**Youth Explore Trades Skills Design and Drafting – 3D Modelling (Architectural CAD)**

# Create a Simple Architectural Structure

## Description

In this activity the teacher will demonstrate how to transform the 2D floor plan into a 3D structure, using the plan created in the Drawing of a Simple Building activity.

## Lesson Objectives

The student will be able to:

* Open up a template
* Use basic 2D drawing tools to draw a floor plan
* Use 3D modelling tools to create walls, cut out for windows and doors, and create a roof
* Import an item from the 3D Warehouse
* Scale and rotate items from the 3D Warehouse
* Apply textures and colours

## Assumptions

The student will:

* Know how to login to a computer and open up the software
* Know how to save their work
* Know the skills learned in the Exploring SketchUp Make activity

## Terminology

**3D Warehouse**: an online distribution platform to share SketchUp models. Any person can post models to this website, including students, businesses, architects, etc. Any person can also download files posted to this site.

**Eave**: the part of a roof that meets or overhangs the walls of a building.

**Fascia**: a flat board that covers the end of the rafters, where the roof meets the eave.

**Floor plan**: a scale drawing of the arrangement of a building.

**Follow Me**: a tool in SketchUp that allows you to draw a 2D path and select a 2D surface, and then pull the surface along the path to create a 3D shape.

**Gable end**: the part of a wall that encloses the end of a pitched roof.

**Offset**: a command that creates a copy of an entity (line, circle, etc.) a specified parallel distance away from the current object(s) selected.



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**Push/Pull**: a tool in SketchUp that allows you to select a surface and push or pull it into 3D. You can also use this tool to push or pull a shape to create a negative space in a surface.

**Scale**: a drawing that is enlarged or reduced from its original size, usually expressed as a fraction in imperial measurement. The most common architect’s scale is ¼ inch to the foot, expressed

as Scale ¼" = 1'-0". In metric measurement, scale is expressed as a ratio (e.g., 1:50, meaning

1 mm in the drawing equates to 50 mm in the actual work). The actual building measure would be multiplied by the scale factor.

**SketchUp Make**: 3D software originally developed by Google to assist in creating Google Earth. Google released the software for free to users and called it Google SketchUp. SketchUp was later purchased by Trimble, and is now software available for purchase, although it is free to teachers and students.

**Template**: a file in a specific unit of measurement with pre-set parameters that can possibly include layers, textures, material, blocks, etc.

## Estimated Time

30 minutes

## Recommended Number of Students

20, based on *BC Technology Educators’ Best Practice Guide*

## Facilities

Computer lab installed with CAD software (SketchUp Make, AutoCAD, etc.)

## Tools

Projector with computer and speakers, Internet access

## Materials

Student activity with instructions

## Resources

Instructional video for teacher and students to follow:

* 14.1 Creating a Simple Architectural Structure (Part 1)
* 14.2 Creating a Simple Architectural Structure (Part 2)
* 14.3 Creating a Simple Architectural Structure (Part 3)
* 14.4 Creating a Simple Architectural Structure (Part 4)

## Teacher-led Activity

Use a computer with a projector and demonstrate the following:

* Open an imperial/inches SketchUp file
* Draw a 2D floor plan
* Create walls and frame in the door and windows
* Apply texture to the inside walls and floor
* Import items from the 3D Warehouse to suite the purpose of the shed
* Apply texture to the outer walls
* Import and scale windows and a door
* Insert the windows and the door
* Offset roof line to create overhang
* Create a roof
* Apply textures to the roof and the eave
* Optional: add other features to the exterior of the shed, as well as the surrounding space around the shed

## Student Activity

Students will follow the video tutorials and the Student Activity “Creating a Simple Architectural Structure” to create a 3D shed.

## Extension Activity

Have students create a more involved floor plan, then complete the remaining structure from that plan (Figure 1).



**Figure 1**—Example of a more involved floor plan

## Assessment

Students will show the teacher what they have created, before moving on to Creating a Simple Architectural Structure activity.

# Student Activity:

**Creating a Simple Architectural Structure**

Using the software, transform your 2D floor plan into a 3D shed. Videos are located under Resources to support the lesson.

## Procedure

1. Open up your SketchUp Make software, and as the software loads watch the Part 1 tutorial video. Once the software has loaded, select a feet and inches template.
2. Once the drawing file is open, check out your toolbars. If your software does not display the same toolbar, go to the View tab, select Toolbars, and then select the toolbars you wish to display.
3. Next, draw your floor plan as shown in the video. Don’t forget to include the windows and doors.
4. Use the Push/Pull button to pull your walls to a height of 8'.
5. Frame the bottom of the windows so they are 3' from the ground.
6. Complete the door so it is 7'4" high, and then align the top of the windows to match.
7. Continue to fill in the surfaces and delete extraneous lines until your base structure is complete.
8. Watch the Part 2 tutorial video; then apply textures and personalize the inside of your shed. What is your shed’s purpose? A tiny home? A reading nook? A potting shed? A motorcycle garage? Give your shed a purpose and get creative with your textures and features inside!
9. Once the inside is complete, watch the Part 3 tutorial video. Then go to the 3D Warehouse and pick out your windows and door.
10. Insert the windows and door into your model and scale them accordingly.
11. Move the windows and door into place, and be sure to line them up perfectly with the space provided.
12. Draw the line wrapping around your structure at the 6" mark (unless you know the building code for your area, and the requirement for exposed foundation; then use that measurement).
13. Apply a concrete texture to the bottom 6" of your structure; then select a siding material to apply to the rest of the walls. You can also modify the size and colour of the texture by clicking on the edit tab and making whatever changes you wish.
14. Watch the Part 4 tutorial video. Decide what type of roof you’d like to make. The tutorial shows how to make a standard pitch roof, with the gable ends at the front and back of the shed.
15. Offset your top outer rectangle by 6"; then pull that top surface by 6".
16. As in the video, draw a triangle on either end of the house, with a 2' peak.
17. To create the ridge of the roof, join the two triangles and enclose the roof structure.
18. Draw two offset lines of your peak on either end, by a distance of 6", and push the unwanted parts away.
19. Apply your selected roof texture to the roof, the fascia, and the eave.
20. Your shed is complete (see example in Figure 2). Add any additional features including signs on the exterior, a chimney, landscaping, etc.
21. Save your work.
22. Show your instructor before creating the cardboard model of your shed in the next activity.



**Figure 2**—Sample completed shed design