



***LED Simple Circuit***

***Table Set-up with Materials***

Target Audience: Parents of elementary school students (grades 3-6) and Middle and High School Students

Objectives:

1. Introduce LED technology; one diode versus a cluster of diodes - bulb.
2. Introduce the LED bulb as an efficient alternative to conventional light bulbs.
3. Provide hands-on experience with building a simple circuit.
4. Provide interaction with engineering students.

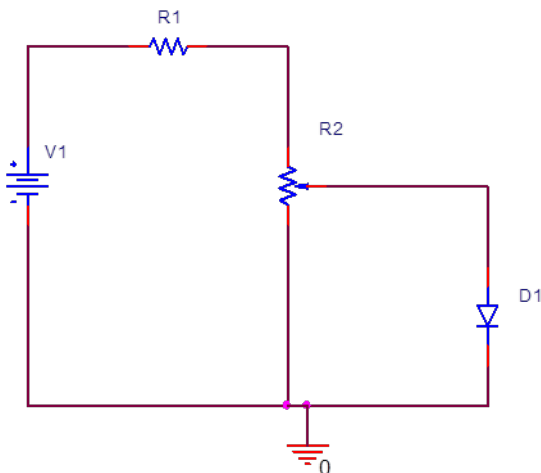
BOM: LED (Light Emitting Diode), breadboard, resistor, Wires, 9V battery, Potentiometer to manage LED brightness, Two handouts; the LED schematic diagram and instruction on building a LED circuit.

Item	Source / Website	Price
Bread board	Electronix Express part # 03MB101 3.3" x 1.8"	Approx. \$2.70
Wires	Electronix Express Jumper Wire for breadboards Part No. 2700RJW90	Approx. \$16.95 / bundle
Resistor Kit (incl. 470K)	Electronix Express Part No. 13RK2501	Approx. \$ 6.75 each set
9Volt Battery Snap	Electronix Express Part No. 2801BSI	Approx. \$.25 each small qualities
Potentiometer	Electronix Express part # 18STS value	Approx. \$.90 each
9 Volt battery	Allied Electronics Item # 774-0240 Dantona Industries, Inc.- Part # LLG-9V G6F22 battery; Carbon Zinc 9V	Approx. \$.43 each
LEDs	Electronix Express Super Bright LED 5 mm Red, Green, Yellow, Blue, Amber Part # 08LCH – color designation	Range - \$.20 - \$1.10 each

Set Up: For a round table, minimum supply of 10 items for each component and multiple copies of handouts.

Activities: (<http://www.robotroom.com/Pumpkin2.html>)

1. Review components of experiment An LED schematic with a breadboard, wire connectors, 9V battery, 470 ohm resistor, potentiometer and a single LED of any color.
2. Describe how the conventional electricity flows from the positive terminal of the battery, through the resistor, through the LED, and then back into the other terminal of the battery. If you put the battery or LED in backwards, the circuit won't work. (Resistors can be installed in either direction.)
3. Explain how the amount of light produced by an LED is controlled by the resistor and potentiometer. The more light produced, the more energy consumed and the more heat is generated. Share warning: Some beginners in electronics try to attach an LED directly to a battery without using a resistor. In most cases, the LED will be instantly destroyed by too much energy. So, always use a resistor.
4. Build the Simple LED circuit referring to schematic 1 below.
5. Discuss LED design and how it differs from conventional light bulbs and the attributes.
6. Discuss what has been learned about light bulb options.
7. Take general questions on the experience of being an engineering student



V1 is a 9V battery  
R1 is the current limiting resistor (can be 200-500Ohms)  
R2 is a potentiometer (1k works well, but 5k and 10k can also be used)  
D1 is the LED

Simple LED Circuit - Schematic 1

Outcomes:

1. Audience will be better informed about a cutting edge technology and how it improves our world.
2. Audience will have an opportunity to build a simple circuit and experience the satisfaction of accomplishment while learning about state-of the art lighting devices.
3. Audience will be better able to understand and appreciate the other activities offered at the event, especially the one examining the structure of a LED.
4. Audience will have an increased understanding and enthusiasm for what engineers do and for an engineering career.
5. Audience will visit the website of the Smart Lighting ERC.

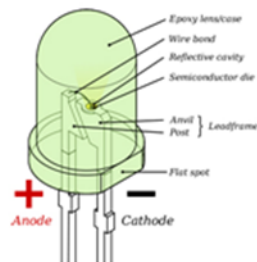
Resources:

Self-guided hand out will be made available to describe components and build with minimal support required.

Battery manufacturer	Type of Light and brief description if unique	#of bulbs	Price / pack	Price / bulb	Retail Store	Date of purchase	Light Output Lumens (brightness)	Voltage (Volts)	Energy Used	Estimated Life (hours)	Claim to fame
GE	Compact fluorescent disguised in globe	1	6.48	6.48	Lowe's	2/15/2011	400	120	11 watts	10000	\$39 in energy savings per bulb and lasts 15 years
Phillips	Dimmable halogen floodlights	1	4.97	4.97	Home Depot	2/15/2011	420	120	45 watts	3000	Can replace similar incandescent floodlights while using less power and having a greater light output
Sylvania	Long lasting soft white incandescent light	8	4.98	0.62	Lowe's	2/15/2011	390	120	40 watts	1500-4000	A cheap and reliable light source for frequently used light fixtures
Ecosmart	Soft white compact fluorescent	4	5.85	1.46	Home Depot	15-Feb	550	120	9 watts	10000	Cheap, bright, and long lasting
Phillips	Small long lasting fluorescent that fits mo	4	7.98	1.99	Home Depot	2/15/2011	500	120	9 watts	12000	A long lasting and efficient fluorescent that is smaller in size
Felt Electric	High-output LED light	1	18.98	18.98	Lowe's	2/15/2011	340	120	6.5 watts	30000	\$121 in savings per year and 30 years of continuous usage
Sylvania	Extremely long lasting LED light	1	21.98	21.98	Lowe's	2/15/2011	430	120	8 watts	50000	Lasts 33 times longer than average incandescent light with 5.7 years worth of continuous usage
Sylvania	Soft white halogen light	4	7.18	1.8	Lowe's	2/15/2011	455	120	28 watts	1000	Energy efficient halogen light at only 28 watts
Ecosmart	Dimmable LED light	1	17.97	17.97	Home Depot	2/15/2011	429	120	9 watts	50000	Extremely long lasting and dimmable
Phillips	Soft white incandescent light	4	1.27	0.32	Home Depot	2/15/2011	500	120	40 watts	1000	Very affordable light source
Phillips	White light LED light	1	21.97	21.97	Home Depot	2/15/2011	480	120	8 watts	25000	Very long lasting dimmable LED light
dated 2/19/11											



## Light Emitting Diode - LED



• One Diode



Thirty-eight (38) Diodes

Takeaways:

Either a handout with the list of online information, light bulb specifications, etc. or a single weblink to Smart Lighting ERC Education outreach information online. The latter is preferred as a mechanism for encouraging the interested public to visit the website of the Smart Lighting ERC. The link provided should also help connect the audience to information on engineering, engineering careers, and K-12 STEM education.

