

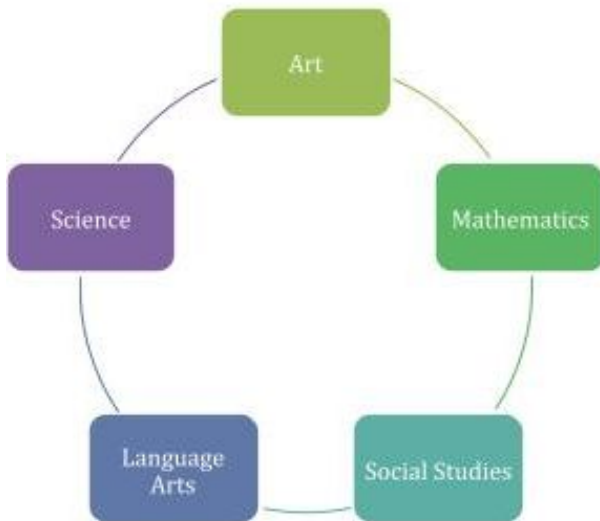
STEM School Chattanooga

9th Grade PBL

Unit Plan Template

Unit 4: Energy

Learning Target Topics



Art I: Integrate ideas, issues, and themes in visual arts and other disciplines to build a model of energy efficient and cost effective house.

Algebra I: Use concept of slope to design a wheelchair ramp.

Geometry: Use concept of similarity to design an additional structure that mimics the design of the original house.

English I: Present information and evidence clearly; Organization and style are appropriate to audience and purpose: Make strategic use of digital media in presentations to enhance understanding.


Physical World Concepts: Explain the relationship between the properties of a material and the use of the material in its application.

World History: Discover a historical feature of architecture and utilize this feature to have an environmental benefit to your structure.

| Grade Level | 9 th Grade | Unit Length | 6 Weeks |
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| Unit Overview | The Unit 4 PBL on Energy will introduce students to the essential concepts of the design thinking process and energy efficiency through the research and design of a cost-effective, energy efficient house model. Based on a given environment location, students will apply research, creativity, and critical thinking to collaboratively plan, build, and design a model of a cost effective, energy efficient house. Within the house, students will develop energy efficient systems for electricity, water, heating, cooling, and other systems. Students will also present their house model, justifying the energy efficient choices based on costs and research. | | |
| Unit Essential Issue | Problem: Design and build a cost effective, energy efficient house model. | | |
| Culminating Events | <p>For the Unit 4 PBL, the students will work collaboratively in groups of 6-7. Student teams will design and develop a model of a cost-effective, energy efficient house. They will also include an evaluation of the design and efficiency of the house in their written reports and group presentation proposal.</p> <p>Presentations – February 22-23</p> <p>The culminating event for this PBL is a 3-5 minute presentation where students will present their model and justify their energy efficient choices based on research and the chosen environment. The following items will be turned in as part of the presentation:</p> <ul style="list-style-type: none"> • Model of a Cost-Effective, Energy Efficient House • Historical Element Report • PWC Construction Report (Template: http://bit.ly/2mbQ4oc) describing and defending group construction choices • House Model Presentation | | |

- The following items will be assessed by the appropriate content area teacher:
- Math (Algebra I and Geometry): Designs using accurate calculations and scale.
 - Physical World Concepts: Clear justification used in the PWC Construction Report to defend construction choices.
 - English I: Use of proper speaking and presentation techniques during the model presentation.
 - Art: Construction and 3D visuals
 - History: Content and structure of the Historical Element Report

Common Assessment

|  | | <h2>STEM PBL Rubric</h2> | | PBL Unit 4 - Energy Student: _____ Date: _____ |
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| | | Advanced | Proficient | Needs Improvement |
| Math Components: Algebra I | <ul style="list-style-type: none"> • In addition to slope, students will determine the most appropriate design and materials used for ramp based on location, ease of use, cost and style of house. | <ul style="list-style-type: none"> • Given a picture of a handicap ramp with a height and length included, students will determine if it is legal based on research of ADA requirements. • Students will calculate the slope of two different handicap ramps, either using digital images or measurements of actual ramps which are labeled with height and length. Based on these calculations, students will determine which ramp is mathematically easier to use. | | |
| Math Components: Geometry | <ul style="list-style-type: none"> • Student “contractors” will design on graph paper a detached garage that mimics the design of the house. They will use properties of similarity to prove that the dimensions of the house and garage are similar. All angles and lengths should be included. Scale must be included. • In addition to angle of elevation, students will determine the most appropriate design and materials used for ramp based on location,, ease of use, cost and style of house. | <ul style="list-style-type: none"> • Student “contractors” will use similar triangles to prove that two triangles within the roof design are similar. Each triangle should be labeled with angle measures and side lengths. • “Contractors” will design a wheelchair ramp for a doorway that meets ADA guidelines. Requirements will be written in paragraph format and include citation. • Calculate the angle the ramp makes with the ground and the horizontal distance covered by the ramp using trigonometric ratios. Angles and side | | |

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| | | | lengths must be labeled. | |
| | Science Components: Physical World Concepts | <ul style="list-style-type: none"> • All AD and PR sections in the PWC Construction Report Template (http://bit.ly/2mbQ4oc) are complete. • The report includes clear justification for the chosen foundation type, chosen roofing and chosen exterior materials. | <ul style="list-style-type: none"> • All PR sections in the PWC Construction Report Template (http://bit.ly/2mbQ4o) are complete. • The report includes thorough descriptions for each researched material. | |
| | Language Arts Components: English I | <ul style="list-style-type: none"> • The information in the presentation is well organized and shows evidence of preparation. • The group members work together effectively to present the house model and the green energy elements. • The presentation includes a strong evaluation of the features and elements included based on the location and prospective occupants, showing the use of empathy in decisions. | <ul style="list-style-type: none"> • Students use effective presentation skills, such as good eye contact and volume, to present the information. • The presentation includes a strong introduction of the members and topic as well as a clear conclusion. • All group members present the information from their area of expertise and its importance to the house model and choices. | |
| | Social Studies Components: World History | <ul style="list-style-type: none"> • The report analyzes the connection between the chosen historical element and the location selected. • The report includes a justification of why the element is important to the energy efficiency of the house model. • The formal language and structure of the report creates a professional product. | <ul style="list-style-type: none"> • The report explains the historical element used in the house model. • The report includes evidence from research about the historical significance of the chosen element. • Formal language and proper grammar is used to make the report clear and easy to understand. | |
| | Art Components: Art I | <ul style="list-style-type: none"> • Structure must be neat and 90% accurately scaled and constructed. • Aesthetically pleasing • 4 or more rooms are in the house. • Roof • Include at least 8 unique green ideas in the house. • List the green materials, the cost of the materials. • Visual 3D rendering of the home with green ideas using your ipad. | <ul style="list-style-type: none"> • Structure must be neat and 85% accurately scaled and constructed. • Aesthetically pleasing • 4 rooms are in the house. • Roof • Include at least 4 unique green ideas in the house. • List the green materials, the cost of the materials. • Research and list the approximate total cost of materials to build an actual house. | |

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| | | <ul style="list-style-type: none"> • Turn work or link into your Google Classroom. | <ul style="list-style-type: none"> • Turn written work in to your Google Classroom. | |
| | <p>Minimum Requirement Components: Must be included to be graded</p> | <p>Algebra I:</p> <ul style="list-style-type: none"> • Information will be submitted in PBL google classroom as a written report. Report must include images of ramps and labeled slopes. • Research must be cited in text and written in paragraph format. <p>Geometry:</p> <ul style="list-style-type: none"> • Information will be submitted in a written report via google PBL classroom math assignment. • Drawings must be precise, labeled and completed on graph paper or digitally. Markings must be included on each triangle to prove similarity criteria. <p>English I:</p> <ul style="list-style-type: none"> • House Model presentation should be 3-5 minutes long and include at least one type of digital media. • All members of the group should participate in the presentation. <p>Art:</p> <ul style="list-style-type: none"> • Structure must be neat and 70% accurately scaled and constructed. • Aesthetically pleasing • 4 rooms are in the house. • Roof • Prototype at least 3 unique green ideas in the house • List the green materials for the 3 unique green ideas and the cost of the materials as if it were in a real house. • Turn work into your Google Classroom. <p>World History:</p> <ul style="list-style-type: none"> • Report should be at least one page in length about at least one element that is based on historic architecture with an explanation of the historic origins. • Report must be in MLA format for style and sources. • Report must be submitted through Google Docs with Mr. Evans by the due date. <p>PWC:</p> <ul style="list-style-type: none"> • All report sections are completed in the provided PWC Construction Report Template (http://bit.ly/2mbQ4oc) • All report sections use proper grammar • Report must include a 'Works Cited' page that includes all resources used | | |
| <p>Unit Learning Targets</p> | <p>Algebra 1:</p> <ul style="list-style-type: none"> • I can compare and contrast key features of functions. <p>Geometry:</p> <ul style="list-style-type: none"> • I can use similarity to solve problems. • I can use trigonometric ratios to solve problems. <p>PWC:</p> <ul style="list-style-type: none"> • I can explain the relationship between the properties of a material and the use of the material in the application of a technology. • I can describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems. <p>English I:</p> <ul style="list-style-type: none"> • I can present information, findings, and supporting evidence clearly, concisely, and logically so that listeners can follow the line of reasoning and the organization, development, and style are appropriate to purpose, audience, and task. | | | |

- I can make strategic use of digital media in presentations to enhance understandings of findings, reasoning, and evidence and to add interest.
- Art:
- I can build a model of energy efficient and cost effective house.
 - I can create a 3D visual design plan for energy efficient and cost effective house, which reflects correlation of materials, technologies, processes, and terminology used in visual art with those in other disciplines.
- World History:
- I can present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Vocabulary

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|----------------------------------|---|
| Math: Algebra I | <ol style="list-style-type: none"> 1. Function 2. Slope |
| Math: Geometry | <ol style="list-style-type: none"> 1. Trigonometric ratios 2. Scale 3. Similarity Criteria 4. Angle of Elevation |
| Science: Physical World Concepts | <ol style="list-style-type: none"> 1. Civil Engineering 2. Basement Foundation 3. Crawl Space Foundation 4. Pier and Beam Foundation 5. Slab Foundation 6. Materials Science 7. Shingles 8. Composite Materials |
| Language Arts: English I | <ol style="list-style-type: none"> 1. Presentation Techniques 2. Digital Media 3. Design Thinking Process |
| Social Studies: World History | <ol style="list-style-type: none"> 1. Evidence 2. Justification 3. Formal Language |
| Art: Art I | <ol style="list-style-type: none"> 1. Aesthetics 2. Balance 3. Construct |