

Play Dough Circuits

We will be making multiple parallel circuits and complete circuits using a battery, conductive play dough, clay for insulation, LEDs, buzzers, switches and motors.

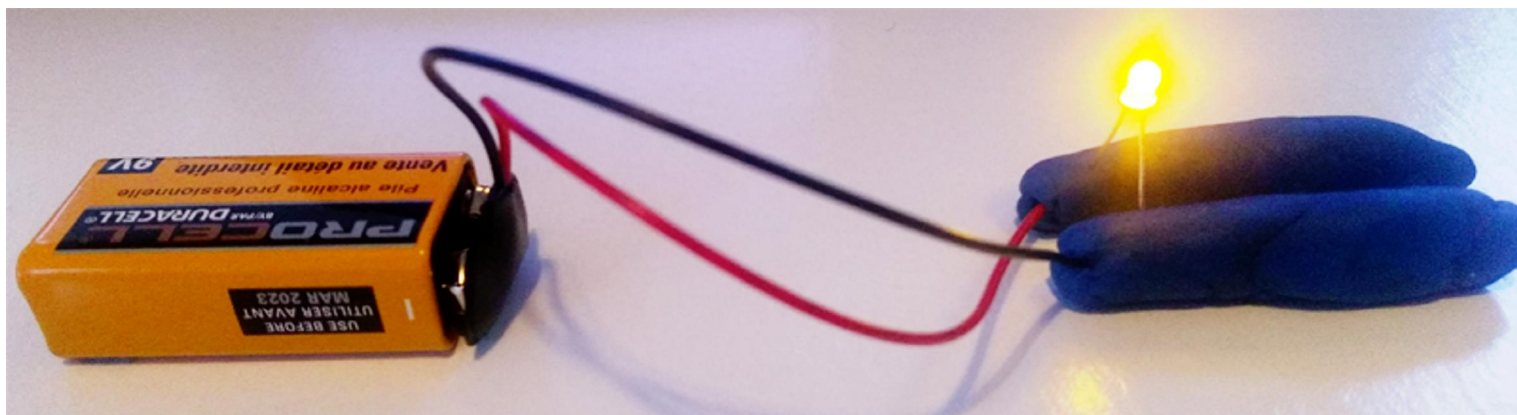
Safety First

Give a quick overview about safety when working with electricity and batteries.

1. Don't connect any of the parts (LEDs, buzzers, motors) directly to the 9v battery. This is too many volts and will cause damage to the parts. The battery wires must go through the play dough and the parts should be connected to the play dough. The play dough has resistance which lowers the volts to about 3v.
2. I will demonstrate resistance by having one of the students push up against me as I try to walk forward. The student is creating resistance slowing me down similar to what happens when the 9 volts goes through the play dough. The play dough is creating resistance lowering the electricity to 3 volts.
3. When not using the 9v battery, unplug it and place the rubber cap on the top. This will assure no electricity will mistakenly transfer to something conductive it may come into contact with.

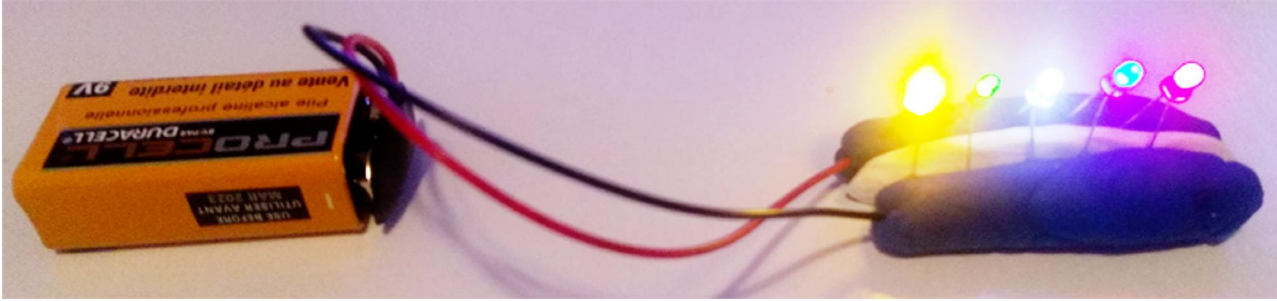
Parallel Circuits

Our first simple parallel circuit with an LED



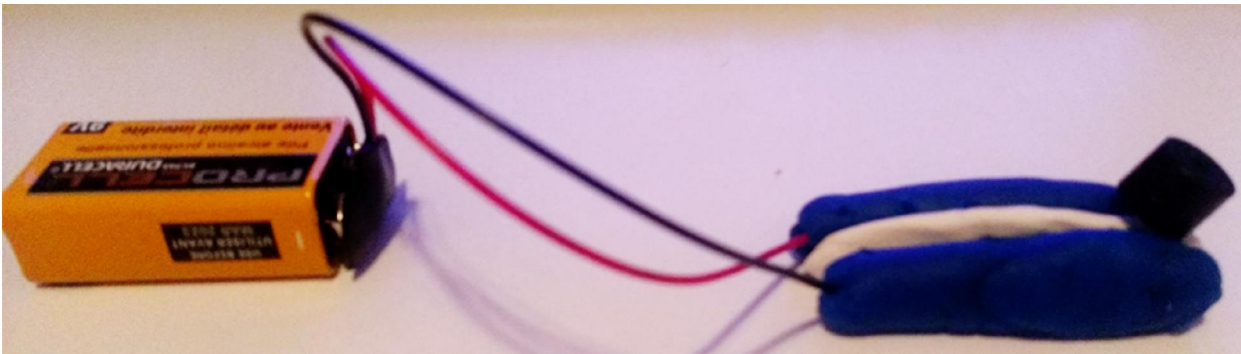
Make two worm like shapes with the play dough and connect the + battery wire (red) into one of the worms and the - battery wire (black) into the other worm. Connect the long leg of the LED to the + side and the short LED leg to the - side.

Using insulation & why it's important



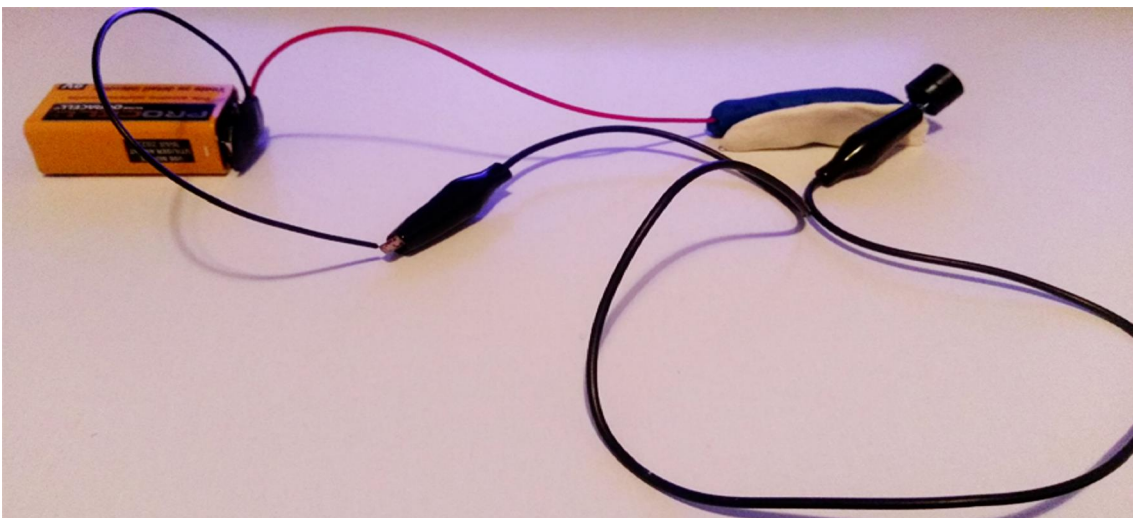
Use the white clay to create insulation in-between the 2 pieces of play dough. The clay is not conductive. This protects your circuit from having a short circuit. Demo what happens with a short circuit and explain why you don't want this to happen. After adding the insulation have the students add multiple LEDs to their circuit and explain why the LEDs start to dim as you add more.

Power a buzzer



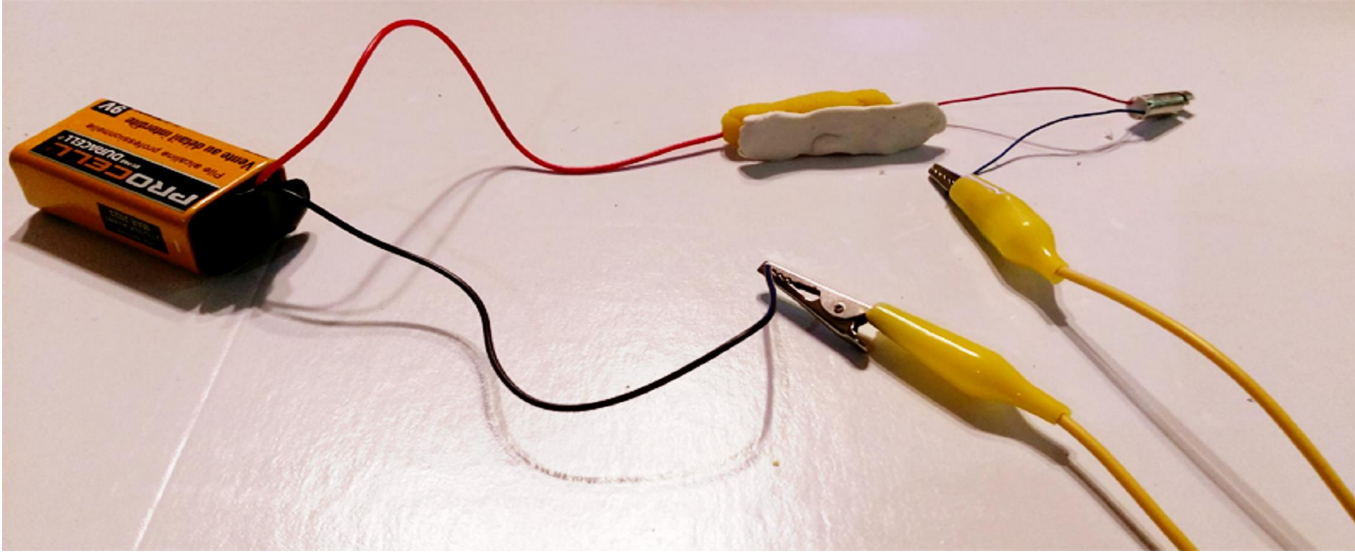
Connect the longer leg of the buzzer to the + side and the short leg to the - side. You should hear a very faint buzzing sound. It is faint because our buzzer is 5 volts but we are only sending it about 3 volts.

Let's give it more power (less resistance). Connect one end of the alligator clip to the black wire from the battery and the other end of the clip to the short leg of the buzzer. Now the buzzer is louder.



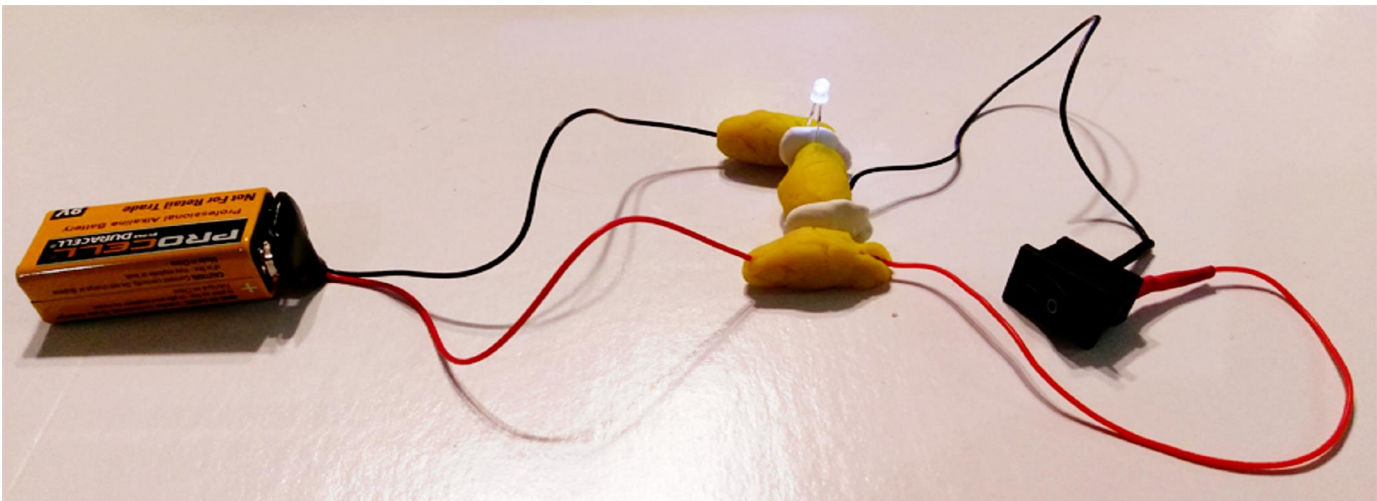
Power a motor

Keep the exact same circuit as you created for the buzzer but just replace the buzzer with the motor. Place the red wire from your motor into the play dough where the red wire from the battery is going into. Connect the blue wire from your motor to the alligator clip.



Complete (Series) Circuits

Add an on/off Switch



Create a complete circuit adding 1 LED and a switch. Add insulation in-between each piece of play dough. The short leg of the LED should be in the piece of play dough where the black wire from the battery is going into, the long leg should be on the piece to the right of that over the insulation. The red wire of your switch should be placed in the same piece of play dough that

the red wire from your battery is going into and the black wire goes into the middle play dough piece.

Turn your switch on and off to see the LED power on and off.

What else is conductive?

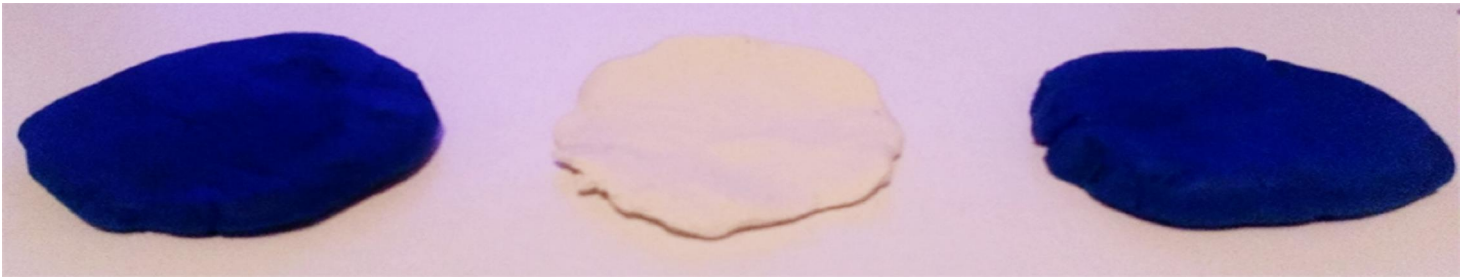
Ask the students if they think paperclips are conductive. Demonstrate this by hooking up a paper clip to your circuit to see if it passes electricity through.

Is a pipe cleaner conductive? Demo this.

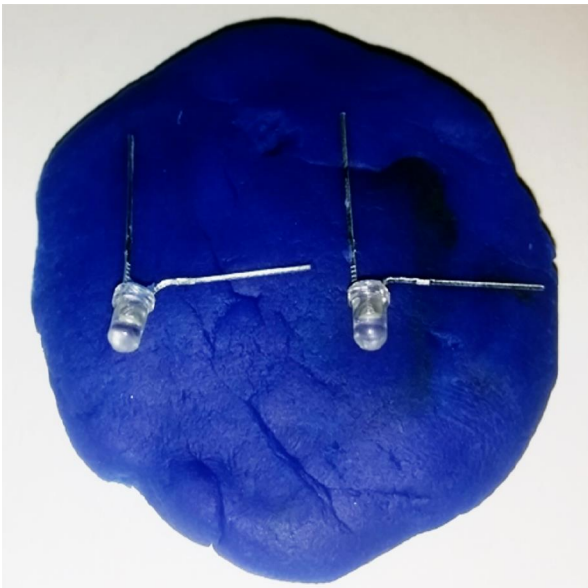
Is paper conductive? Demo this.

Create a happy face with LEDs for the eyes

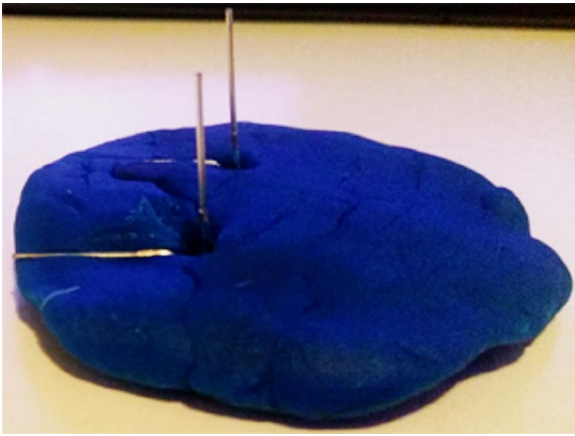
Create 2 small flat circles from the play dough and 1 small thin flat circle from the white clay like small pancakes. These should all be the same size circles but the insulation piece can be thinner.



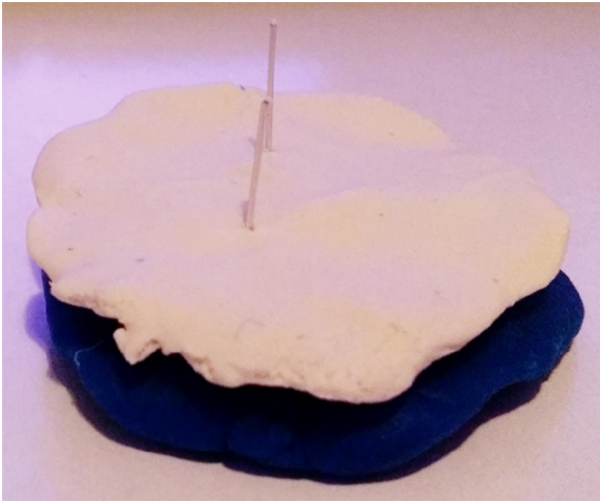
On 2 small LEDs bend the short legs down so your legs look like an L like below.



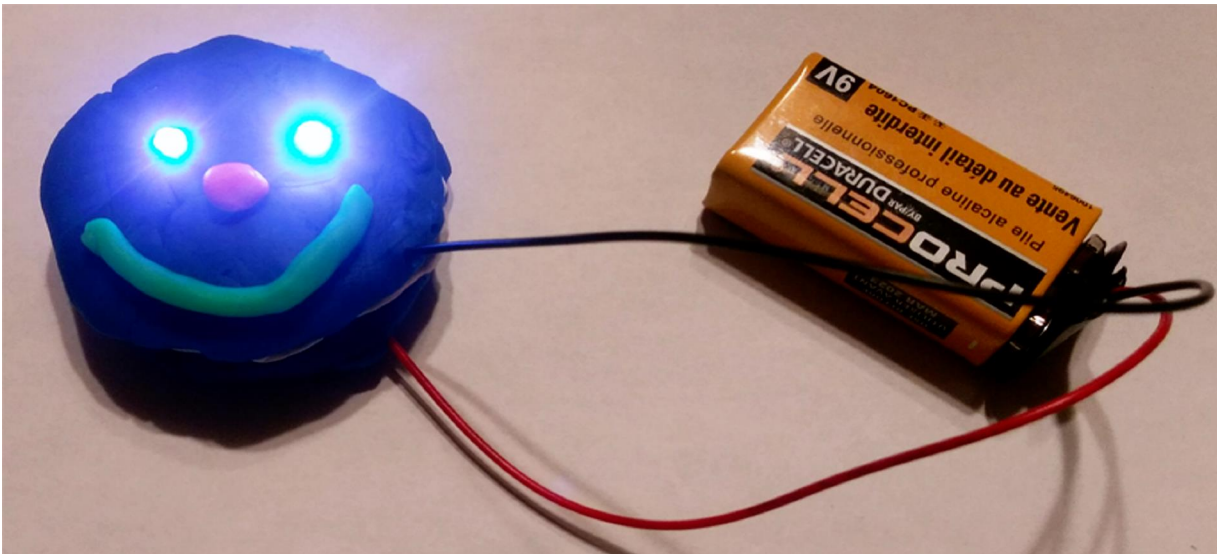
Now poke the heads of the LEDs through the play dough where you want the eyes making sure the short bent legs are touching the play dough and the long legs are pointing up.



Place the white insulation piece over the poking up long legs.



Place the other circle over the insulation and long legs and flip it over. You may need to push the play dough down so the LED tips come through for the eyes. Hook up the black wire to the top piece of conductive play dough and the red wire to the bottom piece of the conductive play dough.



Free time to experiment

If there is free time left maybe they can experiment a little making their own circuits. They can build a heart or robot head similar to the happy face adding LEDs. Or build a parallel circuit adding multiple parts. Whatever they come up with :)