Unit 10: Building for the Future

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 4**
Length: **6 Weeks**
Status: **Published**

Brief Summary of Unit

Introduction: Students will design a library or senior center or other building to meet contemporary trends and anticipate future needs. The activities will be structured to use Project Based Learning strategies that include coordination with subject matter experts and a formal presentation.

Revision Date: July 2023

Essential Questions/Enduring Understandings

Essential Questions

How do buildings types and requirements evolve over time?

How are solutions developed for complex architectural problems?

What are solutions communicated to an audience?

Enduring Understandings

The requirements of a building change over time.

Research and analysis of a novel problem is essential.

Objectives

Students Will Know:

key terms: program, design loop, problem-solving design loop, artifacts, function, aesthetics.

how to make a program (design brief) for a house.

how to distinguish between a function and a room.

how to distinguish between a building requirement and a design solution.

how to critically analyze functions.

how to critically analyze designs.

the client is responsible for the program.

what historically significant house is and the factors affecting house design.

Students Will Be Skilled At:

performing research to determine the requirements of a building.

working with subject matter experts regarding technology and library operations

developing a program (design brief) for a building.

dev eloping a solution and presentation for a building.

presenting a solution for a building.

Learning Plan

Pre-assessment to determine the direction of work.

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

Lecture and discussion about the guiding questions. What is a multi-purpose room? For what purpose does a multi-purpose room perform well? What are the qualities of the perfect dining room? Do we all agree on them? Critically analyze your house. What room works exceptionally well? Why? Do people use the living room or dining room? If not, why is it there? What should be in a house? What do we call the document that tells you what the client wants? How does an architect know what to design? What special knowledge does the designer know about design?

Project Based Learning strategy: explain what major attributes make this project different (use of technology, use of subject matter experts, and presentation to critics.

Formative assessments will be conducted throughout the research problem.

Research problem(s): Identify historically important libraries; identify their attributes and characteristics. Possible oral presentation.

Formative assessments will be conducted throughout the programming problem.

Assessment

Formative

Meaningfully address the essential and guiding questions of this unit of study.

Meaningfully participate in guided question and answer sessions, group and individual discussions, and show an understanding of the purpose of the unit lesson(s), and their key terms and concepts.

Exit ticket

Summative

Design and create presentation drawings, and a prototype for an object, possibly a lamp, that demonstrates the principles explored in a problem. Presentation to be evaluated with the use of teacher and student-designed rubrics.

The presentation will be included in an electronic portfolio.

Complete written tests and quizzes on unit topics and vocabulary.

Benchmark

Midterm Exam/Final Exam

Alternative Assessment

Perform research on historical objects designed by architects.

Demonstrate the ability to utilize the design loop as a problem-solving tool.

Materials

Computer lab with AutoCAD software, one computer per student

White board with projector or Smartboard

CADD Lab including 3d printers, drill press, scroll saw and power drill, soldering iron, xacto knives, and hand tools.

Standards

TECH.K-12.1.1	Empowered Learner
TECH.K-12.1.1.a	articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
TECH.K-12.1.1.c	use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
TECH.K-12.1.1.d	understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
TECH.K-12.1.2	Digital Citizen
TECH.K-12.1.2.c	demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.
TECH.K-12.1.2.d	manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.
TECH.K-12.1.3	Knowledge Constructor
TECH.K-12.1.3.a	plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
LA.RST.9-10	Reading Science and Technical Subjects
	Key Ideas and Details
TECH.K-12.1.3.c	curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.
LA.RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
TECH.K-12.1.3.d	build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.
TECH.K-12.1.4	Innovative Designer
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
	Craft and Structure
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.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
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.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
TECH.K-12.1.4.d	exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
	Integration of Knowledge and Ideas
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LA.RST.9-10.8	Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
LA.RST.9-10.9	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
	Range of Reading and Level of Text Complexity
LA.RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
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.
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.
	Asking Questions and Defining Problems
	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.
SCI.HS.ETS1.A	Delimiting Engineering Problems
	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.
	Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
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.
	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.
SCI.HS.ETS1.C	Optimizing the Design Solution
	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.
	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.
SCI.HS.ETS1.B	Developing Possible Solutions
	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.
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.B	Developing Possible Solutions
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.4	Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.
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
WRK.9.2.12.CAP	Career Awareness and Planning
WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
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.
	Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.

Suggested Strategies for Modifications