



Lesson Guide: An explanation of concepts for the Circuitry 1 lesson plan. Additionally, a suggested guide to navigating the discussion is outlined.

Prior knowledge discussion:

1. The students have a conversation about what they already know about water flow due to gravity or other forces as well as their understanding of what happens to the water we use in our houses as it is “dirty” after we use it.

To begin:

2. The water analogy activity is preformed, “From the Tower to the Town.”
 - a. The instructor will describe a town that the students will draw.
 - i. EX: “My town has a big hill and a low valley. The water tower sits at the top of the hill and the houses in the town sit in the valley.”
 1. The point is that the force of gravity carries the water into the town.
 - ii. Then, ask the students how they think that the water gets from the tower, into the houses? They should talk about pipes in some fashion.
 - b. For the second drawing, a flat town is described, with a water tower places very far away.
 - i. The point here is that the gravity from the tower to the ground is not enough to carry the water from so far away, the students should discuss ideas and likely come up with some sort of water pump as a solution.

Looking at the circuit materials:

3. Now the students will come up with observations about the bulbs, batteries, and wires.
 - a. Examples of good observations are: “the wires are long and thin, made of metal, wrapped in plastic.” “The batteries are heavy, we cannot see inside them.”, “the bulb has very small wires inside of it (the filament).”
 - b. Discuss the observations and talk about conductors Vs insulators in terms of the wire. Electricity can flow through the metal of the wire, but it is wrapped in plastic which electricity does not flow through easily, so we are kept safe from it. Also meaning that anywhere that metal touches metal in our circuit, electricity can flow.

Making connections:

4. Lead the discussion to the “job” of each component.
 - a. The job of the water tower is to store water, and to push it out to the town.
 - b. The job of the pipes is to carry the water/allow it to flow through them from place to place.
 - c. The job of the houses is to use the water as it flows through.

Likewise:

- d. The job of the battery is to store charge and push it out to the rest of the circuit when connected properly.
 - e. The job of the wire is to carry the electric charges around to each component.
 - f. The job of the lightbulb is to use the electric charges as it flows through.
5. The students should make these connections, being led to them as much as needed.

Making REAL connections:

6. Based on knowing the job of each component, the students should (entirely on their own) create a circuit. HOWEVER, they should be advised NEVER to short the battery. This means to have the battery connected to itself with nothing else in the circuit. If the battery loops back to itself with nothing else in the circuit, it will short it out and the battery will go dead very quickly. This can also lead to overheating, which can cause it to burst, which is extremely dangerous. (It will take a long time to heat though, so don't worry about it too much)
 - a. If there are any safety concerns, the students may draw their circuit on paper first prior to building it. That way it can be checked and okayed prior.
7. ASIDE: when I was teaching this, I found that students constructed their circuits like this: Battery connected to wire, wire connected to bulb. This meant that the circuit was a straight line and did not work. I found it to be a very good thing that they did this. They understood the analogy perfectly! However, water's final destination is not the house, it must go down the drain and to a water treatment plant to be cleaned. Then it will refill the water tower. Given this last piece, the students understood that this must be a complete cycle, the path must always be a circle. After connecting another wire from the other side of the bulb to the other side of the battery, the circuits worked!