Unit 3: Residential Architecture Design

Content Area: **Industrial Technology**
Course(s): **Auto CAD II**
Time Period: **1 marking period**
Length: **Weeks**
Status: **Published**

Unit Overview

In this unit, in contrast to the very commercial focused design processes of the previous unit, Students will be focused on the processes and challenges of residential living design. Through the focus on a tiny house project, students will also understand proper use of space, as there is not much space in the design for them to waste. Students will become familiar with alternative usage for mandatory materials, and find creative ways to have storage throughout. There is still a very client design focus on the project as well, making sure that students are including everything that is asked from the client in their design, all while being conscious that someone is going to be living there, and flow of the space is important.

Transfer

Students will be able to independently use their learning to...

- Draw upon previously learned knowledge years after it being implemented
- Utilize processes from engineering and architectural professionals in order to construct objects and solve problems
- Read and understand provided specifications for parts, tools, and objects
- Accurately generate objects when prompted, either verbally, or with provided specifications
- Follow a scheduled time frame and deadlines for project development
- Design for flow and real world circumstances being factored in

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For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand

- The Challenges of having a limited design space to work within
- How to accurately depict full and layer designs within a 2D space
- How to properly translate 2D floor plans into a 3D space
- Application of constraints towards design plans
- Creative positioning of commonly used house hold items based on limited space

Essential Questions

Students will keep considering

- What are ways that I can save space?
- What are interesting ways I can store materials given a limited space?
- How do I design smaller rooms that still include all of my needs?
- What are simple ways for me to translate 2D to 3D?
- What are the core differences between designing tiny houses vs normal houses?
- How does residential design difference from commercial design?

Application of Knowledge and Skill

Students will know...

Students will know

- Design Principles of Tiny Houses

- Methods of Alternative Storage and Conservation/Efficient Use of Space
- Constraints and How they effect the choices in design
- How to translate a 2D plan into a 3D space while keeping it to scale
- How to communicate issues with the client and address design problems and concerns effectively

Students will be skilled at...

Students will be skilled at

- Effectively utilizing AutoCAD and Inventor together to design floor plans and 3D models
- Translating 2D plans into 3D models using a mixture of AutoCAD and Inventor
- Designing for Conservation and Effective Use of Space
- Understanding Fundamentals of Tiny House Design

Academic Vocabulary

Tiny House

Pitfalls

Conservation of Space

Alternative Storage

Constraints

Modeling

Rendering

Scale

Importing

Learning Goal 1 - Tiny House Floor Plan Design

SWBAT Design a floor plan for a tiny house (400 sq ft or less) which fulfills are the requirements and specifications requested by the client

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).

TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Target 1 - Tiny House Design Specifications

SWBAT Understand all requirements asked of the tiny house design for the client

SWBAT Design their tiny house floor plan to demonstrate understanding of these requirements

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Target 2 - Pitfalls and Traps of Tiny House Design

SWBAT Avoid common issues that often appear in tiny house design plans

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Learning Goal 2 - Tiny House 3D Modeling and Rendering

SWBAT Model the design of the tiny house project in a 3D space

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance

	and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Target 1 - Development of Consistent Scale for Objects

SWBAT Scale floor plan and all contained objects to a consistent real world based scale fact for their model

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Target 2 - Importing 2D Floor Plans in order to generate 3D Models

SWBAT Translate floor plan information into 3D models

TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

Summative Assessment

- Performance Tasks
- Test/Quiz
- Benchmark Exam Drawing
- Challenge Drawing of Marking Period

21st Century Life and Careers

Formative Assessment and Performance Opportunities

- Academic Games
- Classroom Discussions
- Classwork
- Closures
- Do Nows / Warm Ups
- Group Work
- Homework
- Student / Teacher Discussions
- Think-Pair-Share
- After School and Lunch Opportunities
- Bonus Design Challenges Introduced into the Assigned Task

Accommodations/Modifications

- Room Tilesets provided to assist with students understanding concepts of limited space operation for the project
- Alternative Color Labels contained within Sample Floor Plans in order to accommodate for the student vision issues
- Project Time Frame Negotiations and Performance Evaluation for Unfinished Work, given communication with the instructor on issues
- If Vision issues with computer screens, can adjust size of text font and icons to fit the needs of the students
- If ESL, Language adjustments can be implimented into AutoCAD
- If ESL, Alternative Notes can be provided
- Preferential Seating will be provided for the sake of demonstrations, note taking, and general physical and behavioral accommodations
- 504 Accomodations
- Additional Challenging / Enrichment Tasks
- Grouping
- IEPs
- Drawing of the Month
- Scaffolding Questions
- General Use of Technology Accommondations (Adjusted to meet needs of student in accordance to 504/IEP)

Unit Resources

- AutoDesk Design Handbook
- General AutoCAD Practice Websites - https://www.investintech.com/resources/blog/archives/5947-free-online-autocad-tutorials-courses.html
- Khan Academy
- Youtube Tutorials - https://www.youtube.com/channel/UC0bEfqT1FZudcnyegNvtu1A?view_as=subscriber

Interdisciplinary Connections

LA.RH.9-10.3	Analyze in detail a series of events described in a text; draw connections between the events, to determine whether earlier events caused later ones or simply preceded them.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.WHST.9-10.6	Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
9-12.HS-ETS1-1.1	Asking Questions and Defining Problems
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking
9-12.HS-ETS1-4.ETS1.B.1	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.