Geometry in Architecture

Underperforming students will take the lead in this project.

Overview
Students work in architecture teams to design their dream houses to scale as floor plan, calculate the cost to build with all basic materials, then create a rendering of the outside of the house on Google SketchUp on a netbook. Lastly, students build their houses to scale out of balsa wood and present their final projects to the class.

Objectives
The student will calculate area, perimeter, and volume of different shapes. The student will demonstrate an understanding of similar figures by building a model. The student will apply a common scale to all of his figures, checking that the scale is accurate for different dimensions using a proportion. The student will learn the basics of Google SketchUp and building with balsa wood. The student will work cooperatively in a group, where each member does his part to contribute to the common goal.

Materials
200 long sticks of balsawood
10 X-Acto knives
20 bottles of glue
32 large sheets of foam board
10 boxes of markers
cardboard, poster board, paint, construction paper

Readiness Activity
Before beginning this project, students learned about scale and proportion through a unit on similar figures. They looked back on their notes from this chapter, if needed, to remember how to create a floor plan, rendering, and model similar to the real houses they were designing.

Also the unit directly before this project was studying area, perimeter, surface area, and volume. Once they learned how to apply these skills to any shape given to them, they could create any form of house and know how to find the flooring or paint needs mathematically.

In addition to what we do in my math class, students who have very low math skills are in a support class. Before beginning our house project, they did a room project where their task was to draw a floor plan and find all of the same calculations of their classroom. This is a great readiness activity if you feel your students need a bit more scaffolding.

Strategies/Activities
1. Students form architecture teams of 3-4 students.
2. Students work together to design the rough draft floor plan of their houses on graph paper. Students include a key to their scale factor.
3. Teacher gives feedback on floor plans and students make any changes or improvements.
4. Students calculate the square footage of each room in their houses. They then research different types of flooring costs and choose the type of flooring they would like in each room, citing their sources. Students calculate the cost of flooring each room and the total cost of flooring as well as the total square footage of the houses.

THIS WINNING PROJECT IDEA SUBMITTED BY:
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9-12 GRADE LEVEL
ARTS
LANGUAGE
MATH
MISC
SCIENCE
HISTORY
SOCIAL STUDIES
6 PERIODS
$495 TOTAL BUDGET
5. Students calculate the square footage of wall space in a few selected rooms. Students research paint colors and types, choosing a few for their selected rooms. Students calculate the cost of painting their selected rooms.
6. Once the teacher approves all of this, students get to use Netbooks and create a rendering of what their houses would look like. Using Google SketchUp, a program downloaded free from the Internet, students draw their three-dimensional models to scale, including walls, doors, windows, yard items, and anything else they have fun adding. They add color and texture and produce very professional looking house renderings. They may work on the inside, but only a few groups in my classes had time to do so.

Culminating Activity
Students build scale models of the homes they designed out of balsa wood, foam board, cardboard, paint, and other found materials. This house must reflect their floor plans, flooring choices, paint choices, and Google SketchUp models. It also must be mathematically to scale.

Evaluation Method
The teacher uses a rubric to grade each part of the process. Students are given the rubric for each part before they turn it in so that they are aware of how they are being graded. Students also graded each member in their group for participation points. At the end of the project, students presented their homes to the class and everyone rated their work and their presentations.