

# iINNOVATE Learning Experience Design

# iInnovate Learning Experiences Include

- > Content Standards
  - Priority Standards
  - Integrated -Cross-Curricular
- > Success Skills
  - Curiosity, Diversity,
     Empathy, Critical
     Thinking, Persistence,
     Collaboration
- > Personalization
  - Student voice and choice
- > Relevancy
  - Real-world connections
- > Assessment
  - Product, project, presentation

- > Culturally Responsive Pedagogy
- > English Language Development
- > Career Technical Education

Note: The features above help us be mindful of the elements to include when planning to make a lesson/unit more robust and aligned to iInnovate learning.

Design thinking elements are embedded throughout the lesson as a way to familiarize facilitators with the process, but it is not true design thinking.

Learning Experience Planning Template

Lesson Title:	Build a Tiny House	
Grade Level:	3	
Learning Experience Description	In this project, student design teams will consult with 'clients" to learn about their budget, needs, and personal preferences for a tiny house. They use this information, along with key mathematics skills related to measurement and geometry, to design and create prototypes of tiny custom homes for their clients. Students also read about housing, tiny homes, and construction and apply what they learn from their reading to their designs and presentations.	
Prior Learning Needed:	Foundational ability to add, subtract, and multiply (or skip count)	

### Standards

## Reading:

## CCSS.ELA-LITERACY.RI.3.1

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

## Writing:

#### CCSS.ELA-LITERACY.W.3.1

Write opinion pieces on topics or texts, supporting a point of view with reasons.

## Integrated ELD

- PI.1 Interacting in Meaningful Ways, Exchanging Information and Ideas
  - Emerging: Exchanging information and ideas Contribute to conversations and express ideas by asking and answering yes-no and wh- questions and responding using short phrases.
  - Expanding: Contribute to class, group, and partner discussions including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, and adding relevant information.
    - Bridging: Contribute to class, group, and partner discussions including sustained dialogue, by following turn-taking rules, asking relevant questions, affirming others, and adding relevant information, building on responses and providing useful feedback.

# Designated ELD

- PI.1 Interacting in Meaningful Ways, Exchanging Information and Ideas
- PI.8. Analyzing language choices
  - Emerging: Distinguish how different words produce different effects on the audience (e.g., describing a character as happy versus sad).
  - Expanding: Distinguish how different words with similar meanings (e.g., describing a character as happy versus ecstatic) produce shades of meaning and a different effect on the audience.
  - Bridging: Distinguish how multiple different words with similar meanings (e.g., pleased

versus happy versus ecstatic, heard versus knew versus believed) produce shades of meaning and different effects on the audience.

# PI.9 Presenting

- Emerging: Plan and deliver very brief oral presentations (e.g., retelling a story, describing an animal, and the like.)
- Expanding: Plan and deliver brief oral presentations on a variety of topics and content areas (e.g., retelling a story, describing a science process, and the like).
- Bridging: Plan and deliver longer oral presentations on a variety of topics and content areas (e.g., retelling a story, describing a science process or historical event, and the like).

# PI.10 Composing/Writing

PI.12 Selecting Language Resources

#### Math:

### CCSS.MATH.CONTENT.3.MD.C.5

Recognize area as an attribute of plane figures and understand concepts of area measurement.

## CCSS.MATH.CONTENT.3.MD.C.6

Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

## CCSS.MATH.CONTENT.3.MD.C.7

Relate area to the operations of multiplication and addition.

#### CCSS.MATH.CONTENT.3.MD.D.8

Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. CCSS.MATH.CONTENT.3.NBT.A.2

Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

#### Science:

#### 3-5-ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

#### <u> 3-5-ETS1-2</u>

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

#### Social Studies:

3.5 Students demonstrate basic economic reasoning skills and an understanding of the economy of the local region.

CTE Connection	Career Technical Education (CTE) Pathway:
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<u>Building and Construction Trades</u> <u>Engineering and Architecture</u>

# Potential Career Paths:

**Custom Millwork**- a person who customizes wood working pieces such as cabinets shelving, custom storage,, because this work has to be customized for the specific space.

**Project Estimator**- Computes costs by analyzing labor, material, and time requirements.

**Woodworking Engineer/Drafter (CAD)**-A drafter or drafting technician is an engineering technician who makes detailed technical drawings or plans for machinery, buildings, electronics, infrastructure etc.

**Heavy Equipment Operator**- A heavy equipment operator operates heavy equipment used in engineering and construction projects. Typically only skilled workers may operate heavy equipment, and there is specialized training for learning to use heavy equipment.

**Welder**- A welder's primary duty is to join metal parts together. They may also fix holes in metal objects as well. They work on the metal components of various structures to include pipelines, **bridges**, **power** plants, buildings, refineries, automobiles, or ships.

**Civil Engineer**- Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment.

**Mechanical Engineer/Technician Mechanical**- Mechanical engineering is an engineering branch that combines engineering physics and mathematics principles with materials science to design, analyze, manufacture, and maintain mechanical systems.

**Plumber**- A plumber is a tradesperson who specializes in installing and maintaining systems used for potable water, sewage and drainage in plumbing systems.

**Electrician**- An electrician is a tradesman specializing in electrical wiring of buildings, transmission lines, stationary machines, and related equipment.

**Building Inspector**- building inspectors or approved inspectors. They ensure that new buildings, alterations, installations and extensions meet the regulatory standards of safety, sustainability, accessibility and design.

	City Planner			
Success Skills	Check the success skills that are present in the lesson.			
	☐ Curiosity	☐ Persistence		
	☐ Diversity	☐ Collaboration		
	☐ Empathy			
	☐ Critical Thinking			
	Ç			
Essential Question	How can we use the engineering and design process to design a tiny house that meets the needs of our clients and fits in their budget?			
Learning Progression				
Learning Intentions "I am learning"				
Success Criteria "I can" Surface, Deep, & Transfer	Build Knowledge (Surface) What/ How	Make Meaning (Deep) Why	Apply Understanding (Transfer) When, Where, Should	
ELD				
English Language Objective "I canin speaking, listening, reading, writing"				
Academic Vocabulary	Area Base Blueprints Floor Plan Layout Prototype Perimeter Place Value Two-Dimensional (2D)			

	Three Dimensional (3D)	
	Units	
	Unit Square	
	Designated ELD, suggested vocabulary	
Culturally Responsive Practices		
SEL Practices		
Classroom Management Needs	Create heterogeneous groups of students.  Manage time and materials.	
	Partner students that know how to play Minecraft with students that might need support.	
	Students at the ELPAC Novice or ELPAC 1 Level need peer interaction and teacher support to chew on ideas and practice language.	
Business / Industry Involvement (field trips	Architect Civil Engineer	
guest speakers)	Realtor	
	Building contractor	
Materials/	Print Out	
Innovation Lab Use	Blueprint	
Innovation Lab ase	Individual room budgets or Overall Tiny House Budget Sheet	
	Bedroom/Loft Tiny House Budget Sheet	
	Bathroom Tiny House Budget Sheet	
	Kitchen Tiny House Budget Sheet	
	General Tiny House Budget Sheet	
	Living Room Tiny House Budget Sheet	
	Other Room Tiny House Budget Sheet	
	Client Profiles	
	Design teams	
	Materials Catalog	
	OREO graphic organizer	
	Consumable Materials	
	Crayons	
	Construction paper	
	cardboard	

Graph paper

Pencil

Scissors

Tape

## Resources

Design Thinking Coloring Page

How to design the perfect room

Read aloud of If I Built a House

<u>Tinyhomebuilders.com</u>

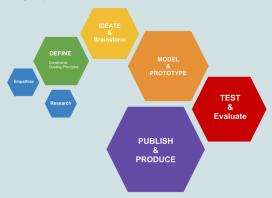
Tiny House Nation

Tiny House article

What is a tiny house?

# Learning Experience Design Plan

Let's review the phases of the design process:



Research/Empathy: We learn about a topic.

Defining our problem: We define our problem.

**<u>Ideate and brainstorm</u>**: This is where you come up with ideas with your partner or team.

**Prototype**: This is where you sketch or draw what your ideas would look like.

Model: This is where you build the best idea!

**Test:** This is where we test to see if your idea works!

**Produce**: If it is good, we can make more.

Recommended: Design Thinking Coloring Page



# **Empathy-** What is the issue?

Empathy is understanding what another person is experiencing OR feeling what someone else is feeling.

What would your **dream house** look like? Allow students to partner up to design their dream house.

After students have shared their designs, allow the class to have a gallery walk to view designs.

Gather students to discuss their designs.

What did you consider when you were building your dream house? Do you think this would make a good house in real life? What do people have to consider when they are planning a house?



# **Research**- What is a tiny house?

# Show the tiny house video.

Today, we will begin the design process to create tiny houses. What are some things we need to consider?

What do we know about tiny houses?

What needs to be included?

## Need to Knows:

What is our budget?
What do you want in your tiny house?
How big can the house be?
How do you draw a blueprint?

Show the youtube read aloud of If I Built a House

At 4:03 pause to show the prototype that the boy built.

Explain that students will create a **prototype** of a tiny house.

Students will also make a <u>blueprint</u> (floor plan or layout terms can be used also) of their tiny house that shows all of the rooms. Use <u>tinyhomebuilders.com</u> for students to view tiny home plans.

Youtube video of basic design



**Define**- Clearly define the need you are trying to solve, sharpen key questions.

**Constraints-** Just like we have rules for sharing that have consequences if we break them, design thinking projects have rules that must be followed. When we identify constraints, we are looking to see all the rules we need to follow for the project. Constraints are also known as limitations. We do not have endless supplies, so the supplies we have to work with are constraints. Constraints help us separate what is real from what is in our imagination.

For example, if I was needing a pencil to write with, I could get one from the pencil fairy (in my imagination) or I could get a pencil from the pencil bin in our classroom. Knowing that the pencil fairy is not real, and that in my classroom we have a specific spot for pencils, I know that that is a constraint. As much as getting a pencil from a pencil fairy sounds fun!

Students will also use graph paper to design their plan-using inch to feet ratios.

Show clips from <u>Tiny House Nation</u> on youtube to give students ideas about what their tiny house could look like.

# Constraints:

Budget: \$10,000

Interior Size: Between 100 sq. ft- 255 sq. ft- area Dimensions: 8.5 ft wide; 30 ft. long; 13 tall- perimeter

Items that must be included in your design:

Trailer Walls Roof

Electricity Plumbing

## Heating

Outdoor space is not included in the building constraints but must be included in your budget.

Custom items can be arranged with your teacher.



**Ideate and Brainstorm**- Brainstorm and create solutions, no idea is a bad idea! Narrow your ideas.

Put students into <u>design teams</u> of 4 with these job descriptions:

- Architect- The architect oversees the overall design on the house, checking to ensure the square footage is accurate. The architect makes sure all jobs are completed to the highest quality.
- **Finance manager** The finance manager is responsible for keeping track of the cost of the project. Each item bought or spent on the house needs to stay under the budget.
- **Designer** The designer is responsible for adding style and artistic flare to the final product. They decide the color scheme in the house and overall aesthetics of the home. They are responsible for making the clients vision come to life.
- Material Specialist- The materials specialist is responsible for shopping and finding the best materials and items to build the house. They work closely with the designer and budget analyst to ensure design and cost are meeting regulations.

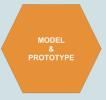
Have them select a "Client Profile"

Once students are in teams, have them review their Client Profile and begin to draft plans on graph paper, being sure to review all their client needs.

• Students will need to convert feet to inches on their graph paper to determine the **area** and perimeter of their tiny house. Use this <u>blueprint page</u> to help teams.

Remind student teams to go back to the client profile and constraints to determine that they are following all input.

Check with teams to make sure they are following client profile and constraints.



# **Model and prototype-** Build representations of one or more ideas

Have students use the <u>tinyhomebuilders.com</u> website to compare their plans to tiny home plans.

Have student teams go back over their client profile to include the needed items for the inside and outside of the tiny house.

Students must browse the <u>Tiny house Materials Catalog</u> to identify items they will need to build their tiny house.

Students should keep track of their budget using the budget sheets created for each room.

Overall Tiny House Budget Sheet

Bedroom/Loft Tiny House Budget Sheet

Bathroom Tiny House Budget Sheet

Kitchen Tiny House Budget Sheet

General Tiny House Budget Sheet

Living Room Tiny House Budget Sheet

Other Room Tiny House Budget Sheet

Once teams have completed their design and budget, the team may construct the three dimensional prototype of the tiny house using construction paper, glue and tape.



**Test and Evaluate**- Test your prototype. Validate ideas and get feedback to improve. Make adjustments as necessary

Have each group check the others to ensure that the teams met the needs of their client.



# Publish and Produce- If it works, share it with the world!

After students have completed their design to fit the client profile and budget constraints, have teams create a persuasive paragraph that tells why their design fits the needs of the client. Have each individual write a persuasive paragraph. Use this graphic organizer. Once all members of the team have completed the paragraph, the team can combine their strongest ideas to use as part of their client proposal. Have student teams include a final budget on paper.

Closure Exit tickets, feedback for next lesson	
Assessment	Tiny House- all components rubric Project Rubric- Creativity and Innovation Presentation Rubric
Extensions	Students will pitch their blueprint, persuasive paragraph, and prototype to their clients for approval.