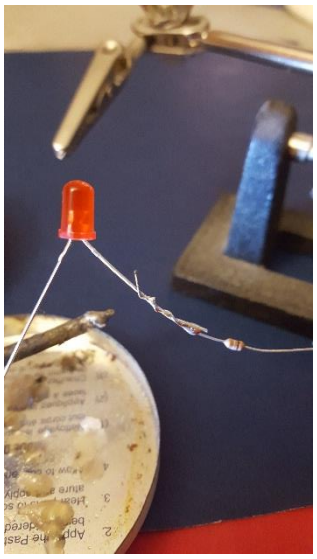
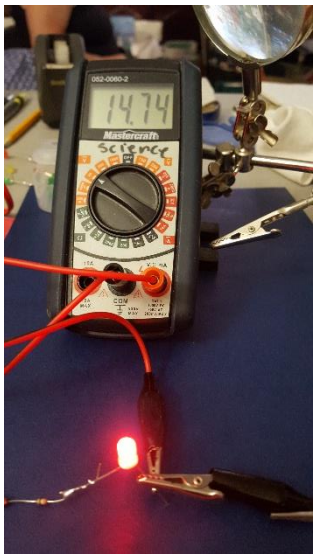
Teaching Electricity:

This is the third part of a series of blogs written to suggest teaching methodology for the topic "Electricity". Brief descriptions of Parts One and Two have been included below.

Part One: Models: In the picture below, soup cans are used to represent students. Actual students formed in a circle will pass and receive playing cards (electrons). Students pass the cards on command, when the teacher says "PASS". A potential boost occurs at the battery, a potential drop at the light bulb. Students are assigned roles at a switch, a load, or a battery. At a load, the student can be asked to twirl at each pass to simulate work being done.

Part Two: High Voltage Lights: Traditional small science light bulbs cost one dollar each and are rated for 3 V or 6 V: by the end of a lab, several have generally blown. LEDs with a low ohm resistor purchased for 10 cents (QKITS in Kingston) can be used alternatively and withstand a lot of abuse. The two pictures below show the load resistor and LED soldered together, and the LED working at in excess of 14 V.

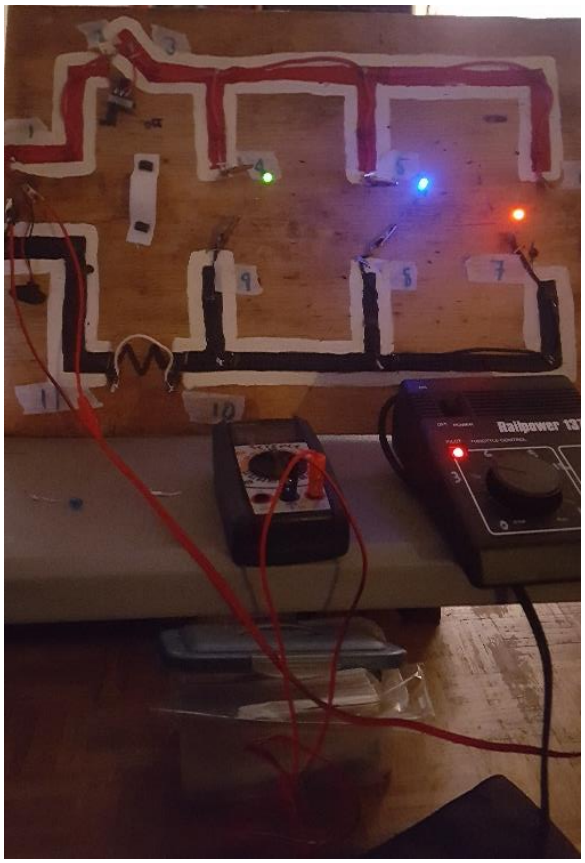




Part Three: Permanent Display Boards: Self standing display boards showing series and parallel circuits can be made and sites can be labelled where voltage and current are to be measured. Using alligator clip connections, the circuit can be broken apart to measure current.

Students can create 3-column data tables with headings: site location, hypothesis and actual measurement. Questions can be asked such as “If the source is 5 V, what will the voltage drop be at site 4 before the LED, and then at site 5 after the LED (see picture below)?”. Once all the predictions have been made, then actual measurements can be determined. In the picture below, the source is 5 V. No load occurs before site 5. Why is the actual measurement 4.95 V? Old wires, poor dirty connections may account for this and bring the practical world into the science class.

Students can be asked to come up and make those measurements. Voltage drops can be made if the negative test lead from the voltmeter is left permanently on the negative terminal of the power supply. The positive lead from the voltmeter can then be touched at each site and the voltage drop recorded. This is a more telling story than measuring individual drops at each load.



With the initial use of modelling to demonstrate the properties of circuits, the use of low cost LEDs and load resistors, and the creation of permanent displays that employ predictions and measurement, students will acquire the knowledge and skills required in electricity. AS the displays are permanent, and the loads are reliable, the planning and preparation time required will be greatly reduced.

Best wishes for the new school year.

This information was presented at the OAPT Conference 2018.

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