



# H I G H S C H O O L

S T E A M , G E O M E T R Y , S O C I O L O G Y





## SMALLER IS SAVVIER

### Driving Question:

How can geometry help design an energy-efficient tiny house?

### Materials Needed:

Graph paper, drawing materials, calculator, prototyping materials such as balsa wood, glue, clay and Legos

### In this lesson, students will:

- use knowledge of calculating the perimeter and area of three-dimensional shapes to design a scale model of an energy-efficient tiny house.

### TEKS:

Geometry: 10(A)(B)

Sociology: 5(D)

Art 2: 1(C); 2(B)(F); 4(A)(B)(C)



## SPINNING THE COCOON

Draw basic shapes on the board such as rectangles, squares and triangles. Tell students you'd like to build one of the shapes out of wood and ask how you can determine the amount to buy. Students should be able to tell you to measure around the entire shape or determine the answer using two sides (length and width). Review with them the formula for finding the perimeter of rectangles and circles.

Next, tell students you want to cover one side of your rectangle with wood siding. As a class, discuss how you would use the area formula to determine what size board you would need to purchase and cut to cover your rectangle. Review with the class the formulas for calculating the area of a triangle, circle and square.

Tell students that these basic geometric concepts are what architects use to design and build a house. Recently, the idea of minimalist living in the form of tiny houses – homes generally under 1,000 square feet – has taken the country by storm. Not only do tiny houses use fewer building materials than larger homes, they also are more efficient and reduce one's ecological footprint. Use [this](#) or any number of websites to show students the array of designs available for tiny houses. Discuss some of the design aspects that make these homes “green” such as natural lighting or lofts that are just high enough to sleep but reduce energy costs associated with heating and cooling.

### KERNEL OF KNOWLEDGE

According to the United States Department of Energy, air conditioners cost homeowners more than \$29 billion a year in energy costs.



# METAMORPHOSIS

Student groups will use their knowledge of area and perimeter to design and draw three-dimensional plans for tiny houses. Students must include exterior and interior schematics with measurements noted for height, width and area. Exterior schematics should include aspects such as window sizing and roof pitch. Interior designs should note areas for sleeping, food preparation, living and bathroom facilities. Encourage students to make their tiny house creative and innovative, not just a box. Students should also focus on ways to make their tiny house “green,” such as by incorporating lots of natural light.

Once their designs are complete, students should choose building materials and use their measurements to complete a rough building budget, excluding costs for plumbing and electrical. Students should keep in mind that the completed footprint of their tiny house should be under 1,000 square feet, but can include aspects such as lofts or rooftop living. Students will then use their knowledge of fractions and scale to build a small-scale model of their tiny house design to present to the class, along with the estimated build budget. During their presentation, students should also point out the green features in their project.

## UPCYCLE

The tiny home movement is considered a type of counterculture to many as it goes against the norms of society. Modern American society tends to value large, expensive homes with several spaces inside to be used in various ways, such as a home office, or exercise, craft, game or theater room. Tiny houses, however, are about the bare necessities and emphasize the idea of “the smaller, the better.”

## THROUGH THE LENS



Have students research the counterculture movement of tiny homes and create a Flipgrid video that explains the movement, its history, its popularity and where to find tiny home builders in the area. If there are tiny homes nearby, students may want to ask if they can create a video tour of one. As they film, they should record narration pointing out efficiencies and comparing electricity and water usage (among other things) to that of their own homes.





## CAREER CONNECTION

**Sociologist** - A sociologist studies human society and social behavior by examining the groups and institutions that people form, including social, religious, political and business organizations. Most positions require a master's or doctoral degree.

**Concrete Truck Driver** - A concrete truck driver operates a truck equipped to deliver concrete mix to construction sites. They also receive the sand, gravel, cement and water used to mix the concrete. For this job, a high school diploma and on-the-job training are required.



## CAREER HIGHLIGHT

Pietro Belluschi was an architect renowned for his skyscrapers that changed the skyline of Portland, OR. Today, he and his son Tony are best known for their design of a very famous tiny house, a tea room located behind their home.

