Middle School Day 2: Electronics Workshop

Goal: Foster interest in participants to explore topics in the field of Electronics.

Learning Objectives:

- Introduce Students to topics in Electronics and general Circuit-Building concepts
- Teach Students how various electronics components function and how they can be used to build circuits

Resources and Materials:

> **Note:** If attempting to use this specific module as a template for running a similar workshop, it is recomended that one checks component sources for prebuilt kits within the group's budget and structure the session around the parts avaliable in the purchased kits, as prebuilt kits tend to be significantly less expensive than purchasing individual components separately, but can vary in terms of included contents with time. Furthermore, utilizing kits fundamentally decreases the amount of time needed to order, organize, and otherwise prepare materials for such activities.

Projects Overview

1. Simple LED Circuit
2. Variable Brightness LED Circuit
3. Simple Motor circuit
4. Variable Motor circuit

`Time-permitting Challenges`:

1. Variable Brightness LED using Potentiometer in Parallel

Agenda

1. Teach participants how **Breadboards** function and how they can be used to build circuits
2. Teach participants how **Batteries** function and how they can be used to induce a current into a circuit
3. Teach students how **Resistors** function and how they can be used to reduce the current flowing through a circuit
    - Tell students about the dangers of creating a short-circuit: a circuit without any resistive elements
4. Teach participants how **LEDs** function, and how they can utilize the current flowing through them to produce light
    - Show students the dangers of connecting an LED to a powered circuit without a resistor in series

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Project 1: Simple LED Circuit

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5. Teach students how **Potentiometers** function, and how they can be used to alter the resistance in a circuit

Project 2: Variable Brightness LED Circuit

6. Teach participants how **Motors** function, and how they can utilize the current flowing through them to produce movement

Project 3: Simple Motor Circuit

7. Teach participants how **MOSFET transistors** function, and how they can control the voltage of a circuit by taking an input from another source

Project 4: Variable Motor Circuit

8. Teach students about the differences between series and parallel circuits and how current and voltage differ across different components in both

Challenge: Parallel Potentiometer Variable Brightness LED Circuit