

## Jewelry from seeds



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### Public

adult

### Software

SketchUp

## Description

### Learning goals:

- master the basics of SketchUp
- practice 3D design with real world measurements

The goal of this workshop is to create a personal jewelry object, using precise measurements, while learning the basics of SketchUp. Participants will create a ring or pendant with a bean as a jewel.

## Timing

### 1. Introduction and presentation of 3D printing - 15 mins

Introduction of the world of 3D printing with video (<http://www.dragontape.com/#!/6319966877908992>) and presentation.

### 2. Overview of the activity - 5 mins

Briefly explain the flow of steps for the day's activity.  
What will the participants do? : Create a ring or pendant  
Which software will be used? : SketchUp

### 3. Open SketchUp for all participants - 2 min

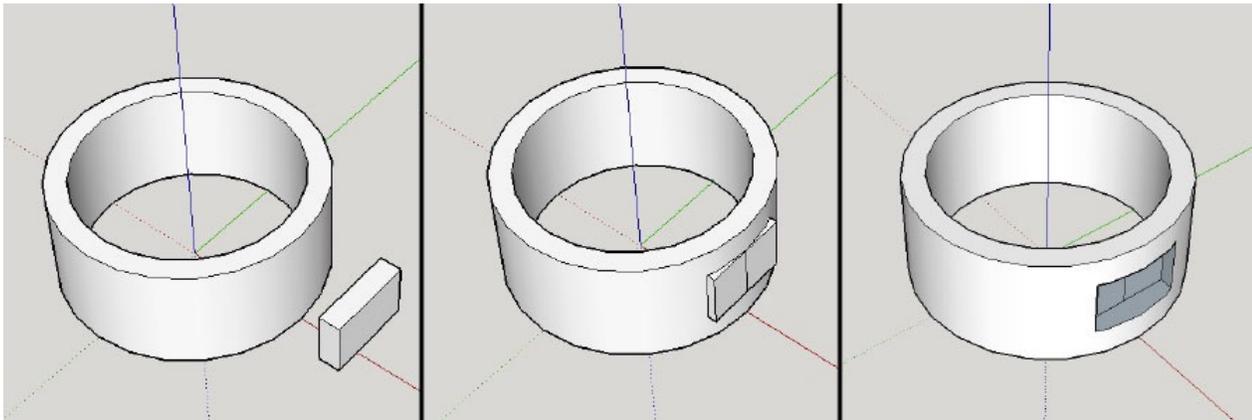
### 4. Introduction to SketchUp - 20 min

- Interface (menu, tools, workplane)
- Changing the viewpoint (orbit, pan, zoom)
- Sketching lines (pencil, shape, arc), snap and alignment to the three axes (red, blue, green)
- Sequence for creating specific measurements (e.g., rectangle measuring 5 x 10 cm)
- Push/pull tool
- Deleting faces (e.g., from a rectangle) and re-creating the face with the pencil tool
- Offset tool for making windows
- Move and rotate tools (holding the shift-key to lock transformation to an axis)
- Measure tool and creating guides for sketching
- Make sure to draw attention to the need for models to be watertight (demonstrate what this is and how to fix it)

Also, see the user guide and tips in the software resources page for SketchUp

## 5. Demonstrate the modeling of a ring using real world measurements.

1. Measure and write down the diameter of your ring finger (e.g., 20mm) and a bean or corn kernel (e.g., 2 x 5 x 8mm). The bean or corn kernel will serve as the jewel in the ring. Set the bean or corn kernel aside as you will need it later!
2. In SketchUp, start the ring by drawing a circle with a radius of half the diameter of your ring finger (e.g., 10mm). To do so, click on the center of the circle, drag the mouse along an axis, let go of the mouse, type in "10mm" with the keyboard, then type "Enter". Draw another larger circle starting from the same center point but add 2mm thickness (total 24mm diameter or 12mm diameter). Alternately, use the offset tool. Select the inner circle and delete it. Using the push/pull tool, give the ring a 10mm height.
3. Using the rectangle tool off to the side of the ring, draw the base of a rectangle with the dimensions of the bean (2 x 5mm). Using the push/pull tool, make the rectangle into a volume which matches the size of the bean.
4. Click and drag a selection box to select all the bean faces and edges, then right-click on the bean and select "Make Group". It will be easier to place the bean correctly on the ring while it is grouped.
5. Using the move tool and rotate tool, align and orient the bean so that it is sticking into the ring where you want it.
6. Right-click on the bean group and select "Explode". Then click and drag a selection box to select both the ring and the bean. Right-click on the selection and select "Intersect Faces" > "With Model". This will make sure that all the faces where the bean meets the ring will have lines on them (which will be needed in the next step).
7. Using the erase tool, remove the faces and edge of the bean which are sticking out of the ring. Take care not to remove faces or edges which will ruin the watertightness of the model. Demonstrate why this is bad and show how to use the Undo command to fix it.
8. Export the STL file. In menu bar select File > Export STL. Leave the units as *model units* (you can scale it in the slicer) and the File Format as ASCII. Use your name when saving the filename.
9. Print the ring. Put a dab of hot-glue on the bean and squish it into place in the ring. Ta dah!



## 7. Participants create their jewelry with SketchUp - 45 min

### 8. Saving the STL file

Ask participants to export their files (see instructions above) and to name their files using their name. Use a USB key to gather the STL files from participants.

### 9. Import the files in Tinkerine or Cura - 5 min

Open the preferred slicer software  
Import the STL file  
Adjust the print settings (fill, wall thickness, speed, height, ...)  
Save the file (.Gcode) to the SD card

### 10. 3D Printing - 30–45 mins

Insert the SD card in the 3D printer  
Select the previously saved file (.Gcode)  
Start the print!

As the rings complete printing, have participants help one another with hot-gluing their seeds or beans into their rings.

### 11. Feedback - 5 min

Ask the participants to provide feedback on the workshop while the models are being printed.

## Equipment

Ruler with millimeters

Calipers or string or fabric ruler

A few beans or corn kernels

Hot-glue gun and hot-glue sticks

## Participant's guide

1. Measure and write down the diameter of your ring finger (e.g., 20mm) and a bean or corn kernel (e.g., 2 x 5 x 8mm). The bean or corn kernel will serve as the jewel in the ring. Set the bean or corn kernel aside as you will need it later!
2. In SketchUp, start the ring by drawing a circle with a radius of half the diameter of your ring finger (e.g., 10mm). To do so, click on the center of the circle, drag the mouse along an axis, let go of the mouse, type in "10mm" with the keyboard, then type "Enter". Draw another larger circle starting from the same center point but add 2mm thickness (total 24mm diameter or 12mm diameter). Alternately, use the offset tool. Select the inner circle and delete it. Using the push/pull tool, give the ring a 10mm height.
3. Using the rectangle tool off to the side of the ring, draw the base of a rectangle with the dimensions of the bean (2 x 5mm). Using the push/pull tool, pull the rectangle up (e.g., by 8mm) to create a volume which matches the size of the bean.
4. Click and drag a selection box to select all the bean faces and edges, then right-click on the bean and select "Make Group". It will be easier to place the bean correctly on the ring while it is grouped.
5. Using the move tool and rotate tool, align and orient the bean so that it is sticking into the ring where you want it.
6. Right-click on the bean group and select "Explode". Then click and drag a selection box to select both the ring and the bean. Right-click on the selection and select "Intersect Faces" > "With Model". This will make sure that all the faces where the bean meets the ring will have lines on them (which will be needed in the next step).
7. Using the erase tool, remove the faces and edge of the bean which are sticking out of the ring. Take care not to remove faces or edges which will ruin the watertightness of the model.
8. Export the STL file. In menu bar select File > Export STL. Leave the units as *model units* (you can scale it in the slicer) and the File Format as *ASCII*. Use your name when saving the filename.
9. Print the ring. Put a dab of hot-glue on the bean and squish it into place in the ring. Ta dah!