

## Hands on Engineering Activity 2

**Topic:** Introduction to Engineering

**Learning Objective:** Introduction to engineering → many different fields in engineering (electrical, mechanical, biological, structural), so what does “engineering” really mean? How does engineering show up in real life? Where have you seen it before? Focus on electrical engineering for this class.

### Alignment with NGSS Grades 3-5

Science and Engineering Practices

#### Constructing Explanations and Designing Solutions

- Construct an explanation of observed relationships.
- Apply scientific ideas to solve design problems.

Crosscutting Concepts and Connections to Engineering, Technology, and Applications of Science

Energy and Matter: Flows, Cycles, and Conservation

- Energy can be transferred in various ways and between objects.

Performance Expectations and Disciplinary Core Ideas for Engineering Design

- 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

### Materials:

- Graphite pencils (normal 2b pencils should work)
- White printer paper
- 9V battery
- Aluminum/copper foil
- Small LEDs of any color

### Detailed Description

- Activity
  - Introductions
  - Begin with engineering overview
    - Ask class what engineering means to them
    - Ask class to give real-life examples
    - Give brief description of different types of engineering with examples
      - Switch focus to electrical engineering
  - Project – graphite and aluminum foil circuits to make LED light up
    - Help students get their circuits working

- Ask students to experiment with drawing thin lines vs. thick lines and different designs
  - Why does the LED not light up sometimes?
- Explain fundamentals of circuits and electricity → electrons/current, voltage, good/bad conductors of electricity
- Where are circuits found in real life? Talk a little about resistors and switches, maybe Ohm's law
- Clean up & discuss
  - Gauge understanding of how electricity works
  - Think about the applications
  - How does electricity hurt/kill people?
  - What can poor conductors of electricity be used for?
  - Examples of real circuits using real materials

**How will you conclude the lesson to enforce the learning objective:**

Ask students to reconfirm what principles they learned today. Go over real-life applications by asking students questions and posing my own examples.

**What science process skills will this lesson exercise?**

Drawing conjectures based on observation of scientific phenomena, Thinking and making predictions about the unknown

**Safety precautions**

Heat from 9V battery and LED(minimal)