



The purpose of this experiment is to show the students what are components are used in designing and building any electrical devices, make them realize how small a components can be, and to make them work on hand on of the fundamental components in electricity. This experiment will take place into more than on experiment where in each experiment another will be linked to it. I started with explaining the breadboard, describing it is construction and connected it directly to the outlet on the wall which made easier for them to understand.

Then, I showed the students resistors and I started to have back and forth questions about it, how does it work, what is the purpose of it and how to measure it, going through every single point with the students where they were answering each other. I started with one resistor, measuring the value of it on the board using the coloring code method, and then I handed out resistors and instructions sheet on how to use this method. It was not easy for the first time to deal with the coloring code because some resistors have 4 lines where the other has 5, but after a couple of tries everyone was able to measure the value of the resistors. After finishing this experiment I did a brief talk on an easier way to measure the resistors and this method will allow us to measure more than the resistivity.

The following class I presented the Multimeter for the students as equipment is used by any electrician and engineer for the manner of electrical circuit's measurement, analysis and troubleshooting. Starting of what the multimeter is capable of measuring, what the limitation is and how to determine what to measure I launched my experiment. The students were able to measure the values of the resistors and compare it to the coloring method were they found some difference, and explained this as an error or tolerance from the manufacture company.

These two experiments were a very good introduction to the main experiment of designing and building and electrical circuit and measure every single thing in the circuit from current, voltage and resistors, after this one we will try to build a photogate from scratch.

Science Lesson Plan

Teacher:

Period:

Class:

Date(s):

SETTING THE STAGE	
<u>Essential Question</u>	How does one measure the voltage and current of a circuit?
<u>Content Objective(s)</u> (Student-friendly)	To show how to use the breadboard, Multimeter and simple electrical components by construct a simple circuit.
<u>Connection to previous or future lessons</u>	Students have used photogate to measure the speed of their index finger. The Experiment will show the students how to build a small circuit, this knowledge will be used to build a photo-detector circuit were I will explain the principle of light detecting.
<u>Critical Thinking Questions</u>	Does the circuit have to be a closed loop? Why did the light intensity changed? When we increased the resistor to a limit why the LED did not turn on?
<u>Key Vocabulary</u>	Multimeter, Light emitting diode (LED), Breadboard, Resistors.
<u>Materials Needed/Safety</u>	Breadboard, batteries, wires, LED, resistors, Multimeter
ACTIVE INSTRUCTION	
<ul style="list-style-type: none"> • Launch (Engage) 	A quick demonstration on how to use the Multimeter by measuring the voltage of the battery and the resistivity of the resistor. Show the breadboard and explain how to use it. Show the experiment circuit and how it should be build
<ul style="list-style-type: none"> • Investigation (Explore) 	Students are given a handout with instructions on carrying out the experiment of Constructing LED circuit to measure the current and voltage. The student will measure the resistivity of the resistor, the voltage of the battery. They will change the value of the resistor and observe what happened to the light intensity and to calculate the voltage and current for each one.
TIME FOR REFLECTION	
<ul style="list-style-type: none"> • Summarization (Explain & Extend) 	Why did the light turn ON? How the resistor does affect the current, voltage and LED intensity?
<ul style="list-style-type: none"> • Assessment (Evaluate) 	Investigate what method is more accurate in determining the value of the resistors

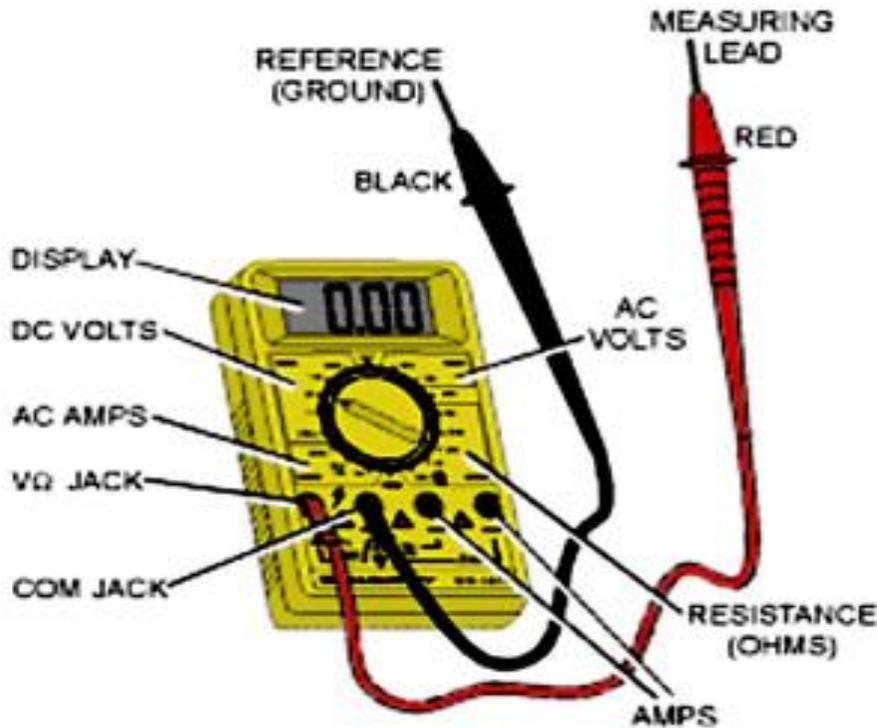
Science Lesson Plan

<ul style="list-style-type: none">• Homework	-Nil-
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Name:..... Date:.....

Measuring the resistor value:

2) Multimeter Method:



Materials: 1 multimeter per group, resistors (same as in color code method)

Instructions:

- 1) Without touching the resistor, let the measuring lead (red wire) touch one end of the resistor, and the reference (Black wire) touch the other end of the resistor.
- 2) Record the value on the multimeter in the table below.
- 3) Calculate the difference between the two methods (use the data obtained in the first experiment).

Multimeter method (R1)	Coloring code method (R2)	Difference (R1-R2)
R1=	R2=	
R1=	R2=	

- 4) Where the difference came from? What does it mean?