# Level 1 - Lesson 1league logo.jpg

## Context:

**Topic**: Electrical Engineering Concepts

**Total learning time:** ~90 minutes

**Number of students:** 1 - 8

**Description:** Introduce students to the basics of electronics, its components and circuits.

## Lesson Objective:

In this lesson, students will learn about:

* What electricity is; how it’s generated; and how it’s measured

## Materials/Preparation (Recipes):

* Verified student GitHub accounts with League-EE Level 1 Module 1 with
  + <https://github.com/League-EE/Level-1>
  + DIY copper-aluminum salt-water battery instructions
* DIY lemon battery material
  + 3 dosage cups
  + Salt and water
  + Small stones or lead weights (to weigh down the cups)
  + Copper tape and aluminum tape
  + Jumper wires with alligator clips
  + Light bulb or digital clock with wires
  + Digital multimeter
  + Paper towels (for cleaning)

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## Introduction and Anticipatory Set:

Note: Students should all have completed an EE Workshop prior to attending this class. If this is not the case, omit this part of the lesson.

“In the workshop, we learned briefly about electricity, voltage, current and resistors. We are now going to delve into these concepts in more depth.“

## 

## Instruction and Guided Practice:

* Prep
  + Fill in the missing components from the introduction activity on the whiteboard.
  + Ask students to clone league-EE/level-1/lesson-1. Should contain
    - DIY lemon battery instructions
* Voltage and Current (duration 20-30 min - 00:00 → 00:25)
  + Example of water flow
    - Voltage is analogous to water pressure
    - Current is analogous to water flow
    - Instead of water, electrons are flowing
      * Convention of electrical flow is the opposite of electron flow. (Note: Emphasize that this convention should be learned/mastered from the beginning to avoid confusion later.)
      * Current flows from higher voltage to lower voltage
      * Just like water flows from high elevation to lower elevation (or pressure)
      * Electrical switches are like valves
    - Board: sketch water system
      * Use water pump, pipe, valve and a wheel as an analogy to a closed circuit consisting of a battery (pump), wires and resistors (pipe), switch (valve) and electric motor (waterwheel).
      * Just like the current flows from the positive end of the
  + Discussion
    - What kinds of things determine how fast water will flow through a pipe?
    - How do you control the flow of water?
    - How can you make the flow of water do work?
    - Electronics is a way to **control and harness** the flow of electrons just like valves and pipes and waterwheels control and harness the flow of water

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* How is electricity generated? (duration 10-15 min - 00:25 → 00:40)
  + 3 main ways:
    - Chemical reaction
    - Electromagnetic Induction
    - Photovoltaic
  + Discussion
    - Help students come up with examples of each, e.g. different kinds of batteries, different kinds of generators (power plant, car alternator, crank flashlight), etc.
    - Board: 3 columns of examples of each generation type
* What is a circuit? (duration 10-15 min - 00:40 → 00:55)
  + A power source is like a pump that circulates water
  + Must have a loop for current (electrons) to flow
    - A switch interrupts the flow. Similar to a water valve.
    - It is the flow of electrons that does work
  + Board: show pump pumping water in a closed loop driving a machine (box representing machine that does “work”). Analogous to battery lighting a bulb.
* Quick Break (5 min - 00:55 → 01:00)
* Lab & Demos (20-30 min - 01:00 → 01:30)
  + DIY battery

## Independent Practice:

* Show the students how to find the lesson material (http://level0.jointheleague.org/Mod0Recipes/RobotGraffiti.html).
* Have students build a simple battery to light up a bulb.
* Cruise the room and help students who are stuck.

## Assessment:

* Informal assessment is made by teacher during guided and independent practice.

## Closure:

* Review electricity generation, voltage, current and circuit concepts with the students.

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