



STEM Learning Standards Integration

Energy Efficiency in Construction

Discipline/Goal	Standard	Possible Activities
<p>Science State Goal 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.</p>	<p>A. Know and apply the concepts, principles and processes of scientific inquiry.</p>	<p>Experimentation and Testing various products, technologies and unique solutions to customer issues</p> <p>Collect and Analyze Data that can then be shared with customers</p>
<p>Science State Goal 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.</p>	<p>B. Know and apply the concepts, principles and processes of technological design.</p>	<p>Develop visual representations of how various technologies and solutions work</p>
<p>Science State Goal 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.</p>	<p>C. Know and apply concepts that describe properties of matter and energy and the interactions between them.</p>	<p>Learn the properties of various building materials and be able to predict how they will work together to enhance the efficiency and comfort of a building</p>

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<p>Science State Goal 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.</p>	<p>D. Know and apply concepts that describe force and motion and the principles that explain them.</p>	<p>Understand how a building can be constructed to mitigate effects of wind on comfort and energy use</p>
<p>Science State Goal 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.</p>	<p>E. Know and apply concepts that describe the features and processes of the Earth and its resources.</p>	<p>Learn how to integrate a home with natural resources such as solar, wind and landscaping to improve the comfort and reduce the energy load</p> <p>Learn how geothermal systems work and how to choose the best installation method for a given client</p> <p>Investigate the variety of recycled and green products that can be used in home construction</p>
<p>Science State Goal 13: Understand the relationships among science, technology and society in historical and contemporary contexts.</p>	<p>B. Know and apply concepts that describe the interaction between science, technology and society.</p>	<p>Learn how to review product literature to determine if the claims for cost or energy savings are supportable</p> <p>Learn how the development of energy efficiency products and technologies has impacted and continues to impact the building industry</p>



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<p>Technology Use appropriate instruments, electronic equipment, computers and networks to access information, process ideas and communicate results.</p>	<p>From the Applied Learning Standards</p>	<p>Conduct Internet research, using credible web sites, on burgeoning energy efficiency breakthroughs</p> <p>Learn how to conduct a blower door test</p> <p>Learn how to create informational materials that help clients understand your recommendations</p>
<p>English State Goal 1: Read with understanding and fluency.</p>	<p>A. Apply word analysis and vocabulary skills to comprehend selections.</p>	<p>Learn the vocabulary of the energy industry by reading product guides, instruction manuals, etc.</p>
<p>English State Goal 1: Read with understanding and fluency.</p>	<p>B. Apply reading strategies to improve understanding and fluency.</p>	<p>Learn reading techniques that include look at the root of the word, applying prior knowledge and questioning/researching meanings</p>
<p>English State Goal 1: Read with understanding and fluency.</p>	<p>C. Comprehend a broad range of reading materials.</p>	<p>Learn to read and understand graphs and charts such as those in product descriptions</p> <p>Compare product claims from various manufacturers to determine the best choice for a given project</p>



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<p>English State Goal 3: Write to communicate for a variety of purposes.</p>	<p>A. Use correct grammar, spelling, punctuation, capitalization and structure.</p>	<p>Learn from potential clients and employers. Help students understand the importance of this goal to their careers by invite clients and employers into the classroom to discuss their responses to bids which do and don't use correct grammar</p> <p>Learn to communicate in a concise manner</p>
<p>English State Goal 3: Write to communicate for a variety of purposes</p>	<p>B. Compose well-organized and coherent writing for specific purposes and audiences.</p>	<p>Prepare a variety of client materials including solution bids; decision memos offering 3 choices to solve a particular problem with pros/cons for each along with a recommendation; marketing materials, etc.</p>
<p>English State Goal 3: Write to communicate for a variety of purposes</p>	<p>C. Communicate ideas in writing to accomplish a variety of purposes.</p>	<p>Research and write a Letter to the Editor, marketing piece, and client bid on one given topic</p>
<p>English State Goal 4: Listen and speak effectively in a variety of situations.</p>	<p>A. Listen effectively in formal and informal situations.</p>	<p>Record various scenarios of clients explaining a problem they want solved, bosses giving instructions, etc. and ask students to speak and/or write what they heard.</p> <p>Ask them, also, to indicate what they thought the most important issue was to the client/boss and why.</p>



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<p>English State Goal 4: Listen and speak effectively in a variety of situations.</p>	<p>B. Speak effectively using language appropriate to the situation and audience.</p>	<p>Using the scenarios above, have students role play their response to the clients and bosses. Include a requirement that students ask questions for clarification.</p>
<p>English State Goal 5: Use the language arts to acquire, assess and communicate information.</p>	<p>A. Locate, organize, and use information from various sources to answer questions, solve problems and communicate ideas.</p>	<p>Develop a series of client needs such as an energy efficient kitchen remodel, a water saving landscape design, a new home that uses little or no non-renewable energy to operate, etc. Put basic descriptions for each need on an index card and distribute the cards to the students. Have them research solutions and present their solutions to the class.</p>
<p>English State Goal 5: Use the language arts to acquire, assess and communicate information.</p>	<p>B. Analyze and evaluate information acquired from various sources.</p>	<p>Find and evaluate information on a product from three different sources. Determine which source is most reliable and why.</p>
<p>English State Goal 5: Use the language arts to acquire, assess and communicate information.</p>	<p>C. Apply acquired information, concepts and ideas to communicate in a variety of formats.</p>	<p>Present either of the above assignments in a variety of ways: PowerPoint, Internet-based radio and written.</p>



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<p>Math State Goal 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.</p>	<p>A. Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.</p>	<p>Working in teams of two, students will:</p> <ul style="list-style-type: none"> ▶ Develop a landscape design to scale and calculate the amount of mulch will be required ▶ Design a library with one wall covered floor to ceiling with shelving and calculate how much wood will be required
<p>Math State Goal 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.</p>	<p>B. Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships.</p>	<p>Students will solve the following problems for a client:</p> <ul style="list-style-type: none"> ▶ Properly size a geothermal system for a 5,000 square foot house in Chicago ▶ Show a client how much energy that geothermal system would have saved them for their 5,000 square foot home versus their traditional 80 percent efficient gas furnace in the winter of 2009 using heating/cooling degree data.
<p>Math State Goal 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.</p>	<p>C. Compute and estimate using mental mathematics, paper-and-pencil methods, calculators and computers.</p>	<p>Organize an estimation competition. Provide students with basic information on costs for labor and materials, then give them different scenarios and different technologies for calculating the client's bill including paper and pencil and hand held calculators.</p>



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<p>Math State Goal 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.</p>	<p>D. Solve problems using comparison of quantities, ratios, proportions and percents.</p>	<p>Help students understand financial management by having them calculate:</p> <ul style="list-style-type: none"> ▶ The total cost of buying a \$25,000 truck using the current auto loan rate over 60 months ▶ The total cost of buying a \$150,000 home using the current mortgage rate over 30 years and over 20 years <p>Help students market energy efficiency to their clients by determining the percentage of the installation will be covered by government tax credits. For example, if the client insulates their 2,000 square foot home, what percentage of the job will be paid for by the government tax credit?</p>
<p>Math STATE GOAL 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.</p>	<p>A. Measure and compare quantities using appropriate units, instruments and methods.</p>	<p>Solve customer scenarios such as:</p> <p>Homeowners will be gone from Thursday - Sunday and they want their 3,000 square foot home insulated while they're gone. This entails taking off the siding, blowing in cellulose and replacing the siding. To accomplish this task in 3 workdays, how many workers will be required and at \$15 an hour, what is the cost for labor.</p>



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<p>Math STATE GOAL 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.</p>	<p>B. Estimate measurements and determine acceptable levels of accuracy.</p>	<p>Students will research contingency fees for various careers such as carpentry, plumbing, general contracting for homebuilders, etc. How were those percentages determined and what happens when costs run over the contingencies?</p> <p>Learn a variety of “rules of thumb” for eyeballing the area of a project by looking at backyard decks, room size for carpeting, etc.</p>
<p>Math STATE GOAL 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.</p>	<p>C. Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings.</p>	<p>Ask students to determine the appropriate tool to use to solve the following customer complaints:</p> <ul style="list-style-type: none"> ▶ My geothermal system in my classroom is louder than the other teachers’ systems ▶ These new lights are too bright for the office
<p>Math State Goal 8: Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.</p>	<p>B. Estimate measurements and determine acceptable levels of accuracy.</p>	<p>Determine area and project size</p>



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<p>Math State Goal 8: Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.</p>	<p>C. Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings.</p>	<p>Identify project scope in terms of area, Construct to-scale models of project details</p>
<p>Math State Goal 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.</p>	<p>A. Demonstrate and apply geometric concepts involving points, lines, planes and space.</p>	<p>Construct models of client solutions</p>
<p>Math State Goal 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.</p>	<p>B. Identify, describe, classify and compare relationships using points, lines, planes and solids.</p>	<p>Develop blueprints and scale models</p>
<p>Math State Goal 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.</p>	<p>C. Construct convincing arguments and proofs to solve problems.</p>	<p>Determine the correct sizing for an air conditioning system for a 2500 square foot house. Verify their conclusions and present this information to an audience.</p>



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<p>Math State Goal 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.</p>	<p>D. Use trigonometric ratios and circular functions to solve problem.</p>	<p>Develop a landscaping solution for a difficult area using proportions, the Pythagorean theorem and its converse or triangles (e.g., distances which cannot be measured directly) using trigonometric</p>
<p>Math State Goal 10: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.</p>	<p>A. Organize, describe and make predictions from existing data.</p>	<p>Document energy savings using charts and other appropriate methods. Be certain that the results are completely consistent with verifiable data/</p>
<p>Math State Goal 10: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.</p>	<p>B. Formulate questions, design data collection methods, gather and analyze data and communicate findings.</p>	<p>Develop experiments to determine how energy improvements have affected comfort</p> <p>Accurately determine energy savings</p>
<p>Math State Goal 10: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.</p>	<p>C. Determine, describe and apply the probabilities of events.</p>	<p>Explain the probabilities of events to clients such as costs based on diverse choices</p>

