Squishy Circuits 4th grade circuits and pathways lesson

This lesson can be launched with your students as they learn about circuits and pathways.

Objectives

- 1. Recognize that electricity in circuits requires a complete loop through which an electrical current can pass, and that electricity can produce light, heat, and sound.
- 2. Identify and classify objects and materials that conduct electricity and objects and materials that are insulators of electricity.

Resources and Tools

- AA batteries (4 per kit)
- Battery holder for 4 AA batteries in Series
- 3mm LEDs
- Distilled Water
- Flour
- Sugar
- Salt
- Vegetable Oil
- Food Coloring
- Cream of Tatar (or Lemon Juice)

Tools for Extension Activity

- littleBits
- MakeyMakey
- Cardboard
- Hot Glue
- Aluminum Foil
- Bowls and cups

Lesson 1: Making the Dough

- Have students break into groups to make each of the dough recipes. Use the provided recipes for Dough A and Dough B.
- 2. Have students hypothesize which dough will be the conductor and which dough will be the insulator. Students should record their hypothesis in a Science journal or eBook.

Lesson 2: Testing the Dough

- 1. Hand out a battery pack and a few LEDs. Students will use the dough they created in Lesson 1 to create their squishy circuits.
- 2. The first challenge is to determine which dough is the conductor and which dough is the insulator. Challenge your students to figure this out using the provided materials.
- 3. Once the dough properties have been determined, students will create a simple, series, and a parallel circuit using the dough.
- 4. Have students record their examples in a science journal or by embedding images into an eBook.

Lesson 3: Extending with MakeyMakey

- 1. Have students identify and test the conductivity of different materials by using a MakeyMakey.
- 2. When a complete circuit is detected the MakeyMakey will send keyboard input to the computer.
- 3. Use a simple notepad, or a Scratch project to capture the keyboard input.
- 4. Have students record their findings in their journals or eBooks.

Lesson 4: Extending with littleBits

 Have students make a satellite dish using a littleBits light sensor. Use a bright flashlight as the "satellite". Test the effectiveness of the flashlight and light sensor in your classroom and determine what the proper distance will be for the challenge.



- Students should use recycled materials like cups, bowls, paper plates, popsicle sticks, and aluminum foil to construct their satellite dish.
- 3. Use a littleBits number or bar graph bit to determine how much light the satellite dish is able to capture.

MA Technology and Engineering Standards

3-5-ETS1-3

Plan and carry out tests of one or more elements of a model or prototype in whichever variables are controlled and failure points are considered to identify which elements need to be improved. Apply the results of tests to redesign a model or prototype.

3-5-ETS1-5

Evaluate relevant design features that must be considered in building a modeler or prototype of a solution to a given design problem.

3-5-ETS2-1

Recognize that technology is any modification of the natural or design world done to fulfill human needs or wants.

These modifications can be improvements to existing technologies or the development of new technologies.

3-5-ETS2-2

Describe that technological products or devices are made up of parts. Use sketches or drawings to show how each part of a product or device relate to other parts in the product or device.

Dough A Recipe

Ingredients

- 1 cup Water
- 1¹/₂ cups Flour
- ¼ cup Salt
- 3 Tbsp. Cream of Tatar (Lemon Juice can be substituted)
- 1 Tbsp. Vegetable Oil
- Food Coloring

Instructions

- 1. Mix all ingredients except ½ cup of flour in a medium sized pot
- 2. Cook over medium heat and stir continuously
- 3. The mixture will begin to boil and get chunky
- 4. Keep stirring until the mixture forms a ball in the center of the pot
- 5. Place the ball on a lightly floured surface. Caution: Dough will be hot
- 6. Flatten out dough and let cool for several minutes
- 7. Slowly knead in the remaining flour until the desired consistency is reached
- 8. Store in a airtight container

Dough B Recipe

Ingredients

- 1/2 cup Deionized (or Distilled) Water
- 1¹/₂ cups Flour
- ¹/₂ cup Sugar
- 3 Tbsp. Vegetable Oil

Instructions

- 1. Mix 1 cup of flour, vegetable oil, and sugar in a large bowl
- 2. Mix about 1 Tbsp. of the deionized water and stir
- 3. Repeat Step 2 until a majority of the water is absorbed by the mixture
- 4. Knead the mixture into one "lump"
- 5. Continue kneading water into the mixture until it has a sticky, dough-like texture
- 6. Know, knead the flour into the dough until the desired consistency is reached
- 7. Store in an airtight container

Simple Circuit

Build a simple circuit. Draw your circuit using the diagram below, labeling all parts.



What did you notice about the LEDs in your simple circuit?

Kennedy-Longfellow School/Lesley University Partnership, 2015.

Parallel Circuit

Build a parallel circuit. Draw your circuit using the diagram below, labeling all parts.



What did you notice about the LEDs in your parallel circuit?

Kennedy-Longfellow School/Lesley University Partnership, 2015.

Series Circuit

Build a series circuit. Draw your circuit using the diagram below, labeling all parts.



What did you notice about the LEDs in your series circuit?

Kennedy-Longfellow School/Lesley University Partnership, 2015.