Central Ideas:

- LEDS (Light Emitting Diodes) are an alternative to traditional lighting, they use a solid semiconductor chip enclosed in epoxy, they are better because they are durable, efficient, and versatile.
- LEDS are used for digital clocks, message boards, traffic lights, tail lights, holiday lights, calculators, fiber optics and night vision.
- LEDS are made of a LED chip/diode, terminal pins (anode and cathode), and a reflector, encased in a transparent plastic case.
- The benefits of LEDS are that they cost less, last longer, smaller, low voltage power, durable, conduct less heat, come in many colors and are more durable than incandescent/traditional lighting.

Essential Questions:

- What are LEDS?
- What are LEDS used for?
- What are LEDS made of?
- What are the benefits of LEDS?

What Arizona Science State Standards are addressed?

- **Strand 2: History and Nature of Science**
  
  **Concept 1: History of Science as a Human Endeavor**
  
  PO 2: Describe how a major milestone in science or technology has revolutionized the thinking of the time.
  
  PO 3. Analyze the impact of a major scientific development occurring within the past decade.

  **Concept 2: Nature of Scientific Knowledge**
  
  PO 1: Describe how science is an ongoing process that changes in response to new information and discoveries.
  
  PO 2: Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.
  
  PO 3: Apply the scientific processes to other problem solving or decision making situations.

- **Strand 3: Science in Personal and Social Perspectives**
  
  **Concept 2: Science and Technology in Society**
  
  PO 4. Describe a technological discovery that influences science.
What do students need to know to work with this module?

*Understandings:*

- What kinds of devices emit light
- The numbers on a digital clock/watch
- Basic electricity concepts.

*Skills:*

- Familiar with computers and the internet.
- Basic reading skills
- Compare and contrast ideas
<table>
<thead>
<tr>
<th>WHAT WILL STUDENTS UNDERSTAND AS A RESULT OF THEIR WORK ON THIS MODULE?</th>
<th>HOW WILL STUDENTS COME TO THIS UNDERSTANDING? They will:</th>
<th>HOW WILL STUDENTS DEMONSTRATE THIS UNDERSTANDING? They will:</th>
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</thead>
<tbody>
<tr>
<td><strong>EXPLANATION 1</strong> 1. Introduce the technology of LEDs. What is it?, definition and examples, What objects uses them?, and a labeled diagram with parts and definitions.</td>
<td>• Read and analyze information and diagrams.</td>
<td>• Choose the correct meaning of LED.  • Decide if a LED is a bulb and does it have a filament.  • Know the definition and difference between an anode and a cathode.</td>
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<td><strong>EXPOLARATION 1, part 1</strong> 2. Find the LED have objects (pictures) some with LEDs and some without and students chose the correct objects with LEDs. (Prior Knowledge/Engage)</td>
<td>• Explore and identify objects and define which do and do not use LEDs.</td>
<td>• Recognize objects as having LEDs and not having LEDs.  • Click on the circle next to the object if it uses a LED.  • Answer questions in science notebook.</td>
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<td><strong>EXPorATION 1, part 2</strong> 3. Diagram of a LED and place the part names in the correct spots.</td>
<td>• Explore, select and place part names in the correct spot on the diagram.</td>
<td>• Label all the parts of a LED correctly.  • Answer questions about anodes and cathodes.  • Sketch the labeled diagram into science notebook.</td>
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<td><strong>EXPLANATION 2</strong> 4. Explanation of the benefits of using LEDs versus traditional lighting.</td>
<td>• Read and analyze information.</td>
<td>• Identify similarities and differences.  • Identify benefits of LEDs.</td>
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<td><strong>EXPLORATION 2</strong> 5. Venn diagram comparing LEDs to traditional lighting (benefits). Have a list of phrases and place them in the correct place on a Venn diagram.</td>
<td>• Explore the benefits of LEDs versus traditional lighting.  • Compare and contrast traditional light sources with LEDs.  • Place phrases in the correct section of the Venn Diagram.</td>
<td>• Place phrases into the correct section of the diagram. (LEDS, Other Lighting, and Both)  • Answer questions in science notebook.</td>
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<td><strong>EXPLANATION 2, continued</strong> 6. More detailed benefits of LEDs.</td>
<td>• Read and analyze information.</td>
<td>• Review more benefits of LEDs.</td>
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<td><strong>EXPLANATION 3</strong> 7. Explanation of digital clocks/watches and number formation. Redefine/summarize LEDs. Introduce the seven segment digital display.</td>
<td>• Read and analyze information.</td>
<td>• Recognize the seven segment digital display pattern and how numbers are created using this pattern and that it is used in digital clocks.</td>
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<td><strong>FINAL ACTIVITY</strong> 8. Assemble the parts of the led and then use those LEDs to create the final activity.</td>
<td>• Explore and create a simulated working LED and use those LEDs to create their favorite number in the seven segment digital display.</td>
<td>• Build the correct amount of LEDs out of the separated parts defined earlier into the correct configuration.  • Assemble the parts of the LED into the correct seven segment formation.  • Create the correct formation of LEDs to build their favorite number.</td>
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