Tiny House, Big Space!

Unit plan for Upper Elementary Gifted Students.

Susan Horton (7/20/2017)

ABSTRACT

Students will design and build a model of a tiny house in a city of their choice that is environmentally friendly while applying area, perimeter, and geometry skills and staying on a budget.

INTRODUCTION TO UNIT:

Rationale:

The following unit plan focuses on the real-world application of math concepts used in building and designing homes, while practicing problem-solving skills (which are one of the most sought after skills in the work force today), collaboration, and using the imagination.

This unit will be especially beneficial/appropriate for gifted learners as a way to assess their ability to use a variety of skills in order to be successful, such as research skills, working in teams, writing composition, and presentation skills. This challenge is very student-driven, with the teacher acting primarily as the facilitator for the majority of the lesson. Students are expected to take ownership of their design and will reflect on the project as a whole at the end of the lesson.

Prior to this project, students should have a basic understanding of the various ways that humans impact the environment, such as water consumption, deforestation, “carbon footprint”, etc. Some students may also have a basic understanding of alternative “green” energy sources, though this is not required, as research will be conducted about “green” technologies. Students will also need a basic understanding of geometry, area and perimeter.

Differentiation and Population for Gifted Learners:

Differentiation includes the design and/or selection of curriculum, the selection and use of instructional practices, including grouping strategies, varied resources, and variations to the pacing of instruction, and the assessment of learning, all of which rely on assessment evidence demonstrating learner differences. Gifted students are often able to make connections between ideas, subject areas and concepts. Encourage students to see the "big picture" by connecting history to art, science and math and examining how one influences the other. Use choice and flexibility to allow students to find their own information about the green technologies and tiny houses and how they impact the sustainability of the environment.

All gifted students would benefit from this unit. It is especially of interest for students who are gifted in math and science. All socio-economic backgrounds will benefit, as the unit is not biased on location or race as students discuss budget and environmental issues. Students who enjoy art and creating new and innovative designs will also enjoy this unit, as they will be instructed to construct a scale model of their tiny home at the end of the unit.

Goals and Outcomes:

Content:

Goal 1: NC Essential Standards for Social Studies **4.L.1.3** Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion). Understand of the use of green technologies and how they impact the sustainability of the environment.

Students will know that:

- Humans impact the environment both positively and negatively
- The use of green technology impacts the sustainability in the environment.
- Humans can adapt their behavior in order to conserve the materials and preserve the ecological systems that they depend on for survival.
- Sustainability will impact choices made for materials/functions within the home and can have a major impact on the environment, whether positive or negative.

Process:

4.E.2.2 Explain how scarcity of personal financial resources affect the choices people make based on their wants and needs.

Students will be able to:

- Analyze resources about green technology and eco-friendly cities.
- Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address their Tiny Home Challenge.
- Determine the sustainability of tiny homes and their impact on environment.

Concept:

To understand the concept of sustainability

Students will be able to:

- Determine what sustainability is and how it impacts the environment through the study of tiny homes and green technologies.
- Green technologies influence the amount of sustainability in a tiny home and the environment.

Assessment Plan:

This activity puts the designing into the hands of the students. Students will dive deep to show they understand the how (and why) math concepts such as area, perimeter, and geometry are used in building a home. This project integrates multiple elements such as problem solving, collaboration, design, and planning that connect concepts across multiple platforms.

The objective of this project is for students to design and build a TINY HOUSE, while applying area, perimeter, and geometry skills. This learning activity also focuses on designing elements, using multiple problem solving skills, and collaborating in the classroom. It allows for easy differentiation, so students can work at a pace they will be successful at.

With this resource students WILL CREATE a miniature 3D version of a tiny house. The sizes of the houses will all be the same, but each student will create a unique

version based on their own ideas, imagination, and application of skills.

The performance task asks students to design a house that contains almost 20 different pieces of furnishings (all in one place) and then finds the area and perimeter of each item after they have done so. They're also asked to apply geometric skills; such as shapes and even developing their own nets (what a three dimensional shape looks like if laid out flat) to create furniture. Students are also asked to make sure their home is sustainable by including at least 10 different "green" technologies into the design of their home.

TEACHER NAME			Lesson #
Susan Horton			1 /Day 1
MODEL	**CONTENT AREA**	**GRADE LEVEL**	
PBL	**Science**	**3/4**	

CONCEPTUAL LENS	LESSON TOPIC
Sustainability	**Tiny House Movement**

LEARNING OBJECTIVES *(from State/Local Curriculum)*
4.L.1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Sustainability impacts Environment	***How does sustainability impact environment?***

CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
Students will know that: • Humans impact the environment both positively and negatively • The use of green technology impacts the sustainability in the environment. • Humans can adapt their behavior in order to conserve the materials and preserve the ecological systems that they depend on for survival.	Students will be able to: • Analyze resources about green technology and eco-friendly cities. • Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address their Tiny Home Challenge. • Determine the sustainability of tiny homes and their impact on environment.

GUIDING QUESTIONS ***What questions will be asked to support instruction?*** ***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding***		
Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
What is sustainability? **What does it mean if something is sustainable?** **How is our world sustainable? If it is not sustainable, what are some ways we can make it sustainable?** **How does housing fit into this discussion of sustainability?**	**What is the Tiny House Movement?** **Based on the video, Planet 100, how can a tiny house help make our world more sustainable?** **What locations would benefit most from constructing tiny homes?** **What do we really need to be comfortable in our living environment?** **Who is in the tiny housing community? What does this "community" stand for?** **How can tiny homes contribute to the economic, environmental and social aspects of sustainability?**	**How does green technology affect human activity on the environment?** **What types of green technologies did you discover would be best to sustain the environment?** ***How does sustainability impact environment?***

DIFFERENTIATION ***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***			
Content	**Process**	**Product**	**Learning Environment**
	Teacher can step in to give more or less support to groups based on research for sustainable cities.		**Instead of letting students choose partners, the teacher could have predetermined groups based on readiness.**

PLANNED LEARNING EXPERIENCES
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Welcome students into the classroom and tell a little about yourself. On the board have PowerPoint icebreaker game "This or That" ready. Tell the students we are going to learn a little bit about each person in the classroom. Flow through the first couple of slides to give direction. Then begin the game. **Encourage conversation.** The point of this game is to get students talking, so be sure to allow discussion time for each question. If students are not interacting with each other as much as you'd like, call on a few students in between questions to share their thoughts with the class. **Allow for interpretation.** At times, some students will think a topic does not apply to them, or they will say they don't have an answer. Allow students to re-interpret questions to fit them better: For example, if a question refers to TV and the student doesn't have TV, they can talk about a book instead. This should take no more than about 5 to 10 minutes of class time.

PROBLEM ENGAGEMENT

Teacher will begin the lesson by asking the students the pre-lesson questions. Allow students to brainstorm and write ideas on the board, regardless of if they are correct or not.

The teacher will then show the Planet 100 presentation https://youtu.be/QFrqTFRy-LU
This presentation gives societal, environmental, and economic data for the world if it were proportional to a single community of 100 people. (For example, 53 out of 100 people in the world are Asian). This is meant to show the students the current conditions of the world.

After the presentation, the teacher will ask the students again, "Based on Planet 100, how is our world sustainable?" The students will discuss the possibilities, which should lead to a realization that our world is not sustainable as it in now.

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

INQUIRY AND INVESTIGATION

Teacher will explain that one way people are trying to fix sustainability is by developing "green" tiny homes. The teacher will explain that in this project, the students will be researching tiny homes for one person in a city of their choice. Their tiny home must be environmentally and economically friendly based on the needs of the city they chose.

Students will count off in to groups of 3-4 and begin researching 3 different cities that they would like to live in as an adult. As they research, the students should fill out the handout "Potential Cities." Once students have gathered the information on their cities, they will then research 10-15

"green technologies" they would like to use in their tiny home and place the information on the People, Profit, Planet Analysis grid

PROBLEM DEFINITION
Following inquiry and investigation of the problem, group members will debrief and identify the solution that is most likely to address how sustainability impacts the environment and prepare to present their solutions to the class.

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

PROBLEM RESOLUTION
After the appropriate amount of work time, the teacher will facilitate a class discussion about student's findings. Ask the During lesson questions. Discuss the similarities and differences of each city chosen and why they were chosen. Discuss also the impacts of the green technologies and how it affects where they plan to live. After selecting the city, students would revisit the green technologies and decided which one is the best fit.

Elaborate *—Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

PROBLEM DEBRIEFING
Ask the After Lesson questions. Teacher will present the following question: Are tiny houses sustainable and how do they impact environment? Divide students into 2 groups-One group will be tasked with brainstorming reasons why tiny houses ARE sustainable and the other group examines why they are NOT sustainable. Allow students to discuss with their partners and generate a list of reasons why they think tiny houses are or are not sustainable. Students will utilize the computer or tablet to search for valid reasons if necessary.
An example, if needed, is below:
Positive:
"*The tiny house movement makes homeownership possible for people who couldn't otherwise afford it. It also gets major points for sustainability. Here's why tiny homes and small homes contribute to sustainable living:*

1. ***They reduce the need to*** *fill your space with waste**. You can't be a pack rat if you don't have anywhere to put your stuff.*
2. ***They can use sustainable building materials.*** *Some people have built their tiny home with salvaged material collected from dumps, neighbors, or Craigslist; others have purchased homes from companies that use recycled or sustainably-sourced materials.*
3. ***They can be incorporated into subdivisions.*** *Micro-apartments are already popping up in New York, San Francisco, and Chicago. Tiny home subdivisions can be used to revive urban spaces and declining rural communities.*
4. ***They can be fitted for life "****off the grid****"*** *Some homes have the typical amenities of a "habitable structure," like running water, flushing toilets, and electricity. Others take advantage of outdoor composting toilets, and solar panels for electricity generation.*
5. ***They consume and waste less energy.*** *It doesn't take much to heat or cool a living space the*

size of a McMansion closet."

Negatives:

1. *Often land outside of city limits is sparse and not available for purchase or rent for a tiny house.*
2. *Zoning laws do not allow for tiny homes to be built in certain areas.*
3. *Tiny homes can often cost more than a traditional home because of special permits, special architects must be hired to complete the home, or features that must be custom built to fit in such a tiny space.*

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Students will be assessed formatively throughout the lesson by their explanations and discussions in their small groups and as a whole class. The students will answer the post-lesson questions and reflect on how sustainability impacts environment.

Group Member Names:_____

TINY HOME CHALLEGE- POTENTIAL CITIES

Research three different cities that you would like to live in when you are an adult. Detail the specific information about each city in the table below.

Questions to answer about each city:	**My Three Potential Cities:**		
	City 1:	**City 2:**	**City 3:**
What is the climate like in this city?			
What societal factors (government/economy) could impact the house you build in this city? Are "green" home common/supported in this city?			
What types of resources are immediately available in your area? What types of renewable resources would work well in this city?			
Additional information about the city that is important:			

Group Member Names: _____

People, Profit, Planet Analysis

Detail the specific information about each green technology in the table below.

Name of technology (Ex. Windmill) Is this a good technology for your chosen city?	Technology type (Ex: Renewable Wind Energy)	How does it benefit **People**? Think of why you would want to buy it. In what ways, if any, does it help you stay healthy or make your life easier?	How does it benefit **Profit**? How much does it cost? Is it a short-term or long-term return on investment?	How does it benefit the **Planet**? Be specific. Include facts and statistics
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Rubric – Tiny House Challenge

Group Members:

_____

Tiny House Criteria for each city: **Green Technologies:** To be considered a "green" build house, the design must include 11-15 creatively implemented green technologies. **People, Profit, Planet Sheet:** Each green technology is clearly defined and detailed.

Power Point Day 1
https://drive.google.com/file/d/0B3Sc2iHmNlhRdE5Zc1pTX1BLZnc/view?usp=sharing

TEACHER NAME			Lesson #
Susan Horton			2/Day 2
MODEL	**CONTENT AREA**	**GRADE LEVEL**	
VTS/Socratic	**Math**	**3/4**	
CONCEPTUAL LENS		**LESSON TOPIC**	
Sustainability		**The Tiny House Movement**	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

CCSS.ELA-LITERACY.RI.4.1
Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-LITERACY.RI.4.2
Determine the main idea of a text and explain how it is supported by key details; summarize the text.
CCSS.ELA-LITERACY.RI.4.3
Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
CCSS.ELA-LITERACY.RI.4.7
Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
CCSS.ELA-LITERACY.RI.4.8
Explain how an author uses reasons and evidence to support particular points in a text.

Additional Standards Addressed

North Carolina Essential Standards – Social Studies

4.E.2 Understand the economic factors when making personal choices.
4.E.2.1 Explain how personal financial decisions such as spending, saving and paying taxes can positively and/or negatively affect everyday life.
4.E.2.2 Explain how scarcity of personal financial resources affect the choices people make based on their wants and needs.

THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?*	**THE ESSENTIAL QUESTION** *(What question will be asked to lead students to "uncover" the Essential Understanding)*
Sustainability Impacts Environment	***How does sustainability impact the environment?***
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
Student will know that: • It is important to meet the needs instead of the wants. • Certain features of a home are most important. • The amount of space will affect what features are selected. • Sustainability will impact choices made for materials/functions within	Students will be able to: • Analyze resources in order to make plans • Use problem solving and reasoning • Evaluate eco-friendly materials used in the tiny house. • Analyze personal and social perspectives in relation to tiny houses. • Explain effective decision making and

the home. • Students will identify what tiny houses are and why they are a trend in society today.	money usage

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
• What do you see in this picture? • What does this picture make you wonder? • How could we answer some of your I-Wonder statements by just looking? • Where else could we begin to seek answers? • If you could build the home of your dreams, what features would that home include? • Of those features, which ones are sustainable resources? • How do you think those features would impact the environment?	• Why did Jay Shafer build his tiny house? • What makes Jay Shafer's house sustainable? • What do you think about living in a tiny house? • Why do you feel that way? • In what ways have your views changed since learning about tiny houses?	• What was the one theme or "big idea" you discovered through this seminar? • What concepts did you explore as a result of this seminar? • What generalizations could you make about the sustainability and impact on the environment of tiny houses? • Why are some people choosing to move into tiny homes? • What are some of the things that tiny homes have that almost every home has? • Why do some tiny houses have wheels? • In what ways is a tiny house sustainable? • In what ways can a tiny house impact the envirnonment?

DIFFERENTIATION ***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***			
Content	**Process**	**Product**	Learning Environment
Content for this learning experience represents above grade level material for this group of students, therefore it is more complex in nature.	Students will participate in VTS and Socratic seminar. Students will facilitate the seminar themselves and will be responsible for crafting questions which maintain the integrity of the seminar.		Students will work in a variety of environments in this learning experience; independently, small group, and seminar.

PLANNED LEARNING EXPERIENCES
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*
Have this picture of Jay Shafer 's house displayed on the screen with the question "What do you see in this picture?" Students are to write down their initial thoughts about the picture. After a few minutes, have students share their thoughts.

Write down students' responses so they can refer to them later. What do you see in this picture? What does this picture make you wonder? How could we answer some of your I-Wonder statements by just looking? Where else could we begin to seek answers? Invite students to focus on the small structure in the background of the picture. Ask students to describe what they see. Students are likely to describe the structure as a small trailer or a dollhouse or something along those lines. The picture actually shows Shafer sitting in the doorway of his tiny home." The structure in the background is another tiny home" that he has built. He builds tiny homes for people who want to keep their lives simple and cut costs. Some people are saving money and conserving energy by moving into homes the size of a closet.

Invite students to answer this question:

If you could build the home of your dreams, what features would that home include? How would those features meet sustainability needs? In what ways would those features impact the environment? Ask students to share what they think it would be like to live in a home that size.

Take a moment to use chalk to mark out on the classroom floor a rectangle the size of Shafer's 8- x 12-foot home to give students a perspective about the size of his home.

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Each student will be given a copy of the article Could a Tiny Home Be the Home for You? (EducationWorld.com) Each student will be asked to read the first page of the article silently. Once all students have read the first page, the teacher will facilitate a "close reading" .

Arrange students into two small groups. Group 1 will read *All the Comforts of Home by* Chris Smith. Group 2 will read *Downsizing to 100 Square Feet* from CNN American Morning.
Each student in the group will read aloud the paragraphs of the story. As that student reads, other might underline important information or write notes in the margin of the story. Each group should craft 5 questions as a result of their close reading. They are not to discuss the story at this time.

Explain - *Students communicate what they have learned so far and figure out what it means. This*

phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.

When groups have completed their task the teacher asks the following questions:

- Why did Jay Shafer build his tiny house?
- What makes Jay Shafer's house sustainable?
- What do you think about living in a tiny house?
- Why do you feel that way?
- In what ways have your views changed since learning about tiny houses

Students respond to the questions orally. Multiple responses representing the different perspectives are allowed.

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Students are divided into two groups. One group will compose the inner circle of the Socratic Seminar; one group will form the outer circle of the SS environment. The inner circle members begin the dialogue while the outer circle members take notes about the dialogue, craft questions they have about the dialogue and observe one participant of the inner circle (their partner for the seminar). The leader, one students designated by the teacher, will begin the Seminar with one provocative question. Inner circle students will respond in a dialogue fashion throughout the seminar.

Opening questions might include: (If the designee does not have an opening question, these could be used. These questions could also be inserted if the dialogue during the Seminar falters).

- What was the one theme or "big idea" you discovered through this seminar?
- What concepts did you explore as a result of this seminar?
- What generalizations could you make about the sustainability and impact on the environment of tiny houses?
- Why are some people choosing to move into tiny homes?
- What are some of the things that tiny homes have that almost every home has?
- Why do some tiny houses have wheels?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Ask students to take a look at the list of things their dream homes" might include. Ask: What do you think about your list now that you've read the story about tiny homes? What will be the residual impact of the Shafers if the Kastrinos ever live in a tiny home like the ones Jay Shafer and the Kastrinos family live in? Discuss the Think About the News question "Think about all of the 'stuff' in your bedroom. Make a list of the items in your room that you really need and the items you could live without." Have students create a two-column chart with one column labeled

Things I Really Need" and the other labeled “Things I Could Live Without." After students have created their lists -- with at least 10 items in each column -- challenge them to consider their lists of “Things I Really Need" and move two or three of them into the “Things I Could Live Without" column. After they have completed that exercise, take time to let students share how they felt about having to pare down their possessions in this way. How would these changes help a tiny home become more sustainable? How will the sustainability impact the environment?

Picture of Jay Shaffer:

News article: Used for lesson
http://www.educationworld.com/a_lesson/newsforyou/pdfs/newsforyou109-download.pdf

Power Point Day2
https://drive.google.com/file/d/0B3Sc2iHmNlhRd0tmcFNpa1ZHWTA/view?usp=sharing

TEACHER NAME			Lesson #
Susan Horton			3/Day 3
MODEL	**CONTENT AREA**	**GRADE LEVEL**	
PBL	**Math**	**4**	
CONCEPTUAL LENS		**LESSON TOPIC**	
Sustainability		**The Tiny House Movement**	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

Measurement and Data

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

Additional Standards Addressed:

North Carolina Essential Standards – Social Studies

4.E.2 Understand the economic factors when making personal choices.

4.E.2.1 Explain how personal financial decisions such as spending, saving and paying taxes can positively and/or negatively affect everyday life.

4.E.2.2 Explain how scarcity of personal financial resources affect the choices people make based on their wants and needs.

THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?*	**THE ESSENTIAL QUESTION** *(What question will be asked to lead students to "uncover" the Essential Understanding)*
Sustainability impacts Environment	***How does sustainability impact environment?***
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
Student will know that: • It is important to meet the needs instead of the wants. • Certain features of a home are most important. • The amount of space will affect what	Students will be able to: • Consider their own perspectives, interests, and ideas as they generate blueprints for an eco-friendly "tiny home." • Analyze resources in order to make

features are selected. • Sustainability will impact choices made for materials/functions within the home.	plans • Estimate quantities needed • Create a budget • Select and apply mathematical concepts and calculations to solve real-world problems. • Use problem solving and reasoning

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
• What does an architect do? • What is a blueprint? • How does an architect approach designing a blueprint? • How does the requirement of sustainability impact the design of the home? • How does the sustainability impact the environment around the tiny home?	• What tools will you use to create your blueprint? • What unique features will your home have that support sustainability? • What tools or resources will you use to make sure that furniture and appliances will fit in your tiny home? •	• How did you decide what to do first when designing your tiny home? • What strategy did you use to determine the total area of your home? • What other mathematics did you use as you created your blue print? • If the home you designed was greater than 400 sq. ft., what strategy did you use to fix this? • In what ways did you make sure your tiny home was sustainable? • How does the area of a home impact its sustainability in the environment?

DIFFERENTIATION ***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***			
Content	**Process**	**Product**	**Learning Environment**
	Students will apply knowledge of geometric skills to an open-ended problem-solving experience to create an innovative home design. Students will be using inference to make sure the home is sustainable for the environment.	Students will apply knowledge of geometry to develop their own nets to create furniture and other features of the tiny home. A "**Geometry Net**" is a flattened out three dimensional solid (a three dimensional shape) -- like a cube, a prism or a pyramid. When you cut out the "**net**", fold it and glue it together you can see what the three-dimensional shape looks like.	

PLANNED LEARNING EXPERIENCES
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

As students walk into the classroom, have a sample blueprint displayed on the board for the students to study.
Explain that …"people all over the world have discovered the benefits of living in "tiny homes." A tiny home costs much less than a standard home, requires less energy, is better for the environment, and reduces the amount of clutter people typically collect. Most tiny homes have less than 400 heated square feet. Preview the PBS video titled "Tiny House Movement".

Examine the sample blueprint that was displayed a the beginning of class
Ask:

- How can you determine the area of space within the tiny house? *Encourage students to use the formula for area –Length x width.*
- What strategies can be used to find the total area of the home? *The porch is not included in the area since it is not a heated space.*
- How does sustainability to the environment impact the design of the home? (Students should be able to answer this question based on the previous lesson)

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

PERFORMANCE TASK: The typical tiny home is shaped like a rectangular shoebox. In order to prove that a tiny home does not have to be boring and rectangular in design, a local architect is having a contest to see who can generate a blueprint for the most innovative tiny home. Our class is part of the Green Build Society of Durham, NC. The architect has asked us to create a tiny house that will be shown off at the Tri-City Realtor Convention as the model home for future tiny home buyers. You are responsible for designing a blueprint for the perfect tiny house. It will include the layout, appliances, plumbing features and furniture. You will use real-world math skills to finish this project. You will also need to showcase ways your tiny house is sustainable and explain how your house will have a positive impact on the environment.

After reading the task, ask students to silently think about the following questions:

- What tools will you use to create your blueprint? (*ex. Graph paper, ruler, calculator, word processing)*
- Many tiny homes feature lofts, rooms that have multi-purposes, outside cooking spaces, gardens, composting areas, and patios. What unique features will your home have that support the sustainability of your tiny home?
- What tools or resources will you use to make sure that furniture and appliances will fit in your tiny home? (*ex. The internet or catalogues to determine dimensions of furniture and appliances*)

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

The City Counsel is working on approving a space within the city that will be zoned for your tiny house. Your house must fit on a 750 square foot plot of land that is 30 feet long. The home must be no longer than 400 square feet. In order for people to walk around the outside of the house, each side of the tiny home must be at least two feet away from the perimeter of the land. If you plan to have green technologies *outside* of the home, you must consider the impacts on the environment (positive and/or negative), the aesthetics (or how the exterior of the home looks), and the sustainability of the home. How will you make sure you are following zoning laws and make sure your home has a positive impact on the environment?

Elaborate *—Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Have students share their blueprints. Conduct a whole group discussion about the strategies and mathematics used to complete the task. Discuss any difficulties that students may have encountered and strategies for rectifying these issues (ex. The home was a few feet too big; the house was too close to the perimeter of the land).

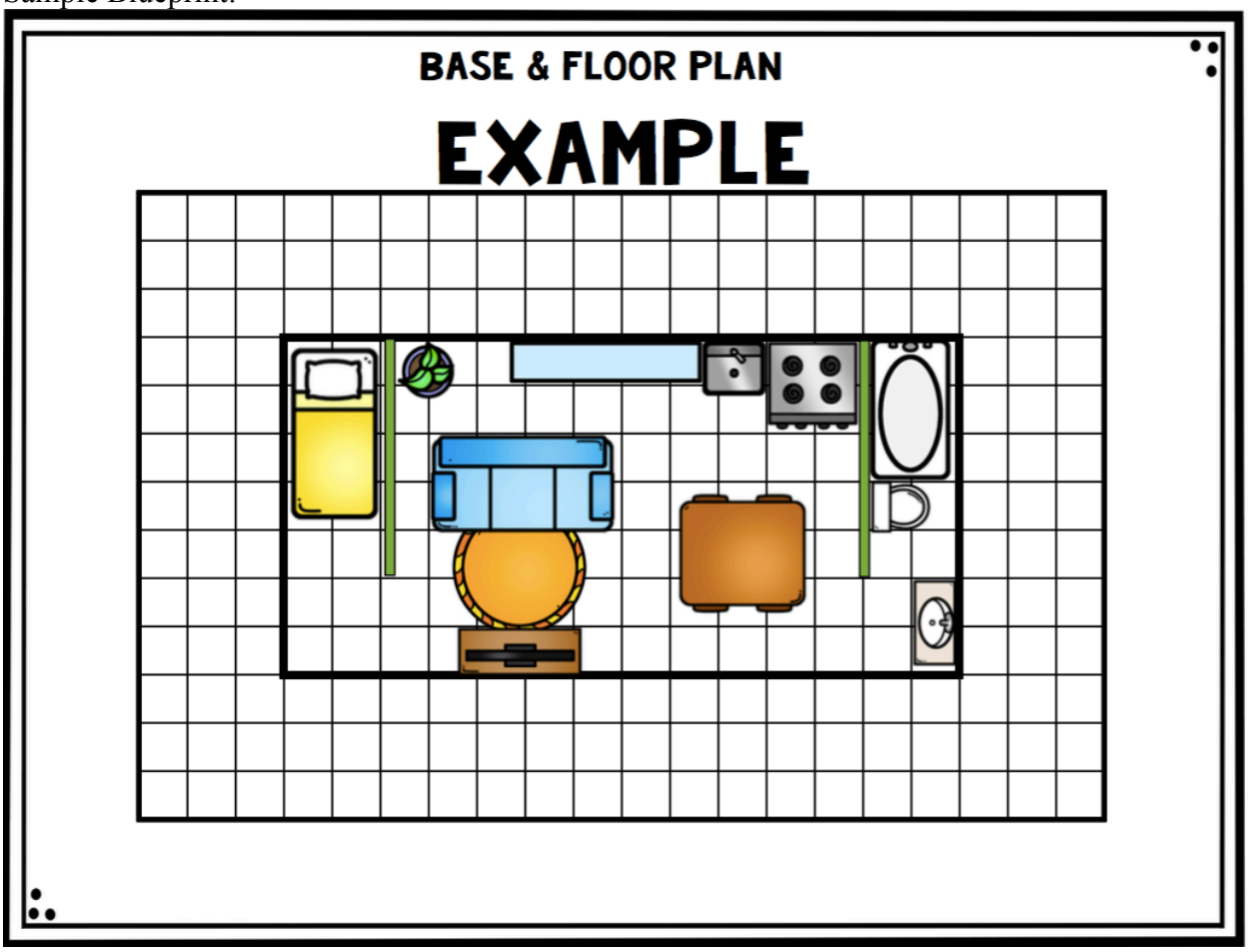
- How did you decide what to do first when designing your tiny home? *Students will need to start by determining the missing dimension for the plot of land: 30 x n=750.*
- What strategy did you use to determine the total area of your home? *Students should apply the standard formula of length x width. Students should also recognize that the area of each room could be added together to find the total area of the home.*
- What other mathematics did you use as you created your blue print?
- If the home you designed was greater than 400 sq. ft., what strategy did you use to fix this?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Students will be assessed as they complete the task and during whole group discussion. The teacher should ask:

- In what ways did you make sure your tiny home was sustainable?
- How does the area of a home impact its sustainability in the environment?

Sample Blueprint:



Power Point Day 3
https://drive.google.com/file/d/0B3Sc2iHmNlhRaDNnYzJ4bkJfRVk/view?usp=sharing

TEACHER NAME			Lesson #
SUSAN HORTON			4/Day 4
MODEL	**CONTENT AREA**	**GRADE LEVEL**	
PBL	**MATH/ART**	**3/4**	
CONCEPTUAL LENS		**LESSON TOPIC**	
SUSTAINABILITY		**THE TINY HOUSE MOVEMENT**	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

Measurement and Geometry

- Calculates the areas of composite shapes, and the surface areas of rectangular and triangular prisms
- Solve a variety of practical problems involving the areas of quadrilaterals and composite shapes
- Describes and applies the properties of similar figures and scale drawings
- Construct scale drawings/models
- Interpret and use scales in photographs, plans and drawings found in the media and in other key learning areas

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
SUSTAINABILITY IMPACTS ENVIRONMENT	***HOW DOES SUSTAINABILITY IMPACT THE ENVIRONMENT?***
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
Students will know: • Sustainability of a home can have a major impact on the environment. • The specific impacts of a tiny home on the environment whether negative or positive. • Green technologies influence the amount of sustainability in a tiny home. • Green technologies impact the environment.	**Students will be able to :** • Calculate the areas of composite shapes, and the surface areas of rectangular and triangular prisms • Solve a variety of practical problems involving the areas of quadrilaterals and composite shapes • Describes and applies the properties of similar figures and scale drawings • Construct scale drawings/models • Interpret and use scales in photographs, plans and drawings found in the media and in other key learning areas • Analyze their tiny home designs to determine sustainability within the environment

GUIDING QUESTIONS ***What questions will be asked to support instruction?*** ***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding***		
Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
1. What method(s) will you use to ensure your blueprint will be able to be successfully built as a 3D model? **2.** What strategies can you use to help your build your 3D model? **3.** What features do you plan to include in your 3D model that will make your home sustainable? **4.** Of the features you included, what impact will those features have on the environment?	1. What strategy will you use to make sure your house meets the requirements? 2. In what ways will you adjust your design if you have exceeded the required square footage of the home? 3. What items are you chosing to make sure your home is sustainable to the environment? 4. How do the sustainable features in your home help with the conservation of water? Electricity? Gas? Land conservation? Etc.	1. How does your final product meet the requirements of size and mobility? 2. What makes your tiny house sustainable? **3.** What impact will your tiny house have on the environment whether it be positive or negative? **4.** Why do you think your tiny house has a positive or negative impact on the environment? **5.** If you found negative impacts on the environment within your tiny house, how can you rectify the situation to make it a positive impact and still make sure it is sustainable?

DIFFERENTIATION ***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***			
Content	**Process**	**Product**	**Learning Environment**
Studnets will by applying higher level concepts to their task throughout the lesson.		**Studens will be creating their own 3D model without preprinted paper based on their own blue print drawings.**	**Students will be working independently on their own homes. They may chose to work in partners to collaborate prior to building.**

PLANNED LEARNING EXPERIENCES
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Today we are going to put our modeled drawings to the test. We are going to build our very own 3D model of our tiny homes we have created. This will be built to scale. There are four major parts of the house that you will build and design.
The Base: this is where you create the floor plan of the house. This is the central part of creating a house.
The Wall: EACH wall section contains two walls. They are folded to create house corners. They can be cut to create a rectangle that fits exactly around the base of the house.
The Roof: The final part of the house. You will be designing the ceilings (fans, lights, vents).

Each of the MAJOR PARTS will be on separate pieces. They will be cut out and placed together to form a tiny house.

Ask pre lesson questions:

1. What method(s) will you use to ensure your blueprint will be able to be successfully built as a 3D model?
2. What strategies can you use to help your build your 3D model?
3. What features do you plan to include in your 3D model that will make your home sustainable?

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Record the area, perimeter and geometric shape of each item from the requirement list. Record area and perimeter of the major sections of the house (base, walls, roof/ceiling). Hand out Spec Home recording sheet for students to locate and apply their measurements.

Students will transfer their blueprint drawings to the foam board, which will later be cut out to form the major parts of the house. Students will decorate walls and ceiling prior to placing the pieces together. Students will create furnishings to complete the house (bed, couch, stools, kitchen appliances, etc.).

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

Students will construct their 3D model using the pieces of foam board they have cut to size and decorated according the requirements page. Students will decorate the interior of the home prior

to constructing the 3D model.

1. What strategy will you use to make sure your house meets the requirements?
2. In what ways will you adjust your design if you have exceeded the required square footage of the home?
3. What items are you chosing to make sure your home is sustainable to the environment?

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Students will design and decorate the exterior of the home to make it more appealing to the Tri-City Realtor Convention attendees.

Awesome! You designed your house and the inside looks great! But…You need to decorate the outside. Make it look like a REAL house!
Be careful will your coloring! Use only crayons or colored pencils. Markers could bleed through and ruin the inside-no leaky house! Look at some pictures of the houses to see what the outsides look like. What are some sustainable features you could add to the exterior of your house to help with the impact on the environment? How do the sustainable features in your home help with the conservation of water? Electricity? Gas? Land conservation? Etc.

If you are up to the challenge, try cutting out where you have windows. Be patient and work slow. Doors are easier, but windows take time.
Decide what kind of exterior you want for your house: wood, stucco, log cabin, or something else. Think back to some of the tiny houses we have explored that last few days. Which exterior would be better for the environment? Color it or add designs…just be creative!

Now it's time to build your furniture by creating 3D shapes. Use the foam board or graphing sheets that have been provided for you. You can use the pre-printed furniture designs or create your own.
First, make sure your furniture size matches what you created in your house. Don't cut out the net (unfolded furniture sample) until you are sure you have enough. Map out what you need. Then tape your shapes together. Don't tape or glue anything to your house until I tell you to do so.

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Students will present their tiny homes to the class (The Tri-City Realtor committee). Students will explain why their house is the most sustainable and how they think their house will impact the environment.

1. How does your final product meet the requirements of size and mobility?
2. What makes your tiny house sustainable?
3. What impact will your tiny house have on the environment whether it be positive or negative? Why do you think this?

FINAL VERSION: REQUIREMENT LISTS

Listed below are all the furnishing elements that must be included inside your tiny house.
Check off each item once it has been added in your house design.

ITEM	COMPLETED
shower or tub	
bathroom sink	
toilet	
bed	
table	
chair	
closet	
desk or side table	
couch/sofa or recliner	
counter	
microwave	

ITEM	COMPLETED
stove/oven	
kitchen sink	
TV or computer	
refrigerator	
front door	
window	
window	
light	
light	
picture/artwork	
mirror	

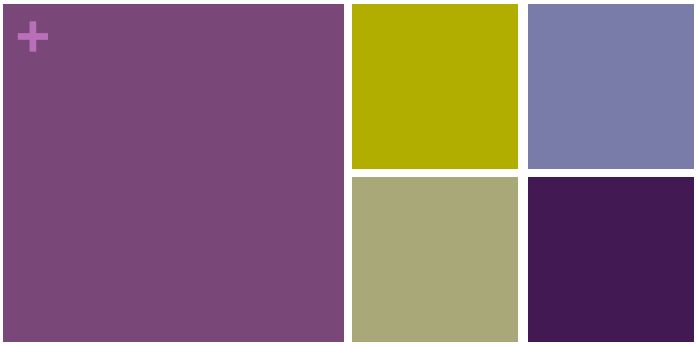
SPEC HOME

Find the AREA and PERIMETER of each REQUIRED item in your house.
Fill in the information below.

ITEM	PERIMETER	AREA
shower or tub		
bathroom sink		
toilet		
bed		
table		
chair		
closet		
desk or side table		
couch/sofa or recliner		
counter		
microwave		

ITEM	PERIMETER	AREA
stove/oven		
kitchen sink		
TV or computer		
refrigerator		
front door		
window		
window		
light		
light		
picture/artwork		
mirror		

Power Point Day 4
https://drive.google.com/file/d/0B3Sc2iHmNlhRa3VtVE5qMFd3Wk0/view?usp=sharing



Tiny House, Big Space!

SPARK Camp Day 4

Lesson 3 and 4:
PERFORMANCE TASK:
The typical tiny home is shaped like a rectangular shoebox. In order to prove that a tiny home does not have to be boring and rectangular in design, a local architect is having a contest to see who can generate a blueprint for the most innovative tiny home. Our class is part of the Green Build Society of Durham, NC. The architect has asked us to create a tiny house that will be shown off at the Tri-City Realtor Convention as the model home for future tiny home buyers. You are responsible for designing a blueprint for the perfect tiny house. It will include the layout, appliances, plumbing features and furniture. You will use real-world math skills to finish this project. You will also need to showcase ways your tiny house is sustainable and explain how your house will have a positive impact on the environment. The City Counsel is working on approving a space within the city that will be zoned for your tiny house. Your house must fit on a 750 square foot plot of land that is 30 feet long. The home must be no longer than 400 square feet. In order for people to walk around the outside of the house, each side of the tiny home must be at least two feet away from the perimeter of the land.

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Image of Jay Shafer http://www.educationworld.com/a_lesson/newsforyou/pdfs/newsforyou109-download.pdf This image shows architect, Jay Shafer, sitting on the porch of his tiny home with a different tiny home shown in the background.

Living Big in a Tiny House: brief article about why the tiny home movement is catching on! http://www.livingbiginatinyhouse.com/tiny-house/

Living large: A look inside the tiny house movement July 29, 2010 http://www.pbs.org/wnet/need-to-know/culture/living-large-a-look-inside-the-tiny-house-movement/2522/ https://safeshare.tv/x/ss58e3faa971dd4 Given the state of the current economy, a growing number of Americans with ordinary lives are choosing to scale down — way down. They call themselves the "tiny house" movement. Need to Know visited one of the movement's proponents, Dee Williams, at her small home in Olympia, Washington. Williams says that the downsized living arrangements bring her a sense of contentment.

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SMITH, CHRIS THE PRESS DEMOCRAT | November 3, 2008 Sebastopol man designs, builds fully functional, livable houses that are smaller than a bedroom http://www.pressdemocrat.com/csp/mediapool/sites/PressDemocrat/News/story.csp?cid=2183290&sid=555&fid=181 This article discusses architect Jay Shafer and the Kastrinos family and their desire to downsize to a tiny home that is 100 square feet in size. Jay's tiny home website https://www.tumbleweedhouses.com/ features the plans his company currently builds for individuals who plan to downsize to a tiny home.

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