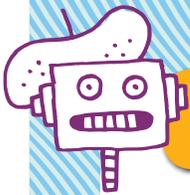


Get Making With

GET

M O V I N G !



## Dear Volunteer,

Juniors learn about various forms of energy and find out what it means to be energy efficient when they go on the **Get Moving!** Journey. Use this booklet to add a special focus to the Journey by discovering what the Maker Movement is and how it can bring exciting hands-on activities related to energy into the Journey. All that's needed is imagination, creativity, some supplies, and a willingness to try new and different things.

*Girl Scouts of the USA has worked in collaboration with the Maker Education Initiative on this booklet.*



# What is “making?”

Some call it DIY: do-it-yourself. Some say crafting, some say building. Others call it being a maker or making. It doesn't matter what you call it as long as you make something!

Makers like making things they're excited about—whether it's a craft, a piece of furniture, a robot, or a computer program. They like exploring new and different materials to see what they can come up with and recycling old materials to give them a new life. Makers like to tinker, take things apart, and try and put them back together again in new ways. Sometimes it works. Sometimes it doesn't. It doesn't matter! What's important is that they try new ideas, learn from their experiences, and have fun while doing it.

Making is social. Makers like to engage with others, share their ideas, and learn by doing. Makers like to solve problems, and they like to make the world better. Sounds like Girl Scouts!

## Why is making important, and how it can help deliver the Girl Scout Leadership Experience?



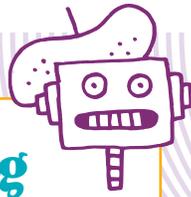
**Making encourages creation** and invention. It can be woven into any subject at any skill level and can help girls uncover their hidden STEAM (Science, Technology, Engineering, and Math plus Art) talents—combining interests in math and art, science and theater, or engineering and design. Girls can start making simply—diving into things that appeal to them so that they can succeed and then moving onto more difficult projects. You can help girls make their ideas into reality by letting them explore, test prototypes, make mistakes, and try again! Girls will benefit and thrive from having opportunities to work together, share their ideas and skills, focus on a common goal or project, and make a sustainable change in their community.

Making can happen in multiple ways. While makers share and collaborate, making is also personal. Let girls lead the way with their own passions and interests, empowering them to tackle new challenges when they're ready to help build creativity and confidence.

**MAKERS:  
DISCOVER  
CONNECT  
TAKE ACTION**

**“MAKING”  
is:  
GIRL-LED  
COOPERATIVE  
LEARNING  
LEARNING BY  
DOING**





## How to Get Started With Making



**Start simply.** Making doesn't need to use expensive, complex equipment. Items like recycled paper, cardboard, fabric, tape, and other materials can be used in an incredibly wide-range of projects. Traditional arts and craft supplies such as craft sticks, pipe cleaners, and straws are very useful for prototyping an idea and building a project. Toys like blocks and construction sets allow for endless hours of exploration and making. Encourage girls to make things based on their own interests. The only thing needed is imagination!

One way to get started with making is by tinkering—just take something apart, like an old toy or a used household item. Change what it does, alter its appearance, or make something entirely new out of its parts. By taking things apart, girls can learn to identify the individual parts of a piece of equipment and then attempt to put them all back together. Or they can use the pieces—from screws to motors to stickers—at another time with another project.



Simple, fun projects one way to begin making. This booklet provides guidelines and suggestions for four open-ended projects:

**Artbots** page 4

**Cardboard Furniture** page 7

**Gliders** page 11

**Squishy Circuits** page 15



MAKING  
STUFF IS  
FUN!



Some other ideas include:

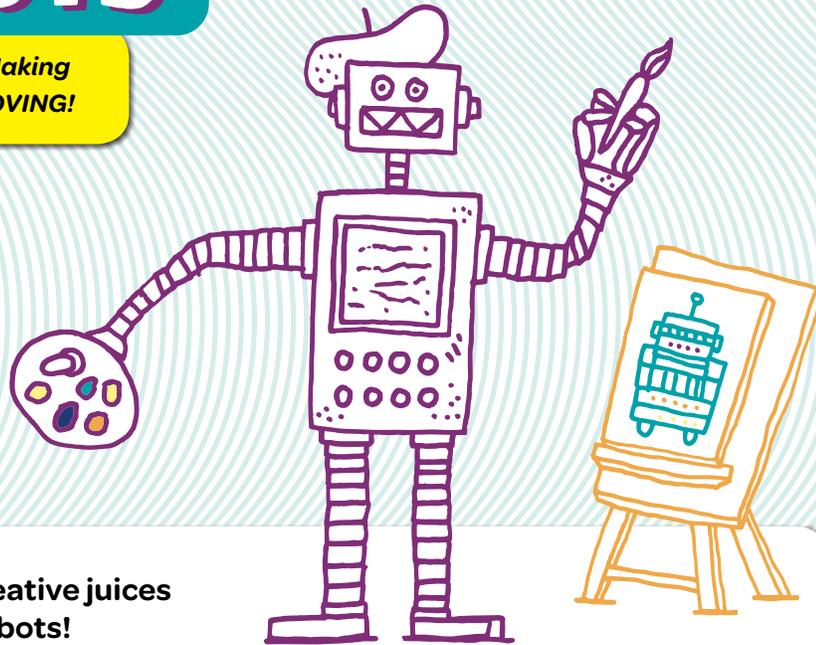
- ② **Sewing a small pillow**
- ② **Building a storage box out of wood or cardboard**
- ② **Creating jewelry or keychains**
- ② **Making a birdhouse out of recycled materials**

Use these as a starting point. Ask the girls what they would like to do, let them come up with the ideas, and give it a try!

The activities in this booklet do not contain a lot of step-by-step instructions. This has been done on purpose, to allow for creativity and possibilities. There are no rules to making. Set aside some time, space, and materials to play with to let the making happen naturally. Just give it a try!

# ARTBOTS

*This activity can be used in place of Making Recycled Paper in Session 1 of GET MOVING!*



## Get the girls' creative juices flowing with artbots!

Artbots are small, creative creations that use markers, vibrating motors, and/or any other components to create unique and colorful art. Artbots can be as simple or complex as makers want them to be, and the wide variety of materials that can be used allow for lots of creativity and flexibility in what artbots look like and what art they will produce!

Using recycled materials in fun and unexpected ways brings creativity to the functionality of everyday objects. Robots are sometimes seen as feats of engineering marvel, but you can create bots too!

## Prepare Ahead

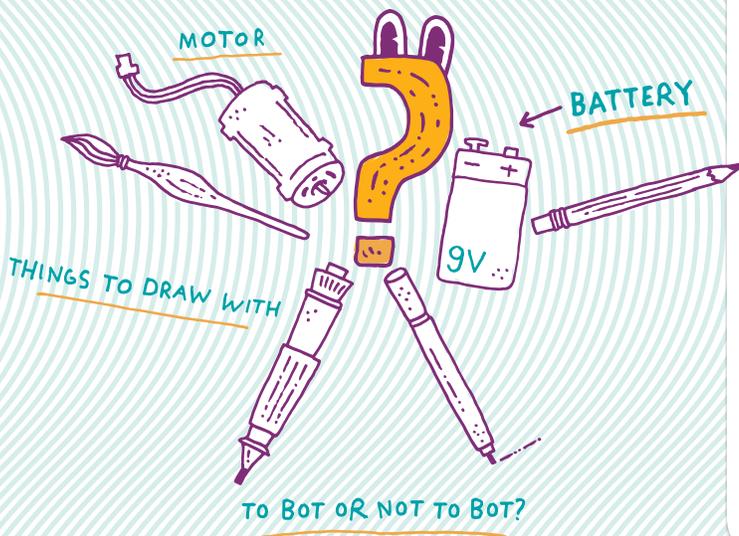
- Before the activity, you will need to purchase and prepare the items listed in the Materials box.
- Materials can be picked up from local big-box and hardware stores.
- Organize all materials, supplies, and tools on tables. There is no need to hand out one item to each girl. Let them choose whichever items are best for their designs and artbots.
- Create 1–3 examples of artbots in advance. Do one example with markers as “legs” using a battery and motor.

# ARTBOTS

continued

Materials	Quantity	Notes & Suggestions
9V batteries	1 per girl	
DC vibrating motors	1 per girl	Low amps are best.
Markers or color pencils	2–4 per girl	Can be used as the “legs” of the robot
Plastic strawberry baskets	1 per girl	
Large plastic or paper cups	1 per girl	
Scrap cardboard boxes	Varies	Small pieces are best.
Rulers or tape measures	1 per 2–4 girls	
Pens, pencils	1 per girl	
Butcher paper or printer paper		For brainstorming, sketching, and artbots drawing
Scissors	1 per 2–4 girls	
Masking tape	1 roll per 2–4 girls	
Hot glue guns	1 per 2–4 girls	
Hot glue sticks	1 per girl	
Decorative items, such as craft sticks, pipe cleaners, rubber bands, wire, felt, googly eyes, fabric.		A variety of colorful supplies can even provide extra inspiration! Try to pick up a few of the decorative items suggested in the far left column, or encourage girls to bring in recycled materials, scraps, or craft supplies of their own.
Coin cell batteries (optional)		
LEDs (optional)		

## WHAT IS MY BODY?



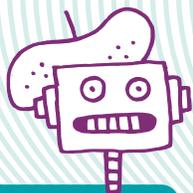
## Getting Started: Designing Your Artbot

**DO** Encourage the girls to work together in groups of 2. If the girls want to work individually, that’s fine too—just get them to collaborate with one another and share ideas.

Hand out sketch paper, pens, and pencils to encourage the drawing of ideas. Allow plenty of time and space for girls to explore, design, and tinker. Let them look at and play with the other materials on the tables.

Have the girls start brainstorming and thinking about what their artbots might look like, do, and be made of.





# ARTBOTS

continued

## ASK

- 🌀 What do you think an artbots is?
- 🌀 What could it do? What could it look like?
- 🌀 Do you want your artbots to move? How?
- 🌀 What kind of art might it create? Will it draw with markers?
- 🌀 How might you combine the available materials to create art? Or an artbot?
- 🌀 What are important components of any robot or device that moves?

## Building Your Artbot!

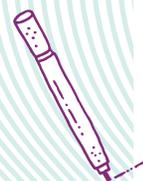
When the girls are done brainstorming and sketching, have them start making their artbots by manipulating and working with materials. This part of the activity can take anywhere between 20 to 60 minutes, depending upon the amount of time you have available.



While they are building their artbots, encourage the girls to make them move. Let them spend time figuring out how to connect a motor and batteries to make the motor run. (Remind them that they will need to leave room on the artbots for the motor and batteries.)

For a simple closed circuit, attach the wire leads of the batteries to the leads of the motor. Motors and batteries have “plus” and “minus” ends (or red and black ends); if connected one way, the motor will spin in one direction. If connected the other way, the motor will spin in the opposite direction. Point out the output shaft of the motor, the little metal end that sits opposite the electrical contacts.

Once the girls have completed and tested their motors and batteries, have them attach the components to their artbots. If girls want things to spin, jitter, wiggle, or vibrate, give them time to figure out how to make this happen. (Hint: They can attach items to the output shaft!) Let them know that when they use markers or colored pencils as the legs of the arbot and a vibrating motor is attached and turned on, the “legs” will create a squiggly drawing as the artbots move around. If needed, you can show the girls the examples you’ve made in advance.



## Project Hints

- 🌀 Encourage girls to think about what components are needed to make their design. Some artbots mimic people (like robots do); some mimic animals; others don’t resemble anything at all. Any sort of bot is fine.
- 🌀 Artbots might need a main “body” structure or shape. Things like strawberry baskets or plastic cups help provide that stability. Arms, legs, tails, and anything else that’s used can come off the main body shape. For example, a plastic cup could be a torso with craft sticks as arms and markers/color pencils as legs.

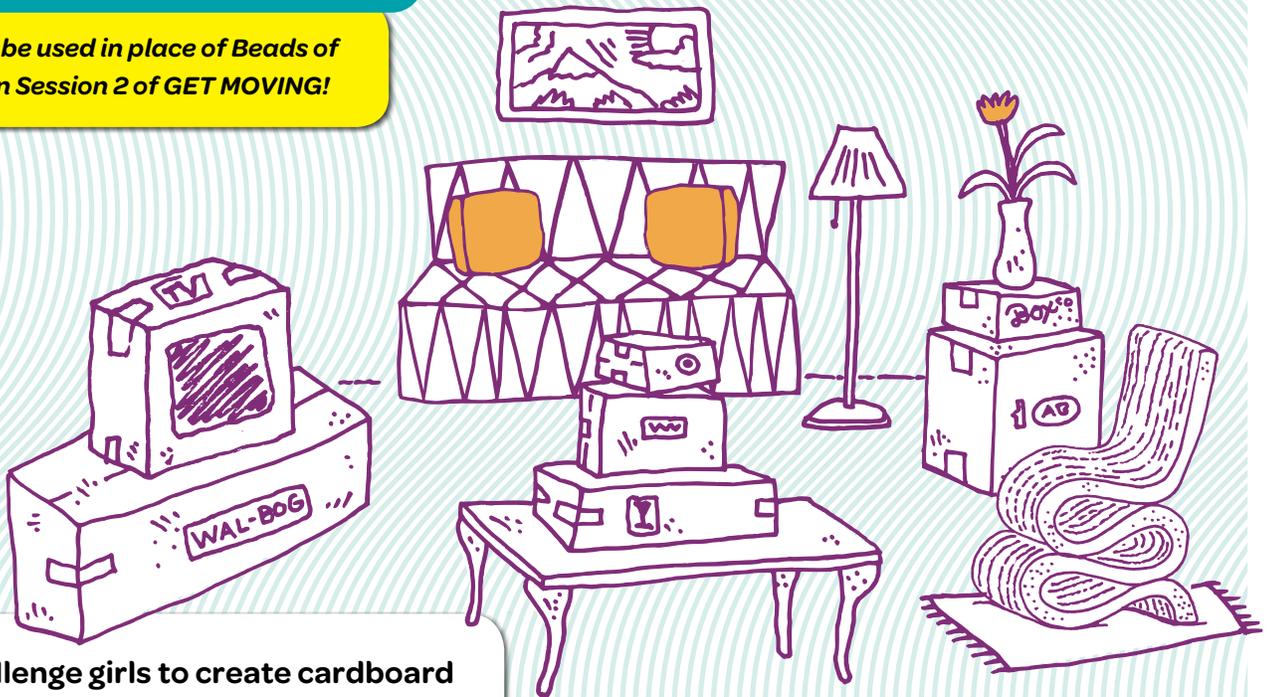


**DO** Keep track of time, and provide updates for the amount of time left for the activity.

Make sure to leave at least 15 minutes at the end of the activity for girls to show off, share, and test one another’s creations. Encourage them to talk about the evolution of their artbots. Allow time for the girls to reflect and share their successes and challenges.

# CARDBOARD FURNITURE

*This activity can be used in place of Beads of Recycled Paper in Session 2 of GET MOVING!*



**Challenge girls to create cardboard furniture!** This is an opportunity for girls to make something useful, strong, stable, and practical—while also being creative with design, decoration, and materials.

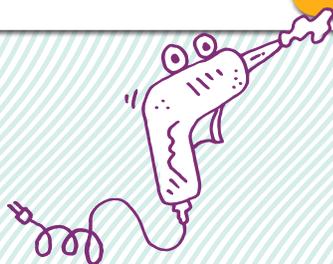
Reusing materials in new ways is one of the best methods of being energy-efficient and energy-conscious. Some of the simplest and most accessible materials can be reused and recreated into new products that are both creative and practical—and makers commonly add their own twist to used and found items. Cardboard Furniture introduces girls to designing and building by using one of the most accessible materials around: scrap cardboard! Imagine creating stylish, functional, and earth-friendly full-size shelves, chairs, and tables out of cardboard. From practical to whimsical, this furniture can really be used at home!

This activity has three parts:

**investigating design,**

**creating your design,**

**building your design.**



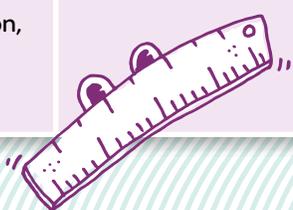
# CARDBOARD FURNITURE

continued

## Prepare Ahead

- 🌀 Before starting this activity, you will need to find or purchase and prepare the items listed in the Materials box.
- 🌀 Since you will need lots of cardboard, check out your local big-box stores, hardware stores, appliance stores, bicycle or furniture shops, and grocery stores to see if they're willing to donate extra materials. Or organize a simple "cardboard drive" and ask the girls, their parents, neighbors, and community members to accumulate and drop off spare cardboard at a location that you designate. The more the better!
- 🌀 Organize all materials, supplies, and tools in an open area but to the side. The beginning focus of the activity is not on the cardboard.
- 🌀 Provide pens, pencils, and paper for girls to sketch ideas and jot down their notes.

Materials	Quantity	Notes & Suggestions
Cardboard of all sizes and shapes, whether scraps, corrugated, cartons, toilet paper, box dividers, paper towel tubes, etc.	Varies	Generally, gather as much cardboard as possible. With variety and availability, girls will have the opportunity to build creatively.
Duct tape in different colors to use as a decorative element	About 10–12 feet per piece of furniture	You may want to prep the duct tape in advance by cutting 1-foot-long strips. If desired, you can limit the amount of tape used by each group (i.e., ten 1-foot strips).
Scissors	1 per girl	These should be adult-sized scissors since cardboard is difficult to cut with small, child-type scissors.
Rulers, tape measures, or yardsticks	1 per 2–4 girls	
Pens, pencils	1 per girl	
Butcher paper or recycled printer paper		For brainstorming and sketching
Box cutters or X-Acto® knives (optional)		If using these tools, please ensure the following safety precautions are followed: always cut away from the body; keep an arm's length away from anyone else before using a box cutter; do not walk around with an open box cutter.
Gloves		Must be worn when using box cutters or X-Acto® knives
Decorative items, such as fabric, markers, paper cups, foam pipe insulation, hot glue, etc. (optional)		Decorative items can provide extra inspiration and are additional ways in which girls can creatively design their furniture. You can also encourage girls to bring in recycled materials, scraps, or craft supplies of their own.



# CARDBOARD FURNITURE

continued

## Getting Started: Investigating Design

**DO** Encourage girls to work together in groups of 2–4. This is a great chance for collaboration.

Start by asking the girls to do some investigation. Have them take a look at existing furniture from all different angles (sideways, upside-down).

Suggest that they make note of the different shapes integrated into furniture pieces. Have them point out squares, circles, and triangles that table and chair legs make, and how the pieces interface and connect with one another and what holds the furniture together.

Provide at least 10–15 minutes for this investigation. You may move the activity along more slowly or more quickly depending on the girls' pace. After the initial investigation, have the girls share their finding with one another.



CHAIRIGAMI  
TABLE



GEHRY'S EASY EDGE

## ASK

- What are common shapes in chairs, stools, desks, tables, and shelves (e.g., triangles, squares, rectangles, circle)?
- Are there strange-looking pieces of furniture that still serve their purpose?
- What allows the furniture pieces to hold weight and be sturdy?
- What's important to you in a comfortable chair? Desk? Table? (For example, height of seat or angle of desk.)

## Creating Your Design

Once the girls have looked at existing furniture and elements, move on to part two of the activity. Provide at least 15–20 minutes for this brainstorming and initial design phase. You may move the activity along more slowly or more quickly depending on the girls' pace.

**DO** Have girls brainstorm and come up with ideas for what their cardboard furniture will look like. Encourage girls to continue to sketch and jot down their designs.

Allow time and space for the girls to explore and design. Let them tinker with the materials available too. Playing with the materials will help their ideas and designs.

During this process, have the girls share their ideas with one another.

## Project Hints

- Creating thickness in materials—whether through folding multiple layers or taping materials together—provides additional strength and stability.



TUBES & TAPE

- Closed forms, like a fully enclosed cube box, are stronger than open forms. Triangular forms can add strength, too.



TRIANGLE

# CARDBOARD FURNITURE

continued

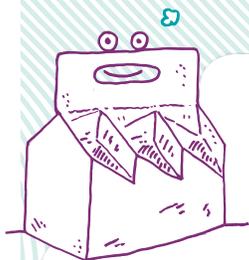
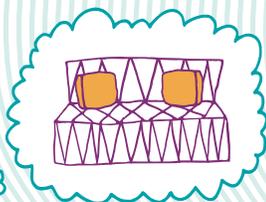
## ASK

- 🎯 What type of furniture do you want to make? Chairs, stools, desks, tables, couches, shelves—or something else entirely?
- 🎯 Can you make something that is both functional and stylish? How does a tall, skinny stools hold a person's weight equally as well as a big, fluffy lounge chair?
- 🎯 What do you think is the most important part of the furniture piece?

## Building Your Design

Once the girls' have finished their designs, have them start making their furniture. This part may take as little as 20 minutes or as much as 60 minutes based on the amount of time you have available. Make sure to let girls know how much time they have to work on their furniture.

**NOTE:** Girls may need guidance or supervision when cutting cardboard, working with box cutters (optional), or accessing materials such as duct tape. To get a clean fold in cardboard, score it first using a straight edge and pen or the blunt side of a scissors blade.



As they draw, cut, assemble, and make furniture, guide them throughout the process and encourage them by using some of the suggestions and guidelines below.

## DO

- 🎯 Remind girls to measure twice and cut once! Expect and celebrate mistakes, as well as multiple versions.
- 🎯 Gauge the girls' progress and mood. If they want more advanced challenges, think about adding a limit. For instance, you might suggest that each group of girls limit the quantity of duct tape allowed by using only ten 1-foot strips for their entire piece of furniture.
- 🎯 Encourage girls to add new, fun, and advanced elements to their furniture creations, such as footrests and cup holders.
- 🎯 Keep track of time, and provide updates for the amount of time left in the activity.



Make sure to leave at least 10 minutes at the end of the activity for girls to show off, share, and test one another's furniture creations! Try putting items on shelves, sitting in chairs, using desks. Then have the girls reflect and share their successes and challenges once they have completed their furniture design.

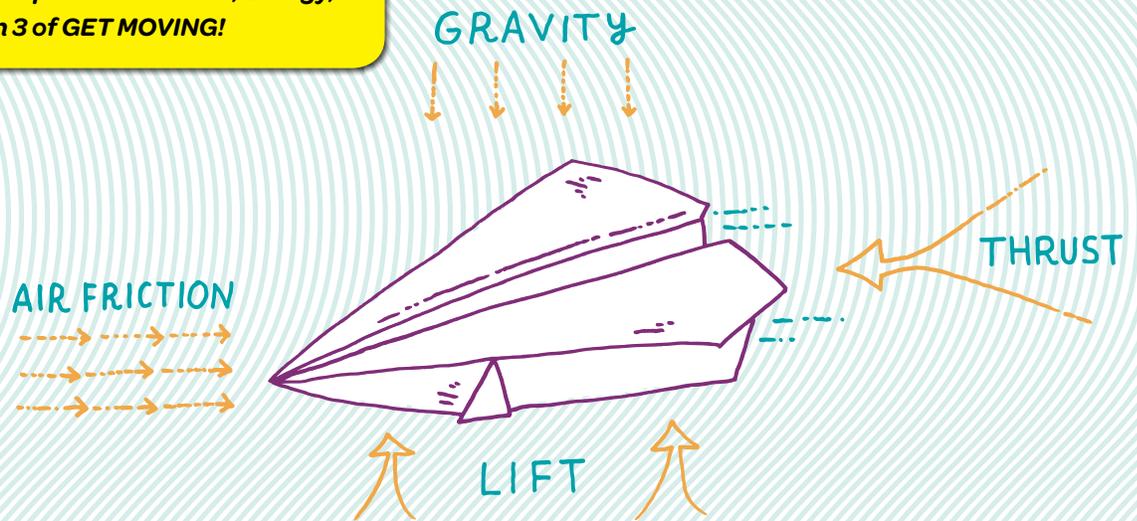
## ASK:

- 🎯 What did the first version or prototype look like compared with the final product?
- 🎯 How many different prototypes and tweaks did you make?
- 🎯 What did the original design sketch look like? Is it the same as the final product? If not, what changed and why?
- 🎯 What decisions did you have to make during the making process?
- 🎯 How did your group work together? What roles and tasks did each of you take on?

**Finally, don't forget to celebrate the successes of making functional pieces of furniture from cardboard!**

# GLIDERS

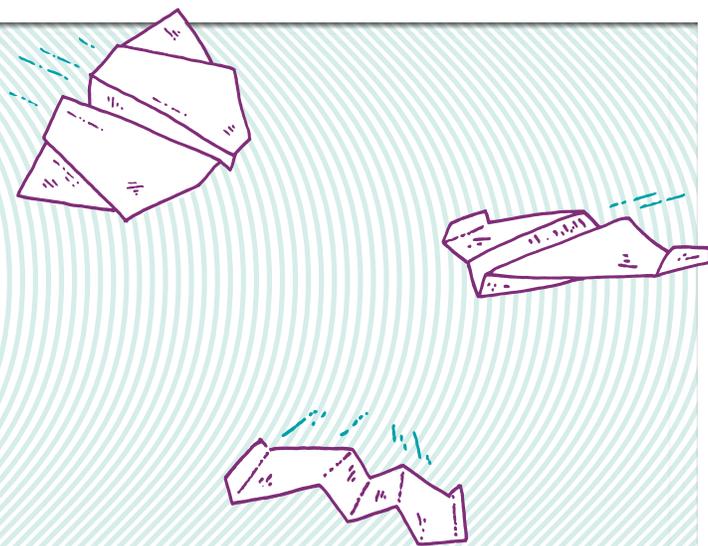
This activity can be used in place of *Animals, Energy, and Movement* in Session 3 of *GET MOVING!*



## Challenge girls to design and make gliders as they explore materials and aerodynamics!

Gliders are aircraft that don't have engines, so their flight is mostly dependent upon wind and aircraft design. This makes gliders quite energy-efficient. You can start to learn about energy-efficient design by making paper airplanes and gliders.

This activity has two parts: making paper airplanes, then designing and building a glider.



## Prepare Ahead

- Before starting this activity, you will need to purchase and prepare the items listed in the Materials box.
- Materials can be picked up from local big-box and hardware stores. You can get cardboard from local big-box stores or recycling bins. Or ask the girls, their parents, neighbors, and community members to accumulate and drop off spare cardboard.
- Simple kit gliders can be found at dollar stores or party stores and are typically made of thin foam, cardstock, or balsa wood. They range in price from 10 cents to \$2 each.



# GLIDERS

continued

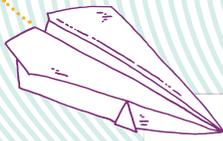


Materials	Quantity	Notes & Suggestions
Recycled paper or magazines	1 sheet per girl + extras	Have at least one sheet of paper for each girl to make a paper airplane. Have additional sheets available for revised versions of their gliders.
Cardboard, all sizes and shapes (optional)	Varies	This cardboard can be recycled pieces does not need to be large; it can vary by size, thickness, and shape. It will serve as an optional material for girls to use for making a glider.
Cardstock, recycled cereal boxes, or the covers of a notebook	Varies	Have sheets of thicker material (about 1–2 sheets per girl) available for girls to use as glider material.
Scissors	1 per 2 girls	These should be adult-sized scissors since cardboard is difficult to cut with small children’s scissors.
Rulers or tape measures	1 per 2–4 girls	
Pens, pencils	1 per girl	
Masking tape	1 roll per 2–4 girls	Decide whether to allow girls to use as many pieces as they’d like or only a set amount to see what they will do.
Paper clips, dried beans, metal washers, or pennies		Any of these small items can be used to add weight to the gliders, to test differences in balance and flight.
Box cutters or X-Acto® knives (optional)		If using these tools, please ensure the following safety precautions are followed: always cut away from the body; keep an arm’s length away from anyone else before using a box cutter; do not walk around with an open box cutter.
Gloves		Gloves must be worn when using box cutters or X-Acto® knives.
Decorative items, such as fabric, markers, foil, hot glue, etc. (optional)		A variety of colorful supplies can provide extra inspiration! Try to pick up a few of the decorative items suggested below, or encourage girls to bring in recycled materials, scraps, or craft supplies of their own.
Balsa wood		Balsa wood tends to be more expensive. This can be a material used for gliders in place of, or in addition to, paper, cardstock, and cardboard.



# GLIDERS

continued

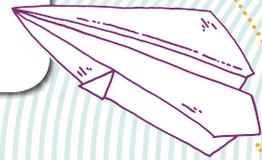


## Getting Started: Making Paper Airplanes

**DO** Ask the girls to make individual paper airplanes by folding recycled copy paper or sheets of paper from a magazine. Let them decide how to do it! No templates, guidance, or other instructions are necessary.

Once finished, girls should try their planes out in an open area that can act as a flight path. Let them test and tweak their paper airplanes as frequently as desired. Encourage the girls to share their designs and ideas and help one another out. This folding activity will likely take between 10–15 minutes.

After making the paper airplane, if the girls haven't already done so, have them form into groups of 2–4. Encourage them to think about how they might improve or re-imagine their paper airplanes. Maybe they want the glider to fly further, spend more time in the air, do a trick, or land in a specific place or manner? Let each group of girls decide which goal they want to work toward.



## Designing Gliders

As they brainstorm ideas on how to improve or re-imagine their paper airplanes, help the girls by guiding their design ideas with these questions.



### ASK

- 🎯 What do aircrafts look like?
- 🎯 What elements of an aircraft might lead to a successful flight?
- 🎯 Where are the wings and tail located? What shape are the wings?
- 🎯 What do the nose and body of an aircraft look like?
- 🎯 What affects a glider's balance and direction?
- 🎯 Can you create a glider that doesn't look like a typical airplane? Does it fly just as well? Better?



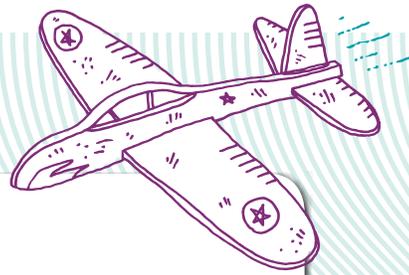
Let the brainstorming and designing part of the activity take 10–20 minutes.

As the girls design their gliders, provide them with materials to begin tinkering and making!



# GLIDERS

continued



## Building Gliders

**DO** Start with simple sheets of paper. As the girls develop and prototype their designs, suggest that they think about using thicker paper (cardstock or cardboard). Have additional supplies available for decoration and weight, such as masking tape, markers, and paper clips.

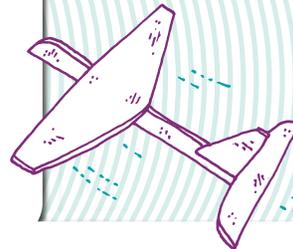
Encourage the process of making by letting the girls prototype their ideas, try out new designs again and again, and continue to revise their gliders. Think about providing a constraint to the project by limiting the supplies available—perhaps by only giving the girls one paper clip, two sheets of cardstock, and 1 foot of masking tape. See what they can make with that!

Have them share their successes and challenges with one another. One girl's experience may inspire another's! This part of the activity can take anywhere from 15 to 60 minutes.

Have the girls explain their work while they're designing and making.

### ASK

- Which goal are you focused on?
- How would you expect the glider ideally to perform?
- What are you tweaking in the design and why?
- How does this current design differ from your original plan? Why?
- How does changing materials affect your design?
- Does a glider made of cardboard fly differently from one made of balsa wood?



Once the girls have finished building their gliders, leave time for them to show off and test their aircraft. Have each group spend 1–2 minutes explaining their designs, challenges, and successes. Then, do a final fly-off!

## Project Hints

- Suggest that the girls tweak one variable at a time. Maybe they could change the position of the wings only, or change the shape of the nose only to see what that will do.

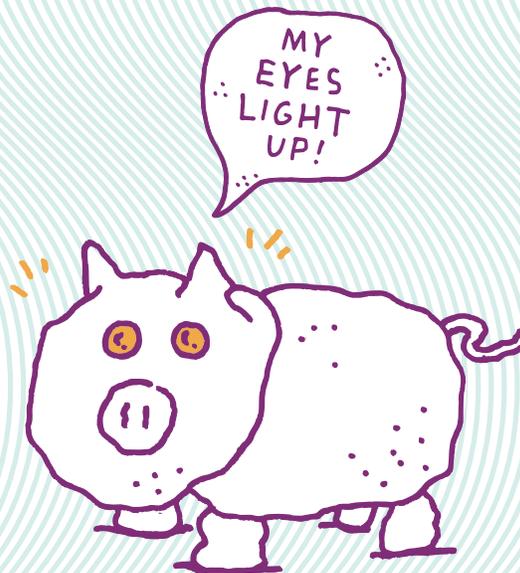


- Have the girls think about energy efficiency. Talk about how a jetliner might be more or less energy efficient than a helicopter. Try making models of both to explore and investigate!



# SQUISHY CIRCUITS

This activity can be used in place of *Brr, That's Cold: Checking for Drafts* in Session 4 of *GET MOVING!*



## SQUISHY PIG CIRCUIT



As girls begin to think about energy and lightbulbs, encourage them first to explore how electricity works!

Squishy Circuits is a hands-on activity that allows girls to explore how circuits work. Girls use dough and basic electronics components to create and interact with circuits. They will be able to easily change and manipulate components to make different types of circuits; activate lights, motors, and sounds; and make fun dough sculptures.

Squishy Circuits was originally developed by Dr. AnnMarie Thomas and Samuel Johnson. More information is available at <http://courseweb.stthomas.edu/apthomas/SquishyCircuits/index.htm>



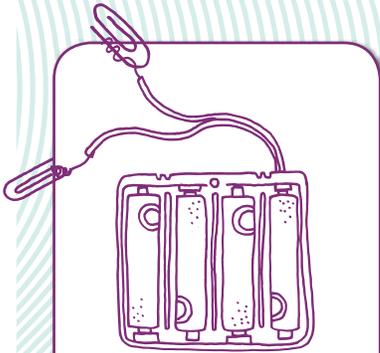
### Prepare Ahead

Before the activity, you will need to purchase and prepare the items listed in the Materials box. The majority of the materials can be purchased online or at a local electronics store. Or you may purchase a full Squishy Circuits kit at <http://squishycircuitsstore.com/kits.html>



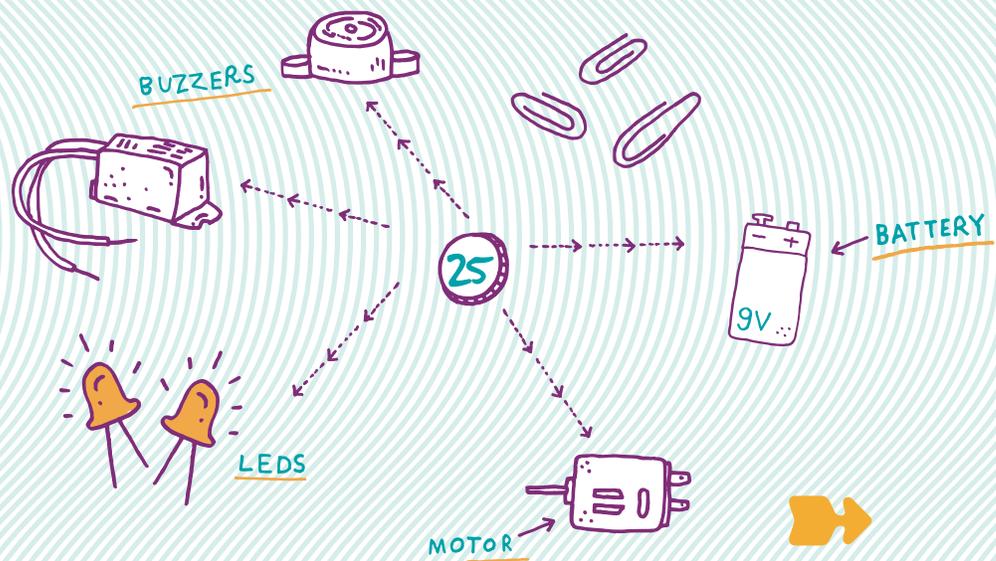
# SQUISHY CIRCUITS

continued



The paper clips will need to be attached to the bare wire ends of the battery pack's leads. The paper clip increases the surface area of the wire and allows the battery to make better contact with the dough. You can wrap the wires around the paper clips before the activity begins. There is no need to straighten the paper clips.

Materials	Quantity	Notes & Suggestions
6V battery pack, with 4 AA batteries	About 1 battery pack per 2–3 girls	
LEDs, any size or color. 10mm superbright LEDs tend to be the most appealing type.	About 1 LED per girl	Any type of LED will work with Squishy Circuits, and you can simply purchase a grab bag of LEDs.
Paper clips	2 per battery pack	
Conductive dough		Conductive dough can be homemade dough or store-bought Play-doh. More notes and suggestions are listed below. If purchasing Play-doh, about one container of dough is sufficient for 4–6 girls.
Homemade insulating dough (optional)		Insulating dough is optional. If you use it, you will need to purchase the separate ingredients ahead of time. This dough can be made in advance by the facilitator or by the girls as part of the activity.
DC motor, low current (optional)		A DC (direct current) motor will show that electricity can power movement.
Buzzer (optional)		A piezoelectric buzzer will show that electricity can power sound.



# SQUISHY CIRCUITS

continued

Conductive dough contains enough salt to act as a conductor of electricity, like a wire, and allows the flow of electrons through the material. It can be made from scratch with everyday kitchen ingredients, or if you're short on time or ingredients, store-bought Play-doh can be substituted. Both types of dough work well.

In contrast, insulating dough contains sugar and acts as an insulator, preventing some of the electrons from flowing. The inclusion of insulating dough in this activity is optional, as air can also act as an insulator; if enough space is left between wires (or in this particular activity, strands of conductive dough), electrons will not flow.

Prepare the conductive and/or insulating dough in advance, or, better yet, have the girls help make the dough as part of the activity. Making dough with the girls allows everyone to think through the ingredients involved.

The recipes for homemade conductive dough and insulative dough can be found online at <http://courseweb.stthomas.edu/apthomas/SquishyCircuits/index.htm>. They are also included below.

**NOTE:** You will need to acquire additional ingredients for making the dough.



## Conductive Dough

In a saucepan or pot, mix together:

- 1 cup flour
- 1 cup water
- ¼ cup salt
- 3 Tbsp cream of tartar or 9 Tbsp of lemon juice
- 1 Tbsp vegetable oil
- a few drops of food coloring, to your desired shade
- plastic bag or plastic container for storage



**Stir the mixture continuously over medium heat until all the ingredients form a sticky ball of dough. Once the ball has formed, take the dough off the heat and out of the saucepan, and place on a nonstick surface. Add in an additional ½ cup flour while kneading the dough to a firmer consistency.**



## Insulating Dough

You will need the following:

- 1 ½ cup flour
- ½ cup sugar
- 3 Tbsp vegetable oil
- ½ cup distilled water (Do not use tap water!)
- food coloring if desired
- plastic bag or plastic container for storage



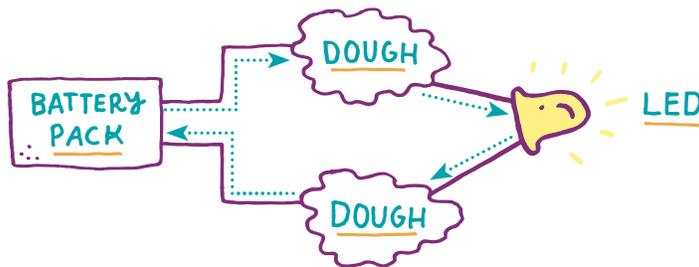
**In a bowl or saucepan (no heat required), mix together 1 cup flour, ½ cup sugar, and the vegetable oil. Add the distilled water to the mixture in small quantities. You may want to take the dough out of the bowl to work on a nonstick surface. Knead it while adding an additional ½ cup flour and any remaining distilled water. Knead until the dough reaches a firmer consistency. Insulating dough will likely be stickier than the conductive dough.**

# SQUISHY CIRCUITS

continued

One possible way to arrange the basic Squishy Circuits components is shown in the diagram below. This is just the beginning of what Squishy Circuits can look like! Allow the girls to explore and try out their own ideas for arrangements before providing this specific diagram.

In Squishy Circuits, the conductive dough acts as a “wire” that conducts electricity between the battery pack and the LEDs, DC motors, and/or piezoelectric buzzers. By touching the battery leads to the dough to the LED, you will have created a successful closed circuit.



## Project Hints

Here's some information that might be helpful while the girls explore and tinker with the materials:

- Electrons like to flow in a complete circle, called a closed circuit. If the circle contains a break, it becomes an open circuit and electrons are unable to flow through.
- LEDs have polarity. One leg (or lead) is longer than the other; the longer leg is positive, the shorter leg is negative.
- Electrons flow easily through conductive dough and encounter more resistance in insulating dough.

## Getting Started: Discovering Squishy Circuits

**DO** Place all materials onto the middle of tables. The materials can sit in small groupings (a handful of LEDs, a chunk of conductive dough, and a small stack of battery packs with paper clips attached to the wire leads).

Encourage girls to work together in groups of 2 or 3.

Start by asking girls to explore the materials and see if they can create a circuit. The first goal is to light up a LED. This may take 5–15 minutes. (If the girls get stuck, show them the diagram of the battery pack with dough and have them follow it to create a closed circuit that lights up an LED. Have each group share their discoveries.)



### ASK

- Can anyone identify the materials?
- What are they? What do they do?
- What did you discover as you explored the materials?
- Using the materials, can you light up a LED?
- How are the electrons flowing? Where do they start, and where do they go?
- What purpose does the conductive dough serve? The battery?

# SQUISHY CIRCUITS

continued

**DO** Next, take 1–2 minutes to identify the materials for the girls. Allow a bit of time for the girls to discover the materials' purposes. You may want to wait to explain how each material is supposed to be used.

If it's helpful, show them the diagram above and have them follow it to create a closed circuit that lights up a LED.

## Creating Your Own Squishy Circuit

As the girls are playing with the materials, ask some of the questions below to encourage their continued exploration of Squishy Circuits.

### ASK

- 🌀 Can you light up 2 LEDs? 3 LEDs?
- 🌀 Can you make the motor spin? (optional, depending on supplies provided)
- 🌀 Can you power the buzzer? (optional, depending on supplies provided)
- 🌀 Is there a difference between the two types of dough? What is it?
- 🌀 What happens if you change the length or thickness of the dough?
- 🌀 Can you create a fun shape or sculpture that lights up, spins, or buzzes?
- 🌀 Other than batteries, what other sources of energy might power these circuits?



SQUISHY PIG  
CIRCUIT

**DO** Encourage girls to make a dough creation that uses LEDs, motors, and/or buzzers. It can be an animated sculpture, character, animal, monument—anything! Tell the girls to let their imaginations soar! This part of the activity can take anywhere from 15–30 minutes. Have the girls share their creations with one another while they are building them so that they can create off of each other's ideas.

Once the girls have finished building their creations, leave time for them to share their dough designs, as well as reflect and talk about what they discovered while playing with Squishy Circuits.



## Clean Up

After the activity, wipe the dough off all battery packs, LEDs, and paper clips. The salt in conductive dough can corrode the leads on LEDs and battery packs. Dough will last for many weeks if stored in airtight plastic bags or containers and kept frozen.



# How to Create a Makerspace



**Makerspaces serve as gathering spots,** often bringing together tools, equipment, ideas, and, most importantly, people with different backgrounds. They want to learn new skills, try new things, and embrace new ideas. Makerspaces can be as small as the corner of a room or as large as a workshop; they are as simple as a table, a garage, backyard, or classroom. They're places where makers can learn new skills or improve old ones, create and build new things, and try out new ideas.

It's easy to design a warm and welcoming makerspace that encourages inspiration, exploration and creativity! As a place to gather, make, and share, makerspaces are ultimately about the makers who fill it. Let the girls help shape what their ideal creative space looks like—and let them build it together!



## You don't need a big budget at all. Start simply:

- ① Think about items you can repurpose and recycle.
- ① Fill the space with tools and materials that are useful for a wide variety of projects and appropriate for the age level of the users.
- ① Consider organizing a materials-and-tools drive to get your makerspace started. Talk to neighbors in your community and see if they can donate things like spare screwdrivers, extra rolls of masking tape, a stool and table, paint, paint brushes, pens and pencils, storage bins.
- ① Ask community businesses (like your local hardware store) if they'd like to donate items.
- ① Check with big -box stores, appliance stores, or electronics stores in your community to see if they have large cardboard boxes to give away that you can use in projects.
- ① Call electronic recycling centers to see if they have free items that can be taken apart and picked through for spare parts.
- ① Check out local thrift shops, which may have inexpensive but useful items.
- ① Gather together an assortment of arts and crafts supplies, like glue guns, pipe cleaners, craft sticks, paper of any kind (from copy paper to cardboard), toilet paper tubes, yarn—whatever you can think of!
- ① Have the girls help sort and organize the materials in a way that is accessible, appropriate, and appealing. Nicely arranged supplies will be used and even inspire new uses.

**All ideas are welcome—big and small!**



# How to Find Makers Near You



**Makers are everywhere!** Invite them to come and talk with the girls about what they're making, show off things they've created, or help girls get started with their projects. Here are some ideas for finding makers near you:

**Events** Most towns and cities host different kinds of festivals and faires. Look for makers at these events, whether they are official Maker

Faires or mini Maker Faires, student science fairs, arts and craft festivals, quilting bees, cultural fairs with extravagant costumes and garments, county or state fairs, farmers markets, or robotics competitions. These events often showcase makers with incredible and unique skills.

**Clubs and community groups** People often gather together to share common hobbies and interests. These may be book clubs, gardening groups, outdoor adventure groups, automobile groups, model train clubs, computer groups, knitting and crocheting clubs, or cooking and baking groups. Find some people who might like to share their knowledge with the girls.

**People in the industrial, manufacturing, automotive, or even agricultural fields** Carpenters, construction contractors, welders, electricians, plumbers, automotive mechanics, farmers, furniture makers, and builders make every day, all the time. These professionals can be mentors who share their expertise and equipment.

**Artists and artisans** Local artists and artisans are another type of creative and imaginative makers. They may work in clay, glass, photography, painting, drawing, or other materials and can share their work and passions.

**Friends and neighbors** These people can be makers too! They may be willing to lend a hand, demonstrate a new tool, or help out with a household project.

**Museums, libraries, and youth-serving organizations** Colleges and community centers are embracing the maker movement with exhibits and workshops. Check out your local spaces to meet people and share ideas!

**Families** Remember the value in intergenerational learning! Grandparents, aunts and uncles, parents, and siblings may have a skill you never knew about.

**All you need to do is ask!**

MAKING STUFF IS FUN!