



Design and Modeling

Standards	Goals
<p>Lesson 1: Introduction to Design 19 days</p> <p>Activity 1.1: Foot Orthosis Instant Design Challenge</p> <p>Technology and Engineering</p> <p>3.5.6-8.M (ETS) Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p> <p>3.5.6-8.N (ETS) Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.</p> <p>3.5.6-8.V Refine design solutions to address criteria and constraints.</p> <p>3.5.6-8.W (ETS) Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>3.5.6-8.X Defend decisions related to a design problem.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Work in a team to solve an instant design challenge. • Design, build, test, and modify an orthosis that stabilizes the ankle and foot. • Explore the steps of a design process. • Use a decision matrix to evaluate product prototypes.
<p>Activity 1.2: A Picture is Worth a Thousand Words</p> <p>Technology and Engineering</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p>	<ul style="list-style-type: none"> • Draw and interpret visual representations of objects. • When designing products, move fluidly among real-world, isometric, and multiview sketches. • Communicate information using engineering drawings and measurement conventions.
<p>Activity 1.3: Measuring Matters</p> <p>Technology and Engineering</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Introduce U.S. Customary and metric systems. • Use a ruler to measure accurately. • Read dimensions on a sketch. • Use a dimensioned sketch to build a paper skimmer.



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<p>Activity 1.4: Skimmer Statistics</p> <p>Technology and Engineering</p> <p>3.5.6-8.M (ETS) Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p> <p>3.5.6-8.N (ETS) Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p>	<ul style="list-style-type: none"> • Define and apply statistical concepts of center and spread. • Read and interpret a box and whisker graph. • Construct a box and whisker graph to visually represent data. • Consider how statistical analysis can inform the design process.
<p>Activity 1.5: Dialed In</p> <p>Technology and Engineering</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p>	<ul style="list-style-type: none"> • Use a dial caliper to measure a 3D object. • Add dimensions to a multiview sketch.
<p>Project 1.6: Investigate the Inside</p> <p>Technology and Engineering</p> <p>3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.</p> <p>3.5.6-8.V Refine design solutions to address criteria and constraints.</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Perform a mechanical dissection of an object to understand its design. • Use sketching to document and communicate designs with accuracy.
<p>Lesson 2: Solid Modeling 14 days</p> <p>Activity 2.1: Taking Modeling to Another Dimension</p> <p>Technology and Engineering</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p>	<ul style="list-style-type: none"> • Learn CAD software tools. • Use measurement tools to change the size of objects. • Create holes in an object. • Add text to an object.
<p>Activity 2.2: For Good Measure</p> <p>Technology and Engineering</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p>	<ul style="list-style-type: none"> • Create solid models of solid and hollow objects. • Calculate the surface area and volume of rectangular prisms.



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<p>Activity 2.3: It's For the Birds</p> <p>Technology and Engineering</p> <p>3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>3.5.6-8.V Refine design solutions to address criteria and constraints.</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Create a nest box solid model.
<p>Project 2.4: Puzzle Cube Design Challenge</p> <p>Technology and Engineering</p> <p>3.5.6-8.M (ETS) Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p> <p>3.5.6-8.N (ETS) Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>3.5.6-8.V Refine design solutions to address criteria and constraints.</p> <p>3.5.6-8.W (ETS) Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Follow a design process to effectively develop a design solution. • Use a CAD application to create a 3D model of a design solution. • Create a prototype to test a solution. • Construct a box and whiskers graph to visually represent and analyze data.



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<p>Lesson 3: Design Challenge 7 days</p> <p>Problem 3.1: Therapeutic Toy Design</p> <p>Technology and Engineering</p> <p>3.5.6-8.M (ETS) Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p> <p>3.5.6-8.N (ETS) Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>3.5.6-8.Q Apply a technology and engineering design thinking process.</p> <p>3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.</p> <p>3.5.6-8.V Refine design solutions to address criteria and constraints.</p> <p>3.5.6-8.W (ETS) Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>3.5.6-8.X Defend decisions related to a design problem.</p> <p>3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.</p> <p>3.5.6-8.JJ Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p>	<ul style="list-style-type: none"> • Apply knowledge and skills learned in this unit to design and build a prototype of a toy for use for therapy with children with cerebral palsy. • Collaborate within a team. goal • Use the design process to create a solution.