

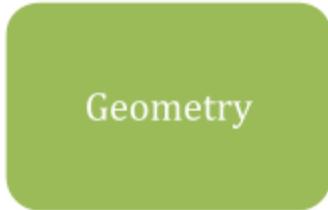


STEM SCHOOL CHATTANOOGA

Mini-PBL

Unit Plan Template

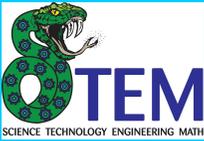
That's A Wrap: Designing the Ultimate Candy Container



Standards (Learning Targets)

Learning Target 13: The Third Dimension - I can expand geometric concepts to three dimensions.

Grade Level	9th	Unit Length	3 Weeks
Mini-PBL Overview	Students will use their understanding of the properties of three dimensional solids to design a candy container meeting specific constraints. Students, working in pairs, will complete a two and three dimensional design using Tinkercad. Students will also create a cardboard box using the Carvey or laser cutter and decorate the outside of the container.		
Mini-PBL Driving Question	How can we, as consultants to Mars Inc., design a functional and eye catching candy container to celebrate the anniversary of the iconic candy M&M's, applying our knowledge of three dimensional solids?		
Hook Event	Students will try to accurately estimate the number of M&M's in various shaped candy jars. Given an 8 by 11 piece of paper, students will be challenged to fold the paper in a way that will hold the most M&Ms. The group whose paper figure holds the greatest number will be awarded M&Ms.		
Scaffolding Activities	<p>Class Activities</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review Rubric: Teacher and students will review components of rubric. <input type="checkbox"/> Math Concepts: Conceptual learning and application of formulas used in determining volume and surface area of three dimensional figures such as prisms, cones, cylinders and Pyramids using Khan Academy. <input type="checkbox"/> First Draft: Create a sketch, including accurate dimensions, of a container, including net. <input type="checkbox"/> Prototyping: Create a prototype using laser cutter or Carvey. <p>Station Activities</p> <ul style="list-style-type: none"> <input type="checkbox"/> Product Design: Use Design software to create a 3D Representation. <input type="checkbox"/> Prototyping: Create a prototype using laser cutter or Carvey. <p>Workshops</p> <ul style="list-style-type: none"> <input type="checkbox"/> The following digital fab options: <ul style="list-style-type: none"> <input type="checkbox"/> Use of Arduino in project to illuminate the container or to incorporate sound. <input type="checkbox"/> Use of Carvey <input type="checkbox"/> Vinyl Cutter <p>Focus Groups</p> <ul style="list-style-type: none"> <input type="checkbox"/> Based on results of Khan Academy assignments, students will participate in the following focus groups: <ul style="list-style-type: none"> <input type="checkbox"/> Review of formula and practice calculating volume. <input type="checkbox"/> Review of and practice calculating surface area. <input type="checkbox"/> Review and practice calculating composite figures. <input type="checkbox"/> Review and practice of changing dimensions. <p>Mini-PBL Teams</p> <ul style="list-style-type: none"> <input type="checkbox"/> Teams will be composed of pairs of students of similar math ability and digital fabrication experience. Contracts will be employed to detail roles and responsibilities of each group member. 		

	Digital Resources <ul style="list-style-type: none"> • TinkerCad • Laser Cutter • Carvey • Vinyl Cutter • Arduino • Computer 																								
Calendar Overview	<table border="1"> <thead> <tr> <th data-bbox="256 422 509 457">Monday</th> <th data-bbox="509 422 760 457">Tuesday</th> <th data-bbox="760 422 1010 457">Wednesday</th> <th data-bbox="1010 422 1260 457">Thursday</th> <th data-bbox="1260 422 1510 457">Friday</th> </tr> </thead> <tbody> <tr> <td data-bbox="256 457 509 617"> HOOK EVENT CLASS ACTIVITY: Review Rubric </td> <td data-bbox="509 457 760 617"> CLASS ACTIVITY: Math Concepts </td> <td data-bbox="760 457 1010 617"> CLASS ACTIVITY: Math Concepts </td> <td data-bbox="1010 457 1260 617"> CLASS ACTIVITY; Math Concepts First Draft </td> <td data-bbox="1260 457 1510 617"> CLASS ACTIVITY; Math Concepts </td> </tr> <tr> <td data-bbox="256 617 509 970"> STATION: Product Design </td> <td data-bbox="509 617 760 970"> STATION: Product Design FOCUS GROUP: Volume and Surface Area </td> <td data-bbox="760 617 1010 970"> CLASS ACTIVITY; Math Concepts </td> <td data-bbox="1010 617 1260 970"> STATION: Prototyping WORKSHOP: Digital: Arduino, Carvey, Vinyl Cutter FOCUS GROUP: Composite Figures </td> <td data-bbox="1260 617 1510 970"> STATION: Prototyping WORKSHOP: Digital: Arduino, Carvey, Vinyl Cutter </td> </tr> <tr> <td data-bbox="256 970 509 1066"> CLASS ACTIVITY: Prototyping </td> <td data-bbox="509 970 760 1066"> CLASS ACTIVITY: Prototyping </td> <td data-bbox="760 970 1010 1066"> CLASS ACTIVITY: Prototyping </td> <td data-bbox="1010 970 1260 1066"> CLASS ACTIVITY: Prototyping </td> <td data-bbox="1260 970 1510 1066"> CULMINATING EVENT: Candy Bar </td> </tr> </tbody> </table>					Monday	Tuesday	Wednesday	Thursday	Friday	HOOK EVENT CLASS ACTIVITY: Review Rubric	CLASS ACTIVITY: Math Concepts	CLASS ACTIVITY: Math Concepts	CLASS ACTIVITY; Math Concepts First Draft	CLASS ACTIVITY; Math Concepts	STATION: Product Design	STATION: Product Design FOCUS GROUP: Volume and Surface Area	CLASS ACTIVITY; Math Concepts	STATION: Prototyping WORKSHOP: Digital: Arduino, Carvey, Vinyl Cutter FOCUS GROUP: Composite Figures	STATION: Prototyping WORKSHOP: Digital: Arduino, Carvey, Vinyl Cutter	CLASS ACTIVITY: Prototyping	CLASS ACTIVITY: Prototyping	CLASS ACTIVITY: Prototyping	CLASS ACTIVITY: Prototyping	CULMINATING EVENT: Candy Bar
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Culminating Event	Product <ul style="list-style-type: none"> <input type="checkbox"/> Students will create a candy container that is at least 64 square inches. <input type="checkbox"/> Students will use 3D Design software, a laser cutter or Carvey. Showcase <ul style="list-style-type: none"> <input type="checkbox"/> Students will share containers at a “candy bar”. 																								
Common Assessment	 <h2 style="text-align: center;">Mini-PBL Rubric</h2>																								
	LT13 - I can expand geometric concepts to three dimensions.		Advanced <ul style="list-style-type: none"> <input type="checkbox"/> Students will answer the advanced level question that was assigned in class in a separate document. https://docs.google.com/document/d/1Vw0LiC8Q9Lt_vQkNnLq3yPiDNq4Btapq8_FtkEawdpo/edit?usp=sharing <input type="checkbox"/> Students will calculate the area of the composite container. 	Proficient <ul style="list-style-type: none"> <input type="checkbox"/> Students will construct a solid (prism, cylinder, pyramid or cone) from rigid or semi rigid material. <input type="checkbox"/> Faces meet at vertices. <input type="checkbox"/> Accurate description including classification, dimensions, faces, edges, vertices. <input type="checkbox"/> Accurate calculation using formula. 																					
	Innovation: Originality		<ul style="list-style-type: none"> <input type="checkbox"/> Students will construct candy containers that are composite figures. <input type="checkbox"/> Containers will have digital joints. <input type="checkbox"/> Students will use an arduino to incorporate either lights or sound. 	<ul style="list-style-type: none"> <input type="checkbox"/> Students will create a container whose shape is not a rectangular prism. <input type="checkbox"/> The container should be decorated using a vinyl cutter or laser engraver. 																					

	Minimum Requirement Components: Must be included to be graded	<ul style="list-style-type: none"> <input type="checkbox"/> 3D solid volume is at least 64 cubic inches. <input type="checkbox"/> Students will use 3D Design software, a laser cutter or Carvey. <input type="checkbox"/> Students must attempt to calculate the volume and surface area of the figure. <input type="checkbox"/> Students must include a description of the figure.
	Grades	<ul style="list-style-type: none"> <input type="checkbox"/> If the Mini-PBL work is all advanced according to the rubric criteria above, the grade is a 100. <input type="checkbox"/> If the work meets all the proficient criteria and not all of the advanced criteria, the grade is an 85. <input type="checkbox"/> If the work does not meet all of the proficient criteria, the grade is a 50. <input type="checkbox"/> If the grade does not meet the minimum requirements, the grade is a 0.
Vocabulary		
	Mathematics – Geometry	<ol style="list-style-type: none"> 1. Volume 2. Surface Area 3. Lateral Area 4. Pyramid 5. Cone 6. Prism 7. Cylinder 8. Sphere