ACTIVITY NAME:	DESIGN:
TINY HOMES CHALLENGE	Mini A-Frame House

ACTIVITY NAME:

Show your students that they have the power to shape and create their world. In this activity, students will put their architectural and engineering skills to the test by designing an efficient Tiny Home that incorporates their knowledge of energy demands, light sources, and housing must-haves.

THEME:

Entrepreneurship: Practicing design thinking, collaboration, and prototyping
STEAM: Infusing creativity and art into engineering and science principles

GRADES:	PRINT TIME:	ASSEMBLY:	MATERIALS, TOOLS, AND SUPPLIES:	
6-12	53 minutes	60 minutes	2x Plywood (Finished) Medium 2x Clear Acrylic Medium	Optional: 1x Natural Leather Medium Adhesive sticky notes for feedback

THEMATIC QUESTIONS:

How can we reduce our carbon footprint by creating an efficient Tiny Home?
How can we think about design as we plan, prototype, and refine our homes?

STANDARDS FOR STUDENTS:

ISTE Standards for Students

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

1.5 Computational Thinker– Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

NGSS Science & Engineering Practices

- Developing and using models
- Constructing explanations (for science) and designing solutions (for engineering)

PREPARATION:

Have students read through the activity details to familiarize themselves with the steps. They should gather all of the materials needed to print, assemble, and customize the Tiny Home. You might have them work in small groups to print and assemble prototypes using the original Tiny Home design.

SECTION:

1. PLAN

Guide students to...

1. Answer: "How might we design a house to limit its environmental impact?" Explore and research ideas using the Internet or other resources. Write these ideas down independently or work in groups to capture their collaborative thinking. Allow time for thinking and time for sharing with others.
2. Consider: "What are the different environmental factors we need to consider to create an efficient tiny home?" Generate lists and then collect all of the ideas on the board or in a digital format.

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SECTION:

1. PLAN (CONT.)

3. Work independently or in groups to design plans for an efficient tiny home using paper, white boards, or digital creation tools. If needed, students can search for ideas and inspiration on the Internet.?
4. Consider: "What are the different environmental factors we need to consider to create an efficient tiny home?" Generate lists and then collect all of the ideas on the board or in a digital format.
5. Collect the feedback on their plans and make adjustments. Repeat the gallery walk feedback activity 1-2 times, as possible.

SECTION:

2. CUSTOMIZE AND CREATE

In small groups...

1. Have students explore design files in the Glowforge app and a pre-printed and assembled Tiny Home. As they explore, ask them to consider things like the features of the Tiny Home that are similar to their plan, features that present efficiency challenges, and how this design might be updated using their efficiency plans.
2. Students should use their plan to customize and create the design for their Tiny Home print in the Glowforge app. Encourage them to think about what items and features they need to include in their design and the strengths and weaknesses of their design. They can use the Glowforge Trace tool or add etchings to their design to add aesthetic or functional details.
3. Review each group's design prior to printing.
4. If creating prototypes prior to doing final prints, use cardboard for test prints. Just remember that if their design uses joinery such as slots or finger joints, these may need to be adjusted to suit their prototyping materials.

SECTION:

3. USE

Ask students to...

- Test their designs. What changes do they need to make based on the results? Have them list challenges and solutions.
- Revise their designs, and repeat steps as necessary.
- Showcase their Tiny Homes around their school.

Pro Tips:

Consider doing a test print on an available, recyclable material, such as cardboard.

Just remember that if your design uses joinery such as slots or finger joints, these may need to be adjusted to suit your prototyping materials.

When choosing test materials, make sure to use materials that are laser compatible. You can learn more about what materials are compatible with Glowforge here.

Invite a local architect to provide guidance and feedback throughout the design process.

REIMAGINE:

- How could the Tiny Home design be adapted to suit a literary or historical figure? Ask students to add artifacts to the printed design that the person or character may have owned. Add possessions that best capture the person.
- How could students alter the Tiny Home design to become a greenhouse for plants? Consider how variables like the location of the greenhouse or soil type can impact plant health.

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REMIX:

- Use the Glowforge's Trace Tool feature to capture hand drawn designs and incorporate them into their prints. How might they use this feature to enhance their Tiny Home designs aesthetically and functionally?
- Further customize their Tiny Homes by using markers, paint, or pens to add artistic details. How can the use of color serve both an aesthetic and functional purpose?
- Investigate the needs of unique climates and how climates may impact home designs. Have each group select a different climate for its design. How does a region's climate impact local home design?
- Pair the Tiny Home activity with a unit on environmental impact. Use a carbon footprint calculator to assess their current impact on the climate. How might students incorporate their personal footprint data into their design?

RUBRIC:

Areas for Improvement	Criteria	
	Developing and using models I was able to use the design process to create an efficient Tiny Home.	**Evidence of Exceeding Criteria**
	Developing and using models I was able to identify elements of an efficient home and explain how my design addressed those needs.	
	Computational Thinker I was able to test and refine my design to improve its efficiency.	