3D MODELING USING TINKERCAD

Written by Lucy Ikpesu

CLASS DESCRIPTION

The course introduces learners to computer 3D Design using the **Tinkercad** software to create 3-dimensional text, structures, and objects. This course is modeled to project-based where learners will complete tasks and construct 3D objects.

TOTAL CLASS TIME: 180 minutes

CLASS OUTCOME

By the end of this class, students will learn how to use a software program called Tinkercad to create their 3D design, understand the basic operations in 3-dimensional design, Movement and manipulation of objects in virtual 3D space, develop series of projects such as Modelling of Text and Objects (for example cup, flower vase, wine glass, containers, interior designs, etc.) and understand the basic operating principle of the 3D printers.

INTRODUCTION

Drawing is a form of visual art in which a person uses various drawing instruments to mark paper or another two-dimensional medium.

Animation is making drawings and pictures to move. Is the process of making the illusion of motion and change by means of the rapid display of a sequence of static images that is minimally different from each other.

Design is a plan or drawing produced to show the look and function or workings of a building, garment, or other objects before it is built or made.

3D modeling is the process of developing a mathematical representation of any three-dimensional surface of an object via specialized software. A 3D model also lets you see the end result before it's built, allowing you to correct issues before it's too late.

3D Printing: is also referred to as additive manufacturing is a process of making three-dimensional solid objects from a digital file. This process is the direct opposite of the regular 'subtractive manufacturing'

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that was cutting out a piece of metal or plastic material with a milling machine or any other device. 3D printing, unlike subtractive manufacturing, is economical. It enables the production of complex shapes using less material than the traditional manufacturing methods through the addition of a precise quantity of material. A 3D printer can make pretty much anything from ceramic cups to plastic toys, metal machine parts, stoneware vases, fancy chocolate cakes or even (one day soon) human body parts.

A 3D printed object is achieved by laying down successive layers of material until the object is created. In the course of the printing, each layer of the 3D printed object comes as a thinly sliced horizontal cross-section of the eventual object. It can also be seen as the idea of building a physical form out of tiny layers.


FlashForge Finder 3D Printer

WHAT IS TINKERCAD

Tinkercad: Tinkercad is an online free software program, easy-to-use app for 3D design, electronics, and coding. It's used by teachers, kids, and designers to imagine, design, and make anything such as 3-dimensional text and Objects.

Tinkercad is a browser-based 3D design and modeling program created to provide a way for a variety of users (beginners to experts) to create projects. The conventional CAD software options are not only expensive, but they are also often quite complicated to learn. Design makers will more likely be happy with Tinkercad, which I regularly use. It's not only free but also very easy to learn and to use.
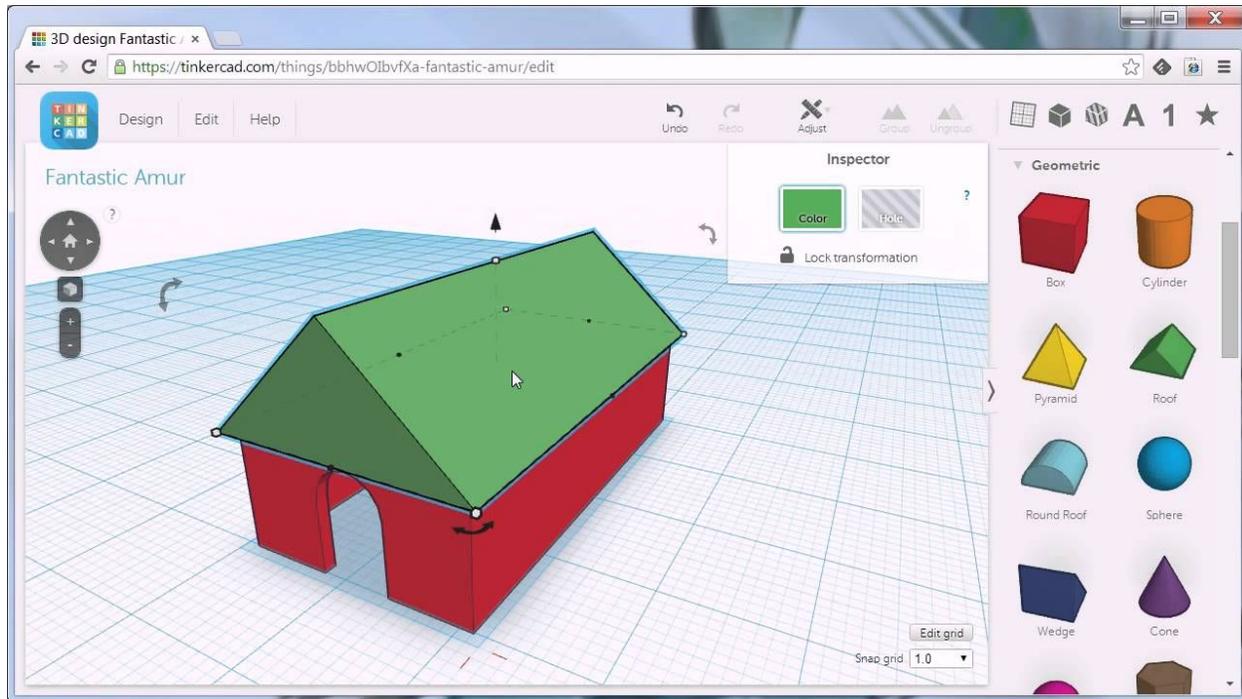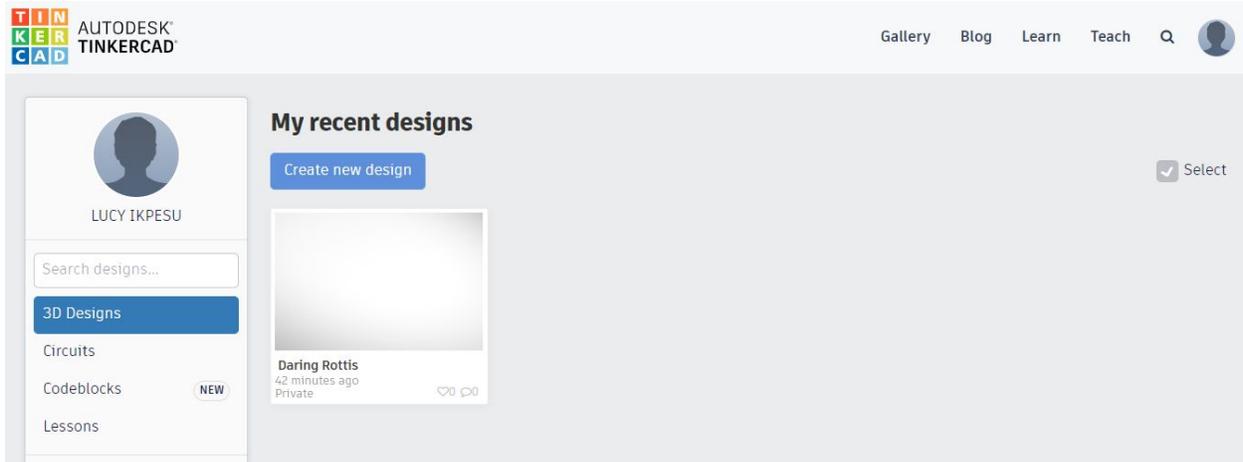
MATERIALS NEEDED

1. Computer
2. Tinkercad software: **https://www.tinkercad.com/** (sign-up to use the software)
3. 3D printer

GETTING STARTED WITH TINKERCAD

Before you start designing on Tinkercad, make sure to get a rough idea of how you want your design to look like or create a hand-drawn sketch. After you have a drawing you are satisfied with or the idea, visit Tinkercad's website using this link; **https://www.tinkercad.com/**

You will need to create a free account to access the Tinkercad dashboard. After logging in, you'll be greeted with a screen similar to this one below:
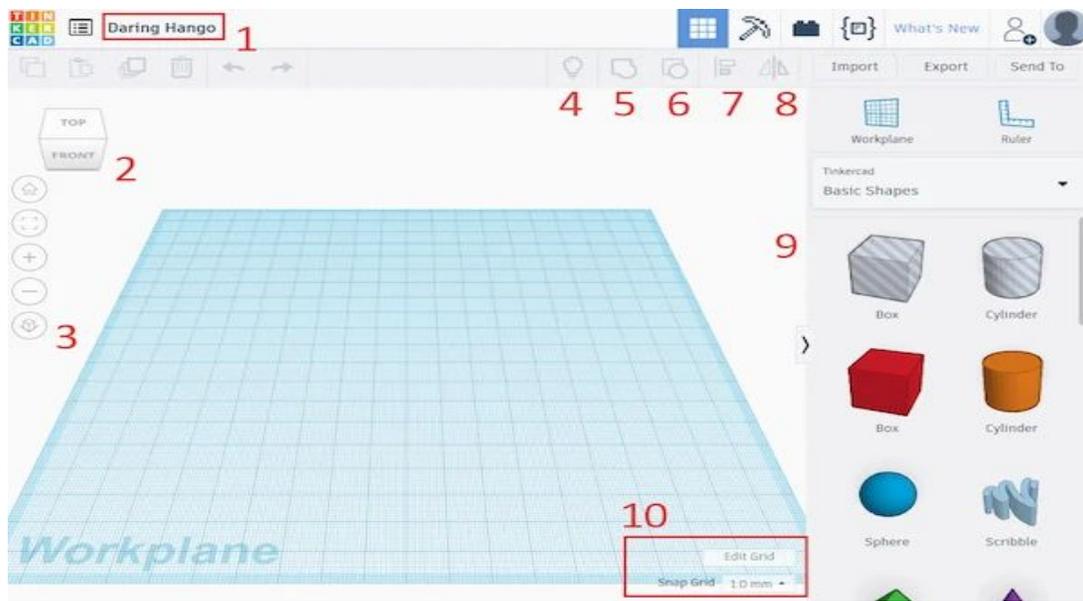
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A screenshot of Tinkercad's profile homepage

Click on "Create new design" right below "My recent designs" next to your profile picture. A new design will open up.

TINKERCAD USER INTERFACE

Let's quickly go over some basics of the main user interface. The screen below will show when you open the Tinkercad software ("Create new design").

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1. You can change your project's name here.
2. It is called the "**view cube**". It allows you to switch to a **side, bottom** or **top** view.
3. These buttons can also be used to control the camera. From the top to the bottom: return the camera to the default position and orientation, place the camera in a way that all your objects fit in the view, zoom in and out and switch between perspective and orthographic projection.
4. You can **hide** elements from your scene by selecting them with your mouse and then using **Ctrl + H**. This button makes all hidden elements visible again.
5. Button number five can be used to group objects. Grouping shapes allows you to combine them to a single shape and to create cut-outs and holes. This represents the boolean "union" operation in Tinkercad. You can also use Ctrl + G for this operation.
6. This button can be used to split up a previously defined group of shapes. You can also use Ctrl + Shift + G instead.
7. Button number seven can be used to align objects.
8. This last button allows you to mirror shape in your scene.
9. These are your basic shapes. You use them to create more complex shapes by creating cutouts and combining them into larger and more complex objects.
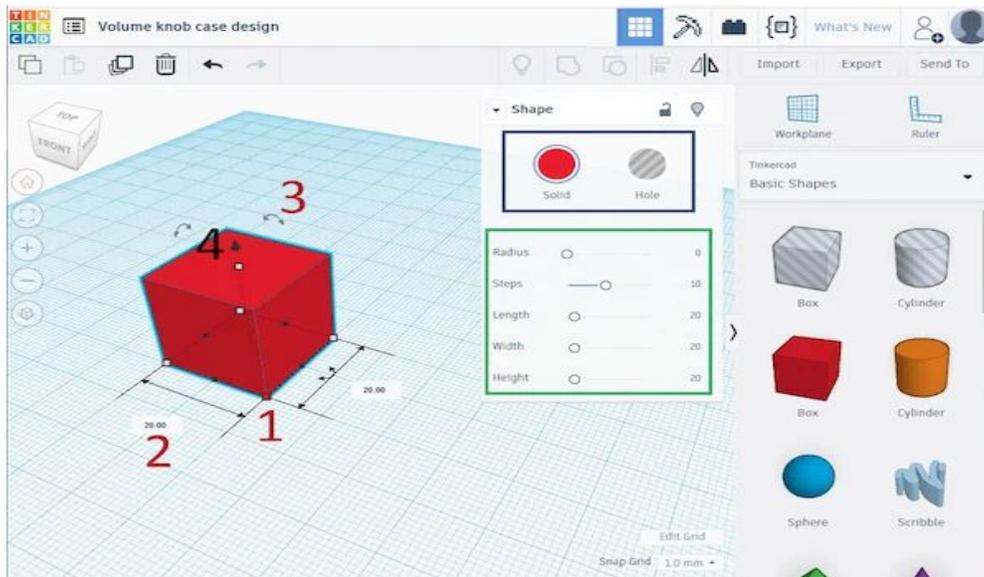10. You can change the grid with the tools in this area.

TINKERCAD APPLICATION

PART 1: BUILDING SHAPES

Almost all objects or shapes can be built by combining the few basic shapes available in Tinkercad and creating cut-outs (holes). Let's start with selecting a cube from the right-hand side of the window and place it on the work plane as shown in the picture below.

After placing the shape on the work plane, a properties window shows up (highlighted with a green rectangle). The sliders in this window might differ from shape to shape, but in this case, you can adjust the dimensions of the red cube and also set a radius and steps.

Right above the sliders, you'll find two buttons which allow you to change the color of the shape and also define whether it's supposed to be a cut-out.

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PART 2: CREATING HOLES AND CUTOUTS IN SHAPES

To create a cut-out and a hole in shape, place a new shape (rectangle) on the work plane and make it intersect the cube where you would like cut-out to be as shown below;
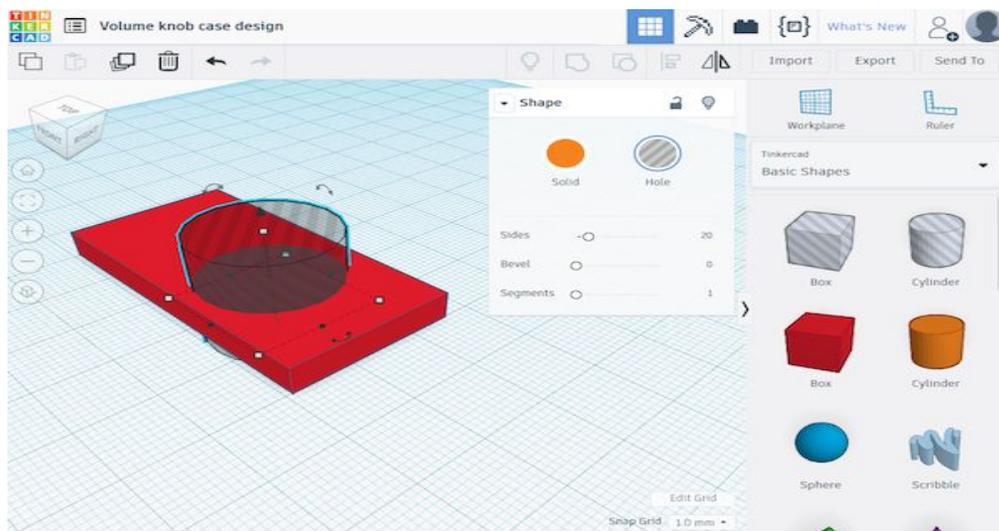
Choose a cylinder shape and change the color to a different one from the rectangular shape, then from a solid color to "Hole". This defines a cut-out in another shape.

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To create the hole, use the group-button on the top of the window (or select both shapes and hit Ctrl + G).
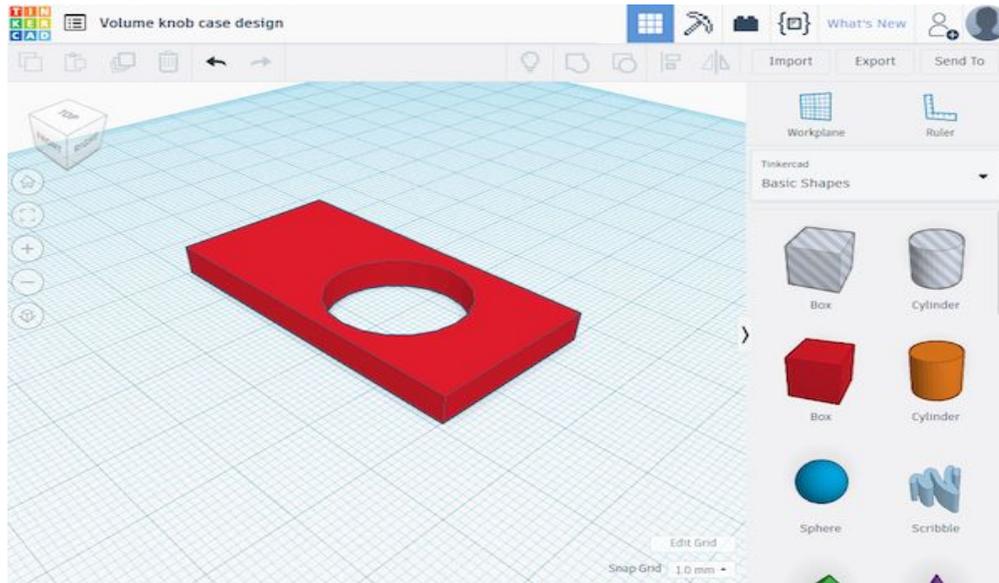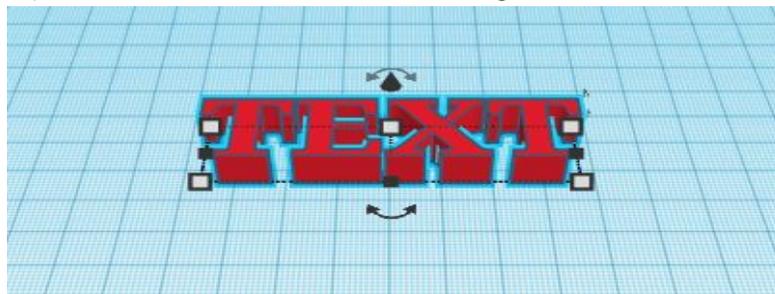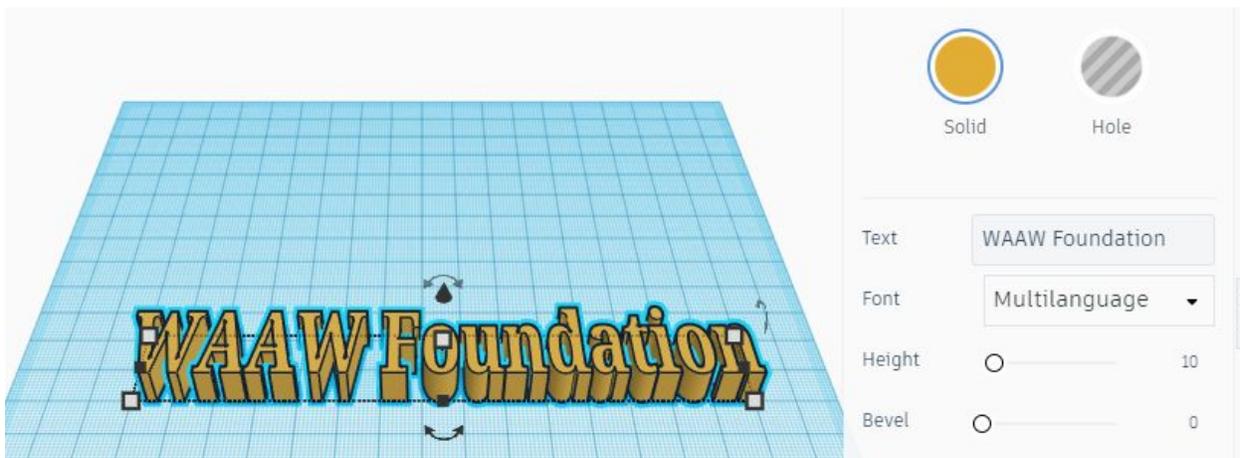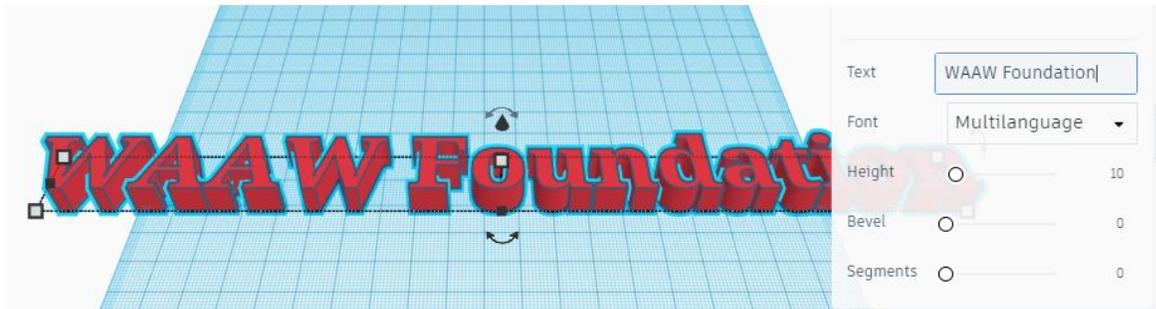

The two shapes can always un-join by clicking the button in the menu bar above the work-pane (or with Ctrl + Shift + G) and then easily adjust the size, shape and position of the hole.

PART 3: CREATE A NAME TAG/ 3D TEXT:

Tinkercad enables you to change the colors and shapes of your letters. Here are the steps to create a name tag;

On the toolbar on the right-hand side, open the **Letters** pane, then drag the letters "TEXT" on the work plane. Edit the text to the desired name e.g. WAAW Foundation. Change the length (150mm), height (10mm), and width (22mm) to the desired figure (ie the dimension of the name tag is 150mm long, 10mm deep, and 22mm wide). The color of the text can also be changed to the desired one.

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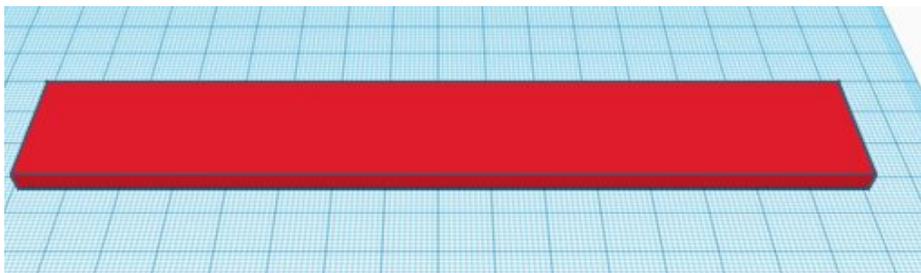Fax: (888) 519 4269

PART 4: NAME TAG ON A SURFACE

The first step is to create a base. Start by taking a basic **cube** shape from the "Shapes" column at the right, and then form it into a thin rectangular shape. Scaling in Tinkercad is simply push and pull at the corners to resize the model. The dimensions are in millimeters, but it can always be scaled up.

Pull and drag at the corners of the cube until you have your desired shape. The length of the rectangle (the name tag base) should be more than the dimension of the name tag. The dimension of the rectangle is 160mm long, 5mm deep, and 28mm wide.

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Drag or move the name tag to the surface created. Align the text properly on the surface and check all views to ensure the text sits perfectly from the side and top view. Make sure that each of your letters is properly on top of your base. When finished, select all the letters and click the **Group** button to join the letters to the tag.

PRINTING YOUR 3D DESIGN

Once, the design is finished, select the "Export" button at the top right. Save design and either create an.STL or.OBJ file for your 3D printer.
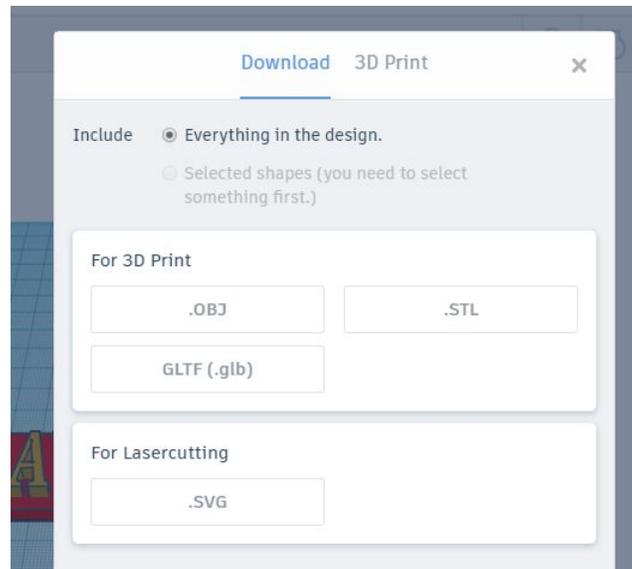
Kindly note that every 3D printer has its supporting file. For example, FlashForge Finder 3D Printer only supports a ".gx" file, hence any other file cannot be printed on it.

No worries, about how to print. Any 3D file can be converted to the other, so far the software for the 3D printer is available. The exported.STL or.OBJ from the tinkercad software can be converted to a ".gx" file using the FlashForge 3D software.