



**The 3<sup>rd</sup> Belt and Road Teenager  
Maker Camp & Teacher Workshop**

**THE ART OF MODEL**

**SEPTEMBER 24-30,2019  
GUANGXI · CHINA**



## **What is Computer Aided Model Making?**

Since the primitive society, human beings have relied on their strong creative ability to use in painting, sculpture, architecture, writing and so on. It is our innate ability to use various materials to construct the objects needed for life and production. Since the first industrial revolution, we have been able to produce on a large scale. The design and manufacture of the model runs through all industrial processes. But until the last 20 years, making a model according to one's own ideas was still something that professionals or a few handicraft enthusiasts could not do. With the price and difficulty of 3D printing/laser cutting technology decreasing, ordinary people only need a little training to master and start to create.



## **What are we going to learn in this course?**

We're going to give you two-day lessons:

- Usage of 3D Printing Pen
- Basic Usage of 3D Design Software
- Basic Use Method of Laser Cutting Machine

At the end of the course, we should design a work to solve the problems in real life independently.



## Activity 1: Design the Badge of Your Group

There is an idiom story in ancient China. A little friend named Ma Liang is kind-hearted, diligent and brave, and good at painting. One day the God gave him a pen. Whatever he drew, it would immediately become a real object. He used this pen to help relatives in his hometown solve difficulties and fight against bad people. So Magic Brush Ma Liang is used to describe a person who can turn what he imagines into reality.

The 3D printing pen is the closest thing to this legend. It is shaped like a pen and toothpaste to extrude the hot-melt printing material, which solidifies quickly and becomes what we describe.

Use 3D printing pen, design a breastpin which represent the honor and spirit of your group, in 30 minutes.

Then, introduce your badge in three sentences.

Material:

- 3D Printing Pen
- PLA Printing Material
- Triangular ruler

Technological process:

1. Connect the printing pen to the power supply correctly under the guidance of the teacher and insert the printing material into the pen.
2. Use your imagination to create the badge



Flat

Tridimensiona

Hollowed-out



*Tip: When using a 3-D printing pen, it is easy to improperly press the pen on paper (or other objects) just like a pen used for writing. This prevents the pen from extruding the material. The trick is to suspend the pen.*

## Activity 2: How to use a 3D Printer

### Part 1. How to use a 3D modeling software.

3D design software is a kind of CAD software, which aims to let users use computers to design 3D models and generate special files for 3D printers.

Through the Internet, we have a large selection of 3D design software. Here we use THINKERCAD, a free 3D design software produced by AUTOCAD, as the two-day learning software. In fact, the use of 3D design software ideas and methods are similar, learn one can quickly learn another.

Next we start with a simple everyday item. You can choose vases, photo frames, or any work whose volume is within the printer size range currently in use and whose printing time is less than 2 hours. If calculating print time is one of the things we need to learn.

Material:

- computer with THINKERCAD installed
- 3D printer

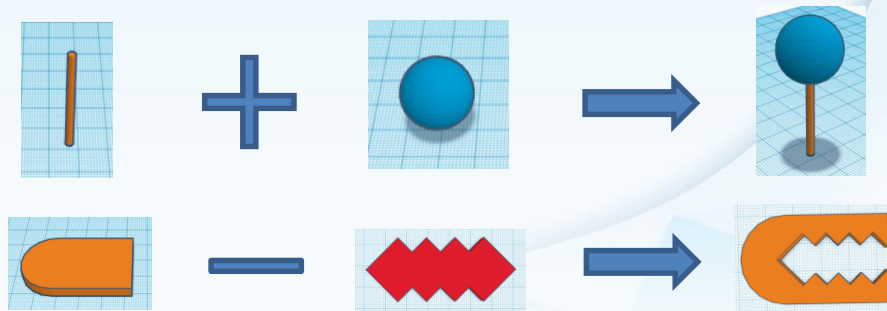
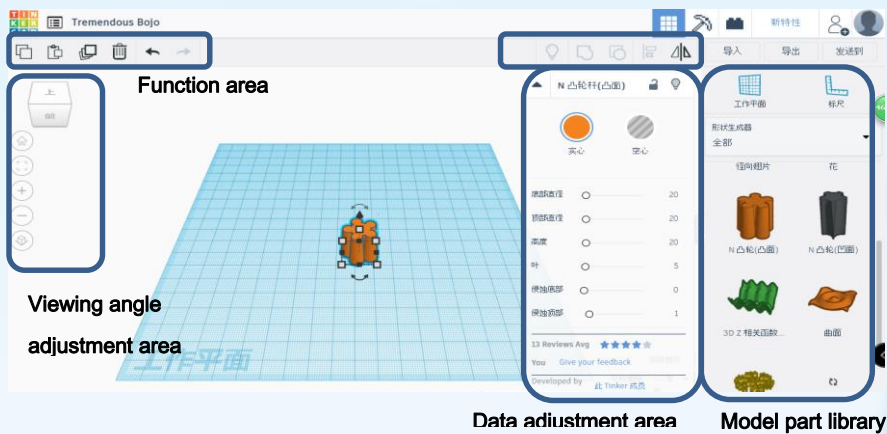




Technological process:

1. Explore the interface and menu items of the software
2. Place it placement
3. View it Perspective
4. Move it Mobile
5. Rotate it rotation
6. Size it Up Size
7. Group IT Portfolio
8. Align it alignment
9. Use these basic functions to start creating your design.

Because the number of 3D printers is limited and the printing time is long, teachers collect documents and arrange printing teams.





## The 3<sup>rd</sup> Belt and Road Teenager Maker Camp & Teacher Workshop

### Part 2: Put your 3D model into a 3D printer.

Step 1: Export images to .stl format

Step 2: Open the 'FlashPrint' software

Step 3: Load the file

Step 4: Adjust the setting

Step 5: Print!



### Activity 3: Using Laser Cutting

Unlike 3D printing technology, laser cutting is the cutting of desired parts in a piece of material. Compared with 3D stereo design, laser cutting design seems to be much simpler, because it is a 2D design. We just need to design the shape and size of a plane. But actually using it to make a three-dimensional structure is more complicated than 3D printing, because you have to design the three-dimensional structure and the combination of the parts, and then cut the parts out of a flat plate (corkboard, acrylic or other non-metallic materials). This is another form of 3D design, but the advantage is that it can enrich the appearance and function of your work.

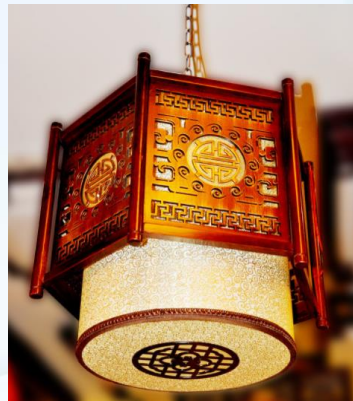
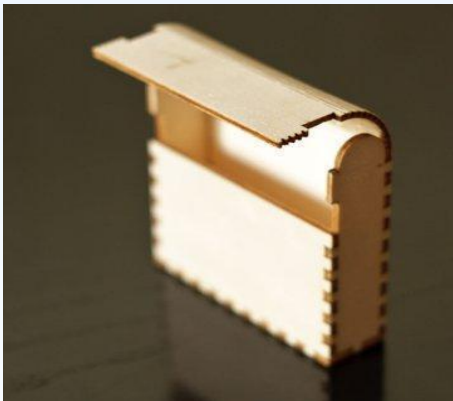
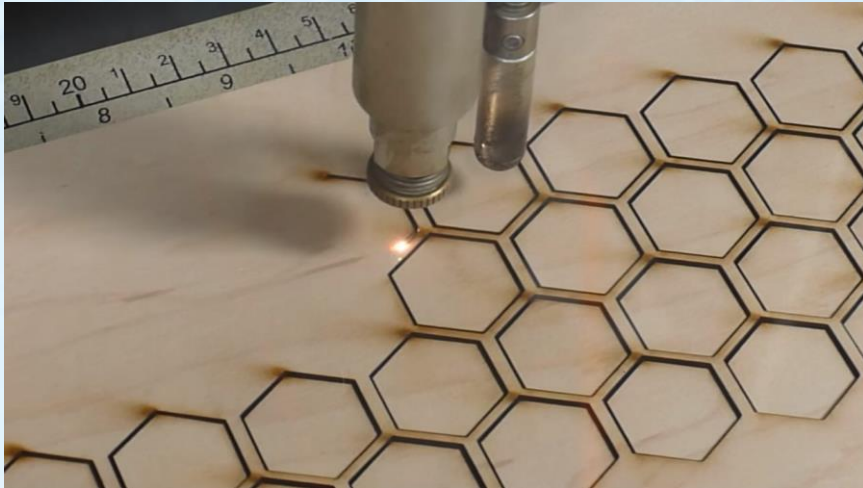
Material:

- Computer with Vector Graph Design Software Installed

Technological process:

1. Designing a seven-piece puzzle (tangram, an ancient Chinese jigsaw puzzle)
2. Try cutting to make a hexahedron/cube and think carefully about how to fix each face.

Due to the limited number of laser cutting machines, teachers collect documents and arrange printing teams.

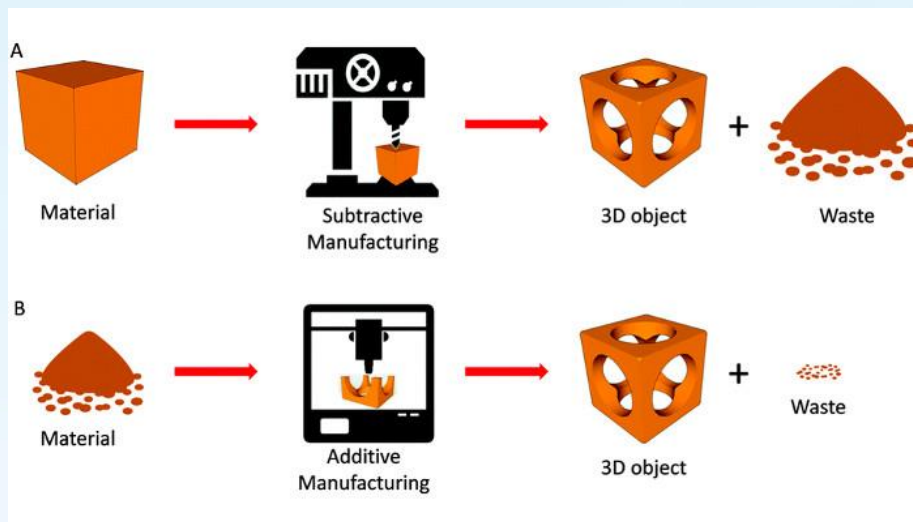




## Knowledge: Additive Manufacturing and Subtractive

### Manufacturing

As two types of traditional manufacturing technology, Additive Manufacturing and Subtractive Manufacturing have their advantages and disadvantages. In traditional manufacturing industry, material reduction technology is widely used. From a raw material, some materials are removed by cutting, drilling, milling and other mechanical processes, so as to obtain a three-dimensional object shape. It can be imagined that all the materials removed in this process become waste, and the material is used. The rate is low.



Additional material manufacturing generates three-dimensional object shape by superimposing a very small unit of raw materials. Although waste may be generated by reprocessing later, it is generally very little waste of materials.

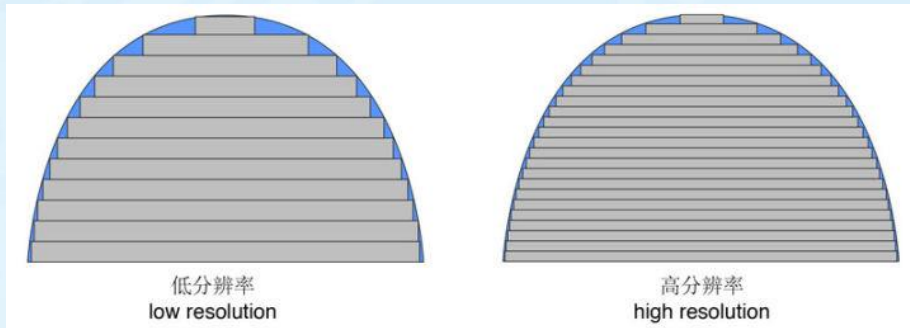
It's like making an apple out of rubber mud, using Additive, you can glue together a lot of very small pieces of rubber mud to form an apple shape, and using Subtractive, you start with a large piece of rubber mud, you use tools to gradually remove the unnecessary parts, and you end up with an apple form.

Of course, we can't judge the advantages and disadvantages of the two manufacturing methods only by utilizing the materials. As the traditional material





reduction technology has been very mature, it has great advantages in process precision, automation and efficiency, and the cost of mass production can also be effectively controlled, so 3D printing technology in most areas does not have the advantage to replace it.



However, 3D printing technology is obviously superior to traditional material reduction technology in prototype production and small batch production. Based on the development speed and process uniqueness of 3D printing technology, 3D printing technology will become increasingly mature and occupy an important position in the manufacturing industry.



## **STEM Project: Future Agreement**

Guess you already had a great time with your friends and taken a lot of pictures. Looking forward to the future, talking about the dreams. Design a gift with photos. Make a pact with the future and this gift will be the keepsake. Hope one day you could reunite and pact it again.

Design:

- Every member should have it and your creative photos should be included in the gift.
- Group members' gifts could be a series or a piece to show your friendship.
- Due to there's only one and a half days to make, please design the gift size reasonably, otherwise it may not be completed.

Works:

1. Take a creative photo shoot and use the laser engraving. (Just draw the design and the teacher will help you to cut it with the equipment.)
2. Use the techniques learned today. (The body of the gift will use 3D-printing or laser engraving.)
3. 3D-pen works can be used as decorations.
4. Team members need to work together and make the PowerPoint to introduce your works on the afternoon of 27th.
5. Presentation will last about 3 minutes.



### Evaluative Dimension

<b>Scientificity</b>	The process of project design and making should be scientific and reliable.
<b>Creativity</b>	In one or more aspects of project design and making, etc. the team should show strong creativity.
<b>Teamwork</b>	Task allocation should be clear and cooperation should be in order.
<b>Practicability</b>	Projects should be of use in reality.
<b>Expression</b>	<ol style="list-style-type: none"> <li>1.The presentation should be clear and brief;</li> <li>2.Understanding the basic scientific principles related to the project;</li> <li>3.The extent to which work is carried out independently;</li> <li>4. Answering questions clearly and briefly.</li> </ol>



## The 3<sup>rd</sup> Belt and Road Teenager Maker Camp & Teacher Workshop

### Project Sheet

(Only one sheet needed for each group)

Name of your group	
Member of your group	
<b>Design Chart</b> (Including the overall modeling picture, and the design of each part)	





<p><b>Materials List</b></p>	
<p><b>Personnel division</b> (List the division of work for each person in your group. Note that one of them needs to act as a spokesperson to speak on behalf of your group.)</p>	