Unit 2.2 Cost & Efficiency Analysis

Content Area: **Science**
Course(s): **Civil Eng & Arc**
Time Period: **Semester 1**
Length: **1 week**
Status: **Published**

Standards

Number and Quantity

Quantities
-Reason Quantitatively And Use Units To Solve Problems.

2. Define appropriate quantities for the purpose of descriptive modeling. (N.Q .2)

3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (N.Q .3)

Geometry

Modeling With Geometry
-Apply Geometric Concepts In Modeling Situations

2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* (G.MG.2)
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).* (G.MG.3)

Reading

Comprehension and Collaboration

2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)

Conventions of Standard English

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4)

DA	Data & Analysis
	Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.
8.1.12.DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
	The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.
8.1.12.DA.6	Create and refine computational models to better represent the relationships among

	different elements of data collected from a phenomenon or process.
ED	Engineering Design
	Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.
8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
	Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.
8.2.12.ED.5	Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
8.2.12.ED.6	Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
NT	Nature of Technology
	Engineers use science, mathematics, and other disciplines to improve technology. Increased collaboration among engineers, scientists, and mathematicians can improve their work and designs. Technology, product, or system redesign can be more difficult than the original design.
8.2.12.NT.2	Redesign an existing product to improve form or function.
MA.12.4.2.12 A.1	Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
MA.12.4.2.12 E.1.2	Pythagorean theorem
MA.12.4.2.12 E.1.3	Right triangle trigonometry (sine, cosine, tangent)
MA.12.4.2.12 E.2	Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.

Enduring Understandings

- The combination of concrete and rebar, called reinforced concrete, is an important component of residential foundations.
- Accurately determining the cost and quantities for a construction project can ensure a successful building project providing a high quality structure with less material and financial waste.
- An effective residential structure should include methods for adequate heating and cooling.
- R-value and U-factor measurements are used to select materials that with ensure a structure is properly insulated.

Essential Questions

- What is the difference between R-value and U-value? When are they used?
- What are some leading causes of solar gain?
- What key areas of a building can minimize heat loss?
- Why is a cost estimate important to create before starting a project?

Knowledge and Skills

Students will be able to:

- Apply math skills to calculate the quantity and cost of concrete needed to pour the pad for a small building.
- Create a cost estimate for a small construction project, including a detailed cost break-down.
- Calculate the heat loss for a building envelope with given conditions appropriate for the project.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72flT8XsUIe3K1VSG7nxuc4CpCec/edit

Resources

- KT CostEfficiency.doc
- EstimatingCostConcretePad.ppt
- ConcretePadEstimate.doc
- A1-ExampleUtilityShedDrawing.jpg
- A1-ExampleUtilityShedDrawing.pdf
- A1-ExampleUtilityShedDrawing.dwfx
- ShedCostEstimate.doc
- BuildingMaterialsCostEstimate.xls
- A2-ExampleUtilityShedFraming.jpg
- A2-ExampleUtilityShedFraming.pdf
- A2-ExampleUtilityShedFraming.dwfx

- HeatLossGain.doc
- HeatLossGain.ppt
- TransmissionLoadWorksheet.xls
- ExampleEngineeringWeatherDataSheet.pdf