

Bay Area Scientists in Schools Presentation Plan

Lesson Name Squishy Circuits
Presenter(s) Chuck Cusumano

Grade Level 4 Standards Connection(s) Energy and Electricity: forms, storage, carrying

Teaser:

This lesson will teach students about basic properties of a simple electric circuit. Students will learn what electricity is and what can cause it. Students will get a chance to build an electric circuit with a battery and some other components such as LED lights, a small electric motor, and a buzzer. They will be able to observe and practice some basic rules to follow when constructing a circuit. The circuitry wiring will consist of electrically conductive play dough.

Objective:

Students will be introduced to the concept of the circuit and why it works. They will be introduced to the concepts of conductors and insulators, and moving electrons. They will be given guidelines on how to build a functioning circuit as well as be introduced to the concept of a short circuit. They will have the opportunity to observe these principles first hand when they each build their own squishy circuit out of play-dough.

Vocabulary:

Electrons – These are the negatively charged particles that move through circuitry making power. When we say that electricity is moving through a circuit, it is actually electrons that are doing the moving!

Circuit – Notice that this word sounds similar to the word circle. That is because circuits are circles! But they are special circles through which electricity is intended to flow in order to power things like lights and motors.

Conductors – Materials that electricity likes to move through, such as wires and the purple conductive play dough.

Insulators- Material that electricity will not move through such as plastic, rubber, or the white insulating play dough.

Short Circuit – A short circuit occurs when two or more parts of a circuit touch where they weren't intended to, causing some elements of the circuit to not be powered.

Materials:

Conductive play dough, non-conductive play dough, wires, LEDs of various colors, battery packs and AA batteries, a small motor, and small buzzers, copies for each student of the "Electric Circuits lab book"

Students should have a pen or pencil in case they want to write in their lab books.

Classroom Set-up:

Students will need a surface on which they can work with play dough such as a desk or table

Classroom Visit

1. Personal Introduction:

5 Minutes

- Engineering student
- Liked to play with electronics/circuits as a kid
- Learning about how and why they work in college physics class and would like to share some of what I'm learning with the students.

Topic Introduction:

10 Minutes

- Have you learned about electricity in school yet? What do you know about electrical circuits?
- Briefly go over anatomy of an atom (just so I can get to the star of the circuit, the electron.)
- how a charge builds up and how this gives rise to electrical energy
- how the electrons move in a circuit
- what causes a short circuit

2. Learning Experience(s):

25-30 Minutes

The students will be given the two types of play dough, some electrical components, and some guidelines. They will each receive an "Electric Circuits Lab Book" which will guide us through the lesson (see attached lab book.) Each step in the lab book ends in a discussion question/prompt. I will assist the students as needed with their circuit building. After the activities in the lab book are completed, there will be a bonus activity where each student will be given either a motor or a buzzer and challenged to make it work in their circuit. After they do this, they will trade components and do it again.

3. Wrap-up: Sharing Experiences

5 Minutes

The materials will be collected. I will give the students a chance to ask questions and share their thoughts on the activity.

4. **Connections & Close:**

5 Minutes

I will let students know that this is a subject that is fun and easy to explore on their own, as I did when I was their age. If they have any interest to do some more complicated projects on their own I would urge them to do so.

Thanks and good-bye! Clean-up.

Total 50 – 60 Minutes

Follow-up – After Presentation

Suggested Websites:

Learning with Squishy Circuits was the topic of a 4 minute Ted Talk by AnnMarie Thomas. Watch her presentation here:

http://www.ted.com/talks/annmarie_thomas_squishy_circuits.html

Squishy Circuits Website: A page all about squishy circuits. It details how to make squishy circuits play dough on your own and gives numerous project ideas

<http://courseweb.stthomas.edu/apthomas/SquishyCircuits/index.htm>



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Squishy Circuits Play-Dough Recipe

A recipe for the play dough will also be included in the in the Lab Books distributed to the students. Here is a copy of the recipe:

Insulating Dough

To make the insulating dough, mix 1 ½ cups of flour, ½ cup of sugar, 3 tbsp. of vegetable oil, ½ cup of distilled water, and 1 tsp alum (as a preservative) in a medium size pot or bowl. Stir it until it until it starts getting a doughy consistency, adding a little distilled water if your mixture is too dry, or extra flour if it's too moist. Coat a flat surface with some flour and knead your dough into a ball.

Conductive Dough

For the conductive dough, mix 1 ½ cups of flour, ¼ cup salt, 1 tbsp of vegetable oil, 1 cup of water (tap is fine), and 3 tbsp cream of tartar, in a medium size pot. Heat it over medium heat, stirring constantly. It will start to dry out and thicken into a mound of dough as you continue to stir. Carefully remove the dough (it's hot!) onto a flat, floured surface, rolling it out so it can cool faster. Once it's cooled, you can knead it into a ball



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ELECTRIC CIRCUITS LAB BOOK

Name: _____

Date: _____

Vocabulary

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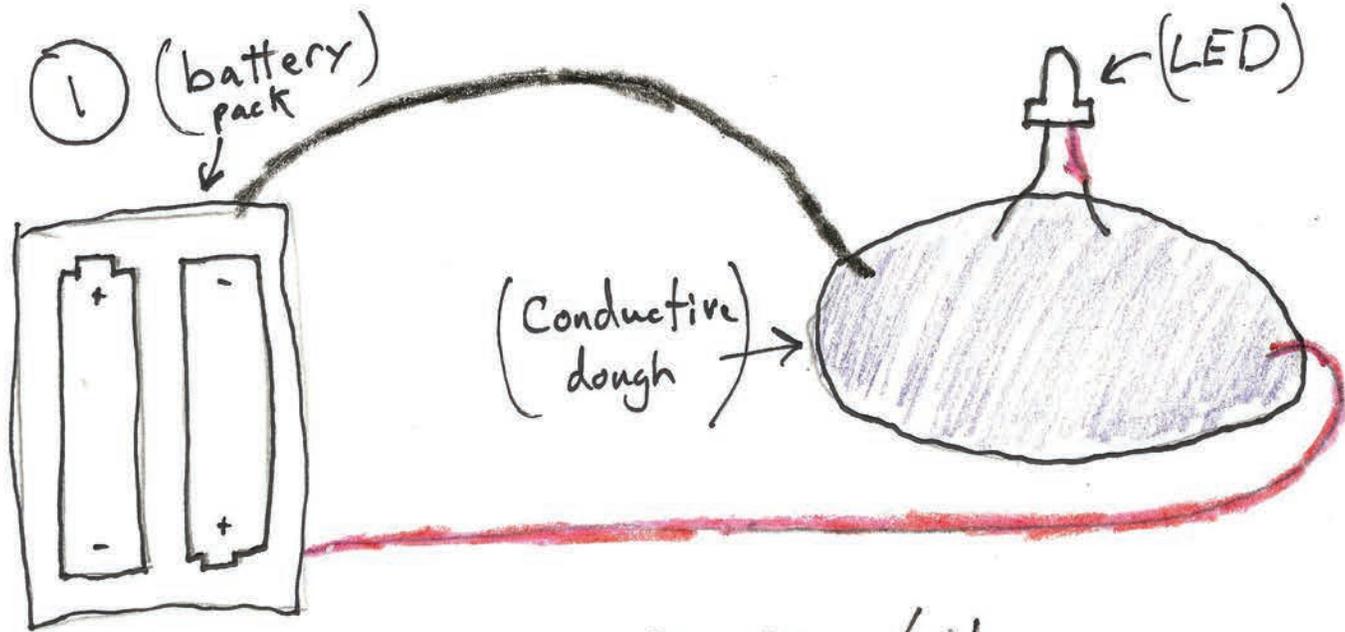
Circuit- Notice that this word sounds similar to the word circle. That is because circuits are circles! But they are special circles through which electricity is intended to flow in order to power things like lights and motors.

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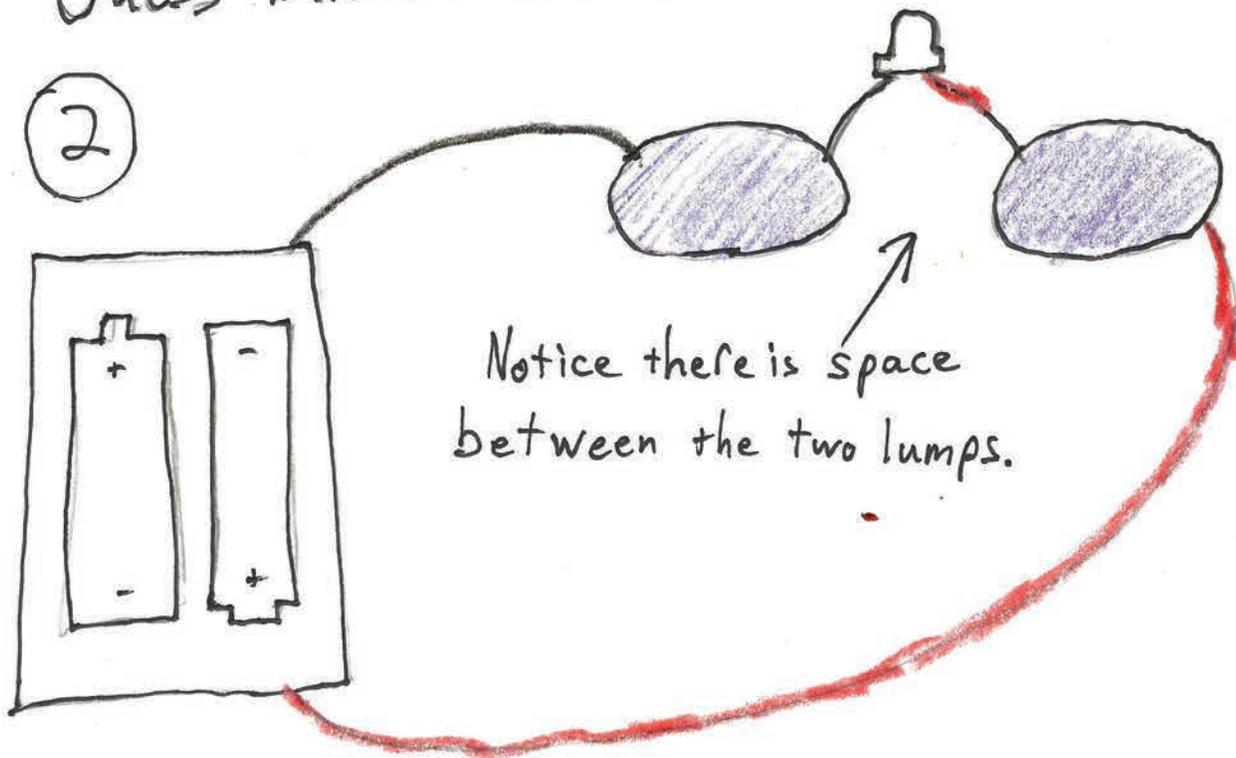
Guess whether the LED will turn on!



Does the LED light up? Yes / No

Why is this the case?

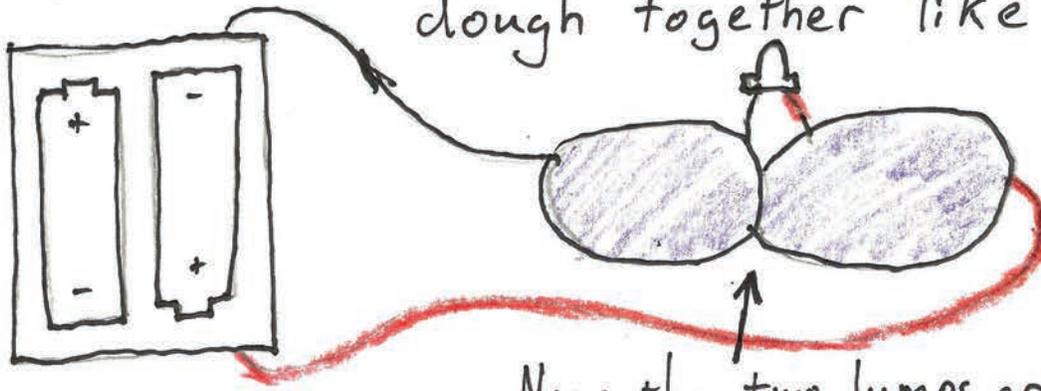
Guess whether the LED will turn on!



Does the LED turn on? Yes / No Why?

3

Now push the two lumps of purple dough together like this:

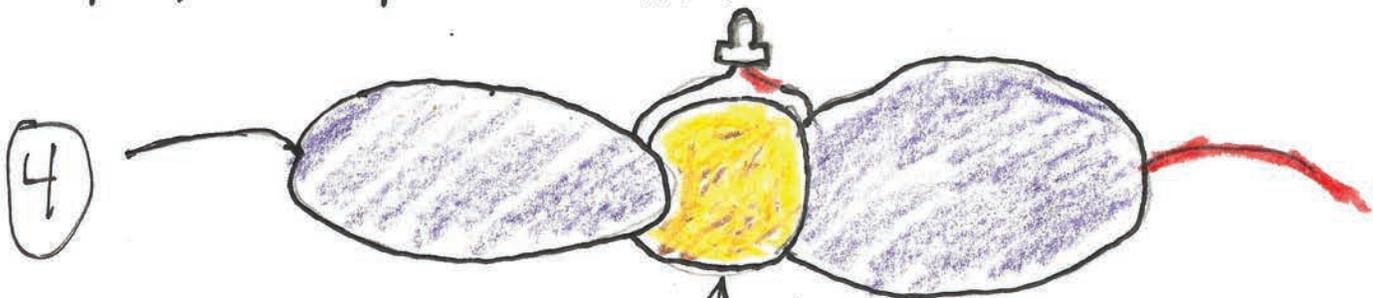


Now the two lumps are touching.

What happens?

Why?

Keep everything else the same, but now put some of the white insulating dough in between the two purple lumps like this:

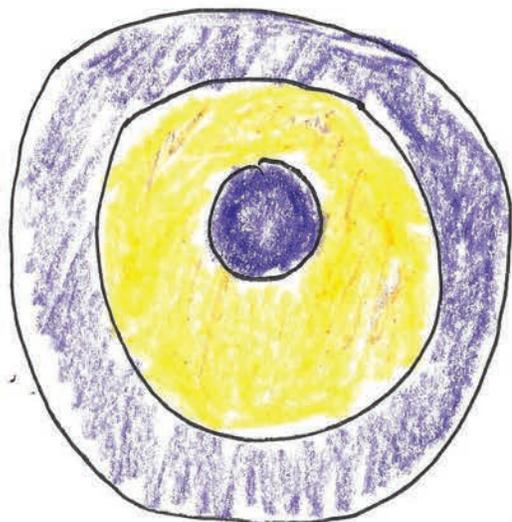


Now what happens? Why?

(insulating dough)

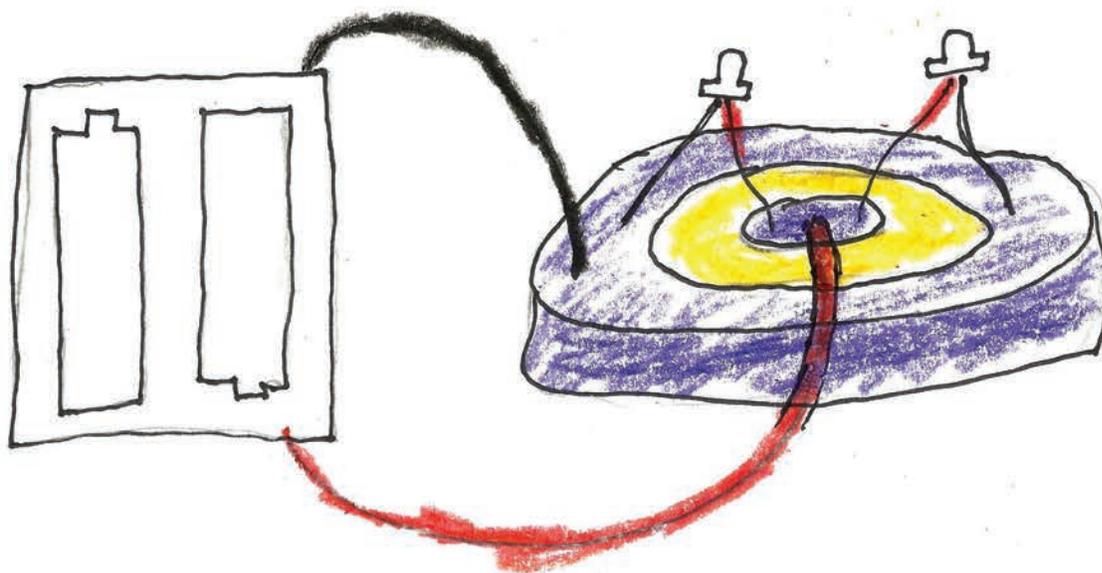
Can you use your purple conductive dough and your white insulating dough to make this fancy shape?

5



Now set up a circuit like this using two LEDs. What happens?

6



Want to try making squishy circuits at home?
Here is a recipe for the play-dough used in this
lab. This recipe along with pictured instructions
can also be found at this web site:

<http://courseweb.stthomas.edu/apthomas/SquishyCircuits/index.htm>

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This can only be done with the assistance of an
adult. Have fun!