Mission Possible Robotic Event Kit

This is a “plug-and-play” event kit to assist GSEIWI Service Units in hosting a badge-earning robotics event for Daisies, Brownies, and Juniors (DBJ).
The goal of this event is for participants to earn the 3 Robotics badges for their age level.



Included in the kit:

- Themed marketing materials
- Facilitator guides covering all three DBJ robotics badges in a multi-level format (with the option to focus on a single age level if you pull out the specific age level items)
- Regional partner contacts to help you connect with local experts (consider inviting them to the event to demonstrate their robots!)
- Email template for partner reach outs
- Supply list with shopping link for ease in ordering
- Cost-per-girl breakdowns
- Suggested volunteer needs for stations



Total Estimated Event Time:
2.5 - 3 hours (Daisy can be shorter by missing the robotics demo)
**Note: smaller groups will take less time*



girl scouts of eastern iowa and western illinois

Program Overview

Welcome & Engineering Identity (10-15 min.)

- Check in Participants
- Activity: Create robotic name tags
- Introduction of topic: what makes a robot and what makes a robot move

Staggered Mission Tracks (20-30 minutes each)

**Note: These can be done with 3 different age levels rotating thru stations or if hosting event with one age level, split the age group into 3 smaller groups to rotate thru stations.*

1. Snackbot Builders: Participants learn how algorithms are used in creating a robot themed snack
2. Mission Code the Course: Participants learn how algorithms can loop as they move through an obstacle course.
3. Invent-a-Bot Studio: (age level specific) Participants will team up with 1-3 scouts in their age group to brainstorm and draw out their ideas and design for their robot. Each participant will make their own robot to take home in the next portion of the event!
    - **(Daisy) Home Helper: Concept is a robot that helps with a household task and solves everyday problems.**
    - **(Brownie) Animal Helper: Concept is animal-inspired robot using biomimicry to help animals.**
    - **(Junior) Planet Saver: a robot that acts as an ocean rescue tool to solve a global environmental problem.**

Transition time (10 Mins)

Debrief on completed activities/volunteers setting up for 2nd half

Robot Makers Lab (45-55 minutes)

(Robotics Badge 2) Step 2

- Daisies learn about parts of a robot as they build
- Brownies learn about robot parts and biological equivalents as they build
- Juniors learn about parts of a robot and mechanical building as they build

Test and Improve (10 minutes)

Program Overview *continued*

Robot Showcase and Reflection (5 minutes)
Each group demonstrates their robot prototype and explains the design and movement they engineered.

Note: Because of their age, Daisies will probably complete the robots much earlier than rest of the group. If they are finished, you can ask them to share their designs with each other. If you have this plan, you can advertise the Daisy portion be done at the 2-hour mark instead of 2.5 hours.

Final (5 minutes)
Debrief on Activities: Connect with entire group

Optional: Robotic demonstration (30 minutes)
Connect with one of the community partners to arrange a robotic demonstration (see partner list). Plan on having the partner demonstration after the Robot Showcase so the youth are not intimidated about their builds prior to their design and build. An email template has been provided.

Brownies and Juniors: Robotics 3

- **Step 3: Learn about robotics competitions**
- **Step 4: Learn about robotics teams**
- **Step 5: See robots in action**

There are also robotic competitions around states which troops could attend to complete Robotics 3 badge for Brownies and Juniors. Competitions are usually held January thru April. You can find dates by googling First Robotics Competition (FRC) Iowa or Illinois to find an event near you.

Note: If you cannot reach a robotics team or go to a competition, you can show the participants some of the robots on this site: https://robotsguide.com/robots

Suggested Minimum Number of Volunteers:

Volunteers can have multiple roles throughout the event. Troop Ratios for safety needs to be maintained. It is strongly suggested that volunteers working the Robot Makers Lab work through facilitator guide to make a robot PRIOR to the event.

- Check-in/Welcome (2)
- Staggered Mission Track (3)
- Robot Makers Lab (3-6): More hands to assist the better!
- Showcase (1)

Event Space Needs

- Check-in area with 1 table away from activities
- Tables with robotic name tags (no chairs are needed, standing can help youth to reach a table better than our adult sized chairs)
- Open area for welcome address to the group
- Open area for obstacle course set up and room to move (if the weather is nice, you can also consider moving this outside)
- Table for Snackbot activity with enough spaces for youth to move freely.
- Table Space for Invent-a-bot activity
- Reuse all spaces for the Robot Makers Lab (volunteers can set up for the materials in age level stages around the room during the transition time).
- Open area for Robotic Showcase so everyone can see the variety of bots created

Cost Per Girl Scout

This cost reflects the approximate base cost of the consumable items for each level. If you must purchase some of the general items then the cost for those items will need to be added. Badges are not included.

- Daisy $9.50
- Brownie: $9.50
- Junior $10.00

Full Event Supply List:

General Supplies
(Items SU may already have)

- Scissors
- Clear tape or glue dots
- Hot glue guns w/ glue sticks
- Copy paper
- Sharpie
- Large die
- Painters tape (1 roll)
- Broom stick or pool noodle
- 10-15 Plastic cups or sports cones
- 3-7 Hoola hoops
- Crayons or colored pencils or markers
- Rubber bands
- Straws
- Yarn
- 2 bed sheets
- 6 chairs
- Couple of heavy books or clips to hold sheets to the chairs (fort to crawl through)
- Power drill with small drill bit
- Multi-purpose art trays (Recommended to hold each participants build components for Robot Maker activity).

Event Specific Supplies

- Sticker copy paper
- Rice Krispie treats individually packaged
- Popsicle or cookie sticks
- Pre-made royal icing
- Ziplock baggies (quart size)
- Candy eyes
- Lego block candy
- String licorice
- Assorted gumdrops
- Electric toothbrush (Dollar tree)
- Vibration motor
- CMOS battery with wires
- Foam tape
- Googly eyes
- Pipe cleaners
- EUDAX set
- AA batteries
- Card stock (pink or any color)
- 4x4” cardboard square
- Large eye needles
- Pool noodles (Dollar Tree)
- Large craft sticks
- Wheels and axels
- Feathers
- Multicolored cardstock

Amazon Shopping List

If you have any questions, concerns, or need assistance, please reach out to EventsAndExperience@GirlScoutsToday.org

Welcome & Robot Name Tags

Time Allotted:
10-15 minutes

Volunteers Needed: 2+

Activity Overview:
Check in and welcome event participants. Participants create a robot name tag to wear during the event.

Learning Objectives:
Daisy: Robotics 1 (Step 1 and 2)
Brownie: Robotics 1 (Step 1)
Junior : Robotics 1 (Step 1)

Supplies:

- Roster of attendance
- TEMPLATE Robot Name Tags
- Robot name tags printed on full sheet sticker paper (see template) 4 per page
- Crayons/colored pencils (markers may bleed while drying)
- Scissors (1 for every 2 girls)
- 1-2 container to neatly hold scissors and coloring pencils
- Visuals of various kinds of robots (Optional)

Approx Cost: $.50/girl scout

NOTE: You will need to plan on one volunteer to check-in everyone and at least one additional volunteer to welcome the Girl Scouts in and get them started coloring their name tags.

Setting up the space

Create a separate space for the check-in area and the name tags so that no one feels crowded as they begin the event. On tables, robot name tags, scissors, and coloring utensils should be set up and readily available for the youth to use.

Name Tag Activity Facilitation

Welcome youth and adults and direct them to the name tags and supplies. Instruct them that while they are waiting for everyone to arrive, they can create the name tag. Encourage parents and troop leaders to let younger Girl Scouts work on cutting out their name tag. Younger Girl Scouts can cut a circle around the robot if they are frustrated or unable to cut into smaller areas. It is important to stress that cutting takes lots of practice. Consider saying, "As an adult, you have spent many years practicing. If they keep practicing, they will get better too!"

As youth finish, stress the importance of leaving things better than they found it and to put coloring and cutting utensils back where they started.

Welcome Address

After everyone arrives:

Hello everyone! Welcome to our Robotics Event! I know all of you may not be finished coloring your name tag but our robot activities are ready to go! Can everyone put their name tag on?

Let's start our event with our GS Promise and Law (everyone says)

Are you ready to have some fun and learn about robots? (Pause for response — "YES!")

Awesome! Let's start with a big question...What is a robot?
(Let kids respond—take a few answers.)

Great ideas! Here's an easy way to think about it:
A robot is a machine that can sense, think, and act.

That means robots can:

- *Sense what's around them*
- *Think using a computer or program*
- *Act by moving or doing something*

They use special parts like:

- *Motors*
- *Wheels*
- *Sensors*

These help them do things automatically or help people.

Everyone stand up: let's act out what robots can do!
Okay, now everyone stand up.
Robots can…

Presenter: Move around! (walk in place)
Kids: Move around!

Presenter: Pick things up! (pretend grab)
Kids: Pick things up!

Presenter: Talk or make sounds! (beep boop noises)
Kids: Talk or make sounds!

Presenter: Follow instructions! (salute or nod)
Kids: Follow instructions!

Where have YOU seen a robot before?
(Let kids answer with examples of vacuum, toys, etc.)

You're right, robots are everywhere!

Ideas if they cannot think of any examples use provided visuals:

- *At home: Robot vacuums clean floors*
- *In factories: Robots build cars*
- *In space: Robots explore planets like Mars*
- *In hospitals: Tiny robots help doctors*
- *On farms: Robots plant and water crops*

Today, YOU get to explore robots just like scientists and engineers! Who's ready to build, code, and play with robots?! (Pause for cheers!)

For our next part of the event, we are going to break into groups by our Girl Scout Level. But don't worry, we will all get to do each activity.

Daisy's will begin at: (Suggestion) Mission Code the Course first to get some energy out!
Brownies will begin at: (Suggestion) Snackbot Building
Juniors will begin at: (Suggestion) Invent-a-bot

Staggered Mission Tracks: SnackBot Builders

Time Allotted:
20-30 minutes

Volunteer Needs for this station: 1-2

Learning Objectives

- Understand that robots do not think on their own
- Understand following directions is an algorithm (ordered steps to complete a task)
- Algorithms coded into computers create instructions for a robot

Daisy: Robotics 1 (Step 1 Learn about robots)
Brownie: Robotics 2 (Step 2 Discover the robot brain)
Junior: Robotics 2 (Step 2 Discover the robot brain)

Supplies:

- Approx. Cost $3/Girl Scout
- Rice Krispie bars (pre-packaged)
- Popsicle sticks or cookie stick (1 per participant)
- Premade royal icing
- Ziplock baggies (1 per person)
- Scissors (2)
- Candy Eyes (2)
- Rope licorice (1)
- Lego block candy (3-4 per person)
- Assorted gumdrops (1-2 per person)
- Containers to hold candy

Volunteer Setup (before rotation)

1. Fill each Ziplock bag with icing; snip a tiny corner right before the activity.
2. Place candies in bowls in the center of the table.
3. Give each Girl Scout a Rice Krispie treat (still wrapped), icing bag, and workspace

Intro Script

For this station, you will pretend you are robots! Your robot job is to build another robot using the pieces in front of you. Robots don't think on their own. Why or Why not? They only do what they are told to do! (If participants get squirrelly, remind them they are robots and cannot move without directions! How still can your robot be?) How do we get robots to do what we want them to do? Many robots have computers which are programed to tell the robots steps. These steps are called algorithms. I'm going to give you an algorithm and see if you, as a robot, can follow it. Your job is to follow it perfectly. Kind of like the game Simon Says, if you aren't being told to do something then you cannot do it!

Step by Step Algorithm

(Facilitator read this very precisely but not the bold faced type! This is just for facilitator knowledge)

1. **Prep your supplies**
- Unwrap your Rice Krispie treat.

2. **Add the stick**
- Push the popsicle stick into the bottom of the treat.

3. **Place your robot**
- Put the treat flat on the table with the stick pointing toward you.

4. **Hold your icing**
- Hold the icing bag pointing down.
- Do not squeeze yet.

5. **Add the eyes glue**
- Squeeze two tiny icing dots near the top of the rice krispie treat.
- Do not let them touch.

6. **Add the eyes**
- Put one candy eye on each dot.
- Count to 3 slowly.

7. **Add the nose**
- Squeeze one icing dot under the eyes.
- Add one candy.
- Count to 3 slowly.

Step by Step Algorithm continued

(Facilitator read this very precisely but not the bold faced type! This is just for facilitator knowledge)

8. **Add the mouth**
- Draw a small line of icing under the nose.
- Place licorice on the line.

9. **Add buttons**
- Put three icing dots on the body.
- Add three candies.
- Count to 3 slowly.

10. **Decorate (optional)**
- Add 3 more candies for antennas, lights, or buttons.

11. **Let it dry**
- Do not touch your robot for 3 minutes.

12. **Robot walk & observe**
- Walk slowly around the table and look at all robots.

Debrief and Debug

- *Did all the robots look the same? Why or why not?*
- *Were any steps confusing?*
- *What happened if you skipped a step?*
- *What did you as a robot have that the one on the table does not? "Brain"*
- *The "brain" in a robot would be a computer. The computer would need to know steps to make a robot move. "An algorithm is just a set of steps to solve a problem coded into a computer.*

Robots use algorithms to:
- *move*
- *make choices*
- *do jobs*

Without algorithms, robots wouldn't know what to do!
Girl Scouts may either eat their robots or place them in a baggie to take home if you run out of time.

Staggered Mission Tracks: Mission Code the Course

Age Group:
Daisies, Brownies, and Juniors (Grades K to 5)

Time Allotted:
20 to 30 minutes

Volunteers Needed: 1-2

Learning Objectives:
Participants complete an obstacle course while learning basic coding concepts like algorithms (step-by-step instructions) and loops (repeating actions) through physical play.

- **Daisies: Robotics 1 (Step 2: Find out what robots can do), Robotics 2 (Step 2: Find out how robots move)**
- **Brownies: Robotics 2 (Step 3: Learn about programming; Step 4: Try Simple Programming; Step 5: Code a Robot)**
- **Juniors: Robotics 2 (Step 2: Discover the robot brain; Step 3: Learn about programming; Step 4: Try simple programming)**

Supplies:
Approx. Cost: $1.50/participant

Course Setup & Game Mechanics
- 8x11 paper: Numbered 1 to 5 to label stations.
- Marker or Sharpie: 1 marker for numbering.
- Painter's Tape: To tape down numbers and create direction arrows on the floor for younger girls and to mark the start and finish lines.
- 1 Die (Dice): To determine the number of loops.
- Stopwatch or phone timer: To track time.
- Loop Trackers: Small tokens like beads, popsicle sticks, or dried beans placed at the start line to help girls count their laps.

Station Supplies

- Station 1 (Limbo): 1 Broomstick or pool noodle, plus 2 chairs (or volunteers) to hold it up.
- Station 2 (Hula Hoops): 6 to 10 Hula hoops. (Alternative: Use tape or chalk to draw circles on the floor).
- Station 3 (Tunnel): 4 Chairs, plus blankets or sheets. (Optional: Add cushions inside for comfort).
- Station 4 (Zigzag Path): 10 Cones or plastic cups spaced out for weaving.
- Station 5 (Balance Beam): 1 Flat board. (Alternative: A straight line of painter's tape on the floor).

Volunteer Set-Up

10 to 15 minutes prior

1. Build the algorithm: Create the 5 obstacle stations. Spread them out in a safe flow that creates a start-to-finish loop path.
2. Label the code: Label each station with a large printed number (1, 2, 3, etc.). Ensure they are in a clear order, as this sequence becomes the "algorithm." (Note: For Daisies who are still learning numbers, place tape arrows on the floor pointing to the next station).
3. Designate roles: Assign one adult to manage the starting line and dice rolling, and one adult to float the course for safety and traffic flow.

Activity Outline & Volunteer Script

Step 1: Learn the Code (5 min)

Focus: Introduce the concepts of algorithms and loops before gameplay.

Volunteer 1 Script:

Welcome, programmers! Why do we need programmers to create robots? Because a robot is a computer, and computers need clear instructions to work. A set of step-by-step instructions is called an algorithm. Today, our obstacle course is our computer program, and the numbers at each station are the algorithm you must follow. What do you think would happen if our instructions were out of order?

Volunteer 2 Script:

In coding, we also use something called a loop. A loop tells a computer to repeat an action over and over. When it is your turn, you will roll this die. Whatever number you roll is your loop! If you roll a 3, you have to complete the entire obstacle course three times. Let's demonstrate how to complete each step of our algorithm!"

- **Action: Have a volunteer or an older Junior quickly demonstrate the correct way to complete the Limbo, Hula Hoops, Tunnel, Zigzag, and Balance Beam.**

Activity Outline & Volunteer Script continued

Step 2: Run the Program (15 min)

Focus: Active gameplay using a staggered start to maintain flow.

The Rules:

- Player 1 steps up, rolls the die, and announces her loop number. The timer starts, and she begins Station 1.
- Each time a player finishes a full lap, they grab a token (bead or popsicle stick) from the start line to track their loops.

The Staggered Start (Instructor Note):

To keep the Girl Scouts moving and prevent waiting, do not wait for Player 1 to finish all her loops! As soon as Player 1 clears the Hula Hoops (Station 2), tap Player 2 to roll her die and begin. Keep filtering girls into the course so multiple "programs" are running at the same time.

- **Action: Continue until everyone has successfully completed their assigned loops. Emphasize learning and correct sequencing over pure speed.**

Debrief and Debug (5 min)

Focus: Group discussion to solidify the coding vocabulary.

Volunteer 1 Script:

Great job running your programs! Let's talk about what just happened. What was our algorithm today? What did the numbers on the dice represent?

Reflection Prompts:

- *Was it harder to do more loops? Why?*
- *How is this like giving instructions to a real robot?*
- *Where else do we use step-by-step instructions in our everyday lives? What about loops?*

Step 4: Level Up! Extensions (Optional)

If you have extra time or are working with older Brownies and Juniors, introduce these advanced coding concepts to increase the difficulty:

- Team algorithms (For Brownie/Junior 'Code a Robot' Step 5): Split the group into two teams. Have each team physically rearrange the stations to create a brand-new algorithm for the other team to follow.
- Conditionals (If/Then Statements): Introduce a rule: "IF you touch the ground outside of a hula hoop, THEN you must go back one station."
- Branching: Make the course tricky by establishing different rules based on the dice roll. For example, if a girl rolls an even number, she must do the course walking backwards. If she rolls an odd number, she must do the course hopping on one foot. The die now determines both the loops and the branches!

Staggered Misson Tracks: Daisy Invent-A-Bot

Age Group:
Daisies (K-1)

Time Allotted:
20-30 Min

Volunteers Needed: 1 who rotates thru all DBJ levels

Learning Objectives:
Use creative and problem-solving skills to conceptualize a home helper robot.

- Robotics 1 (Step 3 Team up to design your own robots)
- Robotics 3 (Step 1: Plan your robot)

Supplies:

- Approx. Cost: $.50/Girl Scout
- 8x11 paper (1-2 per girl)
- Crayons/markers/colored pencils
- Pencils with erasers (1 per GS)
- RESOURCE Home Helper Robot Images (printed)

Welcome/Intro to Activity

Hi everyone! Today we are going to be robotic engineers. Engineers are people who solve problems by building cool things. What do you think a robotic engineer would build? (response)

Do you think an engineer just sits in a room and puts a robot together? (pause for response) Well, before they can build anything, they have to know WHY and WHAT. Take out printed resource images. Let's see what some Robotic Engineers have created to assist people in their home. (Talk about the pictures.)

Welcome/Intro to Activity continued

Let's start with WHY: Why would you need a robot for your home? What are some chores that you do at home? (response) Do you think it would be nice to have a robot to do some of those chores for you? Okay, our idea is something to help with our chores. That is our WHY, we need help with our chores.

Now let's consider WHAT we need! If you had a tiny robot helper, what chore would it help you with? A picker-upper? A duster? Bathroom scrubber? Everyone take a paper and pencil to begin thinking of your design. Sometimes it helps us to think of ideas when we share them with others. Please gather in groups and talk about your ideas as you are drawing them. You can also color them if you have time.

- **Action: Have the girls draw and/or talk about their "Home Helper" robot. Stop them 2 minutes before rotating for final discussion.**

Final Discussion

- *What was easy?*
- *What did you find challenging?*
- *What problem would your home helper robot solve?*

When we put together this event, we realized that it would be very challenging for us to have all the supplies each person would need to build their ideas. Not to mention, very expensive, a lot of time, and testing. But, we wanted you to have experience with putting together a robot prototype. So, for Robot Maker station time, we will all build a bristle bot to assist in cleaning tasks.

Staggered Misson Tracks: Brownie Invent-A-Bot

Age Group:
Brownies (2-3)

Time Allotted:
20-30 minutes

Volunteers: 1

Objective:
Design an animal-inspired robot using biomimicry and brainstorming solutions to help animals.

- Robotics 1 (Step 1 Explore how robots imitate nature)
- Robotics 1 (Step 3 Plan your robot)

Supplies:

- Approx. Cost: $.50/Girl Scout
- Copy paper (1-2 per girl)
- Crayons/markers/colored pencils
- Pencils with erasers
- RESOURCE Biomimicry Robot Images (printed)

Welcome/Intro to Activity

Welcome, Brownie engineers! Today we are earning steps toward our Robotics badges by designing an Animal Hero robot! Did you know that engineers often study animals to get cool ideas? Copying nature to build machines is called biomimicry. Animals, plants, and insects have amazing abilities, and engineers learn from them.

Can anyone think of an animal that does something really well? (Allow a few responses.)

Those are great examples! Maybe a bird flies, a fish swims, or a chameleon blends into its surroundings. Engineers can use those ideas when they build robots. Imagine your robot needs to move around without being noticed. What animal might it copy? (Allow responses.)

Excellent thinking! Some robots are designed to move like animals or even look like them. (Talk about the robots in the RESOURCE Biomimicry Robot Images)
Can you see any similarities between all of these robots? (Allow responses.)

Volunteer 2 Script

What kinds of parts do you see the robots in the pictures having? (Wait for response)What would we need to build a robot that used nature as inspiration? (Wait for response) What do we have that helps our bodies to move?

- *Muscles*
- *Bones/skeletal system*
- *Legs/arms*

What do the robots have that might be like our muscles? (motor)
What do the robots have that might be like our skeleton? (pool noodle and craft sticks)
What do robots have that help them move? (wheels, limbs)

Now it's your turn to be engineers! You're going to design a robot which uses biomimicry. Remember that means that your robot copies something from nature.

First, think of an animal, insect, or plant for your robot to copy. Think about:

- *How does it move?*
- *How does it stay safe?*
- *How does it blend in or disguise itself?*
- *What would its job be? Can you think of a robot that mimics an animal and what robots can help animals do?*

Next, plan your robot's disguise. Will it look like leaves, a butterfly, a frog, or something else? (Give Girl Scouts time to discuss and plan.)

Now think about movement. Will your robot crawl like a bug, hop like a rabbit, slither like a snake, or fly like a bird? Everyone take a paper and pencil to begin thinking of your design. Sometimes it helps us to think of ideas when we share them with others. Please gather in groups and talk about your ideas as you are drawing them.

- **Action: Have Girl Scouts draw and/or talk about their "Animal Helper" robot. Walk around and talk to them in groups about their design! Participants can add color if there is time.**

Final Discussion

- What was easy about designing a robot with biomimicry?
- What did you find challenging?
- What are some of the animals you decided to mimic? What would your robots do?
- When we put together this event, we realized that it would be very challenging for us to have all the supplies each person would need to build their ideas. Not to mention, very expensive a lot of time and testing. But, we wanted you to have experience with putting together a robot prototype. So, for the Robot Maker station time, we will all build a duck robot that can help lost ducklings find their way back to the pond.

Staggered Misson Tracks: Junior Invent-A-Bot

Age Group:
Juniors (4-5)

Time Allotted:
45 minutes

Volunteers: 1

Learning Objectives:
Design a robot that acts as an ocean rescue tool to solve a global environmental problem.

- Robotics 1 (Step 2 Determine your robots expertise)
- Robotics 1 (Step 3 Plan your robot)

Supplies:

- Approx. Cost: $.50/Girl Scout
- Copy paper (1-2 per girl)
- Crayons/markers/colored pencils
- Pencils with erasers
- RESOURCE Planet Saver Robot images

Welcome/Intro to Activity

Today, you're going to become a robotics engineer! These are engineers who build_____ (guess)

As Planet Savers, your challenge is to design a robot that helps solve a problem in the ocean. Before engineers build a robot, they first identify a problem. What are some challenges our oceans face?

(Allow responses.)

Great ideas! Oceans around the world face problems like plastic pollution, oil spills, damaged coral reefs, and dangers to marine animals. Engineers create robots to help solve these problems. (Using the RESOURCES Planet Saver Robot Images, show and talk about the kinds of robots that have been built and their jobs.) What did the robots in the pictures have in common?

Now it is your turn to design a robot. Think about this question: "Your robot is an expert. What problem does it solve in the ocean?" Maybe your robot collects plastic trash, rescues animals, protects coral reefs, or cleans polluted water. There are lots of possibilities!

Everyone will need a piece of paper and a pencil. Once you have your idea start by sketching your design. As you draw, label these three important parts:

- *Brain – How does your robot gather information and make decisions?*
- *Movement – How does your robot travel through the ocean?*
- *Tool – What special feature helps solve the problem?*

As you work, think about:

- *How will your robot find the problem?*
- *How will it solve the problem?*
- *What makes your robot especially good at its job?*

Share your ideas with a partner. Explain what problem your robot solves and point out the Brain, Movement, and Tool in your design.

- **Action: Give Girl Scouts the time to draw their ideas and talk with each other. Leave a few minutes at end of session for closing and debrief.**

Final Discussion

- What was easy?
- What did you find challenging?
- Tell us the job you would be having your robot do. What is in your design to help them do that job?
- When we put together this event, we realized that it would be very challenging for us to have all the supplies each person would here need to build their ideas. Not to mention, very expensive alot of time and testing. But, we wanted you to have experience with putting together a robot prototype. So, for the Robot Maker station time, we will all build an octobot proto-type which could use it's tentacles to clean the ocean floor.

Transition:

Wow! Give yourselves a big round of applause! Everyone please leave your stations and come near me. Today you have been working just like real engineers and programmers.

At Snackbot Builders, you learned how robots follow algorithms and step-by-step instructions.

At Mission Code the Course, you discovered how coding and loops help robots repeat actions and complete tasks.

And at Invent-a-Bot Studio, you used your imagination to design amazing robots that solve real-world problems!

- **Daisies created robots to help at home.**
- **Brownies designed robots inspired by animals.**
- **Juniors imagined robots that can help save our planet.**

Now it's time for the next exciting step! Engineers don't stop at drawing ideas, they bring them to life! In just a few minutes, you'll begin building your very own robot to take home. Before we can start building, our amazing volunteers need a few minutes to transform this space into a robot workshop. Let's thank them for helping us today!

(Lead applause for volunteers.)

While the volunteers are clearing tables and setting up supplies, let's do a recap: What do robots have that make them move? What is it called when a robot is built to mimic an animal? What are some things that are used in building robots?
(Allow responses)

- What do robots have to make them move? A computer (brain), skeleton (frame), algorithm, sensors, body
- What is it called when a robot is built to mimic an animal? Biomimicry
- What are some things used in building robots? Computer, metal, wheels, motors, power souce like the sun, batteries, electricity, wires to carry electricity, gears for movement, cameras

Transition: continued

One more time!
Robot!
(Kids)Ready!

Now a quick robot challenge.
When I say "Robot," you say "Ready!"

Robot!
(Kids) Ready!

Robot!
(Kids)Ready!

As we talked about in your last session, it would be very challenging for us to have all the supplies each person would need to build their ideas. Not to mention, very expensive alot of time and testing. But, we wanted you to have experience with putting together a robot prototype. So, for Robot Maker station time, we will all build a robot that is the same, but you can add your own artistic touches.

When the volunteers finish setting up, we'll head into our Robot Workshop and turn our ideas into reality.

Engineers, are you ready?
YES!

Future inventors, are you ready?
YES!

Then get those creative brains warmed up! Robot building is coming next!

Direct the age groups to their building stations.

Daisy Robot Maker Lab: Home Helper- Bristle Bots

Age Group:
Daisies (K-1)

Time Allotted:
45-50 minutes

Volunteers Needed: 2+

Learning Objectives:
Build a household helper scrubbing robot prototype that could help with chores at home.

- Robotics 2 (Step 2 Find out how robots move)
- Robotics 2 (Step 3 Make a robot move)
- Robotics 3 (Step 2 Create a prototype)
- Robotics 3 (Step 3 Get feedback on your robot)

Supplies:
Approx. Cost: $2.80/Girl Scout
Robot Components (for each participant)

- Toothbrush Head: Dollar Tree online is the best cost-effective way to purchase these. Brush unit works for Daisy build and bottom battery unit works for Brownie build.
- Vibration motor: 1 unit
- CMOS battery with wires: 1 unit
- Foam tape: 2 pieces
- Multi-purpose small craft trays to hold all items (1/GS)

Customization & Decoration

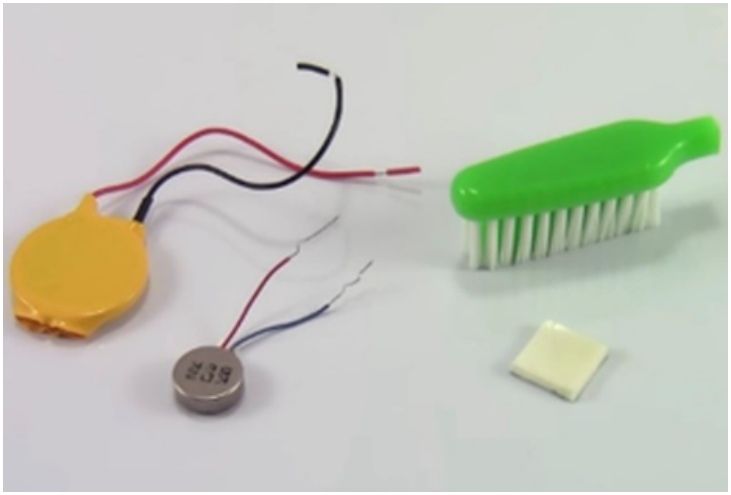
- Googly eyes: 2
- Pipe cleaners: 1–2

Shared Tools (Per Table)

- Scissors
- Adhesives: Glue dots or hot glue guns/sticks (adult supervision required)

Volunteer Script

Let's build our robots step-by-step. What do we need to build our robot prototypes?

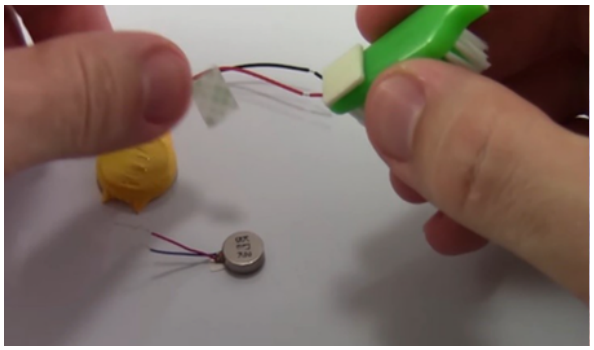


To build our robot, we need three main parts: a battery for power, a motor to make it move, and a body to hold it all together. Look at the picture to see what our robots will look like! We are going to build our robots together step-by-step. Make sure you listen closely so all our moving parts fit together just right! If you need help, just raise your hand and a volunteer will come to assist.

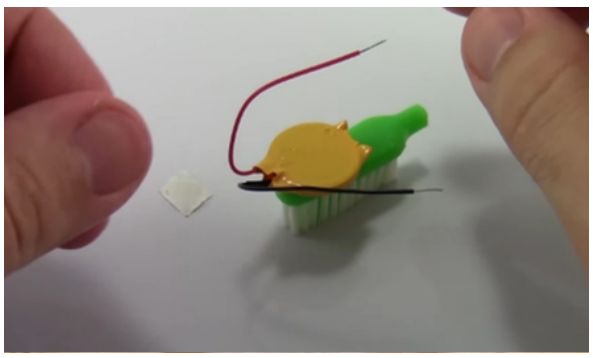
Everyone is getting a tray which holds ALL the things you will need to build your prototype. Let's keep everything on the tray. Now we are going to go over what everyone should have on their tray (Volunteer: Show each item as you name it.) Toothbrush head is our robot body, the battery is our power source, and finally we will need a motor to help the robot move. You should also have foam pieces which are double stick tape. Put everything back on your tray. Let's pretend to be a robot building another robot again and follow the directions!

Step-by-Step Construction Guide (Volunteer Led):

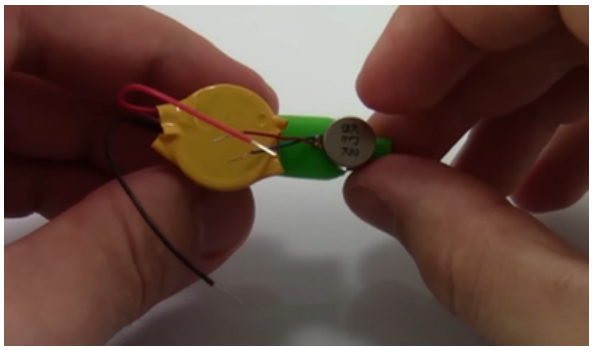
1. *Our first step will be to pick up the toothbrush head. No, we are not brushing our teeth! This will be part of our robot prototype. Take a piece of the foam tape. Peel the paper backing off one side of your foam and stick it to the top of your toothbrush head. This will be our body for our robot!*



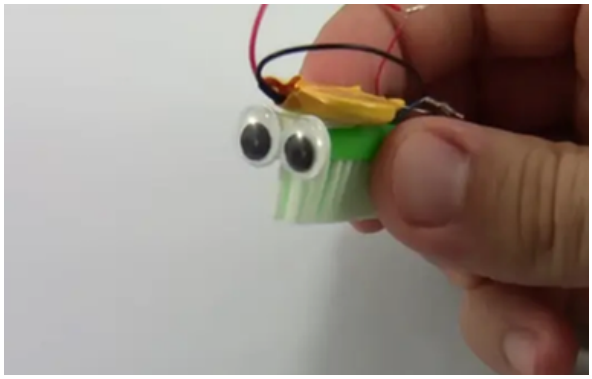
2. *Next, peel the paper backing off the other side of the foam tape on the top of your toothbrush head. You are going to want to attach the battery to the top.*



3. *Peel the paper backing of another piece of foam tape. Place this on top of the battery. Peel the paper backing of the other side of the foam tape and carefully attach the motor to the top.*



4. *We are at the last step! Twist the red wires together and then twist the black wires together. Be very gentle; these wires are thin and can break if pulled too hard. When we connect the battery to the motor, we complete the circuit. This makes a tiny weight inside the motor spin, causing it to vibrate, just like a cell phone in your pocket.*



Volunteer Note: Keep red and black wires from touching each other, as this creates a short circuit and will drain your battery.

Test & Improve (10 min) – The Engineering Design Process: Test & Improve

Volunteer Script:
Now it's time to test! Does it move fast or slow? If your robot falls over, try centering your battery and motor on the toothbrush. If you want to change how it moves, try tilting your bristles, or we can use pipe cleaners to give your Home Helper extra 'cleaning' features!

- **Action: Have the girls race their robots against each other to see which design is faster.**

Reflect (5 min) – The Engineering Design Process: Share

Volunteer Script:
Great work, engineers! Before we go, tell us: what chore does your robot do? Which part made it move? What was the hardest part to build, and how did you fix it?

Prepare to Showcase (5 min) – The Engineering Design Process: Share

Volunteer Script:
Great job, engineers! In a few minutes, our families are coming in to see your hard work. Let's practice what we want to tell them. We need to tell them three things: What is your robot's name? What chores can it help with? And how does it move?

- **Action: Help the girls form small groups or pairs. Give them these simple sentence starters to repeat together:**
  - "My robot's name is..."
  - "It helps by..."
  - "It moves because of the..." (Prompt them to say "motor" or "vibration").

- **Action: Allow the girls to practice speaking these lines to their partners. This repetition builds confidence when they speak to the larger group.**

Brownie Robot Maker Lab: The Animal Hero Robot Maker

Age Group:
Brownie (2-3)

Time Allotted:
45-50 minutes

Volunteers: 2+

Objective:
Build an animal-inspired robot prototype using biomimicry that helps people or animals, following the Engineering Design Process.

Badge Connections Earned at this Activity:

- Robotics 1: Designing Robots: Step 4 (Create a prototype), Step 5 (Get feedback on your robot).
- Robotics 3: Showcasing Robots: Step 1 (Create a presentation to share how you designed your robot), Step 2 (Tell others how you designed your robot).

Supplies
Approx cost: $4.00
Robot Components (for each participant)

- Pool noodle: 1 section (approx. 8 inches long, pre-cut with a hole in the middle to access the toothbrush power button)
- Electric toothbrush base: 1 unit (if purchased from Dollar Tree, save the brush head for Daisy activities; includes 1 AA battery)
- Craft sticks / tongue depressors: 4 sticks
- Wheels: 4 small wheels
- Axle / metal rod: 2 thin metal rod (to connect two wheels through the craft sticks as shown in your photo)
- Rubber bands: 1–3 heavy-duty rubber bands
- Colored cardstock
- Mother duck print-out: 1-2 cardstock with duck template printed. (Optional: provide colored paper/cardstock for girls to design their own mother animal)
- Power drill: Adult use only. Used to prep tongue depressors
- Multi-purpose small craft trays to hold all items (1/GS)
- Feathers

Shared Tools (Per Table)

- Scissors
- Glue dots
- Markers, crayons, or colored pencils
- Trays (one per girl with all materials they need together)

Materials to Prep:

- Either before or during the event- have an adult drill 1 hole at the end of each tongue depressor so youth participants can insert their axel and wheels.
- Cut noodles into 8” pieces (about 6/noodle)

Volunteer Script

Now it is time to build our prototypes! Does anyone know how a mother duck leads their ducklings to the water or the nest? Kind of like “follow the leader”. What if something happened to mother duck? If we build a robot which mimics a duck would it lead ducklings to the water? We are going to build our duck robots step-by-step. Make sure you listen closely so all our moving parts fit together just right!

Step-by-Step Construction Guide (Volunteer-Led):

Everyone is getting a tray which holds ALL the things you will need to build your prototype.

Let’s go over what everyone should have on their tray. (Volunteer: Show each item as you name it.) Toothbrush bottom is our power source. We have a motor, a pool noodle, scissors, 4 craft sticks, 3 rubber bands, glue dots or double stick foam pieces, 2 metal rods, 4 wheels. Put everything back on your tray if you need to put an item down so that we won’t lose our parts.



Let’s pretend to be a robot building another robot again and follow the directions! Ready?

1. *Insert the Motor: Let's start with the motor which will act like the "muscles". With a marker, hold the vibrating electric toothbrush against the pool noodle. Make a mark on the pool noodle to indicate this is where the power button will be. Using scissors, create a finger sized hole on the marked spot on the pool noodle. When complete, take your pool noodle and slide the vibrating electric toothbrush base into the center. Make sure the power button lines up with the cut hole so you can turn your robot on and off!*
    - **Optional: Volunteers could create holes in pool noodles prior to the event.**



2. *Build the Frame: Now for our frame/skeleton. Take two of your craft sticks and place both horizontally against one end of the pool noodle. You will need the end of the craft stick with the holes sticking out past the bottom edge of the noodle. Secure them tightly by wrapping rubber bands around the noodle and the sticks. Repeat same steps on the opposite end of the noodle. (See photo reference for alignment).*



3. *Attach the Wheels: You will do this step twice on each end with the two craft sticks. Insert the metal rod between the craft sticks and into the drilled holes. There should be part of the metal rod sticking out of each side of the craft sticks. You will now attach your two wheels to each side of the metal rod axle.*



4. *Create Your Animal: Cut out 1-2 copies of the printed duck. You can use glue dots to add feathers to your duck. Then, use your glue dots to firmly stick your Mother Duck cutouts onto the pool noodle, one on each long side. Now your animal disguise is complete! Note: Youth can create alternate animals if they choose! Feathers are available for youth to decorate their duck!*



Test & Debug (5 min) – The Engineering Design Process: Test & Improve

Focus: Troubleshooting vibration, balance, and wheel friction.

Volunteer 2 Script:
Engineers always test their prototypes and fix any bugs! Let's press the power button through the hole in the pool noodle and watch what happens. Does your duck move smoothly across the table, or does it wobble and fall over?

- **Action: Have the girls test their robots on a flat surface.**

Troubleshooting Prompts:

- *If it doesn't move well: Try adjusting how tight your wheels are pressed against the craft sticks!*
- *If it falls over: Adjust the rubber bands and slide your craft sticks so they are even on both sides.*

Prepare to Showcase (5 min) – The Engineering Design Process: Share

Focus: Organizing thoughts to meet the Robotics 3 presentation requirement.

Volunteer 1 Script:
You did it! Now, to finish earning your Robotics badges, we need to prepare a mini-presentation to share how we designed our robots with our friends and families!

- **Action: Pair the girls up and ask them to practice answering three simple questions:**
  - *How does your duck reflect biomimicry?*
  - *Which part of your robot acts as the muscles and skeleton?*
  - *How did you debug or fix your robot when you tested it?*

Showcase & Reflect (5 min) – The Engineering Design Process: Share & Give Feedback

Focus: Peer and family presentations.

Volunteer 2 Script:
Let's gather around! Who would like to show off their Animal Hero first? As you watch your fellow Brownies present, make sure to give them positive feedback on their prototype designs!

- **Action: Allow each girl 30 seconds to run her robot, share her answers, and receive a round of applause from the group.**

Junior Robot Maker Lab: Planet Saver Robot Maker

Age Group:
Junior (4-5)

Time Allotted:
45-50 minutes

Volunteers needed: 2+

Learning Objectives:
Create a basic robot that acts as an ocean rescue tool to solve a global environmental problem using a motorized winch mechanism.

- Robotics 1 (Step 4 Create a prototype, Step 5 Get feedback)

Supplies:
Approx. Cost: $4.50 per Girl Scout
Electronics & Hardware (See Amazon Wish List)

- EUDAX 6 Set Includes:
- Small DC motor: 1 unit
- Motor mounting bracket: 1 white plastic clip
- AA battery holder: 1 unit (must include wire leads)
- Mini rocker switch: 1 unit
- Extra wire piece: 1 piece (3–4 inches long for switch-to-motor connection)
- AA batteries: 2 units
- Multi-purpose small craft trays to hold all items (1/GS)

Construction & Craft Materials

- Cardstock/heavy paper: 2 sheets (1 for head, 1 for 8 leg strips) pre-print the template onto the cardstock
- Cardboard base: 1 piece (approx. 4x4 or 5x5 inches)
- Clear plastic straw: 1 section (cut to approx. 1 inch)
- Yarn: 8 pieces (cut to approx. 6–8 inches each)
- Large eye needle to thread yarn

Shared Tools (Per Table)

- Scissors
- Clear tape
- Hot glue (optional, requires adult supervision)
- Markers/pens (for decorating the octobot face)

Volunteer Script

Let's build our robots step-by-step. What do robots need to do a job effectively? Remember a robot is a machine that can sense, think, and act.

That means robots can:

- *Sense what's around them*
- *Think using a computer or program*
- *Act by moving or doing something*

For our prototype today, we are going to create a 'winch' system. When we turn the motor on, it will wind up the strings to pull the octopus legs in. Let's go over what everyone should have on their tray. (Volunteer: Show each item as you name it.)

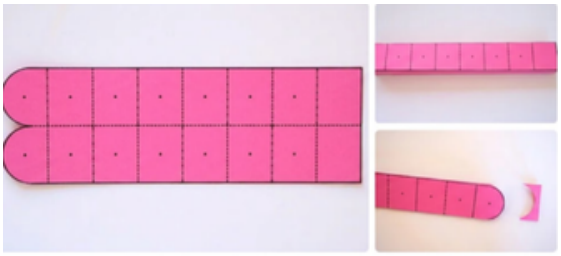
- *EUDAX 6 set includes:*
  - *Small DC motor: 1 unit*
  - *Motor mounting bracket: 1 white plastic clip*
  - *AA battery holder: 1 unit (must include wire leads)*
  - *Mini rocker switch: 1 unit*
  - *Extra wire piece: 1 piece (3–4 inches long for switch-to-motor connection)*
- *AA batteries: 2 units*
- *Cardstock/heavy paper: 2 sheets (1 for head, 1 for 8 leg strips)*
- *Cardboard base: 1 piece (approx. 4x4 or 5x5 inches)*
- *Clear plastic straw: 1 section (cut to approx. 1 inch)*
- *Yarn: 8 pieces (cut to approx. 6–8 inches each)*
- *Large eye needle to thread yarn*

Put everything back on your tray. So based on the items on the trays, does the prototype we are creating today have a brain? Why not? (Allow reponses)

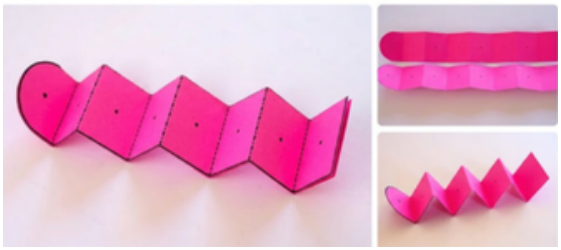
Correct, we do not have a computer system to program and act as the brain.

Step-by-Step Construction Guide (Volunteer-Led):

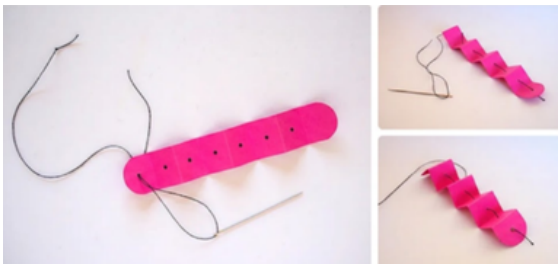
Mission 1: Build the Tentacles



1. *Cut the tentacles. Cut the 8 tentacle strips from the cardstock template*

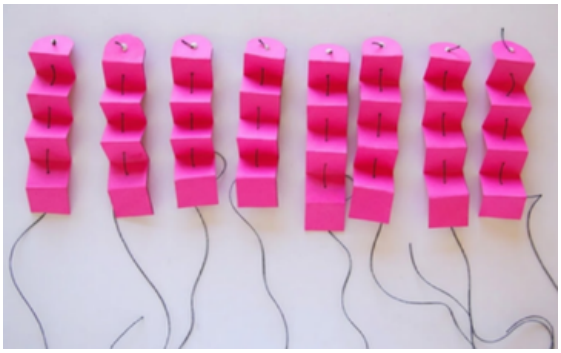


2. *Fold the tentacles. Fold each strip back and forth like an accordion or zigzag. You should end up with a small folded strip.*



3. *Make a hole. At the top of each folded strip, make a small hole through all of the layers. A volunteer may need to help with this step.*

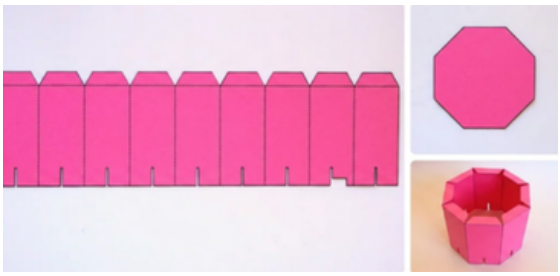
4. *Add the yarn. Thread one piece of yarn through the hole. Tie a knot at the bottom of the folded strip so the yarn cannot pull through. The loose end of the yarn should come out the top.*



5. *Repeat. Repeat these steps until all 8 tentacles have yarn attached.*

Volunteer Tip: Try to keep all 8 pieces of yarn approximately the same length.

Mission 2: Build the Octobot Body



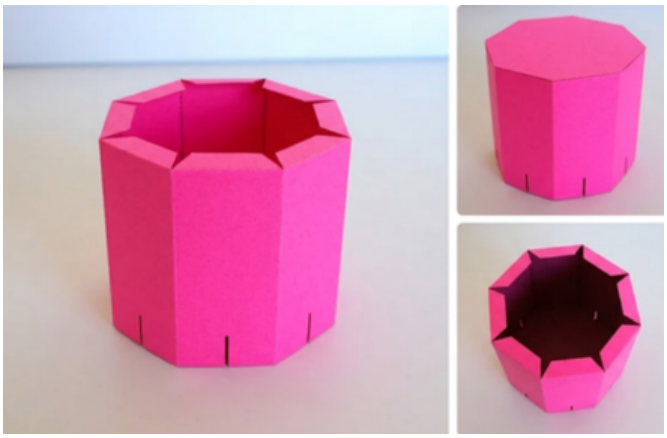
1. *Cut out the body. Cut out the Octobot body and top pieces from the cardstock template.*

2. *Fold the body. Fold along the lines marked on the template.*

3. *Form the body. Bring the two short ends together. Overlap the ends and glue or tape them together to create an 8-sided shape.*

4. *Add the top. Fold the tabs inward. Attach the top piece to the tabs using tape or glue.*

Volunteer Tip: It may be easier to turn the body upside down while attaching the top. Set the body aside for now.

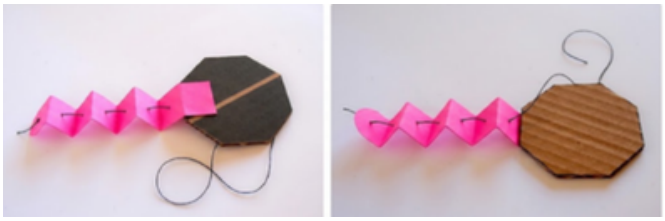


Mission 3: Build the Base and Attach the Tentacles

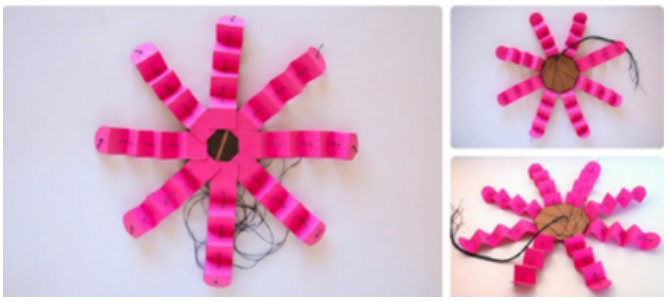
1. *Make the base. Use the octagon stencil on the template to trace an octagon onto the cardboard. Cut out the cardboard octagon.*



2. *Attach the tentacles. Place one tentacle underneath the cardboard base. Only attach the last folded section of the tentacle to the cardboard. Use tape or glue to secure it.*

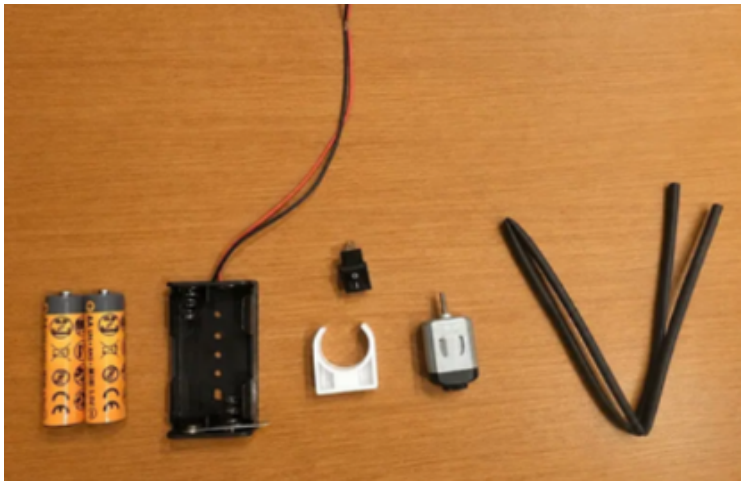


3. *Repeat. Attach the remaining 7 tentacles around the bottom of the cardboard base. You should now have 8 tentacles hanging around the base.*



Mission 4: Build the Motor Circuit

Volunteer Note: This is the most technical part of the activity. Demonstrate each connection one at a time and have the girls copy you.

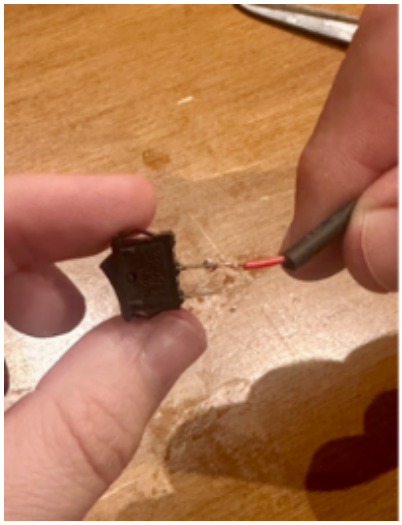


How the Circuit Works

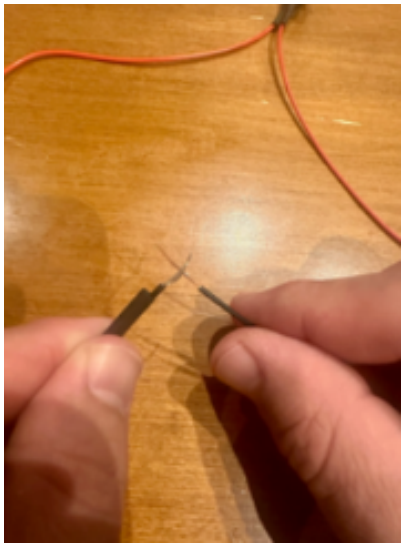
Explain: Our batteries provide the power. The wires carry the power. The switch controls the power, and the motor uses the power to spin. The circuit needs to make a complete loop for the motor to work.

Remember:
Red wire = positive (+)
Black wire = negative (-)

1. *Connect the battery pack to the switch. Take the red wire from the battery holder. Insert the exposed end of the red wire through one connection on the rocker switch. Twist the wire around itself to secure it.*



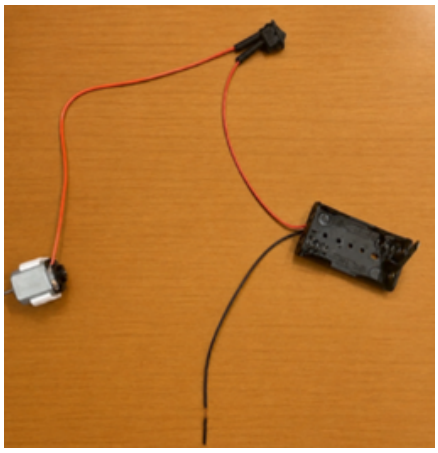
2. *Add the extra wire. Take one end of the extra wire. Insert it through the second connection on the rocker switch. Twist the wire around itself to secure it. The switch should now have: Red battery wire → Switch → Extra wire*



3. *Connect the switch to the motor. Take the other end of the extra wire. Attach it to one of the metal connection loops on the motor. Twist the wire around the connection to secure it.*



4. *Connect the black wire. Take the black wire from the battery holder. Attach it to the other metal connection loop on the motor. Twist the wire around the connection to secure it. You should now have: Battery → Switch → Motor → Battery. That is your complete circuit!*



5. *Cover the connections. If using heat-shrink tubing: slide the tubing over the exposed connections. A volunteer should use a hair dryer on warm to shrink the tubing around the connection. Make sure no exposed copper is showing.*

Adult Supervision: Volunteers should handle the hair dryer. If heat-shrink tubing is not being used, carefully cover the exposed connections with electrical tape.



6. *Add the batteries. Insert the 2 AA batteries into the battery holder. Make sure the batteries are facing the correct direction. Tip: Match the flat negative (-) end of each battery with the spring inside the battery holder.*

7. *Test the motor. Flip the rocker switch. The motor should spin. If the motor does not spin: Check: Are the batteries installed correctly? Is the switch connected securely? Are both motor connections secure? Is any wire loose?*

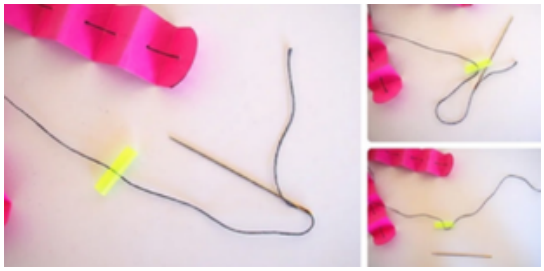
Do not worry if you need to fix something! Engineers troubleshoot their designs all the time.

Mission 5: Attach the Motor and Winch

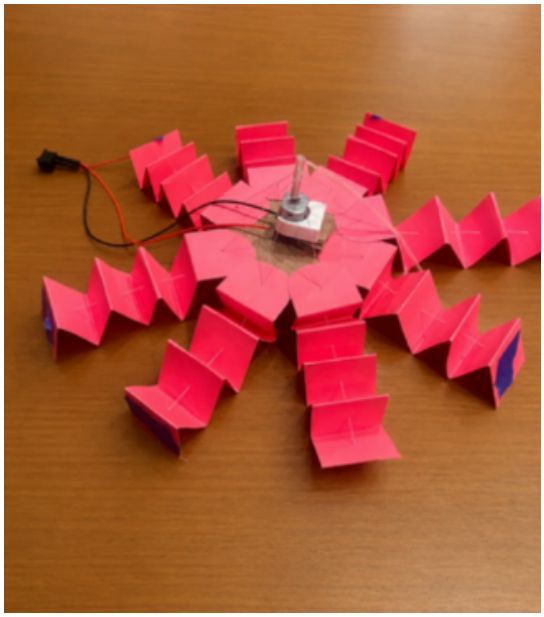


1. *Attach the motor bracket. Place the white plastic motor bracket in the center of the cardboard base. Secure it with glue or strong tape.*

2. *Attach the motor. Snap the motor into the white bracket. The motor's metal spinning shaft should point straight up.*



3. *Attach the yarn/string. Gather the loose ends of all 8 pieces of yarn. Bring them toward the center of the robot and thread each one through the straw using a needle.*



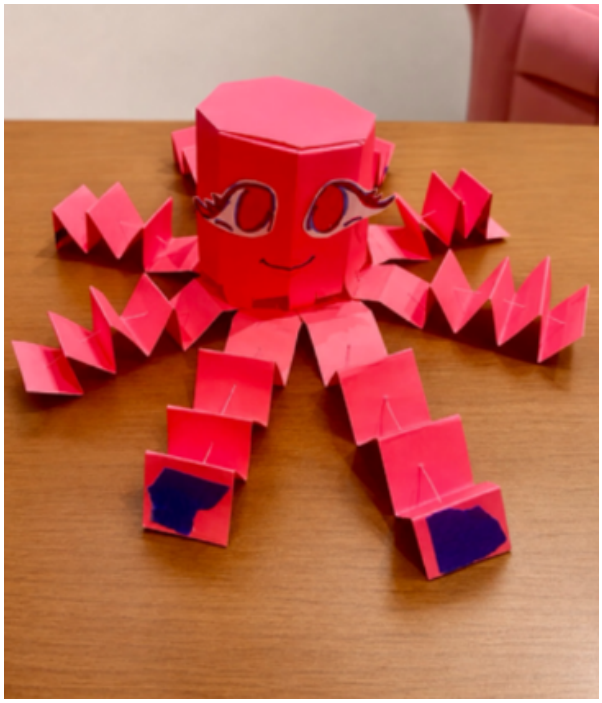
4. *Add the straw. Slide the 1-inch piece of clear plastic straw onto the motor's spinning shaft. The straw should sit securely on the shaft*

5. *Test the winch. Turn the switch ON. The motor should spin the straw and begin winding the yarn. As the yarn winds up, the tentacles should move inward.*

Final Mission : Add the Octobot Body

1. *Decorate. Use markers to give your Octobot a face. Think about what your ocean-saving robot might look like!*

2. *Attach body to the base. Place the head over the motor and wires. The body should hide the motor mechanism and wires while leaving the rocker switch accessible. Use a small amount of tape if needed to keep the head in place.*



Step 3: Test, Evaluate, & Improve (10 min)

Focus: Put the prototype through its paces, analyze the results, and make on-the-fly adjustments.

Volunteer 1 Script:
Engineers never build something just once; they have to Test and Evaluate their designs! Turn your switches on. What happens? Does the straw spin and wind up the thread? Do your legs pull inward to capture ocean debris?

Volunteer 2 Script:
It is time to talk about improvements. Did your yarn get tangled? If they did, how could we change the length of the yarn or the placement of the tape to fix it right now?

- **Action (The Test): Have the girls flip their switches to wind the yarn and pull the paper legs inward.**

- **Action (The Reset): Instruct the girls to turn the switch OFF. Show them how to manually reset their prototype by gently pulling the legs back out to unspool the yarn.**

- **Action (The Fix): Allow girls a few minutes to adjust their tape, trim their strings, or fix any loose wires.**

Step 4: Prepare to Showcase (5 min)

Focus: Informing the girls of the presentation expectations and allowing time to practice.

Volunteer 1 Script:
Great job today, engineers! In just a few minutes, we are going to invite your parents and families in for a showcase. Before they arrive, we need to prepare what we are going to say to them.

Volunteer 2 Script:
When it is your turn to present, you will demonstrate your Octobot and tell everyone three things: what your specific robot does to help the ocean, what you learned about building a circuit today, and one way you would improve your design if you had more time or different materials. Take the next 5 minutes to think about your answers and practice showing off your robot with your neighbor!

- **Action: Allow the girls 5 minutes to organize their talking points, practice their demonstrations, and ensure their manual reset process is smooth.**

Final:

Wow! Let's give one more huge round of applause to all our amazing robot engineers today!

We have seen so many creative ideas, thoughtful designs, and incredible robots.
You should all be proud of yourselves because today you did exactly what real engineers do:

- *You identified problems.*
- *You explored ideas.*
- *You worked through challenges.*
- *You designed and built solutions.*

Let's think back to everything we accomplished today. We learned that robots can sense, think, and act. We discovered how algorithms help robots follow instructions. We practiced coding and loops through our missions. And then we turned our ideas into robot creations! Before we go, I want you to look at the robot you created today. This represents your ideas, your creativity, your problem-solving skills, and your willingness to try something new.

Today wasn't just about building robots.

It was about building girls of courage, confidence, and character who make the world a better place.

It takes courage to try something you've never done before.

It takes confidence to share your ideas and believe you can solve problems.

It takes character to use your talents to help others and make a difference in your community and our world. We hope you leave here knowing that your ideas matter, your voice matters, and that you can make a difference.

Resources and Templates

- Biomimicry Robot Images
- Home Helper Bristle Bot Build Images
- Home Helper Robot Build Images
- Mother Duck Robot Build Images
- Planet Saver Robot Build Images
- Octopus Robot Template
- Robot Name Tag Template
- Partner Reach Out Template
- Robotics Team Contacts

Share your feedback!

Fill out this survey to share any feedback about the Mission Possible Robotic Event Kit with our team.

GET STARTED