Green Building Design

Using Google SketchUp

Overview

Google SketchUp is a free software program that can be used to design a 3 dimensional "green" home. This lesson introduces students to the software and helps them build a simple structure from which they can add their own "green" additions. This lesson would be appropriate in a unit on energy conservation, environmentalism, art design or computer graphics. It can be used with grades 6 and up.

Objectives

1. Students should implement concepts of green buildings into their own home design.
2. They should consider the environmental impact of their home and try to minimize negative impacts.

Oregon State Standards- 2009

Engineering Design 8.4D.2

Design, construct, and test a proposed engineering design solution and collect relevant data. Evaluate a
    proposed design solution in terms of design and performance criteria, constraints, priorities, and
    tradeoffs. Identify possible design improvements.

Student Pre-requisite Knowledge and Skills

Students should have some previous experience using a computer.

Materials

- Computers for each student with the ability to access the internet
- Printed copies of the instruction packet (students can always save the packet and use it as a resource from their desktop)

Teacher Preparation for lesson

Teachers should be comfortable with the basic functions of Google Sketch up. COSEY has created a YouTube video to help with instruction and it will help to view this video before leading the instruction. The video can be found here: Part 1, http://www.youtube.com/watch?v=IBPo5KeZz60 and part 2, http://www.youtube.com/watch?v=fp2DYV0YDQc. Mike Bailey, a professor at Oregon State University, has created an in-depth learning packet on using Google SketchUp. He has allowed us to use it for teaching purposes and it is available to download through his website which is http://web.engr.oregonstate.edu/~mjb/sketchup/. The packet includes step-by-step processes for making a house. Google SketchUp is available for download online, use a search engine and type in

"Google SketchUp 8" and follow the directions for downloading. Make sure the program is available at every computer before the lesson.

Procedure

1. **Anticipatory Activity -** Start by showing students pictures of "green" buildings. Ask students what makes this building different? Start a discussion about what makes a building green: green roof, solar panels, many windows, filtering gutter system, self-heated pool, plus many others.

2. Go through the basics designing a home in Google SketchUp. The following procedure outlines the order that best serves the activity. Key commands and detailed instructions can be found in Dr. Bailey's instruction packet.

   1. Draw a rectangle and then make it 3-D
   2. Make the roof by creating a pitch
   3. Paint the roof and the walls
        a. Talk about the aspects of incorporating a "living roof"
   4. Add solar panels to roof by making rectangles on the roof and painting them with different materials.
        a. Which way do you want the panels to face, south or north?
   5. Add windows either by making them from scratch or downloading them under the components window.
        a. Talk about the placement of windows. Do you want them facing north or south? How many?
   6. Build a passively heated pool.
        a. The pool is passively heated because the black tile uses the sun to heat the water. "Why would a dark colored pool work better for this?"
   7. Water catchment systems can be made by making containers that are positioned at the corner of the house or under gutters to catch rainwater.
   8. There are many components that have been drawn by other participants in Google SketchUp. Students can access these drawings. Mike Bailey's instructions give a good explanation of how to access the component archive.
        a. Components are under the "Window" tab
   9. At this point students can work independently on their houses.

Wrap up
The student's designs can be saved to a communal drive and printed out. Each student should incorporate three green building aspects. Students should share their favorite part of their design with the class group.

EXTENSIONS

Google SketchUp can be used to design many different things, not just homes. Students can design larger building and design other items as well. Students can also come up with their own "green" features for their building.