Squishy Circuits

Mission Concept

Building flexible circuits out of conductive dough.

Basic Electricity (open circuit, closed circuit, short circuit, parallel circuit, series circuit, atom, electron flow)

Mission Objective

What is an Atom?
What is an Electron? How does an electron travel through a circuit?
What is Electricity?
What is a basic Electric Circuit?
What is an Open circuit? Closed circuit? Short circuit? Parallel circuit? Series Circuit?

Resources
Conductive dough
Insulating dough
LEDs of various colors
Buzzer
Battery pack + 4AA batteries
Paper plate
Worksheets
WARNING: do not directly connect battery pack to the LEDs --- may blow out the LED.

Squishy Circuits
http://courseweb.stthomas.edu/apthomas/squishycircuits/
http://www.sciencebuddies.org/science-fair-projects/Classroom_Activity_Student_SquishyCircuits.shtml

Electronics supplies
Electronic Goldmine (http://www.goldmine-elec-products.com/)
Electronix Express (https://www.elexp.com/default.aspx)

1. Make 2 lumps of conductive dough. Insert 1 metal prong from the battery pack into each lump. Make sure the conductive dough is packed tightly around the prong so it does not wiggle.
2. The tiny lights from the kits are called LEDs (which stands for Light-Emitting Diode). They have 1 long metal leg and 1 short metal leg. The LED legs are called "leads" (pronounced "leeds").
3. Insert the longer LED lead into the lump of conductive dough that is connected to the red battery pack wire.
4. *What happens?* Your LED should not light up yet, because you have an open circuit.
5. Now, connect the LED's *shorter* lead to the lump of conductive dough that is connected to the *black* battery pack wire.

6. *What happens?* Your LED should light up, because now you have a closed circuit. This works because the conductive dough and the battery pack wires are conductors. If your LED does not light up, you might have gotten the long and short leads switched. Try flipping your LED around.
7. Now, press your 2 lumps of conductive dough together. *What happens?* Your LED should go out, because you created a short circuit. The electricity follows the path of least resistance through the conductive dough, instead of going through the LED.
8. How can you prevent a short circuit? Put a lump of insulator dough in between your 2 lumps of conductive dough. Now, squeeze them together again. Your LED should still light up! This works because the insulator dough is an insulator, so it helps to prevent a short circuit.
9. If time permits extend Squishy Circuits to series and parallel circuits using the hot dog method (long thin logs of conductive dough + insulator dough + conductive dough); and/or using the target method (inner circle conductive dough + middle circle insulator dough + outer circle conductive dough); and/or using the sandwich method (layer of conductive dough on top of insulated dough and another layer of conductive dough under the insulated dough.

Mission report (outcome)

Now you can experiment with your circuit and build your own design. Try adding more LEDs or making a sculpture like an animal with LEDs for eyes. (example: frog, butterfly, etc…)
Use the buzzer to add functionality to your creations.
Combine Squishy Circuits with other electrical toys you may have.
Design a switch to control the lights, buzzer.

Debrief

Why is it important the all parts of the circuit are connected?
What do you think would happen if you tried to connect more than 2 wires to each battery pack?
Do you think the size of your creature affects whether or not its eyes light up? Why or why not?
How would you go about giving your creature 3 sets of eyes and a way to make a scary sound?
What would you add to your design to make your creature even better?