



## Lesson Plan Template

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<b>Title: Designing Parts for a Keychain Flashlight</b>		
<b>Content Area: Mathematics &amp; Industrial Technology</b>	<b>Grade: 10-12</b>	<b>Duration: 2-3 class periods</b>
<b>Career Technical Industry Sector:</b>	<b>X</b>	<b>Engineering and Design Industry Sector</b>
<b>Standards and Benchmarks:</b>	<p><b>Grades Eight Through Twelve - Mathematics Content Standards</b></p> <ul style="list-style-type: none"> <li><b>Geometry 8.0</b> Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.</li> <li><b>Geometry 16.0</b> Students perform basic constructions, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.</li> </ul> <p><b>Engineering Design Pathway Standards:</b></p> <ul style="list-style-type: none"> <li>C4.1 Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means.</li> <li>C4.4 Use the concepts of geometric construction in the development of design drawings.</li> <li>C5.1 Understand the commands and concepts necessary for editing engineering drawings.</li> <li>C5.2 Know the various object-altering techniques.</li> <li>C5.3 Know the CADD components and the operational functions of CADD systems.</li> <li>C5.4 Apply two-dimensional and three-dimensional CADD operations in creating working and pictorial drawings, notes, and notations.</li> </ul> <p><b>SCANS Competencies:</b></p> <ul style="list-style-type: none"> <li>C5 Acquires and evaluates information.</li> <li>C6 Organizes and maintains information.</li> <li>C7 Interprets and communicates information.</li> <li>C8 Uses computers to process information.</li> <li>F1 Reading: Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.</li> <li>F3 Arithmetic: Performs basic computations; uses basic numerical concepts such as whole numbers, etc.</li> <li>F4 Mathematics: Approaches practical problems by choosing</li> </ul>	



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	<p>appropriately from a variety of mathematical techniques.</p> <ul style="list-style-type: none"> <li>• F10 Seeing Things in the Mind's Eye: Organizes and processes symbols, pictures, graphs, objects and other information.</li> </ul>
<b>Objectives:</b>	Given a variety of resources, students will use Solid Modeling Cad software (Solid Works) to create drawings of parts necessary to build the circuit for a keychain flashlight.
<b>Resources and Materials</b>	<ul style="list-style-type: none"> <li>• Sample parts; i.e. – push button switch, battery, LED</li> <li>• Measuring devices; i.e. – vernier calipers, micrometers, standard ruler</li> <li>• Website locations for part specifications</li> </ul>
<b>Differentiation:</b>	<p>Higher level students: Draw all parts necessary for flashlight, complete with isometric and 3-view drawings. Students may also become involved with peer teaching (working with a lower level student).</p> <p>Lower level students: Draw parts as assigned by teacher (considering difficulty of drawing vs student ability). May work with higher level student in a peer teaching mode.</p>
<p><b>Preparing Students for the Lesson:</b></p> <ul style="list-style-type: none"> <li>• <b>Transitions</b></li> <li>• <b>Expected Behaviors</b></li> </ul>	<p><b>Transitions:</b></p> <p>Discuss principles of a simple circuit – <i>Load, Conductor, Power, and Control</i>. Demonstrate how to find data sheets for the parts on the internet and discuss methods of dimension input (inches vs millimeters). Review use of micrometer and Vernier calipers. Remind students of safe file storage and back-up procedures.</p> <p><b>Expected Behaviors:</b></p> <p>Use the tools and other resources appropriately. It is alright to help a peer solve a drawing problem, but not to do the drawing for them. Respect each other's need for parts and tool, sharing appropriately when necessary.</p>
<p><b>Teaching the Lesson (Lesson Sequence/ Activities):</b></p> <ul style="list-style-type: none"> <li>• <b>Motivation/ Anticipatory Set</b></li> <li>• <b>Pre-Assessment/ Activating</b></li> </ul>	<p><b>Motivation / Anticipatory Set:</b></p> <p>Yesterday, we looked at the parts necessary to construct a simple electrical circuit. Today, you are going to begin design of the perfect example of a simple circuit: a keychain flashlight. Once you complete this initial design process, you will take on the challenge of designing an enclosure for your flashlight. Remember, accuracy is extremely important, as this flashlight will get built exactly the way you design it!</p> <p><b>Pre-Assessment / Activating Background Knowledge:</b></p> <p>Review construction of a part from geometric shapes, as well as problem solving for missing dimensions. Terms such as radius, cylinder, perpendicular and parallel</p>



<p><b>Background</b></p> <p><b>Knowledge</b></p> <ul style="list-style-type: none"><li>• <b>Teacher Input, Modeling, &amp; Checking for Understanding</b></li><li>• <b>Guided Practice</b></li><li>• <b>Closure</b></li></ul>	<p>lines as they relate to the drawing will also be reviewed.</p> <p><b>Teacher Input, Modeling, &amp; Checking for Understanding</b></p> <p>One of the important parts of any flashlight is a source of power. Without it, things would be pretty dark! We are going to start the design of your flashlight by drawing the battery together. Once we have finished the battery, you will continue by drawing the LED, battery clip, and push button switch.</p> <p><i>(Pass out battery specification sheet)</i></p> <p>Let's take a look at this battery's specs.</p> <p>What is its diameter?</p> <p>What is its total height?</p> <p>Notice that the top edge has a small curve to it. We call this a radius on a part. What is the measurement of the radius?</p> <p>Good! Looks like we're ready to get started with the drawing!</p> <p><b>Guided Practice</b></p> <p><i>To Draw the Battery:</i></p> <ol style="list-style-type: none"><li>1. Open Solid Works</li><li>2. Select "Create a PART"</li><li>3. Set-up the drawing to use "inches" as the default measurement.</li><li>4. Draw a circle in the top view plane, and then dimension it to the diameter on your spec sheet.</li><li>5. Extrude the circle the height given in the specs.</li><li>6. Now, create a radius on the top edge of the extrusion using the dimension given in the specifications.</li><li>7. Take a look at a neighbors drawing. Does your drawing look similar to theirs?</li><li>8. Make certain you have the correct diameter and radius on your battery, then save it as "battery-3v".</li></ol> <p><b>Independent Practice</b></p> <p>Now you have three more parts (also known as components) to draw. You may draw them in any order you wish, but need to remember the following:</p> <p>The web addresses for the battery clip and push button switch specification sheets are listed on the whiteboard. However, you will need to use a vernier caliper or the micrometer to get dimensions of the LED.</p>
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	<p>Remember to check all dimensions and to name the parts according to the guidelines on the whiteboard:</p> <p>Push Button Switch = PB Switch</p> <p>Light Emitting Diode = LED1</p> <p>Battery Clip = Bat Clip</p> <p><b>Closure</b></p> <p>Once again, compare drawing with your neighbor, paying particular attention to dimensions. Does their part fit the specifications? Would you be willing to trade it for the one you have drawn?!</p> <p>Now that you have completed 3-dimensional models of your flashlight parts, you are ready to design the case that will (<i>hopefully</i>) make them work together as a flashlight.</p>
<b>Assessment:</b>	<p><b>Informal Assessment:</b> During the lesson, the teacher will monitor student progress while circulating around the room and looking at computer monitors.</p> <p><b>Formal Assessment:</b> Students will turn drawings in (electronically). Teacher will use the attached rubric to assess the drawings. (Lesson 1 Rubric)</p>
<b>Notes &amp; Reflections:</b>	<p>I know there will be considerable amendments to this lesson once I teach it to my classes in the fall of 2010. My hopes are that this will be a springboard of practical applications of drawings done by my students.</p>

<b>Externship Sites:</b>	Sierra Innotek, Cameron Park, CA 95682-9673
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