

# CIC Lesson Plan

Lesson Name Electricity and Food: From Glowing Pickles to Citrus Batteries

Developed by Erik Garnett

For Grade 5

## Related CA Science Standards and Vocabulary

*Specific standards and new vocabulary related to lesson*

### CA Science Standard(s):

Electrical energy can be converted to heat and light

Building a simple batter

Making series and parallel circuits

### Vocabulary Definitions:

**Electrons** – charged particles that can flow to create electricity

**Current** – the number of electrons flowing through a wire

**Voltage** – the change in potential energy of the electrons

**Resistance** – difficulty of electron flow

**Potential Energy** – the energy stored in the position of an object

**Electrolyte** – a liquid that allows electrons to flow through it easily

## Introduce and Engage

*Making personal connections, engaging curiosity, building connections to kids' experiences*

**Personal Introduction:** *What do you do for work, hobbies, play? Why are you interested in this topic?*

I am a graduate student in the Ph.D. chemistry program at UC-Berkeley. I work for Dr. Peidong Yang on making silicon nanowires (super-tiny hairs) to be used as a new kind of tape and also in a new solar cell. In my spare time I really like to go fly-fishing, rock-climbing, hiking and backpacking. I live in North Berkeley with my wife, Gretchen, who is a professional dancer. I have always been interested in energy and especially like solar cells, batteries and other types of alternative energy. Electricity is important in almost every area of our life from televisions and computers to the electrical signals in our body that control our brain and heart. I hope to get all of you excited about electricity too!

**Building Connections to Kids' Experiences:** *Can you think of an experience most kids would have related to your topic? Is there something to show that will grab their attention? Or can you pose a mystery with a question about something they see everyday?*

Have you ever been walking along the carpet in your socks and gotten shocked when you touched the doorknob? Do you wonder why electricity only flows out of the socket when you plug something into it? Have you ever seen a ball roll up hill?



## Learning Experiences

*What kids will see, do, hear, touch, taste or make.*

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**Any combination of demonstrations, hands-on activities, and pictures that helps kids explore new ideas. Describe specific experiences in the order you plan, including instructions you need to give students.**

1) **Glowing Pickle Demo.** *Caution: This can be extremely dangerous (or deadly) and should not be repeated without careful consideration.* I will demonstrate the idea of converting electrical energy into heat and light energy by running a high current through a pickle. Once the pickle gets hot enough, it will start to glow yellowish. The demo emphasizes the ideas of resistance, current, electrons and electrolyte. Hopefully this will get the kids excited about the topic and interested to learn more.

2) **Citrus Fruit Batteries.** This will be a hands-on demo where kids will break into groups of 5 or 6. Each group will get a box with the following equipment: 3 pieces of fruit, 6 metal objects, 2 wire connectors, 1 multimeter. Each group will build batteries from materials of their choice and measure the voltage, current and resistance of each. The groups will record their data in a table on the board as they go and compare their results to those of the other groups. I will try to give them hints to help interpret their results. If time permits, we will then have a contest to see which group can build the best power source, connecting multiple batteries in series or parallel.

## Sharing Experiences & Building Ideas

*How kids will share experiences and build links to ideas and vocabulary.*

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**Sharing and Interpretation:** *Ideas for questions to invite sharing and guide interpretation of experiences.*

What affects voltage, resistance, and current? Which metals have electrons with the highest potential energy? Lowest? Which way do the electrons flow? Why do the metal objects need to be inside the fruit? Why does it matter how the batteries are connected together?

**Closing Statements:** *connect experiences to larger world, big ideas, vocabulary.*

**Electrons** flow through **metals** and **electrolytes**. Different metals have electrons with different energies, so when we connect them together they fall down to a lower **potential energy** and we can measure this difference in a **voltage**. The number of electrons flowing is called the current, just like in a river or ocean. Voltage and current combined give **electricity**, which can be converted into other types of energy like heat and light. In the glowing pickle demo, there was a large **resistance** to electron flow which caused the pickle to get hot and glow.

## Follow-On Activities

*Ideas for follow-on activities, your favorite kid books, things to notice*

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Ask Teacher and kids to write a letter about what they learned. Include drawings!

## Materials and Preparation in Classroom

*Required materials and classroom set-up for complete lesson.*

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### **Volunteer Brings:**

6 boxes, 6 multimeters, 18 pieces of fruit, 36 metal objects, 12 wire connectors, glowing pickle demo setup (1 extension cord, 1 wooden holder with metal skewers, 1 giant pickle)

### **Classroom Needs:**

1 outlet, counter for demo, chalkboard or whiteboard for data chart, room for group work

**Set-Up Requirements:** Glowing Pickle Demo

