

## Architecture

Student will take an existing floor plan (Plan View) then create a 3D model of that floor plan using Google Sketchup.

**Subject Area:** Engineering    **Grade Levels:** 9<sup>th</sup> to 12<sup>th</sup>    **Date:** November 12<sup>th</sup> – December 5<sup>th</sup> (12 Days, this included Thanksgiving Break)

### Lesson Overview

Students will Choose an image of a floor plan (plan View) from Houseplans.com. The student will import this image into Google Sketchup. The student will complete the following assignments. (Each step or assignment is included as an attachment and contains details about the assignment.)

- Step 1:** Trace the walls. Use the Push/Pull command to make the walls 3D.  
 Use the paint bucket tool and add paint to the walls  
 Use the paint bucket tools and add carpet, tile, hardwood floor, etc to the floors  
 Use the paint bucket tool to add stucco, wood siding, or brick to the outside of the house
- Step 2:** Add doors and windows
- Step 3:** Add components, fixtures, and casework to the kitchen and bathrooms
- Step 4:** Add components, fixtures, and casework to the other rooms in the house
- Step 5:** Create Scenes/Views

### Materials Included in this Lesson

- Handouts for each step of the lesson
- Google Sketchup
- Computer
- Class Notes
- Google Sketchup Quick reference guide

### Skills the Student will Learn

- Student will learn the drawing, editing, modifying, and other commands of Google sketchup
- how architects need to balance their clients needs and expectations when designing a project
- Drawing in 3D space (Very different from 2D Drawings)

### Student Deliverables

- Google Sketchup practice assignment (In class)
- Google sketchup 3D model (Final) which will include the final Scenes/Views

## Length of Lesson: 12 Days

### Day One

Introduction to Google Sketchup – Practice making a small condo with Teacher using the Gradual Release of Responsibility (GRR) Strategy.

### Day Two and Three – Step 1

Student will take an image of their floorplan (Plan View) and insert it into Google Sketchup.

Student will use the line, offset, and edit tools to trace the walls of the floorplan.

Student will use the Push/Pull command to extrude the walls to make a 3D model.

### Day Four to Eleven – Step 2

Student will use the editing, modifying and drawing commands to create doorways and windows in the 3D model. They will insert doors and windows into their 3D model

Student will use the paint command to add materials (paint/color) to the walls, floors, and outside of the house

### Day Six - Eight – Step 3

Student will use the drawing commands and the online library to create and insert casework in their 3D model. They will also insert doors, windows, cabinets, oven, refrigerator, toilets, showers, bathtubs, washer/dryer, beds couches, other relevant fixtures, etc...

### Day Nine to Eleven – Step 4

Student will use the drawing commands and the online library to create and insert casework in their 3D model. They will also insert doors, windows, cabinets, oven, refrigerator, toilets, showers, bathtubs, washer/dryer, beds couches, other relevant fixtures, etc...

### Day Twelve – Step 5

Students will create the Scenes/Views that are required per Step 5

## Common Core Academic Standards

- 2. Define appropriate quantities for the purpose of descriptive modeling.
- 2. Developing and using models
- 8. Obtaining, evaluating, and communicating information
- 3. Scale, proportion, and quantity
- 11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

## CTE Pathway Standards

- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.

### Pathway Standards (*Architectural Design*)

- A3.0 Understand the sketching processes used in concept development.
  - A3.2 Produce proportional two- and three-dimensional sketches and designs.
- A4.0 Understand the use of computer-aided drafting (CAD) in developing architectural designs.
  - A4.1 Develop a preliminary architectural proposal using CAD software.
  - A4.2 Analyze viability of a project as the design is developed using Building Information Modeling (BIM).
- A8.0 Systematically complete an architectural project.
  - A8.2 Develop a preliminary proposal for presentation of an architectural design
  - A8.3 Read and interpret architectural and construction plans, drawings, diagrams, and specifications.
  - A8.4 Develop a complete set of architectural plans and drawings.
- A9.0 Using various methods create both written and digital portfolios to represent architectural renderings.
  - A9.2 Prepare an effective oral presentation of the portfolio content

## Lesson Plan Relevance To Externship

At Williams + Paddon Architects they participate in numerous meetings with clients. These meetings take place before the building is designed, while it is being built, and after it is completed. During these pre-planning meetings the architecture firm will make a 3D model of the house using various programs. One program they utilize is Google Sketchup. These 3D models allow the client to visualize the house before it is built.

Students will be using industry appropriate technology to create a 3D model of a floor plan they choose. They will add to the floor plan to include the kitchen fixtures, bathroom fixtures, bedroom furniture, casework, etc. The students will then create a presentation using “Scenes” and they will share it with the class, just like an architect would with his/her clients.



## Rubric for the 3D Modeling Project

<b>Student Deliverables</b>	<b>1 Fails to meet Expectations</b>	<b>2 Approaches Expectations</b>	<b>3 Meets Expectations</b>	<b>4 Exceeds Expectations</b>
Step 1				
Step 2				
Step 3				
Step 4				
Step 5				

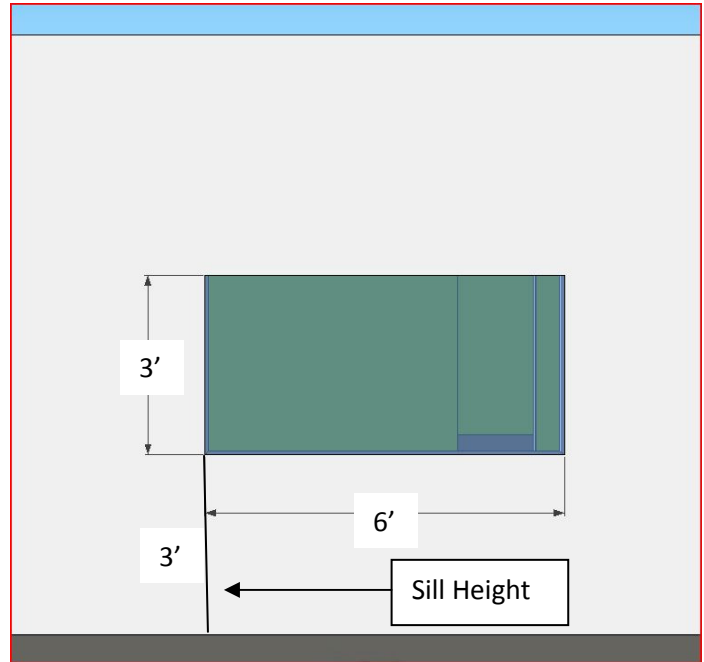
## Step 1 - Making your house 3D

1. Open your floor plan using AutoCAD
  - a. Turn your Dimension Layer on
2. Go to the Start Button (Bottom left of your computer)
  - a. Select → Programs → accessories → Snipping Tool
3. Using the Snipping tool draw a box around your Floorplan
  - a. If you have 2 Floors you can include both levels in the image
4. Save the picture to your H: Drive
5. Open Google Sketchup
6. With your H: Drive open, click on the image and drag it to Google Sketchup
7. Scale the drawing using the tape measure tool.
  - a. Select the Tape Measure Tool
    - i. Remember to zoom as close as you can to the dimension
  - b. Click on the left dimension line
  - c. Click on the right dimension line
  - d. Type the length of the dimension and hit Enter
    - i. Select Yes
8. Using the Line Tool trace over the walls
  - a. You will want to trace over the outside walls first.
  - b. Sketchup has a built in ORTHO and SNAP command.
    - i. Practice with this command for a few minutes
    - ii. Once you close the loop of the lines, it will become one solid object
      1. The inside will fill with a blue-gray color
  - c. Use the Offset tool to offset the wall by the thickness of the wall.
    - i. 6"
  - d. Delete the inside part of the room (blue-gray color)
    - i. Where the floor would be.
    - ii. The only blue-gray area will be covering the walls.
  - e. Continue tracing until ALL the walls have been drawn.
    - i. Do not trace the door, windows, etc. Just the walls
      1. Makes sure the door openings stay the correct size.
    - ii. Use caution so you don't delete the original image of your floorplan.
      1. If you do, Press CTRL+Z to UNDO
9. After you have drawn ALL the walls, use the EXTRUDE Command to Extrude or LIFT the walls up 10'
  - a. Make sure ONLY the walls are extruded, not the floor
10. Using the Paint Bucket command to paint the walls of each room.
  - a. Be creative and use a variety of colors
11. Use the Paint Bucket Command to paint the floors of each room.
  - a. Use the Line tool to separate rooms
12. Using the Paint Bucket Command to paint the floor
  - a. Use carpet, Wood, Tile, etc...

- i. Bathrooms, laundry rooms, kitchen, entry way, foyer, etc typically have tile, wood, or laminate
- ii. Bedrooms, hallways, etc can have either carpet, tile, or wood
- iii. Paint the garage a light grey to represent Concrete.

## Step 2 - Adding Doors and Windows

1. Add Windows to your floor plan
  - a. The width of your windows varies depending on your floor plan you selected.
  - b. Sill height of bedroom and living area windows are 3' – 5'
    - i. Sill height = How far off the ground the window is
  - c. Window heights vary from 3' – 5'
  - d. Use paint bucket tool to add a transparent style to the window



2. Add doors (Several Options)
  - a. I created 2 standard size doors which you can use, they are in the assignment folder
    - i. 2'6" - inside door – height 6'8"
    - ii. 3' – outside door – height 6'8"
  - b. Make your own.
    - i. If you make your own when finished, make a "component"
      1. Draw window around object
      2. Right Click "Create Component"
        - a. This makes it all one piece and it's easier to move
  - c. Import from the 3D Warehouse
    - i. File → 3D Warehouse → Get Models
      1. Search for Doors
      2. Download Model
        - a. Import directly into Sketchup model



## Step 3 - Adding Components

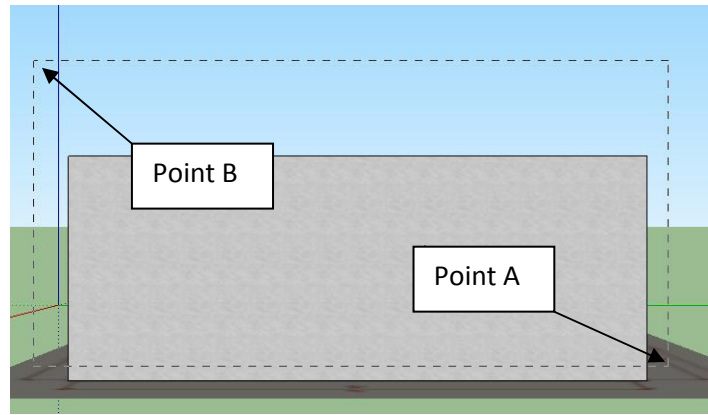
1. This is to be completed after you have done the following:
  - a. "Push/Pull your walls to make them 3D
  - b. Added doors and window
  - c. Painted the walls and added a material to the floors

2. View → Toolbars → Layers



3. Select the "Layers Manager Tool"

- a. Button on the right
- b. Select the ⊕ button on the dialogue box and name the new layer "WALLS"
  - i. Close that window
- c. Go to the side view of your floor plan and select all the walls, do not select the bottom of your floor plan.
  - i. See example to the right
- d. After selecting the walls, select the drop down Layers Menu and choose Walls.
  - i. Make sure you uncheck the bubble that says "Visible"



1. This will make you walls temporarily hidden. It will now be easier to move, rotate, and place your components.

4. Choose File → 3D Warehouse → Get Models.

- a. Once the Dialogue box is displayed search for your component.
  - i. Start by placing fixtures in your bathrooms and kitchen.
    1. Toilets, bathtubs, showers, cabinets (Casework), countertops, ovens, sinks, refrigerator, etc
  - ii. Next you may place other items in your bedrooms and living areas
    1. Examples include chairs, couches, beds, lamps, TV's, Tables, area rugs, etc..
- b. Take time to make sure everything is placed and aligned correctly on your floor plan.
  - i. You will need to utilize copy, mirror, and rotate to place your items

## Step 4

### Adding Components for you living room, family rooms, bedrooms

1. This is to be completed after you have done the following:
  - a. "Push/Pull your walls to make them 3D
  - b. Added doors and window
  - c. Painted the walls and added a material to the floors
  - d. Created a layer for your walls
  - e. Inserted the fixtures for your bathroom and kitchen
  
2. Choose File → 3D Warehouse → Get Models.
  - a. Once the Dialogue box is displayed search for your component.
    - i. You will start placing fixtures in your bedrooms and other living areas
      1. Examples include chairs, couches, beds, lamps, TV's, Tables, area rugs, etc..
  - b. Take time to make sure everything is placed and aligned correctly on your floor plan.
    - i. You will need to utilize copy, mirror, and rotate to place your items

## Scenes / Views

You need to create several different “Scenes” or “Views” of your floor plan for the final submission.

You will be creating the following Scenes/views: *(See below for instructions)*

- Plan View
  - Top View
- Isometric View
  - TWO taken from opposite sides
    - Make sure to pan up so you can see the majority of the inside of the home
- Bathroom View
  - Choose 1 bathroom
  - Multiple views may be needed in order to “see” everything
- Kitchen View
  - Multiple views may be needed in order to “see” everything
- At least 3 additional views of any portion of your home including, but not limited to.
  - Bedroom(s)
  - Living Room
  - Family Room
  - Game Room
  - Backyard
  - ETC
- When finished you will have at least 8 total “Scenes” or “views”
  - Give them a specific name
    - Isometric View
    - Bathroom
    - Kitchen
    - Etc...

## How to create Scenes/Views

1. If the walls are in the way of getting a view, then you will need to Create a section plane
  - a. Tools → Section Plane
  - b. Align the cursor on the wall that you want to create a section plane
    - i. Hit SHIFT to lock onto a plane
  - c. Click on the wall and move your cursor to “cut” into the house
    - i. You can use the MOVE or ROTATE tool to adjust your section to get your desired view
    - ii. You can also “Right Click” on the Section Plane for additional options
      1. Reverse
      2. Hide
      3. Active Cut
2. Once you get your desired view go to (Windows → Scenes)
  - i. Click on the + button and a scene will be create.
    1. You will notice a tab on top of your drawing space
  - ii. Right click on the View to Rename it.
  - b. Repeat the above steps to create ALL your views.
    - i. At least 8 total (See above for required views)
3. You now have 8 scenes (Views) that are separated by Tabs on the top of your drawing window.