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| **Name: Mike Day** | **Contact Info:** | **Date:7/18/16** |

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| **Lesson Title : The Big Idea: Energy Driven Devices** | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **2** |
| **Activity Title: Electricity** |

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| **Estimated Lesson Duration:** | **3 Days** |
| **Estimated Activity Duration:** | **2 Days** |

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| **Setting:** | **Foundations of Engineering Class, 11 -12 Grade** |

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| **Activity Objectives:**   1. Students will cite examples of how electricity is generated 2. Students will explain how electricity flows 3. Students learn the definitions of voltage, ampere, and wattage 4. Students will build a circuit board to demonstrate knowledge of electricity flows |

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| **Activity Guiding Questions:**   1. How does electricity work? 2. What does electricity flow using electrons? 3. What are volts, amps, and watts, and how do we measure the flow of electricity? 4. Why do people get shocked? |

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| ☒ Asking questions (for science) and defining problems (for engineering) | ☐ Patterns |
| ☒ Developing and using models | ☒ Cause and effect |
| ☒ Planning and carrying out investigations | ☐ Scale, proportion, and quantity |
| ☐ Analyzing and interpreting data | ☒ Systems and system models |
| ☒ Using mathematics and computational thinking | ☒ Energy and matter: Flows, cycles, and conservation |
| ☐ Constructing explanations (for science) and designing solutions (for engineering) | ☐ Structure and function. |
| ☒ Engaging in argument from evidence | ☐ Stability and change. |
| ☒ Obtaining, evaluating, and communicating information |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| ☐ Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| ☐ Demonstrating Science Knowledge **(D)** |
| ☐ Interpreting and Communicating Science Concepts **(C)** |
| ☐ Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or**  **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| ☐ Make sense of problems and persevere in solving them | ☐ Useappropriate tools strategically |
| ☐ Reason abstractly and quantitatively | ☐ Attendto precision |
| ☐ Construct viable arguments and critique the reasoning of others | ☐ Look for and make use of structure |
| ☐ Model with mathematics | ☐ Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, OLS and/or CCSS):** NGSS: [HS-ETS1-1 Engineering Design](http://www.nextgenscience.org/pe/hs-ets1-1-engineering-design) Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. NGSS: [HS-ETS1-2 Engineering Design](http://www.nextgenscience.org/pe/hs-ets1-2-engineering-design) Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. NGSS: [HS-ETS1-3 Engineering Design](http://www.nextgenscience.org/pe/hs-ets1-3-engineering-design) Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. |

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| **Materials**:  Circuit Boards from the science department  Bill Nye the Science Guy video about electricity:  <https://www.youtube.com/watch?v=gixkpsrxk4Y> |

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| **Teacher Advance Preparation:** Knowledge about electricity, and Ohm’s Law |

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| **Activity Procedures:**   1. Students are asked to generate questions about electricity and circuitry 2. Watch video of Bill Nye the science guy about electricity 3. Students build a circuit board from a kit 4. Explain how voltage, amperes, and wattage work and how they are measured 5. Students fill out worksheet about Ohm’s Law |

**Formative Assessments:**

Ohm’s Law Worksheet:

<https://docs.google.com/a/readingschools.org/viewer?a=v&pid=sites&srcid=cmVhZGluZ3NjaG9vbHMub3JnfG1yZGF5MjAxNnxneDo2NzhmNWRjZTIwMTQ4YmZj> .

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

*The Ohm’s Law worksheet allowed me to see if they understood the different concepts of current, amps, and volts. It helped.*

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details.  *Again, having them in groups helps with the different types of learning skills and abilities in the class. Since they got to go at their own pace and do different activities, they were allowed to create their own syllabuses.* |

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.  *This lesson went very well. The students were excited about the electricity and seeing if they could make things blink and turn. We used a kit the science department had to help with the ideas of volts and current and amps. It was called Snap Circuits, by Elenco. We also watched a Bill Nye the science guy video that did a great job of explaining electricity.*  *The worksheet mainly had them use the formula I = V/R. They did a great job of understanding the differences between these variables.*  *This took two days because there were some intricate ideas they were working with in their kits and they really did not want to stop.* |