

Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science and Technology Education	Course:	PLTW Gateway to Technology (DSF)	Unit 2 Title:	Design and Modeling Design Process	Grade Level(s):	7-8
Assessed Trimester:	Trimester 1	Pacing:	6 Days	Date Created:	6/16/2014	Last Revision Date:	

Course Understandings: <i>Students will understand that:</i> <ul style="list-style-type: none"><li>2 Students will understand that three-dimensional computer modeling uses descriptive geometry, geometric relationships and dimensioning to communicate an idea or solution to a technological problem</li></ul>
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DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals	
<b>Science</b> <ul style="list-style-type: none"><li><b>Standard: 6.1.2.2:</b> Engineering design is the process of devising products, processes and systems that address a need, capitalize on an opportunity, or solve a specific problem. <b>Benchmark:</b> <b>6.1.2.2.1:</b> Applying a Design Process Apply and document an engineering design process that includes identifying criteria and constraints, making representations, testing and evaluation, and refining the design as needed to construct a product or system that solves a problem. <i>For example:</i> Investigate how energy changes from one form to another by designing and constructing a simple roller coaster for a marble.</li></ul>	
<b>Reading</b> <u>Key Ideas and Details</u>  <b>6.13.2.2:</b> Determine the central ideas or conclusions of a text; provide an accurate summary of the test distinct from prior knowledge or opinions.	
<b>Technological Literacy</b> <ul style="list-style-type: none"><li><b>Standard:</b> Students will develop an understanding of the attributes of design. <b>Benchmark:</b> E. Design is a creative planning process that leads to useful products and systems. (8.6-8.E) F. There is no perfect design. (8.6-8.F) G. Requirements for design are made up of criteria and constraints. (8.6-8.G)</li><li><b>Standard:</b> Students will develop an understanding of engineering design. <b>Benchmark:</b> F. Design involves a set of steps, which can be performed in different sequences and repeated as needed. (9.6-8.F) G. Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum. (9.6-8.G)</li></ul>	
Transfer	
<b>Students will be able to independently use their learning to: (product, high order reasoning)</b> <ul style="list-style-type: none"><li>Students will solve an engineering problem using the design process and decision matrix to create a viable solution.</li></ul>	
Meaning	
<b>Unit Understanding(s):</b> <b>Students will understand that:</b> <ul style="list-style-type: none"><li>Many different design processes are used to guide people in developing solutions to problems.</li></ul>	<b>Essential Question(s):</b> <b>Students will keep considering:</b> <ul style="list-style-type: none"><li>What is the design process and how is it used?</li></ul>

<ul style="list-style-type: none"><li>• The design brief is a tool for defining the problem; it is an agreement between the engineer and client.</li><li>• Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints.</li><li>• Design teams use brainstorming techniques to generate large numbers of ideas in a short amount of time, striving for quantity, not quality.</li><li>• A decision matrix is a tool used to compare solution ideas to the criteria so that you can select the best solution.</li></ul>	<ul style="list-style-type: none"><li>• Why is brainstorming important when modifying or improving a product?</li><li>• Why do people work in teams when solving design problems?</li><li>• What is meant by constraints and criteria?</li><li>• Which step in the design process uses a design brief? Why?</li><li>• Which step in the design process uses a decision matrix? Why?</li><li>• Why are design elements considered when engineers and designers invent or innovate a product?</li></ul>
Acquisition	
<p><b>Knowledge - Students will:</b></p> <ul style="list-style-type: none"><li>• Understand how to successfully use a Decision Matrix and Design Brief to effectively communicate a solution to a design problem. (TL (8.6-8.E)</li><li>• Recognize the importance of working in in a team. (TL (8.6-8.E)</li><li>• Understand that design solutions are constantly re-evaluated for innovations. (TL(8.6-8.F)</li><li>• Recognize the criteria and constraints of a design problem. (TL(8.6-8.G)</li><li>• Understand how to define a design problem that has not been clearly been defined. (TL(8.9-12.I)</li></ul> <p><b>Reasoning - Students will:</b></p> <ul style="list-style-type: none"><li>• Integrate information</li><li>• Implement the design matrix</li><li>• Identify the constraints and criteria</li></ul>	<p><b>Skills - Students will:</b></p> <ul style="list-style-type: none"><li>• Correctly complete a Decision Matrix and Design Brief before starting a design challenge. (TL (8.6-8.E)</li><li>• Describe how teams use the design process in order to solve a Design Squad problem. (TL(8.6-8.F)</li><li>• Complete a design challenge following a given set of criteria and constraints. (TL(8.6-8.G)</li><li>• Identify a design problem that has not been clearly defined. (TL(8.9-12.I)</li></ul>

<p><b>Common Misunderstandings</b></p> <ul style="list-style-type: none"><li>• Students, and consumers in general, often assess a product's effectiveness by price and effectiveness alone, without examining hidden trade-offs in terms of the environment, human rights, and economy.</li><li>• Students believe that design is coming up with good ideas. And that's it. They forget about the rest of it - how to <i>realize</i> these ideas and <i>evaluate</i> them.</li><li>• Students forget the constraints of the environment in which the design will reside. They "arrogantly" ignore the constraints of the user.</li><li>• Students tend to focus on the first solution that comes to mind. They stop considering alternatives.</li><li>• Students focus only on the very high level (function) or the very low level (structure), without moving between them in a formal manner and considering the giant gulf between the two levels.</li><li>• Students belief that design is a serial/linear process, ignoring iterative cycles, revisiting past decisions, and evaluating alternatives."</li><li>• Evaluation and testing a product are not important</li></ul>	<p><b>Essential new vocabulary</b></p> <ul style="list-style-type: none"><li>• Aesthetic</li><li>• Annotate</li><li>• Brainstorm</li><li>• Constraint</li><li>• Criteria</li><li>• Decision Matrix</li><li>• Design</li><li>• Design Brief</li><li>• Design Elements</li><li>• Design Process</li><li>• Evaluate</li><li>• Model</li><li>• Modify</li><li>• Problem Solving</li><li>• Process</li><li>• Prototype</li><li>• Requirements</li><li>• Specifications</li><li>• Trade-off</li><li>• Visualization</li></ul>
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