School District:
Teacher's Name:
Class Grade Level:

Lesson Name: Batteries, Bulbs, and Wires – part 1
Lesson: Science/STEM
Accommodations:
Material(s):

- 4 AA Batteries
- 4 Battery holders (1 unit)
- 1 Lightbulb
- 1 Lightbulb Holder
- 2 Wires (1 red and 1 black)
- From the Tower to the Town worksheet
- Observation of Materials worksheet

Time allotment (varies according to grade level): 50 minutes for lower grade levels

MLS Standards:

- 3-5.ETS1.A.1 – Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5.ETS1.B.1 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5.ETS1.C.1 - 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.

Learning Goal(s):

- Associate the components of the water analogy to the components of a circuit.
- Design and construct a working circuit based on their knowledge of components and electric charge flow using the water analogy.

Objective(s):

- Describe how water in a water tower is pushed to the houses through pipes with the aid of gravity and/or a water pump.
- Identify the current's path through the circuit

Background information and/or Activate Prior Knowledge:

- Talk about how a water tower is often the first thing you see when you enter a small town. Students can lead a discussion about what they think a water tower's purpose is. You will lead them to the idea that a water tower holds *clean* water for the

town to use. When someone inside the town turns on the faucet in their home, they are using the water from the tower. But how does it get from the tower into the town?

- Complete the worksheet From the Tower to the Town. In order to do so, you will describe to them a town which has a water tower on top of a tall hill. The town is down in the valley. The students will draw how they think the water gets from the tower to the town. The goal is that they draw a pipe from the tower to the house and understand that gravity (from the tower being up on top of the hill) is what pushes the water along.
- For the next section of the worksheet, describe to the students a different town where the water tower is on flat ground and the houses are on the same level flat ground. They will again draw how they think the water gets from point A to point B. The goal here is to have them draw and understand that a pipe connects the places, and a water pump is used to push the water along.
- FOR OLDER GRADE LEVELS: this all can be a brief discussion, perhaps a drawing on the whiteboard instead of the worksheet.

Introduction/Anticipatory Set/Engage:

- Complete the first part of the Observation of Materials worksheet by having the students make and write down 3 observations about each of the listed components.
- To complete talk with students about observations and lead them to the fact that components are often made of metal and coated in some other material. Talk about the definitions of conductors and insulators. Have them create their own definitions and write them in the worksheet.

Teaching (I do):

- Explain the components of a circuit. The battery (combined with the holder), the bulb (combined with the holder), the wires, and the electricity/charges.
    - These detailed explanations can be found in the companion lesson plan guide found linked in the planbook lesson.

Guided Practice (We do):

- Talk together and make connections between the components of the water tower analogy and the circuit.
- Final answers will be written at the bottom of the Observation of Materials worksheet.
    - Again, a more in-depth discussion of this can be found in the companion doc.
    - Pipes = wires
    - Tower = battery
    - Houses = bulbs
    - Water = electricity/charges
    - Battery = tower AND the pump/gravity

Group/Independent Practice (You do):

- Using their knowledge of the water analogy, the students will construct a circuit based on the town drawings they have or have been shown.

- They will (younger grades) likely construct an exact replica: a battery connected to a wire which is connected to a bulb. This is exactly what they have drawn but will not be a working circuit.
    - Here, we have left some information out purposefully, older students will likely understand immediately.
- You will explain the role of the water treatment plant, and how the water, after flowing through the house, will then flow there and eventually flow back into the tower. This final part will lead students to connect the other wire from the bulb to the battery (PLEASE MAKE SURE THEY ARE CONNECTED CORRECTLY – no more than 2 battery units should be in a circuit, the battery should NEVER be connected to itself, if the battery starts to get hot disconnect the circuit immediately and allow it to cool completely before reconnecting)

Assessment (Formative or Summative)

- Have students think pair share what they understand about how the electricity is moving within the circuit.
- For older grades ask them if, based on the analogy, they can tell you how and why the battery is dying.

Questions/questioning strategies:

Notes, Reflections, Attachments