Unit 8: Form and Function in Architecture

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 2**
Length: **2 weeks**
Status: **Published**

Summary

Students will explore how program requirements evolve into a space. Students will perform an analysis of the program written in Unit 3, the dream house. They will make an adjacency diagram to analyze the spatial relationships. Students will analyze and use architectural elements to design their dream house. Students will explore how material choices relate to energy conservation.

Revision Date: July 2024

Essential Questions/Enduring Understandings

Essential Questions:

What factors affect a building's form?

What tools can be used to create a design?

Why do functionally similar buildings look different?

Enduring Understandings:

a building's form is affected by functional, and engineering requirements

a building's form is affected by societal and historical influences.

analyzing the functions of spaces may lead to solutions that are dramatic and new.

Objectives

Students will know:

vocabulary and terms including but not limited to program, adjacency diagram,

buildings are designed to meet functional criteria, i.e. capacity, performance

buildings are designed to meet aesthetic criteria, i.e. meeting expectations for context, history, importance, permanence, and prominence.

building criteria is found in the program.

Students will be skilled at:

analyzing the requirements of a program and developing alternate solutions.

creating drawings that communicate solutions that solve a problem.

Learning Plan

Preview the essential questions and connect to learning throughout the unit.

Teacher will provide formative and summative assessments of skills attainment.

Lecture and class discussion using the Smart Board and computer to provide students with building structures for analysis.

Lecture and demonstration on adjacency diagrams

Lecture and activity: modern architecture and how usual functions had unusual solutions. Formative activity: students to design a column.

Suggested activity: problem-based learning-students will design the out-building from the site planning unit. Students will be provided with a program. Students will perform analysis using an adjacency plan. Students will develop a plan, section and elevation(s) to communicate their solutions. The project may run concurrently with another unit.

Suggested activity: develop plans, sections, and elevations for their dream house.

Materials

core book list

Smartboard

AutoCAD and Computer lab

Materials for modeling: cardboard, tape, glue

Standards

ELA.K-12.1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
ELA.K-12.2	Adapting Communication: Adapting communication in response to the varying demands of audience, task, purpose, and discipline.
ELA.K-12.3	Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others.
ELA.K-12.4	Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media.
ELA.K-12.5	Leveraging Technology: Employing technology and digital media thoughtfully, strategically and capably to enhance reading, writing, speaking, listening, and language use.
MATH.9-12.A.REI	Reasoning with Equations and Inequalities
MATH.9-12.A.REI.A	Understand solving equations as a process of reasoning and explain the reasoning
CS.9-12.8.2.12.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.
CS.9-12.8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
CS.9-12.8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
CS.9-12.8.2.12.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).
CS.9-12.8.2.12.ED.6	Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
CS.9-12.ED	Engineering Design
SCI.HS.ETS1.A	Delimiting Engineering Problems
SCI.HS.ETS1.B	Developing Possible Solutions
SCI.HS.ETS1.B	Developing Possible Solutions
SCI.HS.ETS1.C	Optimizing the Design Solution
SCI.HS-ESS3	Earth and Human Activity
SCI.HS-ETS1	Engineering Design
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
WRK.9.2.12.CAP	Career Awareness and Planning
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
WRK.9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
WRK.9.2.12.CAP.7	Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.K-12.1.4	Innovative Designer
TECH.K-12.1.4.a	know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
TECH.K-12.1.4.b	select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
TECH.K-12.1.4.c	develop, test and refine prototypes as part of a cyclical design process.
TECH.K-12.1.4.d	exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
TECH.K-12.1.6	Creative Communicator
TECH.K-12.1.6.a	choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
TECH.K-12.1.6.b	create original works or responsibly repurpose or remix digital resources into new creations.
TECH.K-12.1.6.c	communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
TECH.K-12.1.6.d	publish or present content that customizes the message and medium for their intended audiences.
	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
	An individual's income and benefit needs and financial plan can change over time.
	With a growth mindset, failure is an important part of success.
	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.

Constructing Explanations and Designing Solutions

Integration of Knowledge and Ideas

Asking Questions and Defining Problems

Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

Constructing explanations and designing solutions 9–12 builds on K – experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.

When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Constructing Explanations and Designing Solutions

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Career planning requires purposeful planning based on research, self-knowledge, and informed choices.

Analyzing and Interpreting Data

Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.

Analyze complex real-world problems by specifying criteria and constraints for successful solutions.

Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.

Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Craft and Structure

Analyze data using computational models in order to make valid and reliable scientific claims.

Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed.

Innovative ideas or innovation can lead to career opportunities.

Assessment

Formative assessment:

class discussion about optimizing spaces for different functions: how should a kitchen be designed?

exit tickets

participation in class discussions on form and function in Architecture

demonstrate knowledge and understanding of vocabulary through correct usage.

Summative assessment:

answer the essential questions.

make an adjacency diagram. The diagram will be assessed with a rubric.

develop plans, sections, and elevations for a building with an unusual program that emphasizes efficient use of resources. The drawings will be assessed with a rubric.

complete writing prompt: Example. Provide three possible explanations for the placement of columns in front of a government building. Example. An adjacency diagram is used for analysis. Explain what it is and how it can be useful for analyzing a seemingly simple building.

Benchmark Assessment:

Final exam

Alternative Assessment:

Research and presentation on column placement

Integrated Accommodation and Modifications...

Integrated Accommodation and Modifications, Special Education students, English Language Learners, At-Risk students, Gifted and Talented students, Career Education and those with 504s