

Activity 1 - Building an LED Light Circuit

Reference: [Arduino: Get to Know Your Tools](#)

Making a breadboard circuit to turn on an LED. The activity requires about **1 hour** to complete. This lesson plan assumes free access to a black-and-white printer as well as a classroom with a whiteboard, blackboard, or chart-paper.

Learning Objectives

1. Applications of electronics in society
2. Basics of electricity
3. Circuit diagrams
4. Breadboarding
5. Problem solving and exploratory learning

Presentation Method

- Drawing and explanation using a whiteboard, blackboard, or flipchart
- Student handouts with key concepts and diagrams

Materials and Cost per Student

Item	Qty.	Cost per Student ¹	Expendable ²	Supplier
Push Button	2	0.04	yes	Aliexpress
LED Assorted 3mm 5mm	2	0.04	yes	Aliexpress
Resistors Assorted 2100pcs	1	0.01	yes	Aliexpress
Jumper Cables, M/M	4	0.07	yes	Aliexpress
9V Battery Snap	1	0.16	no	Aliexpress
Breadboard 400 point	1	1.49	no	Aliexpress
Breadboard Power Supply	1	0.75	no	Aliexpress
9V Ni-Mh 450mAh	1	5.17	no	Aliexpress
Total Cost per Student		7.75		

The diodes used should have a 1.8V forward voltage and handle 20 mA current. The resistor used should be greater than 160 ohms and no more than 1 kilo ohms, and handle 1/4 watt power. The breadboard power supply should be set to output 5V. Please be aware of shipping times and costs when planning the activity.

Lesson

Electronics in Society

Adapt the following to be applicable to your student's environment:

- Can provide clean light to remote communities, replacing gas/wood
- Communication with family and friends
- Access to information (internet, [One Laptop per Child](#))
- Clean-energy future: hydroelectric, wind, solar ([Gham](#))

Electricity

- Controlling the movement of electrons in materials
 - There are electrons in everything
 - Electrons move more easily in some materials than others (insulator v.s. conductor)
 - We can control these electrons to power things (e.g. lights, movement) and communicate information
- Rock slide analogy of Ohm's law
 - The height of the hill represents voltage
 - The sliding rocks represent current
 - Trees represent resistance
 - Current always flows from high to low voltage

Circuit Diagrams

See the student handout for images and explanations of each. Introduce the following symbols on the handout:

- Voltage source
- Wire
- Diode
- Resistor
- Button

We combine the parts into the circuit diagram on the handout, with electricity flowing from the (+) side of the battery to the (-) side. Note that electricity will only flow in one direction through a diode, and that the resistor is used to limit the current flowing through the circuit.

Breadboard Prototyping

See the student handout for a diagram.

- Breadboards conduct along the lines
- The long lines on the outside of the board are usually used for the voltage source (+) and (-)
- [be explicit] On the breadboard, the RED lines are the (+) and the BLUE lines are the (-)
- Comprehension questions: draw an example of a board with
 - two parts inserted on different rows. Are they are connected? NO.
 - two parts inserted on the same row. Are they are connected? YES.
 - one part inserted with both ends inserted in the same row. Is this okay? NO. If they are connected, they will not flow through them (same voltage, like being on flat ground in the rock slide analogy).

Building an LED Light Circuit

See the student handout for the circuit diagram. Provide the students with the following parts and have them start to try to build the circuit.

- one breadboard with the power supply attached
- one 9V battery with a snap connector for the power supply
- one LED (Red, Green or Yellow), and one resistor (220 ohms).
- one push button

Tell the students to *ask three friends* for help before coming to an instructor for help.

Challenge and Explore

When a student has successfully built the circuit, they can explore the concepts of parallel and series electrical connections, and further test their understanding of breadboard prototyping. Ask them to try the following:

- 1) Give the student a 2nd LED. "Can you get two LEDs to light up? What happens to the brightness of the LEDs? Can you draw the 2nd LED into the circuit diagram?"
- 2) Give the student a 2nd button. "Try using two buttons in the circuit. Can you setup the circuit so that both buttons must be pressed to turn on the light? How about pressing either button to turn on the light? Draw the 2nd button into the circuit diagram."

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1. Currency is CAD, 2017-06-10. [↩](#)
 2. Likely to be broken or lost during the activity. [↩](#)