#ILoveSTEM Day 2017 Activity Guide

Gumdrop Bridge

The Challenge:

Using gumdrops and toothpicks, design a structure that can hold the weight of a large book.

Supplies Needed:

- 30 Gumdrops
- 60 Toothpicks
- 1 Paper Plate
- 1 Pencil
- 1 Piece of Paper

The Big Ideas:

- The way triangles are shaped makes them great for base and support structures.
- Large bases support more weight.

STEM Connections:

Science & Math = physics & shape comparison

Engineering & Technology = load distribution & building structures

Activity Rules:

1. Your goal is to support the weight of a large book, by creating a strong enough structure with your supplies.
2. Be creative!
3. Have fun!

Instructions:

STEP 1: [10 Minutes] Brainstorm different bridge designs that you think could hold up a book. What shapes and structures might help you build the strongest bridge? Draw a sketch of the Gumdrop bridge that you will build and test.

STEP 2: [10 Minutes] Build your bridge, this a great activity to do by yourself or to invite your friends over and work as a team.

STEP 3: [10 Minutes] If you're working within a team explain how you built your bridge and why you think it will be strong enough to hold a book.

STEP 4: [5 Minutes] Test your structure by placing a large book on top of the structure. (See photo below for example.)

STEP 5: [10 Minutes] Rebuild your bridge using a different design (and different shapes, if it fell under the weight of the book.) Test your bridge again. If your bridge supported the book the first time, test to see if it will hold two books.

Activity Questions:

- Did your structure hold a book? Why?
- What shapes do you think made the strongest structure?
- Does the length of your toothpick affect the strength of your bridge? Can you think of a solution that might help you make a stronger bridge?

Marble Roller Coaster

The Challenge:

You're the engineer of rides at a new amusement park! Brainstorm, design and construct a marble roller coaster to attract new guests. The coaster must be exciting and fun (lots of turns, loops and hills), but as the engineer, you must also ensure all the passengers reach the end safely.

Supplies Needed:

- 4 pieces of pipe insulation (3ft each)
- 1 marble
- Roll of masking tape
- Paper for brainstorming/design
- Various cups, books, etc. for supports

The Big Ideas:

- The size and shape of your roller coaster effects the kinetic energy of the marble. (The kinetic energy here is the amount of energy that your marble possesses due to its motion going around your track.)
- How do we change the amount of kinetic energy in an object? What do we need for our roller coaster for the marble to safely complete its journey?
- Potential energy is the energy stored in an object. In this case, your roller coaster's success depends on the marble's potential energy to go around the track. What do you think changes the marble's potential energy?
- What causes your marble to gain momentum? What causes your marble to lose momentum?

STEM Connections:

Science & Math = physics & energy

Engineering & Technology = design & building structures

Activity Rules:

1. The marble must make it to the end of the track without flying off or stopping in the middle.
2. Each Coaster must have at least 2 of the following:

   How many points can you earn?

   a. Hill (1 pt)

   b. 90º turn (1 pt)

   c. 180º turn (2 pts)

   d. 270º turn (3 pts)

   e. Loop (4 pts)

3. Be creative.
4. Don't be afraid to try something that other people aren't doing.
5. HAVE FUN!

Instructions:

STEP 1: [10 Minutes] Brainstorm different roller coaster designs. How high will you have to start your track so the marble makes it all the way through the course? Draw a sketch of the roller coaster that you will build and test.

STEP 2: [10 Minutes] Use the piping insulation to start forming your track and the tape to hold together the insulation. Use items like books, pencils, and cups to help support your design. Example: Try using a couple of books to support the beginning of your roller coaster and use a cup to catch your marble at the end! Get creative!

STEP 3: [5 Minutes] Test your structure with the marble to see if the marble makes it all the way through. Tally up the points! Can you add more points while still making your roller coaster a safe ride?

STEP 4: [20 Minutes] If the marble makes it all the way through, retest, and modify your coaster design. How can your design be improved? Can you add more turns or another loop?

Activity Questions:

- Which of your roller coaster designs were most exciting? Which were safest?
- What did you learn from testing your model?
- How important is it that engineers test their designs (for appliances, cars, bridges, stairways, roller coasters, etc.) before they build?

Snap Circuits®

This activity kit provides hands-on experience designing and building models of working electrical circuits. Build working models of a photo sensor, a flashing light, and an adjustable-volume siren.

Snap Circuits® Jr. makes learning electronics easy and fun! Just follow the colorful pictures in the manual and build exciting projects such as a flying saucer, alarms, doorbells and much more. You can purchase the activity kit shown at retail stores such as Walmart & Kohls or order it here on Amazon: http://amzn.to/2u5ToVr.

Supplies Needed:

- 1 Snap Circuit® Jr. kit
- 2 1.5V AA batteries

Activity Rules:

1. Have an adult assistant nearby to help with set-up and proper clean-up.
2. Follow the manual carefully!

Instructions:

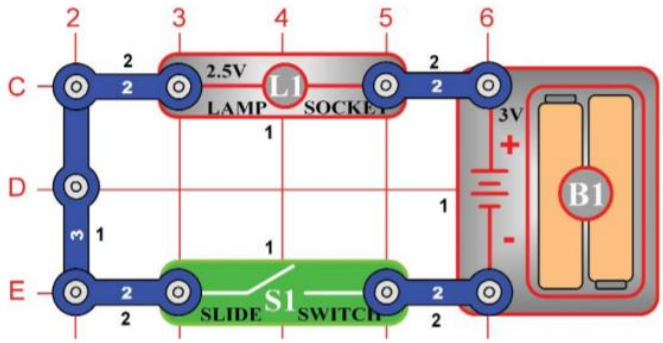
During #ILoveSTEM Day, we completed projects 1 and 3 which took approximately 20 minutes.

Follow the instructions given in the SnapCircuit® Jr. manual to build your own circuit. These activities (and more) are available in the printed instruction manual that comes with the kit. You can also find the manual online by following this link: http://bit.ly/1ARO7gx.

Project #1

Electric Light & Switch

OBJECTIVE: To show how electricity is turned "ON" or "OFF" with a switch.



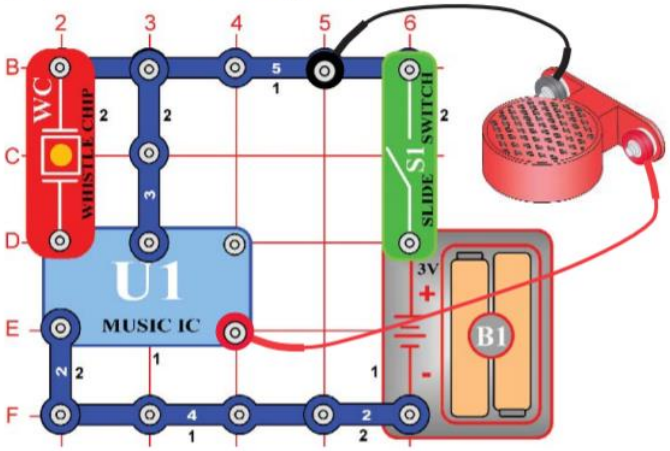
Build the circuit shown on the left by placing all the parts with a black 1 next to them on the base grid first. Then, assemble parts marked with a 2. Install two (2) "AA" batteries (not included) into the battery holder (B1) and screw the bulb into the lamp socket (L1) if you have not done so already.

When you close the slide switch (S1), current flows from the batteries through the lamp and back to the battery through the switch. The closed switch completes the circuit. In electronics this is called a closed circuit. When the slide switch is opened, the current can no longer flow back to the battery, so the lamp goes out. In electronics this is called an open circuit.

Project #3

Sound Activated Switch

OBJECTIVE: To show how sound can turn "ON" an electronic device.



Build the circuit shown on the left by placing all the parts with a black 1 next to them on the base grid first. Then, assemble parts marked with a 2. Finally, lay the speaker (SP) on the table and connect it to the circuit using the jumper wires as shown.

When you close the slide switch (S1), the music may play for a short time, and then stop. After the music has stopped, clap your hands close to the whistle chip (WC) or tap the base with your finger. The music should play again for a short time, then stop. Blow on the whistle chip and the music should play.

You could connect the speaker using snap wires instead of the jumper wires, but then the speaker may create enough sound vibrations to re-activate the whistle chip.

Activity Questions:

- What various components are required to complete a circuit?
- Can you name some items that are non-conductors (things that do not carry electricity)?