7.** Push the button and move the slide dimmer to the right. Your DC motor axles should spin.

8. Power off your circuit.

MODE: off

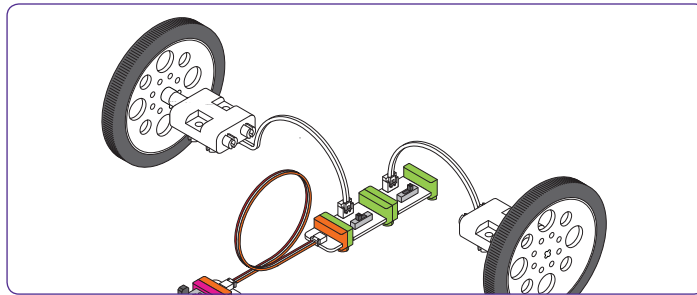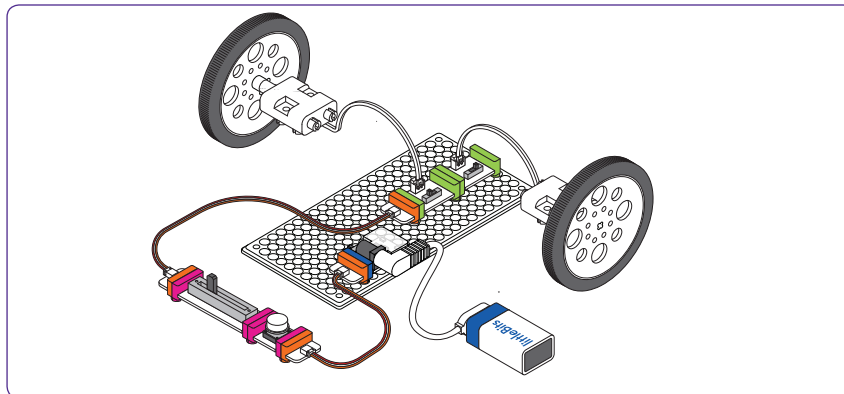**9.** Pick up a wheel and lay it on the table with the longer axle side facing up.

10. Line up the DC motor cross axle with the cross shape of the wheel and gently press together.
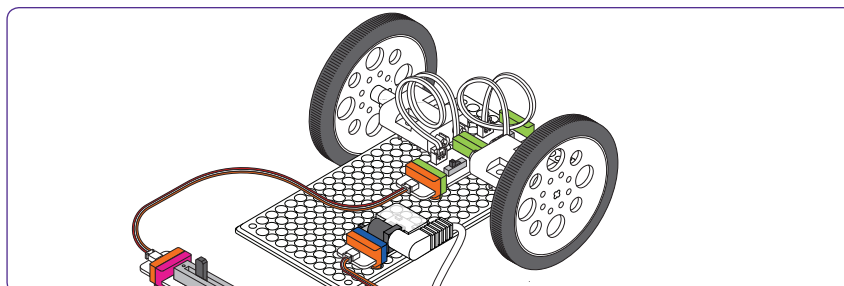

11. Repeat with the other wheel and the second DC motor.

12. Press the power, wire, and DC motors onto the mounting board like the image below.

13. Press the wheels into the mounting board, as shown below.

14. Slide the 9-volt battery into the battery clip and press the battery onto the mounting board.
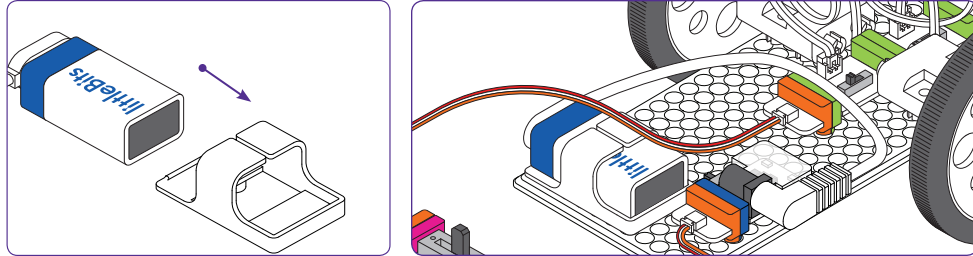
15. Use tape to attach two magnet shoes to the underside of the mechanical arm. The magnet side should be facing out towards you.
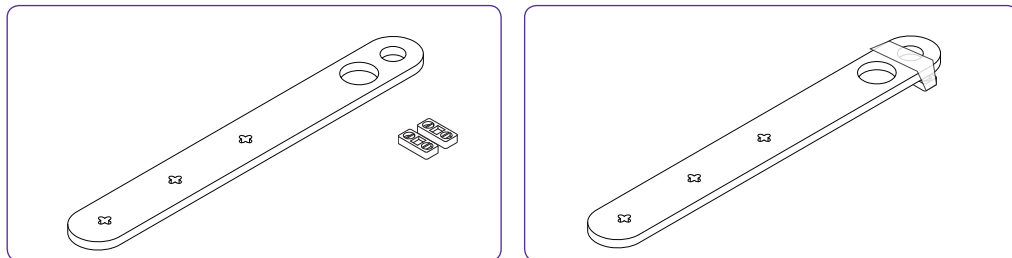
16. Use a twist tie to secure the other end of the mechanical arm to the mounting board between the battery and wire Bit.

17. Let's test that our Beebot works!

PLAY

18. Power on your circuit. Push the button and move the slide dimmer. Your Beebot should move forward in a straight line. If it's moving in a circle, check to make sure that one DC motor is set to CW and the other is set to CCW.
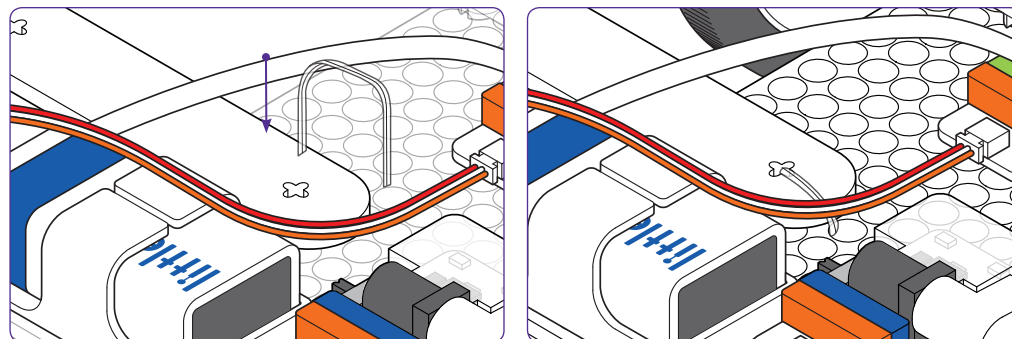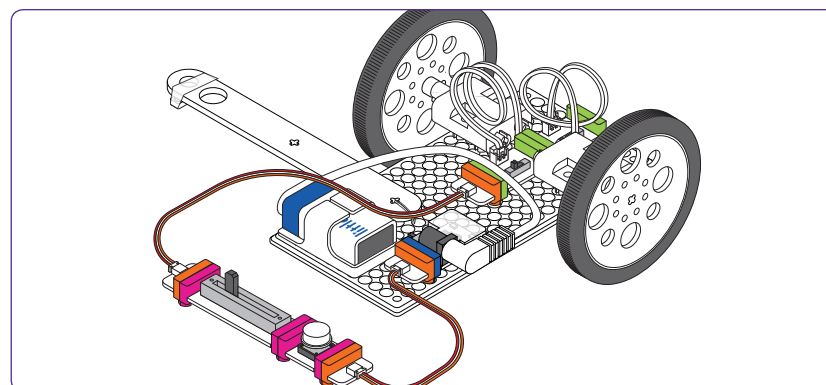

MODE: on
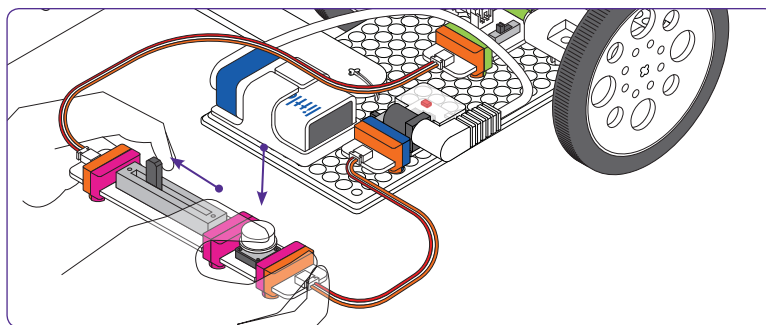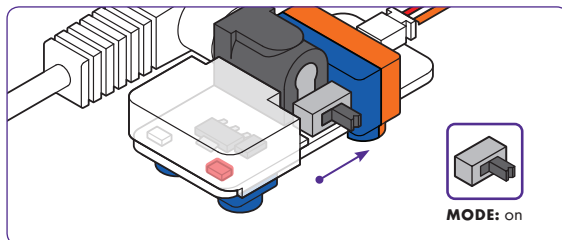
Setting the stage

19. Draw two brightly-colored flowers, one on each piece of 5" x 7" paper. Label one piece of paper with "stamen" and label the other with "pistil."
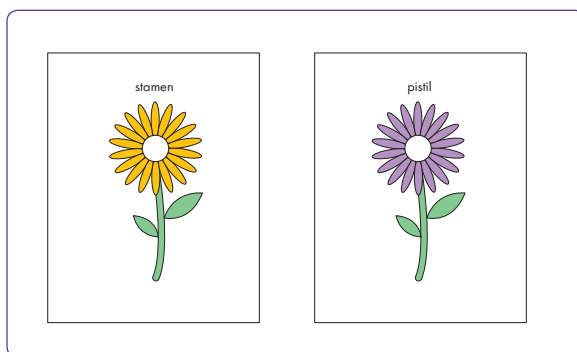
20. Place a pile of small paper clips (the pollen) on the paper flower stamen.

21. Place the bar magnet under the flower part of your pistil drawing. If needed, tape the papers to your surface to hold them in place.

PLAY

PLAY

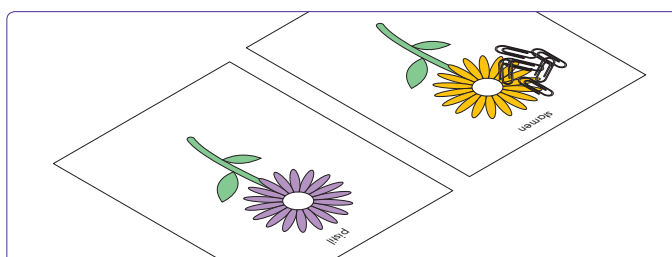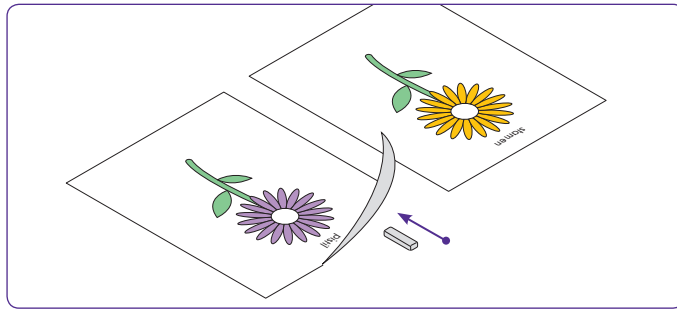**22.** The magnet on the Beebot's mechanical arm mimics the behavior of the bee. Drive the Beebot to the stamen, the male part of the flower and pick up paper clips, which represent "pollen." Then, drive the Beebot over and transfer the paper clip "pollen" to the pistil, the female part of the flower.
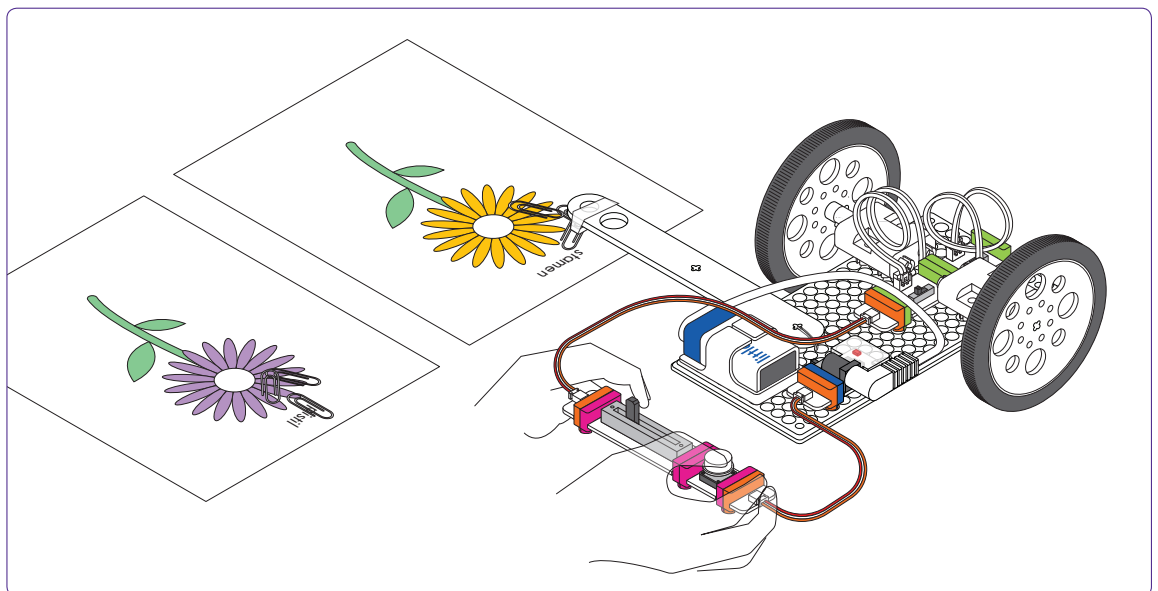
23. Complete Writing Box #2 in your guided handout.

WRITE

REMIX

WRITE

CLEAN

REMIX

- Complete Writing Box #3 in your guided handout.

CLEAN UP

- **Until next time, littleBits!** Place the Bits gently back in the box according to the diagram on the back of the Bit Index; return classroom materials to their proper place and check the area around your workstation.

littleBits
BUSY BEES

Name:

CHALLENGE OVERVIEW

Let's invent a robotic bee that pollinates a
paper flower!

GUIDING QUESTIONS TO REACH LEARNING OBJECTIVES

How are honeybees and flowers connected?

CREATE

1. What will we need to include in our pollination model if we want to show how new seeds are
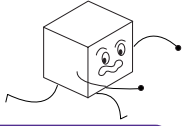   formed in a flowering plant? Sketch your ideas.

PLAY

2. Look closely at the different parts of your Beebot. What does our model tell us about the
   adaptations of a honeybee that help it to survive? Sketch and label your ideas.

3. Imagine that we wanted to model how new seeds form in a pine tree instead of a flowering plant. Pine trees do not need help from insect pollinators, like bees, to reproduce. Instead, their seeds are carried by the wind. How would we need to change our model to help the pine trees reproduce?