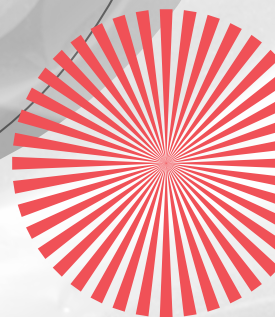


DIY MAKE & BUILD



Illinois Extension

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN



DIY Make and Build Activity Guide VI.0

By Keith Jacobs, STEM Specialist, University of Illinois Extension, State 4-H Office

Over the last decade, Do-it-yourselfers have shown the world that you do not need to be an engineer or computer scientist to create useful, innovative devices, gadgets, and gizmos through what is known as the Maker Movement. In fact, with very little background, and a can-do attitude, almost anyone can enter the Maker world and create anything their imagination guides them to.

DIY Make and Build is an opportunity for youth to learn about design, engineering, manufacturing, electricity and computer programming while being innovative and imaginative. While each activity has a specific goal in mind, this guide is to be used as a starting block to expand on each of the concepts and ideas presented here.

This activity guide is designed to guide you in creating a sustained learning experience for youth using readily available materials purchased both online and locally, as well as common items found around the house. These activities are accompanied by video guides that can be used by youth independently (or at home) as well as in group settings. In addition, youth are encouraged to perform “Online Reconnaissance Missions” to research topics not explicitly covered in this guide. These will be marked as “ORM”. Each day can be done independently but could also be done in succession for a sustained learning experience. There are suggested activities in each of the topic related days. There are several online resources with similar activities that can be added to extend the time or others can be used in place of the ones listed.

Learning Objectives

- Understand and learn the basic concepts and skills needed to be a “Maker” including but not limited to designing, cutting, manufacturing, simple circuitry, electronics and micro controllers.
- Become familiar with terms/techniques such as circuitry, wire stripping, conductivity, and hydraulic pressure.
- Become familiar with using online open and external resources to enrich the learning experience
- Develop a sense of creativity, innovation and independence using different materials to create practical & fun mechanical and electronic devices.
- Apply maker concepts and skills to your own designs and creations.
- Have fun!

Audience

Lessons are appropriate for youth ages 10-14 with local assistance, and with interested older youth independently with the aid of the video guides.

Lessons can be taught by adults or Teen Teachers.

Time Frame

Lessons can be used consecutively on multiple days or as one off, one day activities. Lessons can be used in a club, camp, or classroom setting.



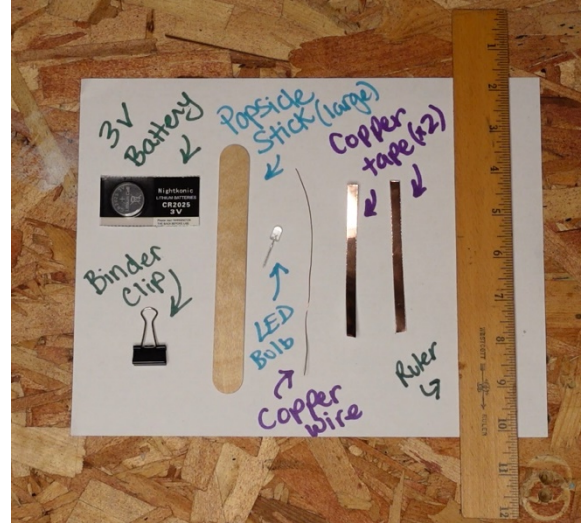
DIY Make and Build Day 1: Popsicle Flashlight

[Video Guide: go.illinois.edu/DIYmake1](http://go.illinois.edu/DIYmake1)

[Featuring Aja Capel](#)

Materials:

- 3V Battery
- Large Popsicle Stick
- LED
- 1x 6" length of Copper Wire
- 2x 5" lengths of copper tape
- Ruler
- Hot Glue



This Activity was adapted from Illinois 4-H's very own, Aja Capel and her organization See Me In STEM. Over 200 Kits were supplied by her organization to pilot and test this activity state-wide. Her organization can be found at the link below, along with the original content for this activity:

Seemeinstem.org

The 411 (background information) (10-15 minutes incl. 5 min video)

Please play the following video before beginning this project:

<https://www.youtube.com/watch?v=HOFp8bHTN30>

This video is a good starting point for a discussion about LEDs and electricity. While some concepts are not useful for this project, the overall knowledge will be useful for more advanced versions of this project, as well as future projects presented in this guide.

Discuss electricity and circuits as a group:

What to Cover

- What is a circuit?
- How does it work?
- What is a switch?
- What is a conductor (ORM)?
- What is an insulator?(ORM)

Additional information on these concepts can be found in the 4-H Magic of Electricity.

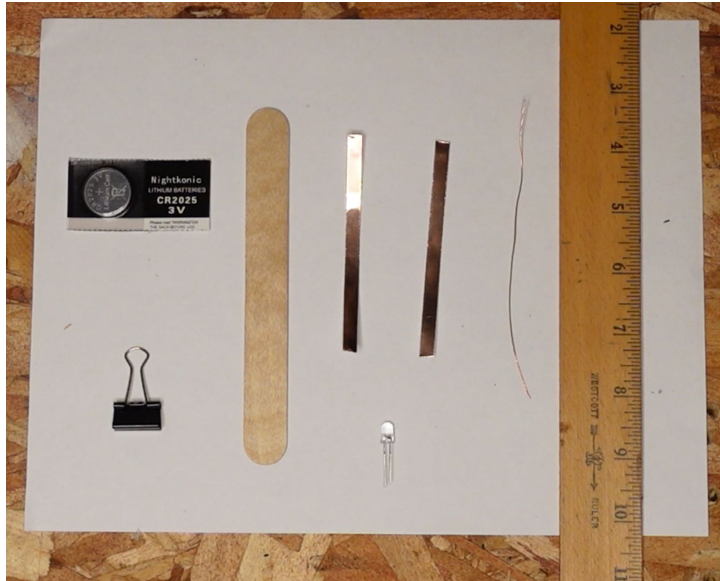
An active way to explain these concepts is having the youth stand up and hold or touch hands. Have the group pass a hand squeeze or clap around a circle. Then see how this changes by turning a switch off (have that youth sit down or step out of the circle). You can also use this to explain why electricity only travels one direction.

Lets Build! (15 Minutes)

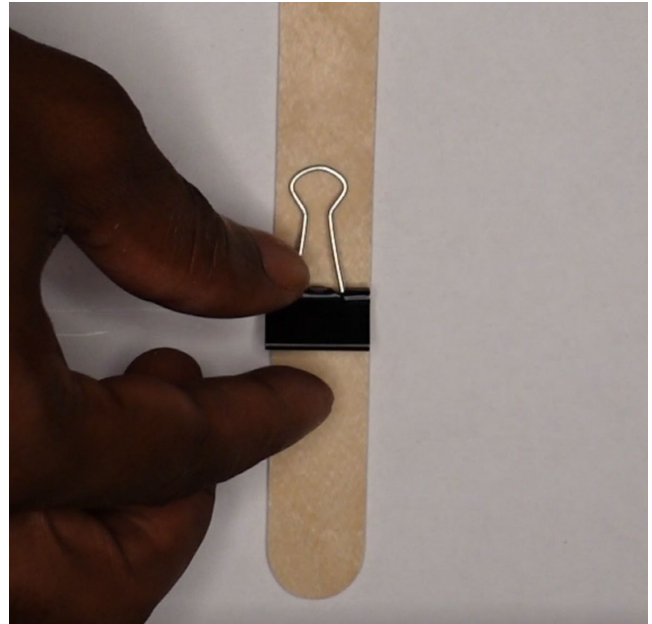
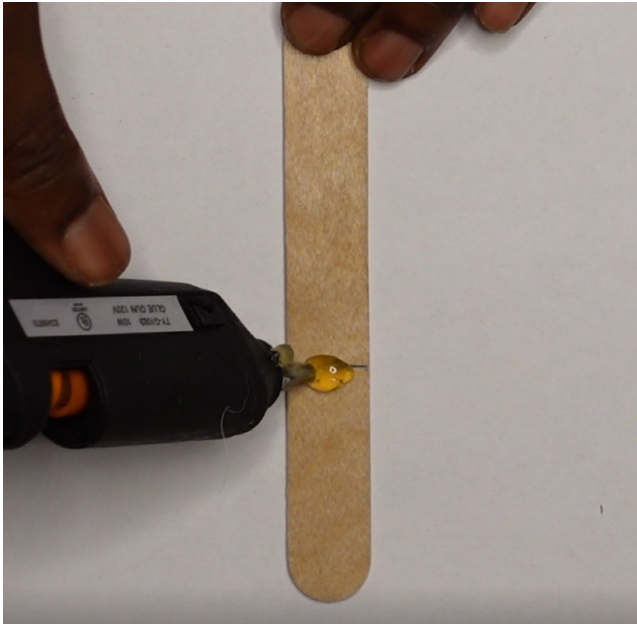
DIY M&B Activity 1: Popsicle Stick Flashlight:

It is now time to gather all your materials and get ready to build. Follow along with the video guide for a first person view of how the project will come together. This is especially helpful for solo makers as well as large groups to follow along with. Feel free to pause or rewind as you wish and take as much time as you need. Good luck & HAVE FUN!

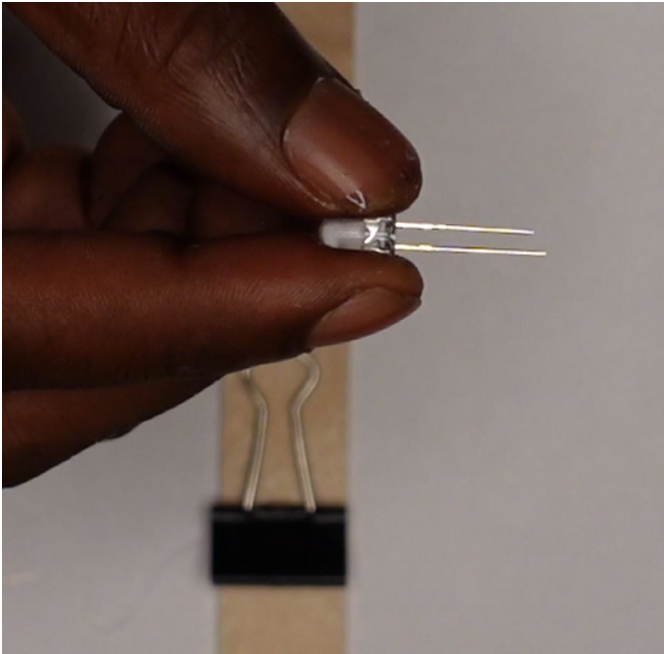
Step 1: Gather all your materials and be sure that nothing is broken or damaged before you begin



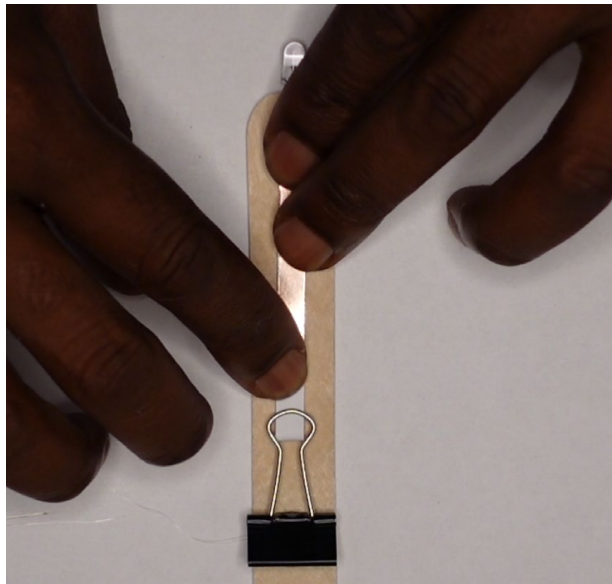
Step 2: Measure 2 inches from the end of the popsicle stick and mark a line. Remove one of the metal binder clip legs and glue the binder clip with the clip opening facing the long end of the stick with the clip handle on top.



Step 3: Place the LED on the end of your popsicle stick with the long end (anode) on the same side as the binder clip.

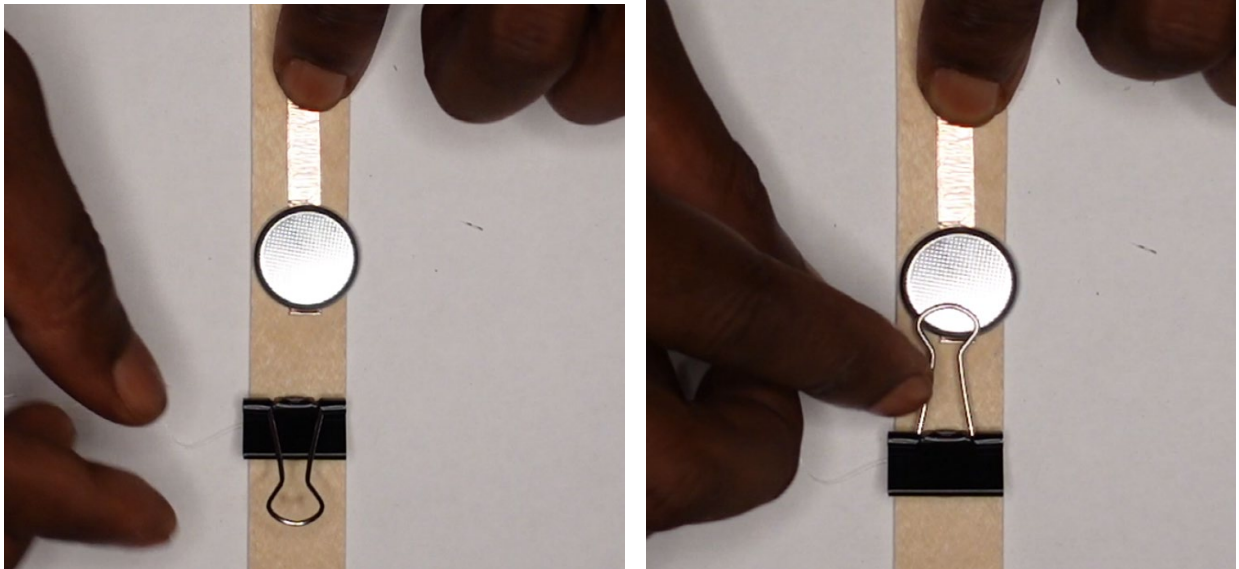


Step 4: Take one piece of your copper tape and place it on the end of your popsicle stick, making sure you cover the end of the LED anode. Fold the copper tape back onto itself just under the binder clip.

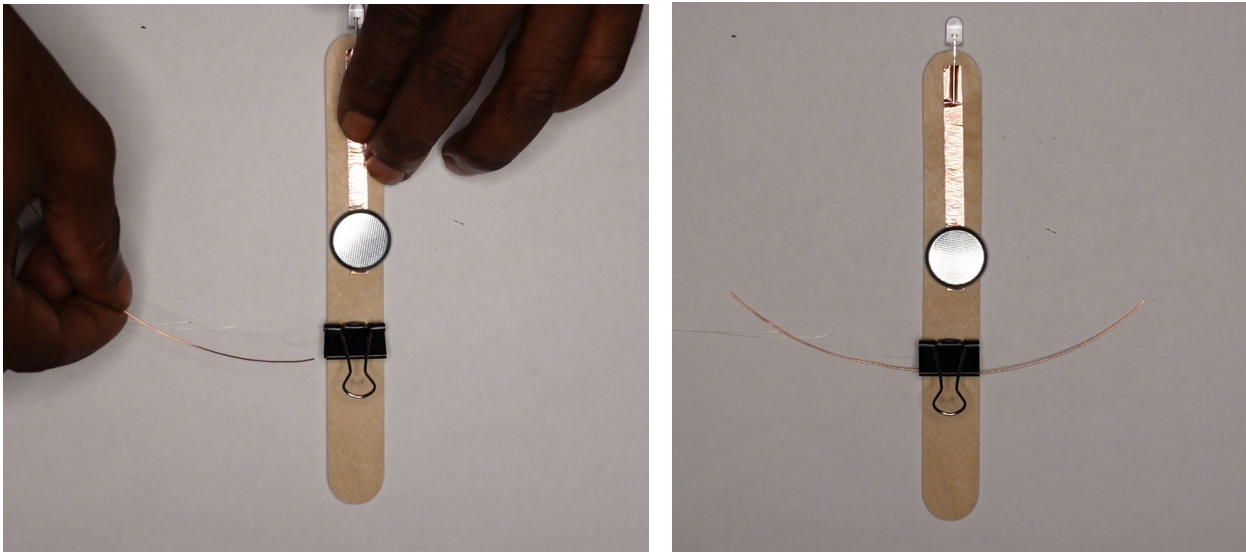


Note: The tape may try to coil up if you do not secure it before taping it down.

Step 5: Place the battery on top of the loop of copper tape, making sure the smooth side of the battery (the + side) is facing the tape. Be sure that when you flip your binder clip down, it touches the battery. If it does not, then move your battery close to the clip.

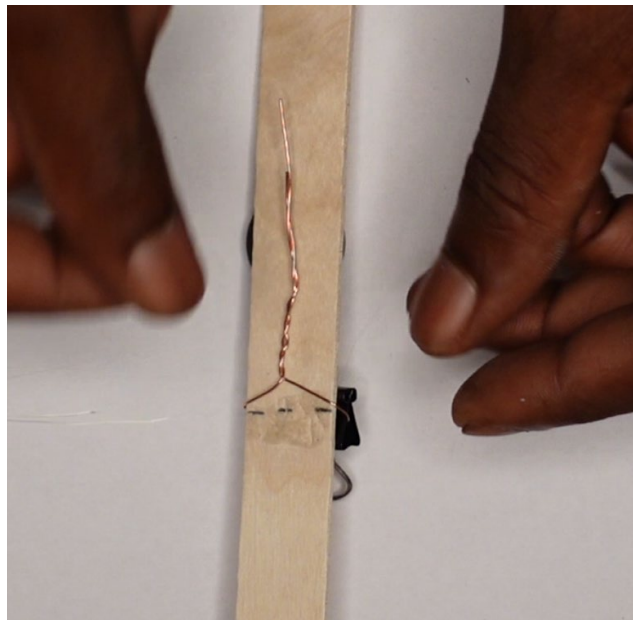
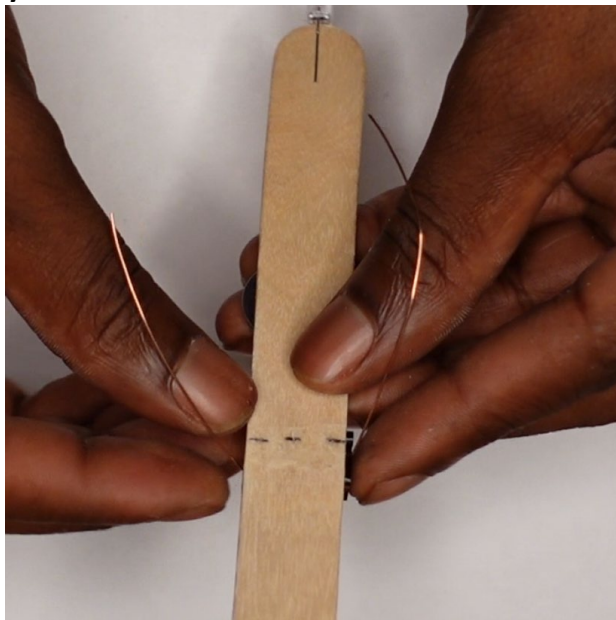


Step 6: slide your copper wire through your binder clip making sure that you have about the same amount of wire on each side.



Note: Your wire should be in contact with the binder clip where it meets the popsicle stick wood.

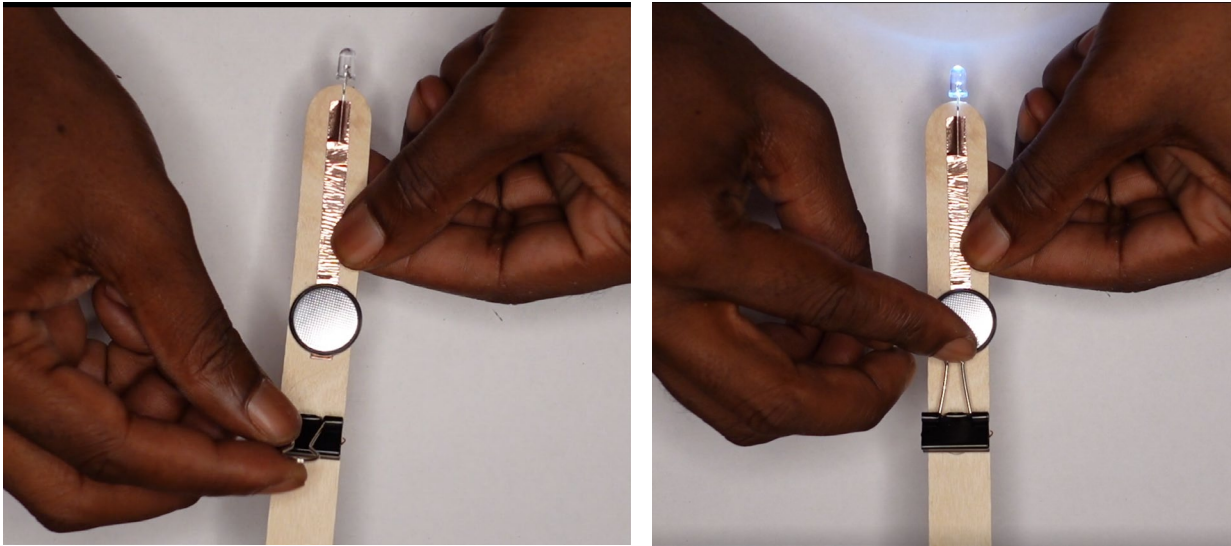
Step 7: Flip your popsicle stick over and pinch the wire in the back of your stick and twist it all the way down.



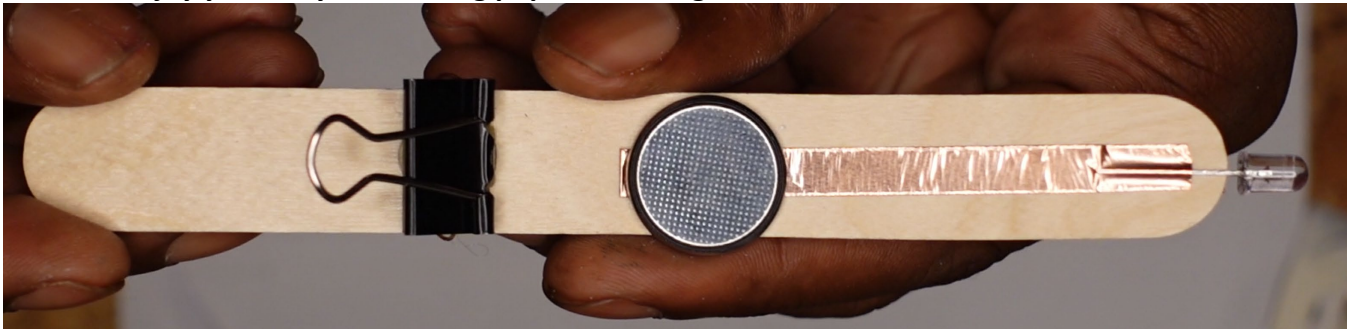
Step 8: Take the other piece of the copper tap and place it over the short side (cathode) of the LED as well as the twisted wire.



Step 9: Flip down the binder clip leg to close the circuit and illuminate your LED.



STEP 10: Enjoy your fully functioning popstick flashlight!



Reflect and Apply (10 Minutes)

1. How did it go? Did your flashlight work?
2. What modifications, if any did you make to the design?
3. What did you enjoy about this activity?
4. What did you learn from building your popstick flashlight?
5. What was challenging about this build for you? What went wrong?
6. What would you do differently if you had to build your radio again?
7. What skill did you learn in this build that you will be able to use in the future. How?