

IT in Education Subject-related Series:

Using 3D-Printing Technology and e-Learning
Tools to Enhance Learning, Teaching and
Assessment of Science (S1-3) Curriculum

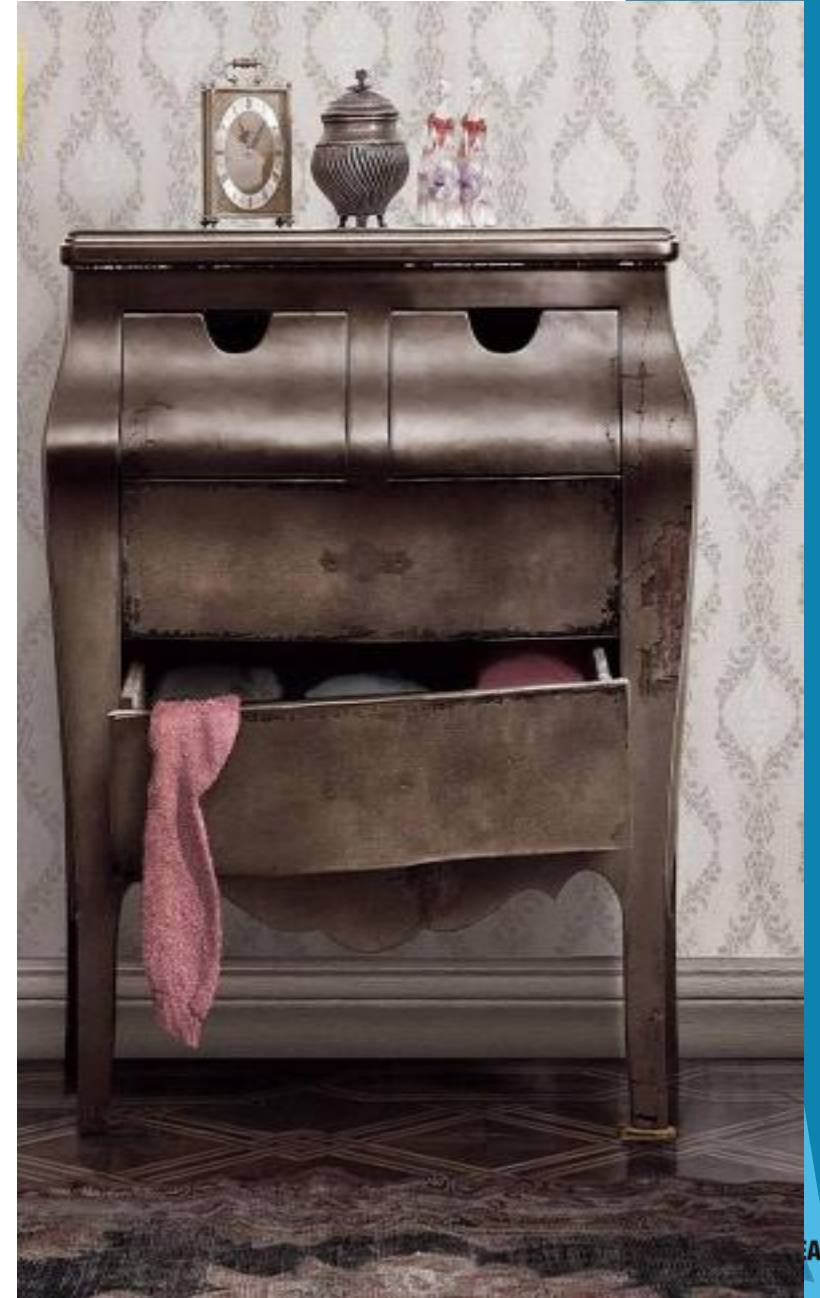
Session 1



Member of VTC Group
VTC 機構成員

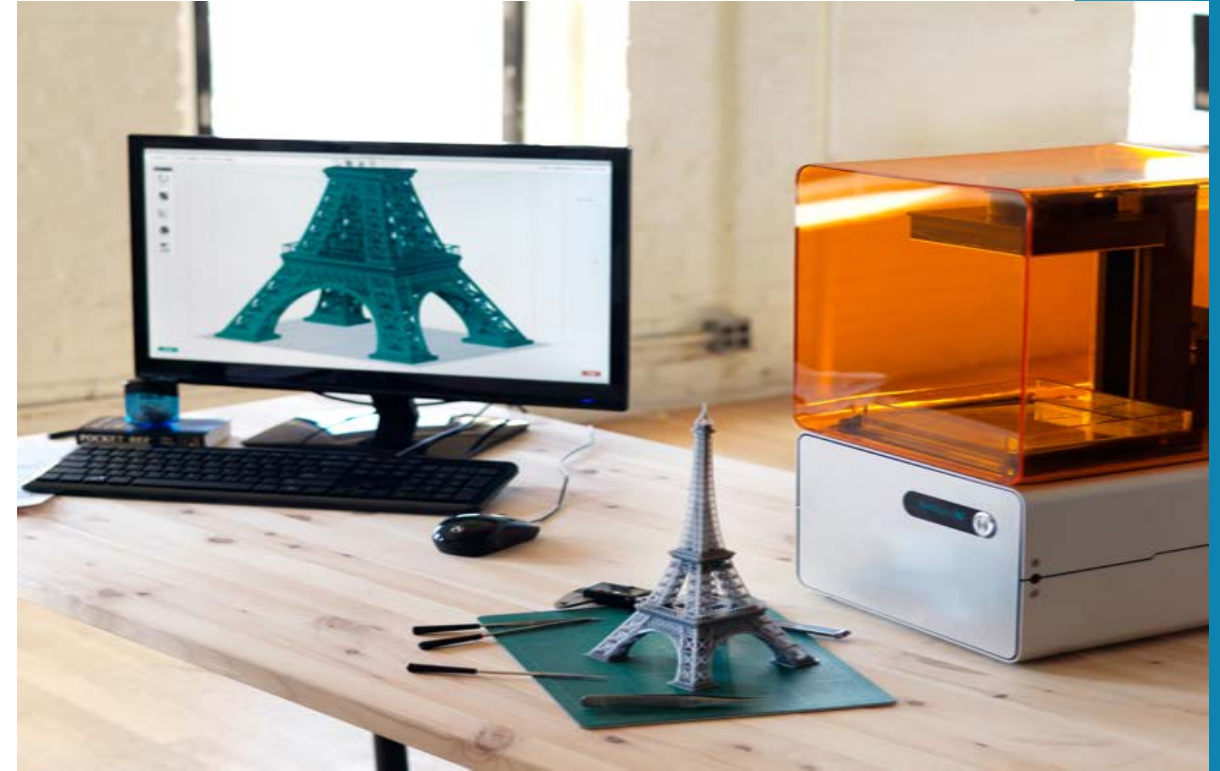
Introduction to 3D Printing





What is 3D Printer?

- ▶ Tools to 'create' physical objects from a virtual 3D model
- ▶ Additive manufacturing process, widely uses in design and prototyping



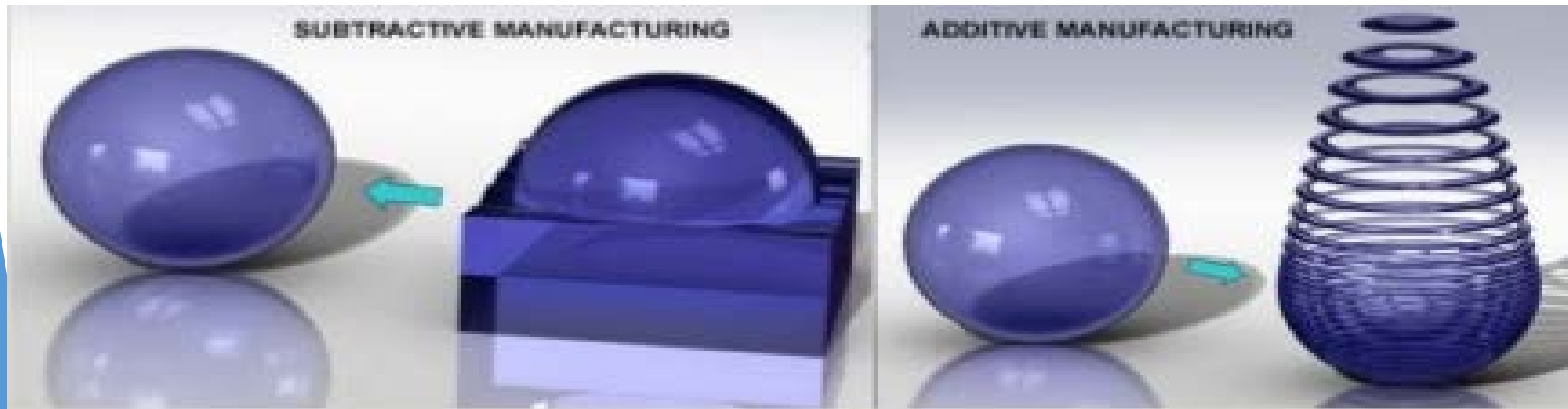
Shapeways

PEAK

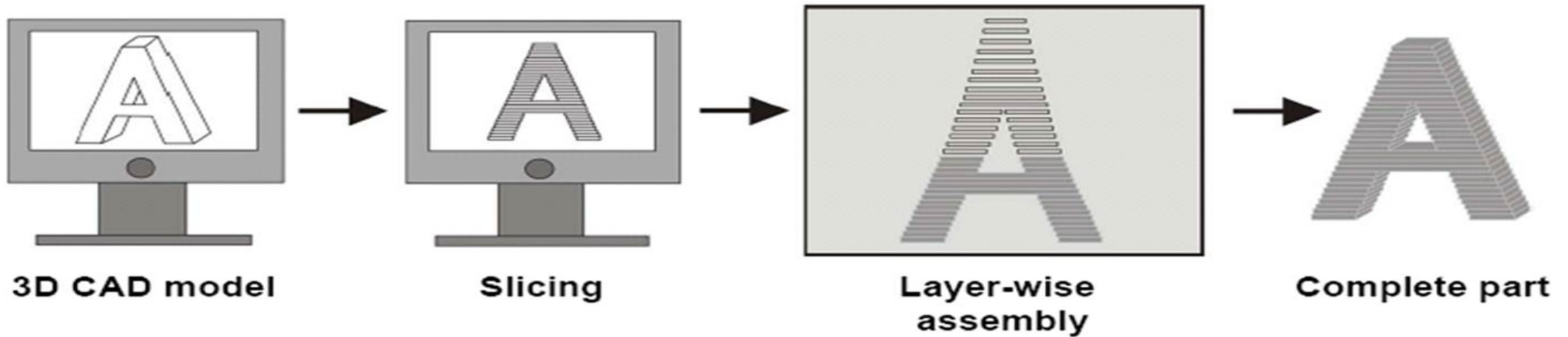
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Additive manufacturing

- ▶ 'Add' small materials together to form objects
- ▶ Can produces difficult shapes
- ▶ Less scraps after manufacturing



'Layer by Layer'

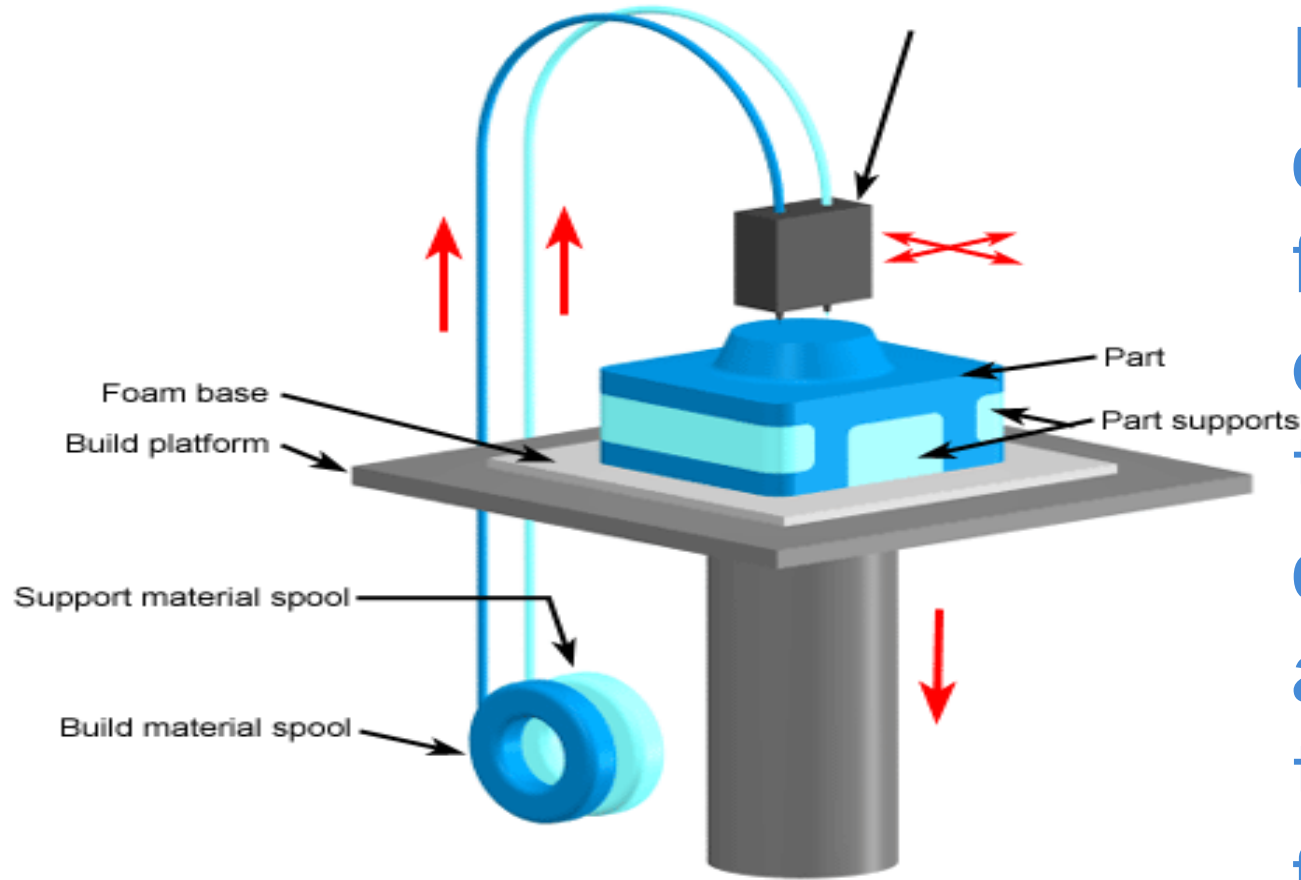


History of 3D printing

- ▶ First 3D printer invent in 1984 year, by Chuck Hull (3D Systems Corporation)
- ▶ Mainly used in industrial prototyping over 20+ years

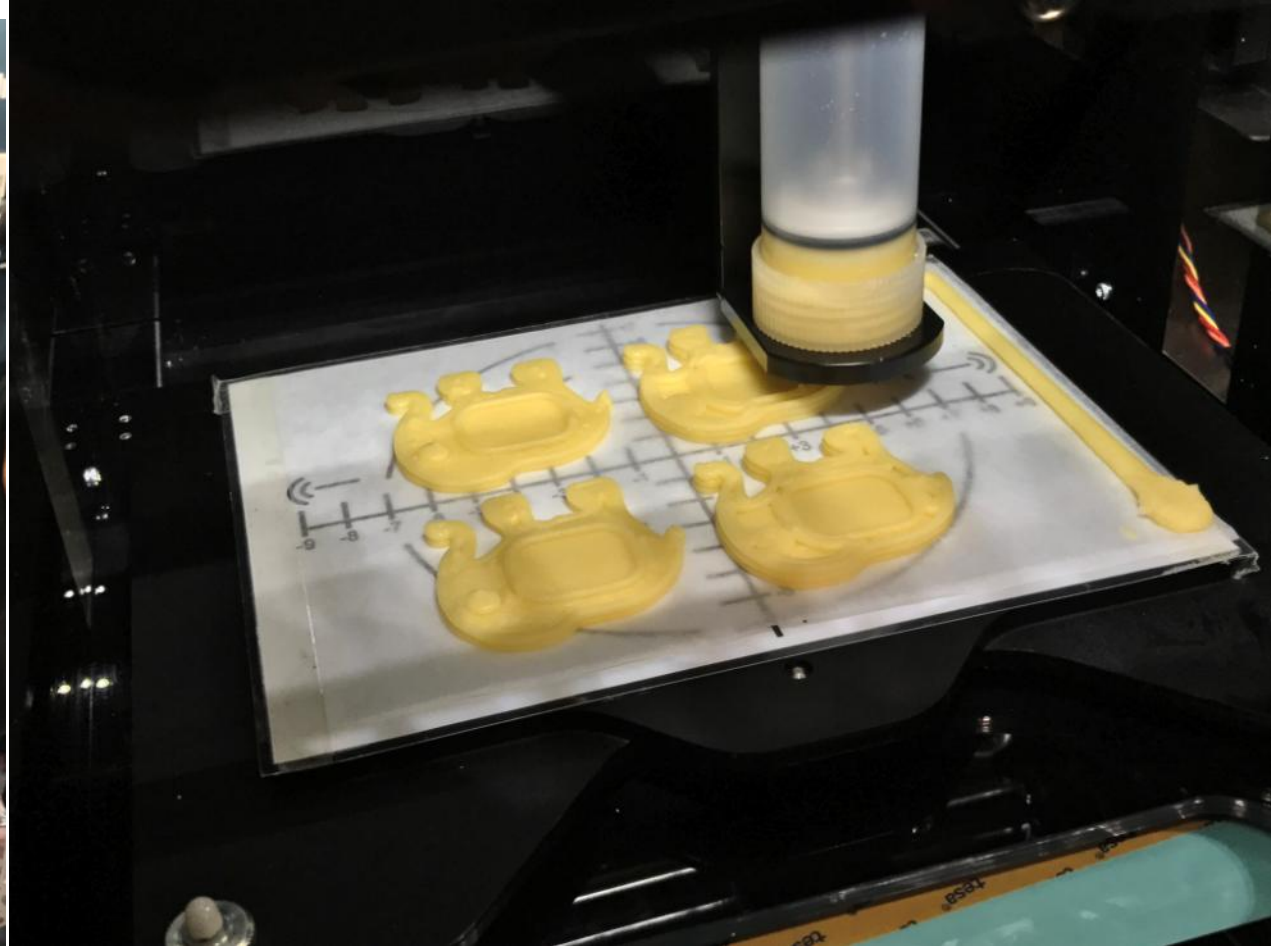


Fused Deposition Modeling (FDM)



FDM uses a reel of plastic filament and extruding it through a small diameter nozzle and fused together to form objects.

Fused Deposition Modeling (FDM)



Food Printer

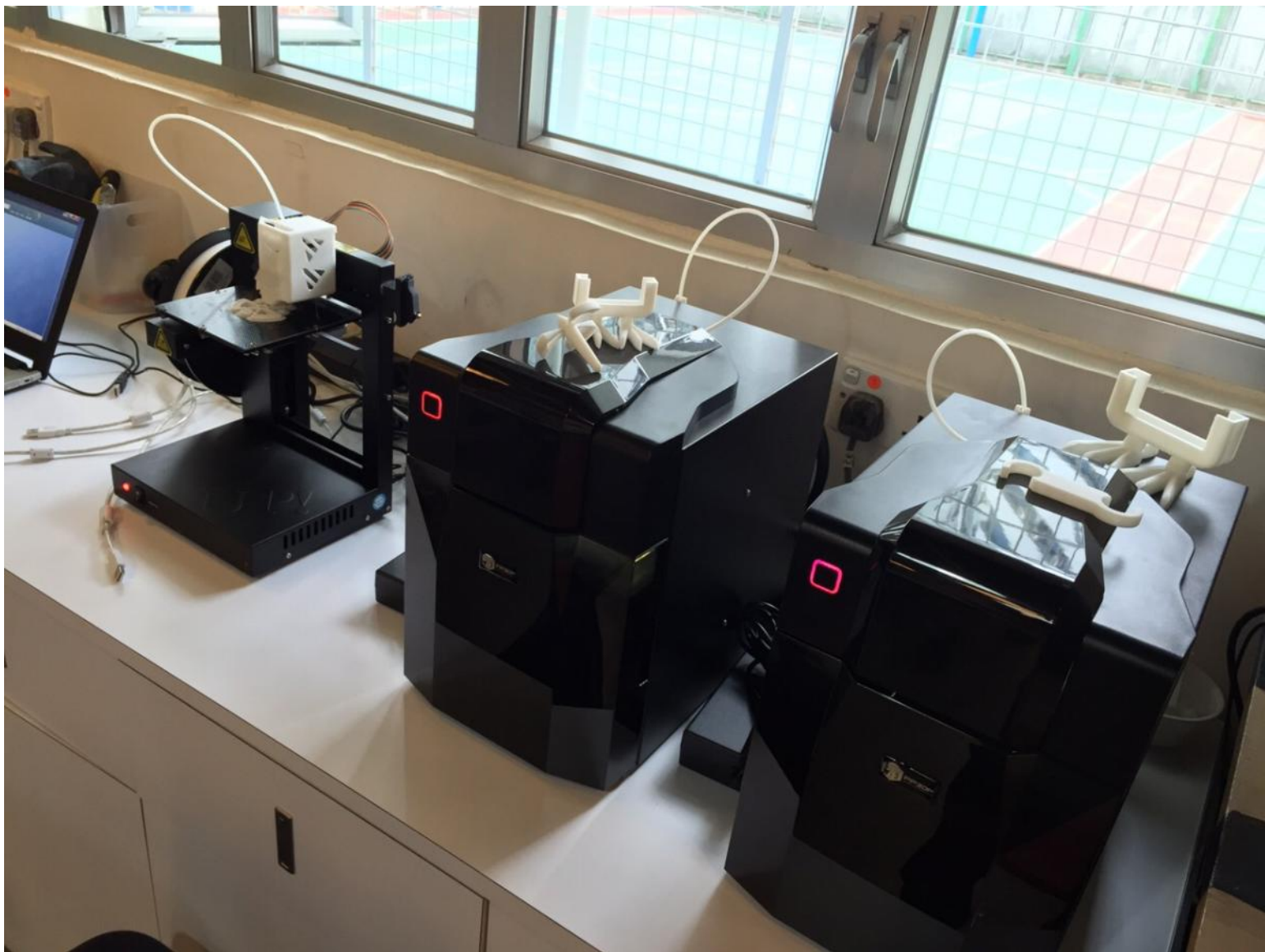


Food printer



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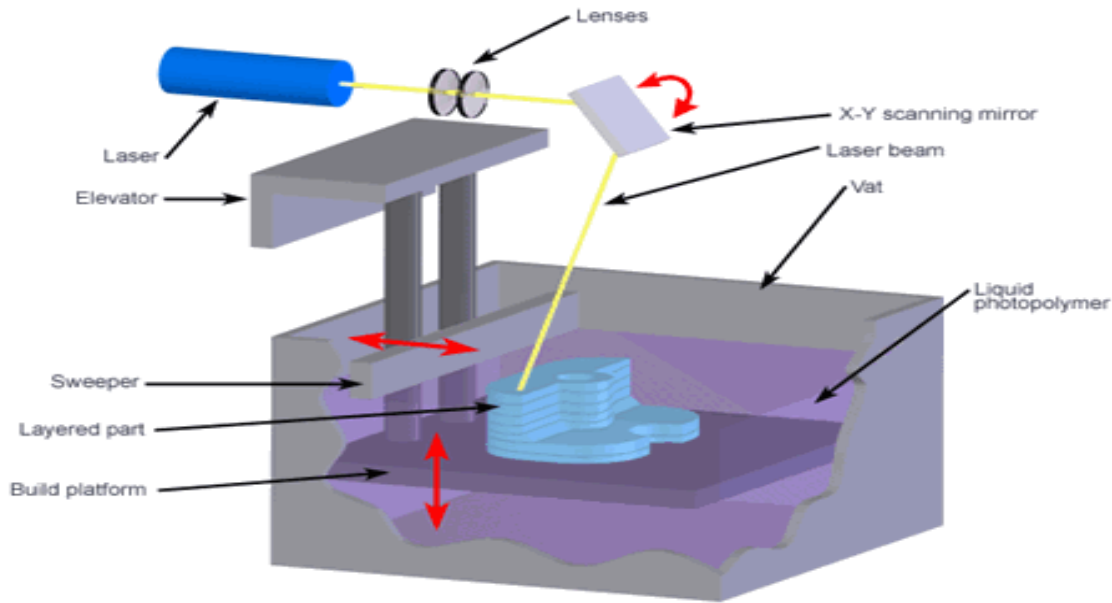


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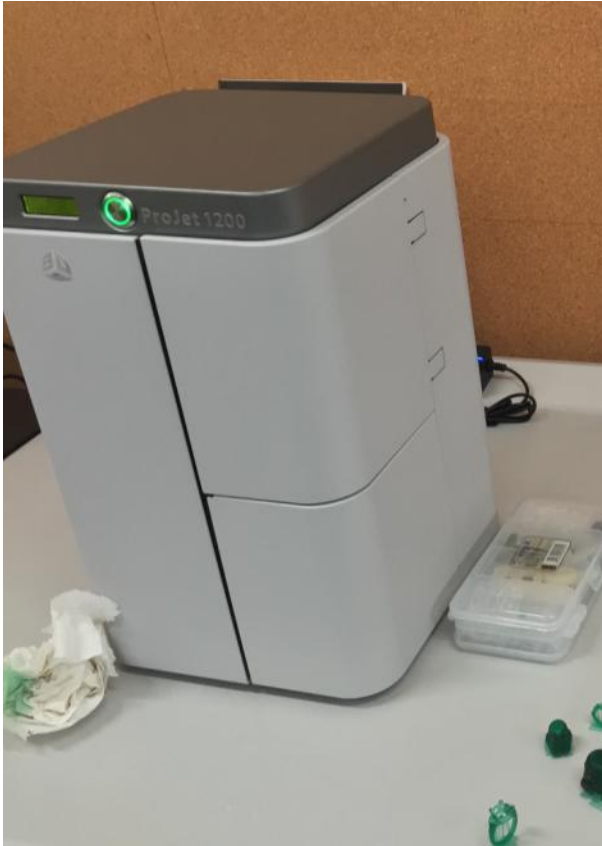
Stereolithography (SLA)



SLA uses a laser and a set of mirrors to **solidify the layer of UV light curable resin.**

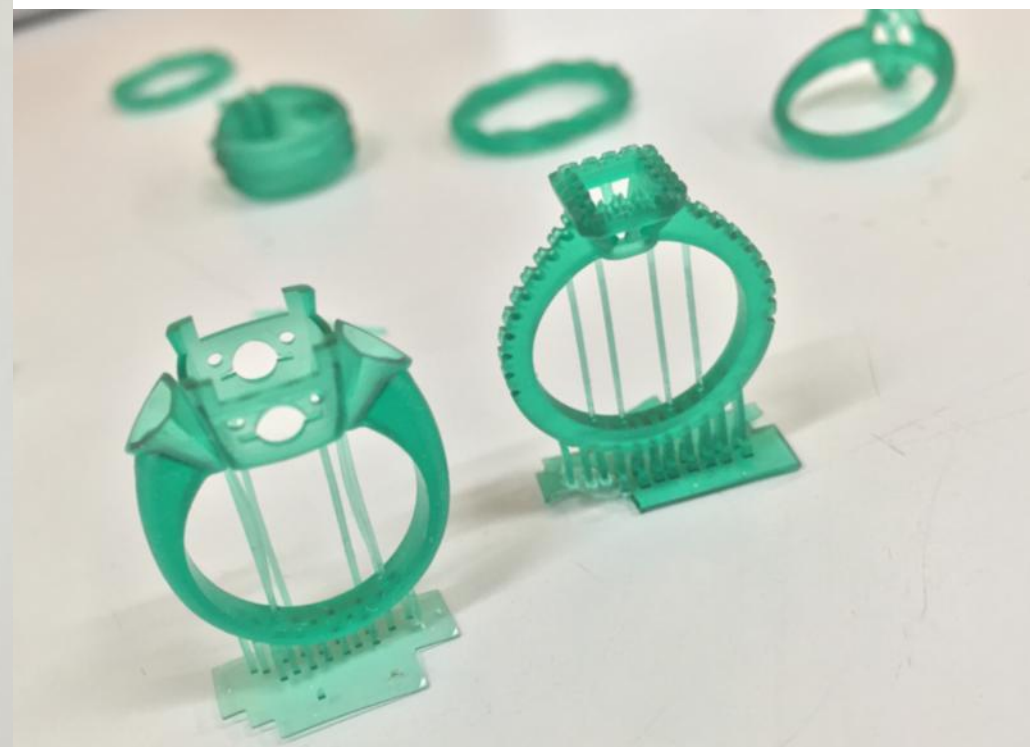
Since laser beam is narrow enough, **output quality is better than FDM.**

Stereolithography (SLA)





Products printed

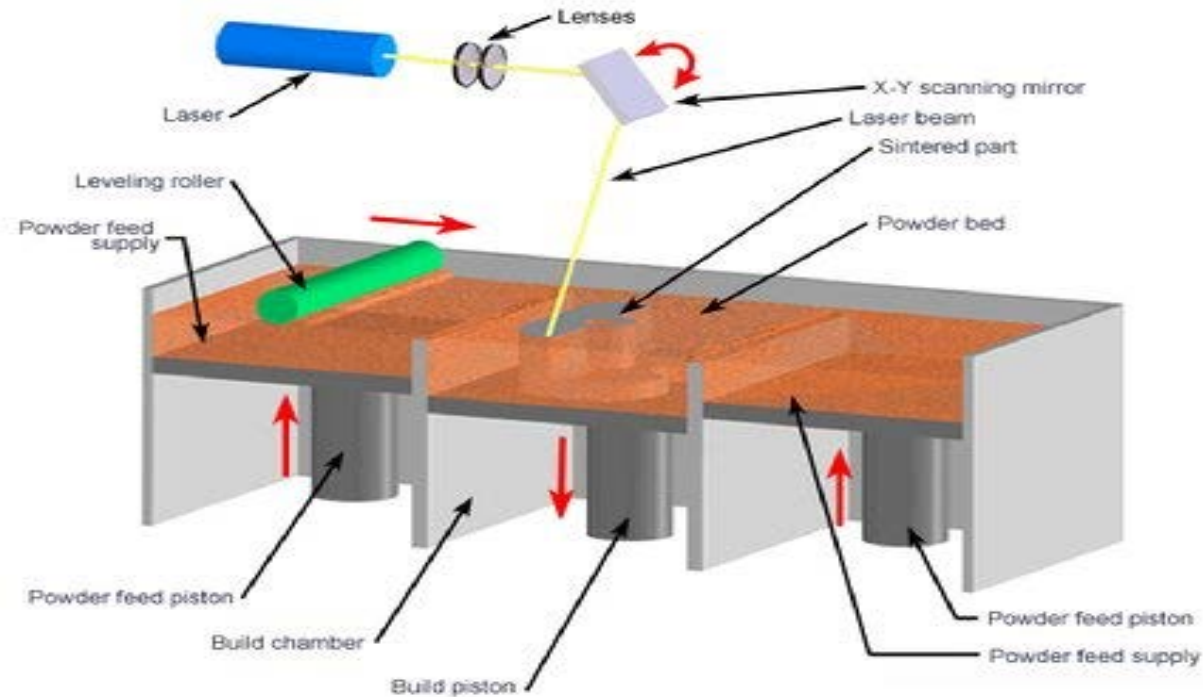


Selective Laser Sintering (SLS)

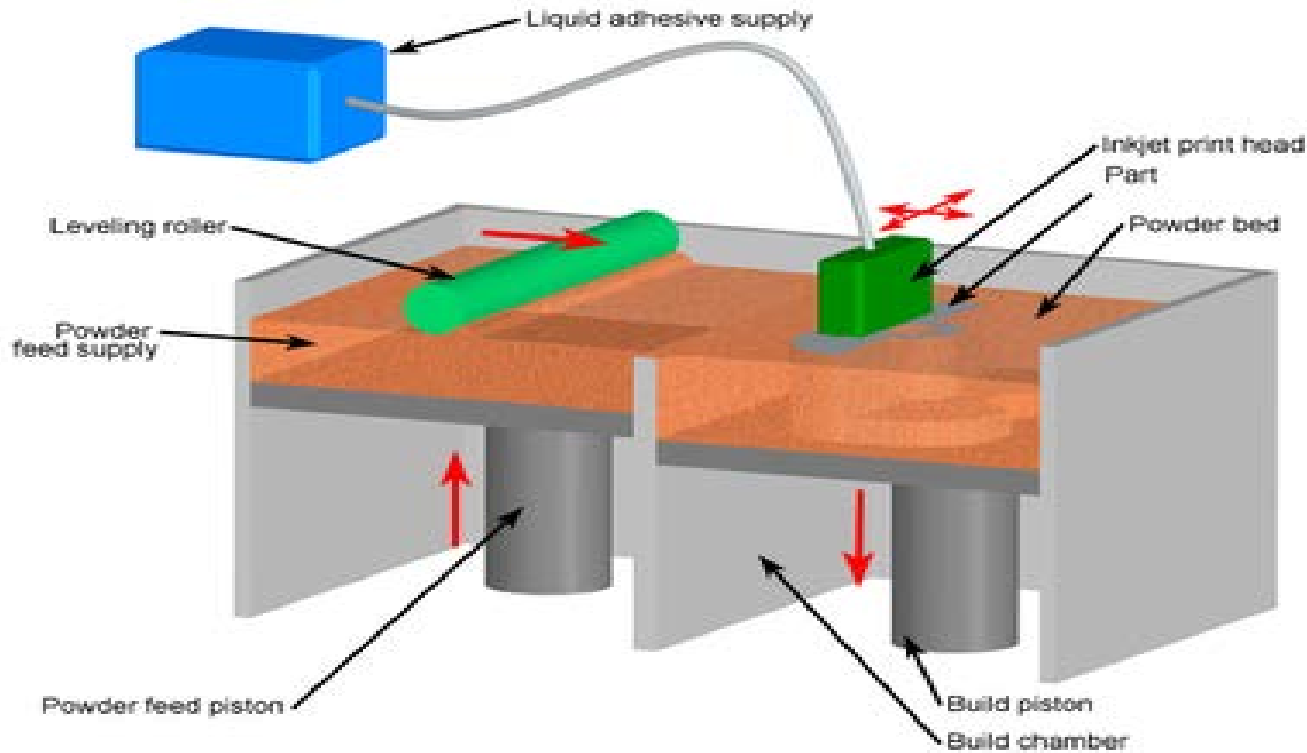


SLS uses a laser to melt the selected metal/ polymer powder and form a physical object.

This method usually uses building metal objects.



Binder jetting / Polymer jetting



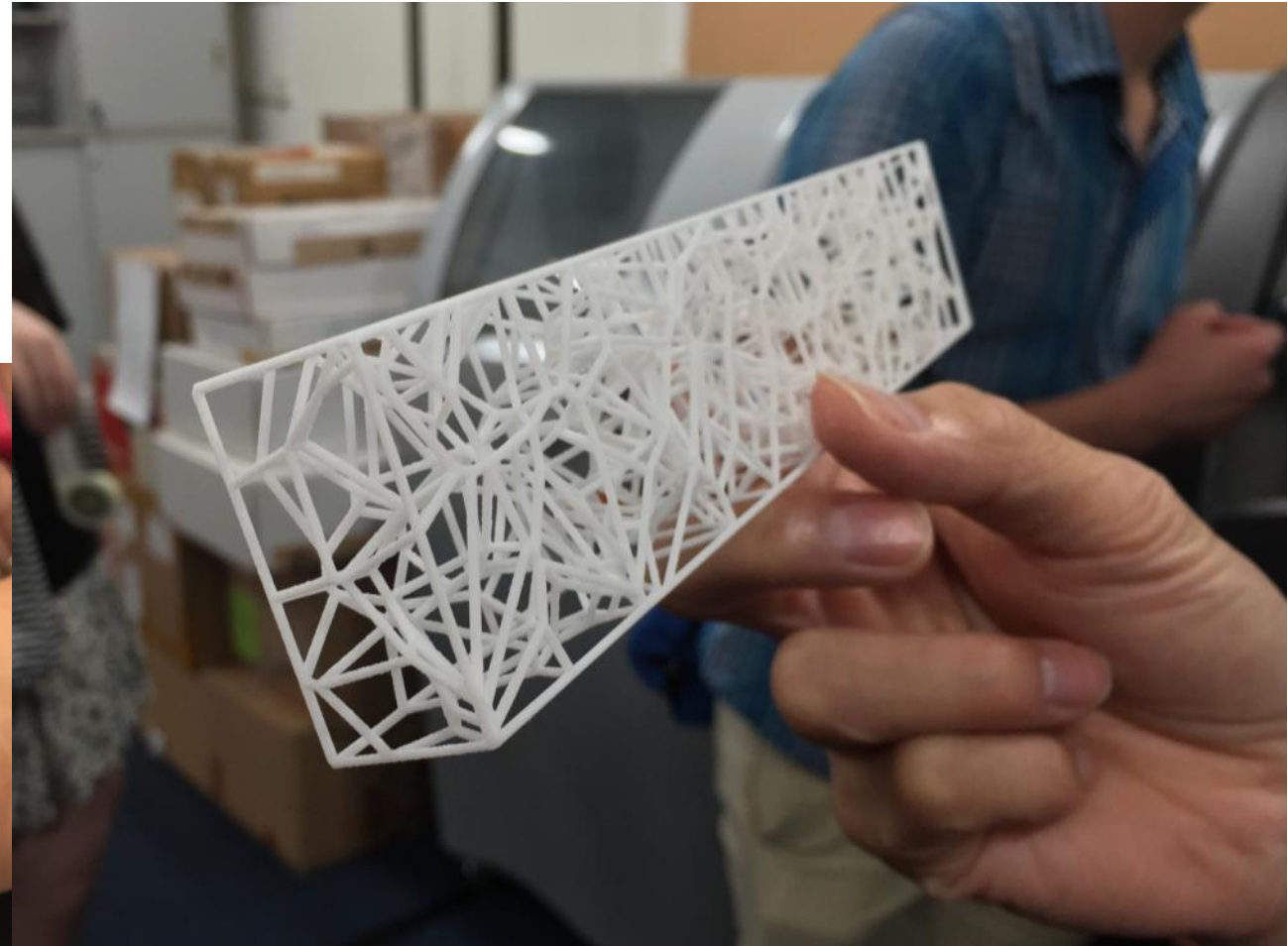
Binder jetting uses liquid adhesive to binding the selected polymer powder to form a physical object.

With colour adhesive, it can form colour objects.

Binder jetting / Polymer jetting



Products printed



Products printed





Setting for scanning:
only at 0.1s for 3D scanning



More about FDM technology

- ▶ Usually print with plastic filaments, likes:
 - ▶ **ABS** – Strong and last long, bad smell during printing
 - ▶ **PLA** – Made from corn, bio degradable
 - ▶ **PVA** – Water soluble, uses to print 'supports'
- ▶ Nozzle size from 0.25mm up to 0.8mm
- ▶ Layer thickness from 0.05mm up to 0.4mm

1 Extending thoughts with 3D printing

1.1

Products of 3D printing can be...

···a set of creative accessories





<http://www.thingiverse.com/thing:554850>

The Open Toy project is the result of a 2013 workshop at Domaine de Boisbuchet.







1.2

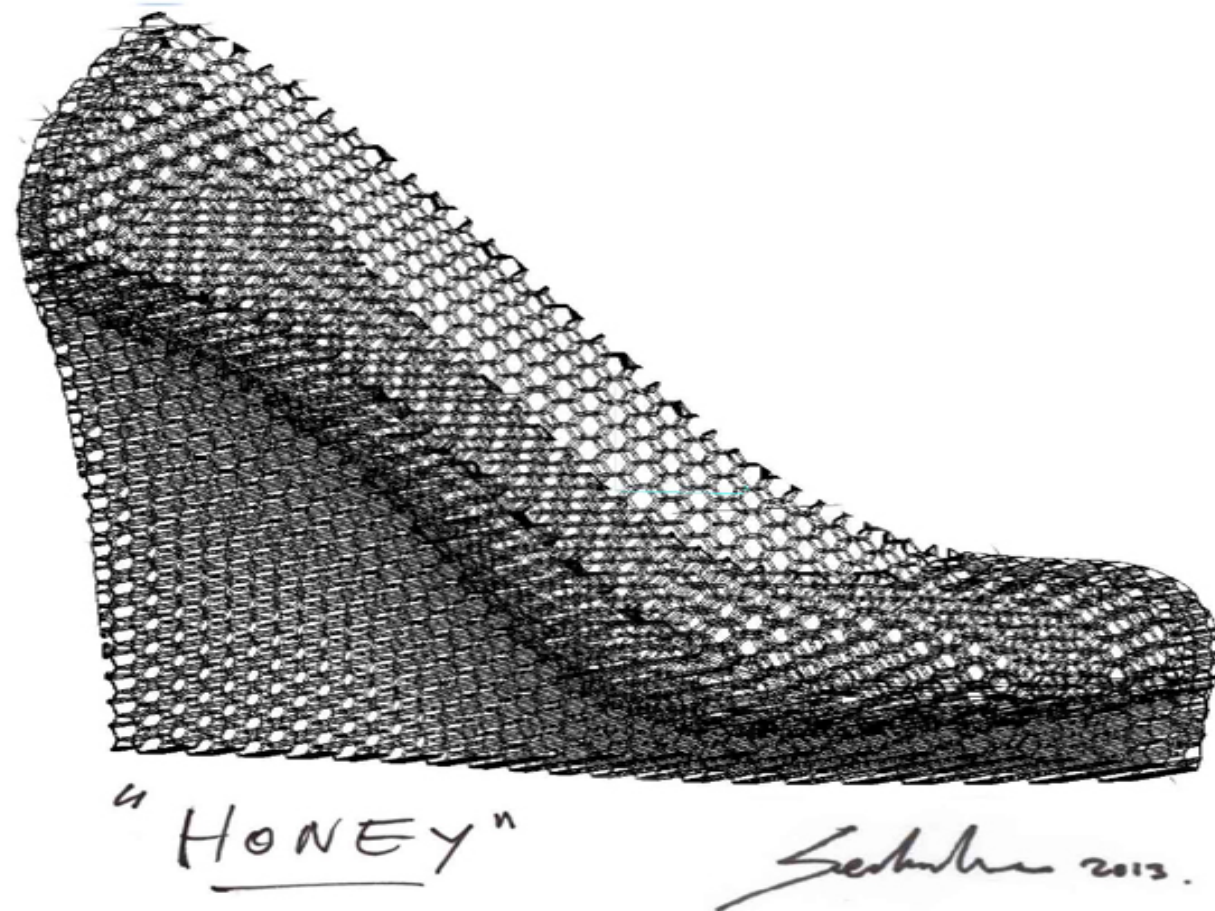
People express their feeling
towards their lovers...

...media for creation

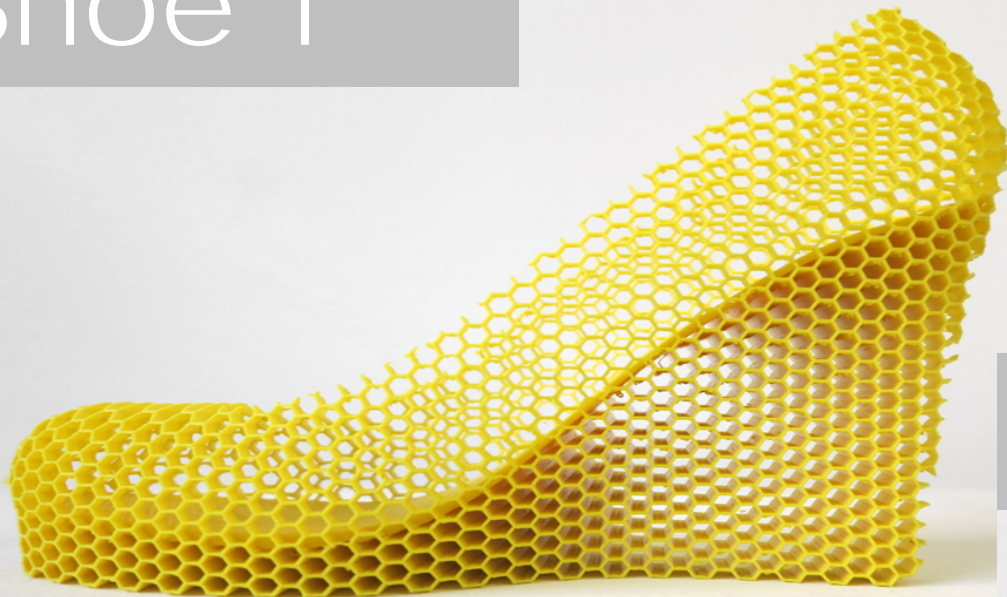


'12 shoes for 12 lovers'

by sebastian errazuriz



Shoe 1



'honey' natasha

Shoe 2



'cry baby' alexandra

Shoe 3



'gold digger' alison

Shoe 4



'heart breaker' laura

Shoe 5



'ice queen' sophie

Shoe 6



'hot b' caroline

Shoe 7



'the virgin' anna

Shoe 8



'jetsetter' jessica

Shoe 9



'the boss' rachel

Shoe 10



'GI jane' barbara

Shoe 11



'the ghost' valentina

Shoe 12



'the rock' alice

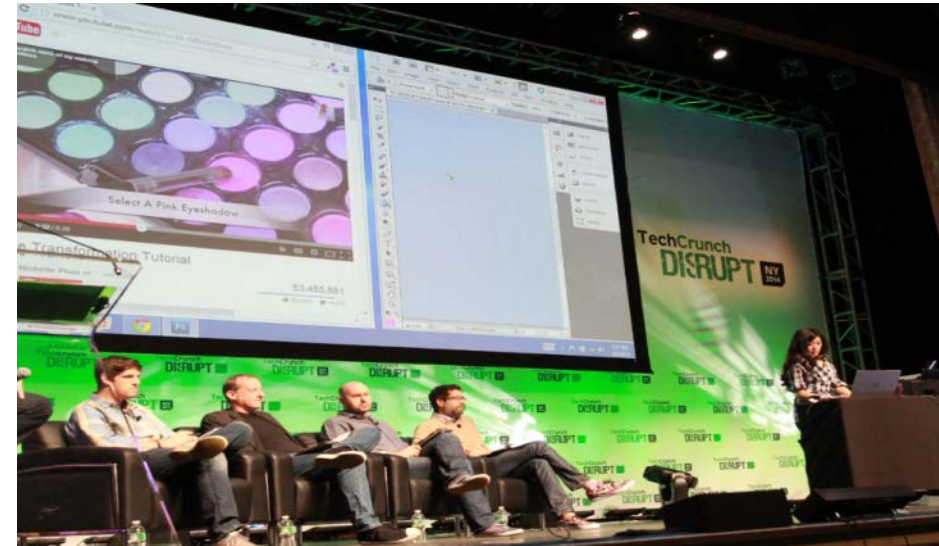
1.3 Home made gun



Functioning 3D-printed rifle you can make at home

<http://www.digitaltrends.com/cool-tech/functioning-3d-printed-assault-rifle/>

1.4 Home made cosmetics machine



Grace Choi, a Harvard Business School graduate, has Created a 3D printer, Mink, that allows anyone to print makeup at home by using colors straight off the Internet.

<https://www.youtube.com/watch?v=cBZHFUQip8Q>

1.5 Converting trash to shoe



3D-Printed Sneakers Are Made From The Trash We Throw Into The Ocean

<http://www.iflscience.com/technology/3d-printed-sneakers-made-ocean-plastic-showcased-adidas>

1.6 Medical use



83-Year-Old Woman Gets the World's First 3D Printed **Titanium** Replacement Jaw

[83 Year-Old Woman Gets the World's First 3D Printed Jaw | Inhabitat - Sustainable Design Innovation, Eco Architecture, Green Building](#)

1.7 Building components



D-Shape Printer *Enrico Dini*

<http://inhabitat.com/3-d-printer-creates-entire-buildings-from-solid-rock/>



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1.8 Fashion design



Bikinis? Shoes? This Duo Will 3D Print Your Wardrobe

<http://mashable.com/2012/07/17/3d-printing-continuum-fashion/#>

1.9 Food printing



3D Printed Ice Cream

http://www.3d-print.today/3D_Printed_Ice_Cream

More can be found...

3D Printing Time Lapse Photography - Yoda

https://www.youtube.com/watch?v=8_vloWVgf0o

How Dutch team is 3D-printing a full-sized house

<http://www.bbc.com/news/technology-27221199>

What's Next in 3D Printing, by Avi Reichental (9mins)

https://www.ted.com/talks/avi_reichental_what_s_next_in_3d_printing

3-year-old Maui boy receives 'Ironman'-like 3-D printed hand (2:34)

<https://www.youtube.com/watch?v=CQKcEhTd-Ck&feature=youtu.be>

Bionic hand designed and 3D printed in bedroom

<http://www.bbc.com/news/technology-24209140>

3D Printer Will Print You In Chocolate And Full-Color Sugar Candy

http://www.3d-print.today/3D_Printer_Will_Print_You_In_Chocolate

3D Printed Furniture- A Revolution In The Design Technology

http://www.3dprint.today/3D_Printed_Furniture_A_Revolution_In_The_Design_Technology



Now we commonly come across...





Platinum



Gold



Sterling Silver



Precious Plated Metal



Strong & Flexible Plastic



Frosted Detail Plastic



Acrylic Plastic



Metallic Plastic



Brass



Bronze



Steel



Full Color Sandstone



Porcelain



Castable Wax




Elasto Plastic



Aluminum

shapeways, 3D printing with different materials

<http://www.shapeways.com/materials?li=nav>

A close-up photograph of a person's hand holding a 3D printed flower. The flower is white with many thin petals and a textured center. The background is dark and out of focus.

Digitally Hand Crafted

Personalized, 3D Printed Products

SHOP

Discover products
crafted by our
community of designers

MAKE

Create personal
products regardless of
your skill level

Everyone's a Maker

Whether you're an experienced 3D designer or just want to personalize a unique gift,
Shapeways gives you the tools to make something that matters.

... send your design for service providers to print out



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MeMoment, high fidelity figurine by 3D Imaging and 3D Printing

<http://www.memoment.net>



...scan and print

Ease of use of 3D softwares

1. Tinkercad



2. 123D Sculpt



+



3. 123D Design



4. SketchUp



1. Tinkercad



← → ↺ 🏠 <https://www.tinkercad.com> 應用程式 📁 Yahoo!字典 📁 WiseSearch 📧 klss-110514 📁 SAMS-191213 🔍 Search 🌐 Ads of the World 🌐 Google 📄 明報周刊 Online 📄 Wong Sek-Ching 📁 其他書籤

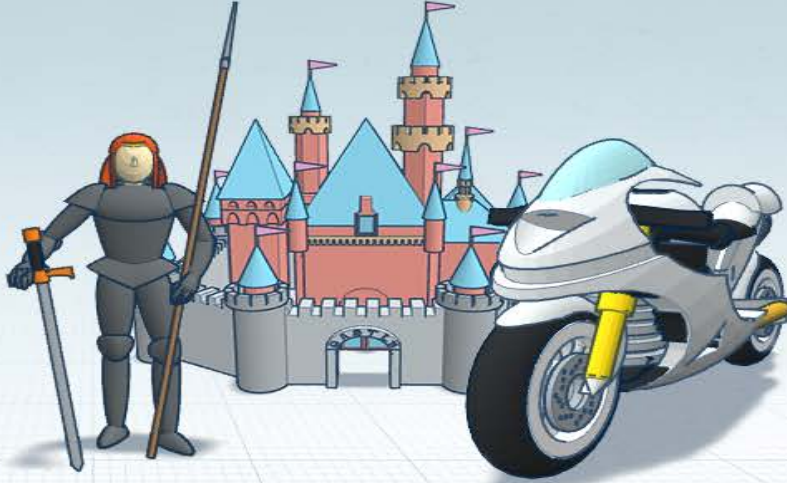
Community Challenge: March Tinker-Madness! Make your team's mascot for a chance to get Tinkercad gear. ✕

TINKERCAD FEATURES LEARN GALLERY BLOG SIGN IN SIGN UP

The easiest, fiercest 3D design tool around.

Tinkercad is a free, easy-to-learn online app anyone can use to create and print 3D models.

[Start Tinkering now](#)

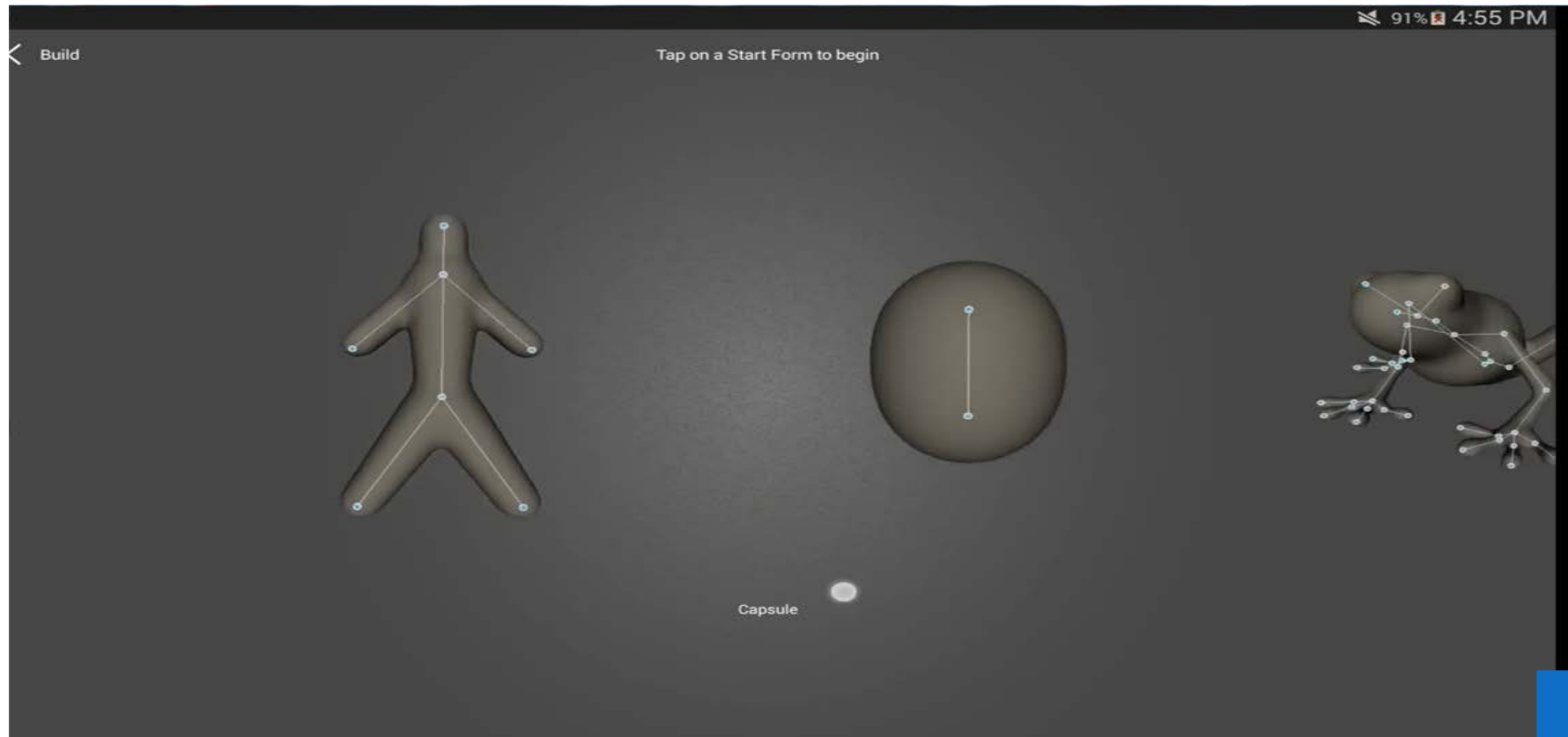


Box

bodacious_tum....stl fabulous_migelo.stl

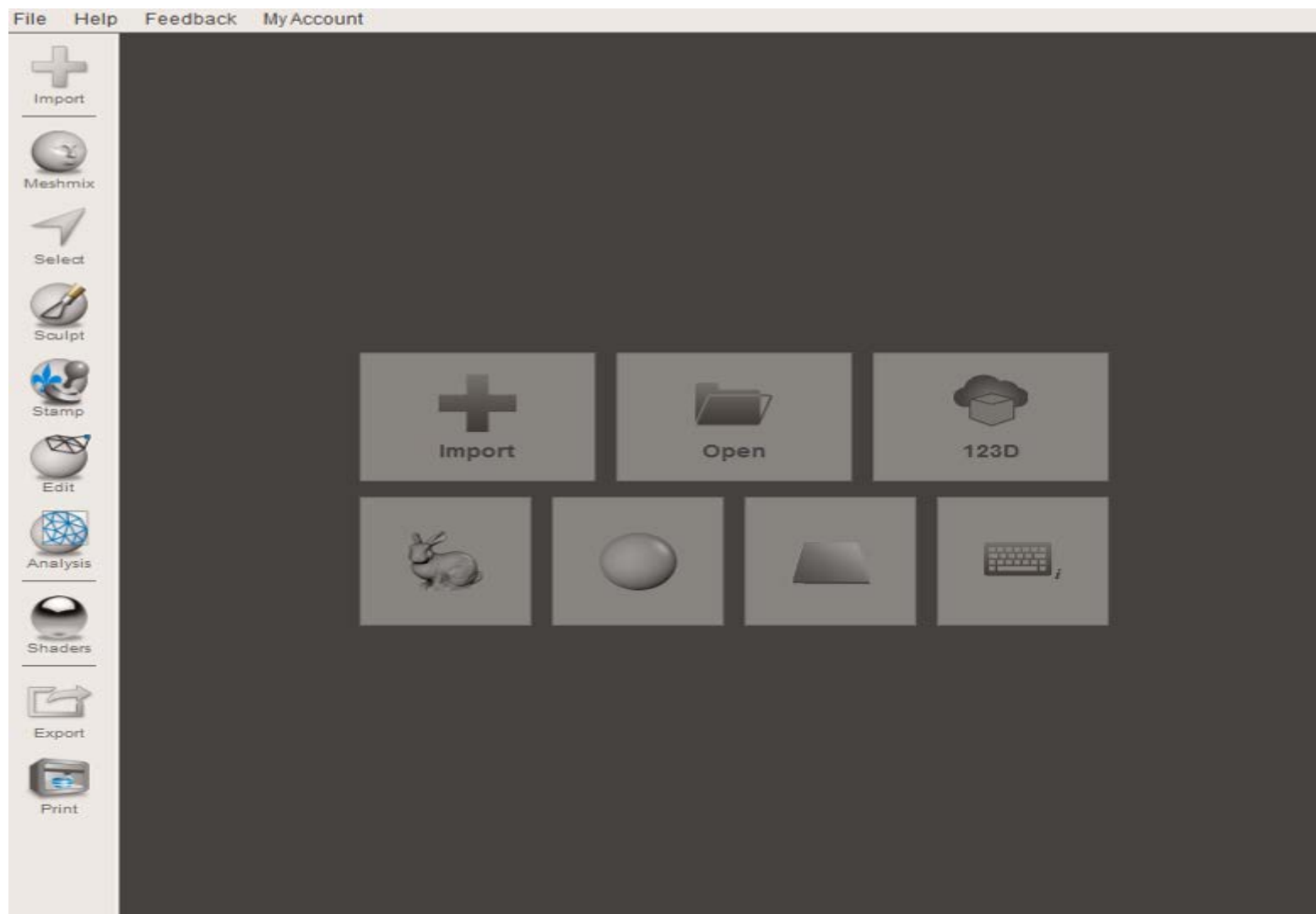
顯示所有下載...

2. 123D Sculpt

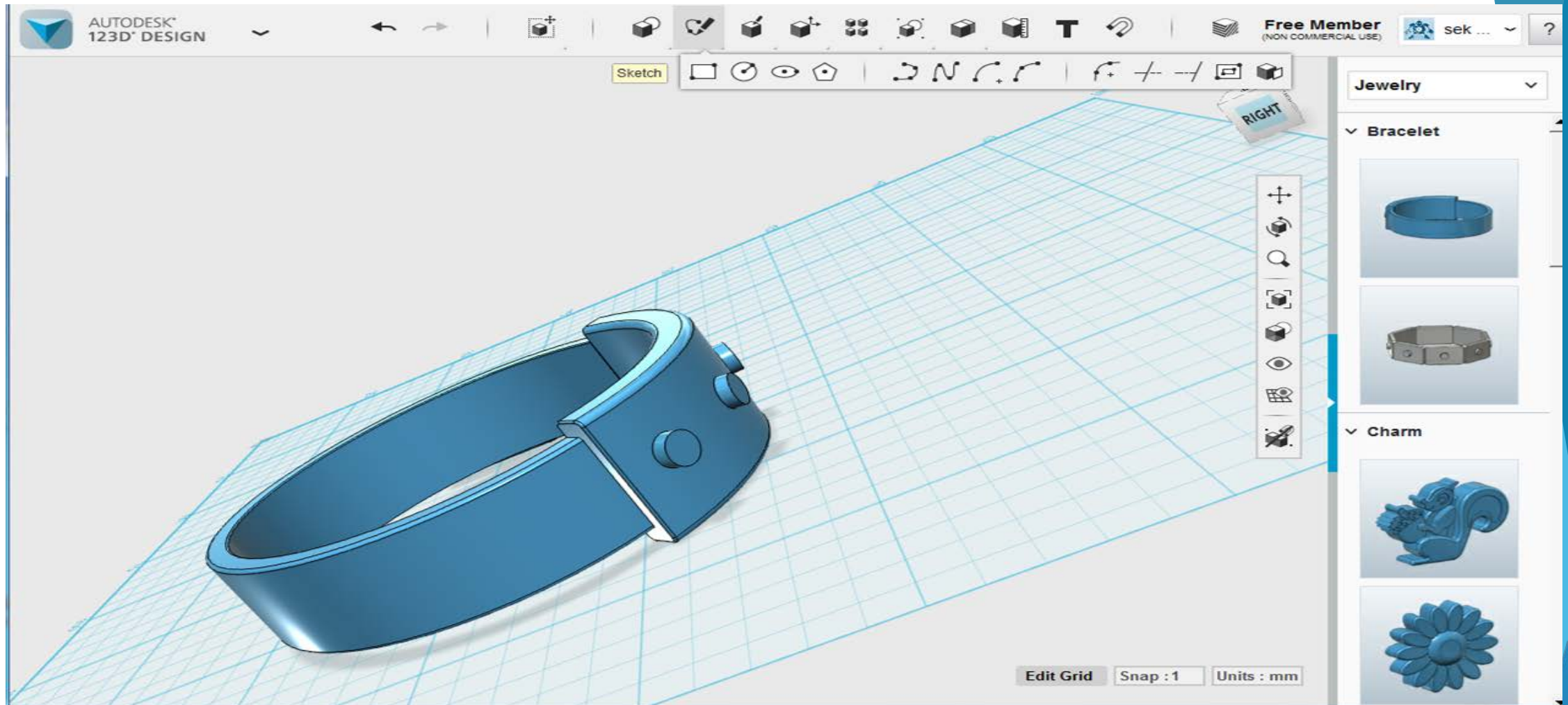


123D

2. Meshmixer



3. 123D Design



4. SketchUp



Next...



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VTC 機構成員

Tasks :

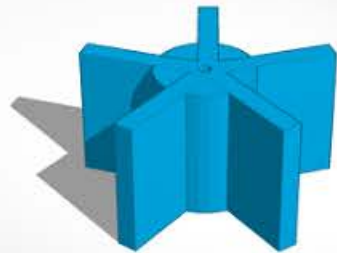
Learning Tinkercad

Create
new
design

My recent designs

Create new design

Create new design with Beta



Bodacious Bigery-Snicket

dt3d80 a day ago



3xfins-20

dt3d80 3 days ago



short fins

dt3d80 3 days ago

Search designs...

COLLECTIONS

Lessons

My recent designs

PROJECTS



Create project

TWEETS

Follow



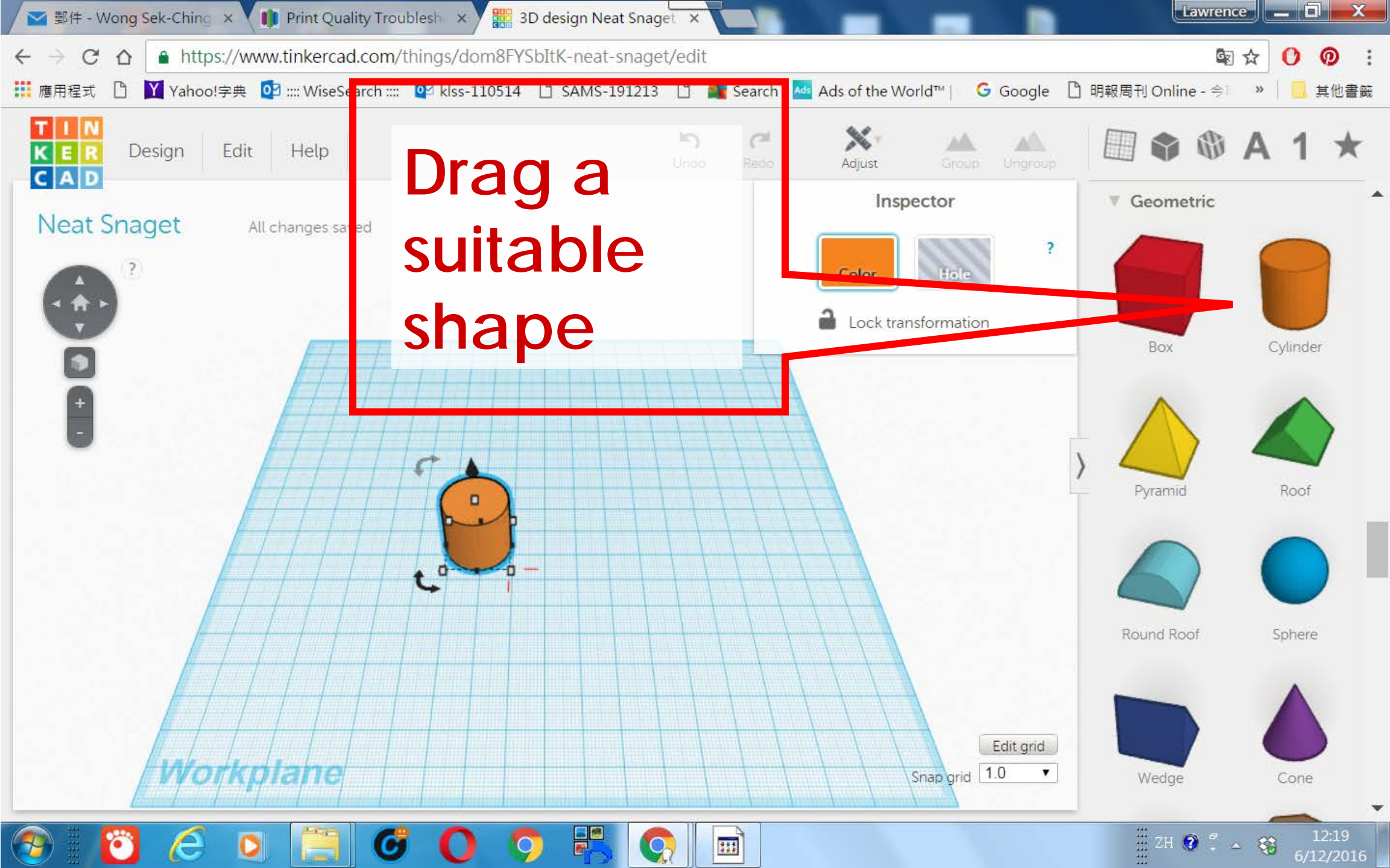
Tinkercad Retweeted



Khang Nguyen
@khangnguyen8



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Drag a
suitable
shape

← → ↺ ↻

https://www.tinkercad.com/things/dom8FYSbItK-neat-snaget/edit

應用程式 文件 Y Yahoo!字典 W WiseSearch K klss-110514 S SAMS-191213 Search Ads Ads of the World™ G Google 明報周刊 Online - 其他書籤

TINKERCAD

Design Edit Help

Neat Snaget

↶ ↷ ↸ ↹

+

-

Adjust the dimension by ruler

Inspector

Color Hole ?

Lock transformation

Helpers

pyramid for skil... by Jean Flower

Workplane Fractal Penrose...

Components

Connectors

Socket Seated V... by team tinkercad

Socket Seated by team tinkercad

20.00

2.00

1.00

20.00


20.00

0.00

mm

Edit grid

Snap grid 1.0



Design | Edit | Help

Undo ↶ Redo ↷ Adjust ✂ Group ▴ Ungroup ▴

Inspector

Color

Hole

Lock transformation

pyramid for skil...
by Jean Flower

Workplane

Fractal Penrose...

Components

Connectors

Socket Seated V...

by team tinkercad

Neat Snaget

All changes saved

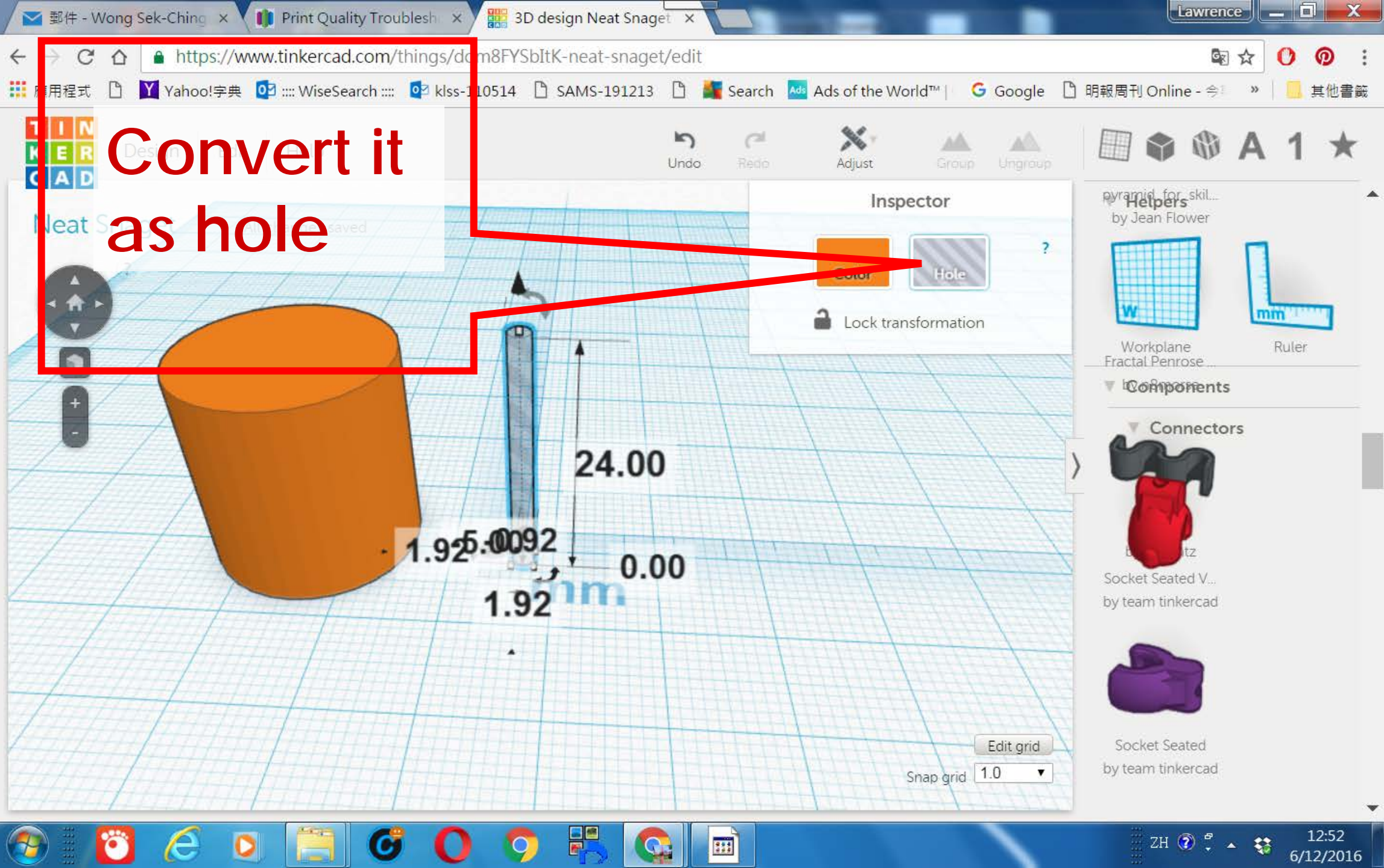
5.00 9.00 1.92 3.00 20.00 0.00

mm

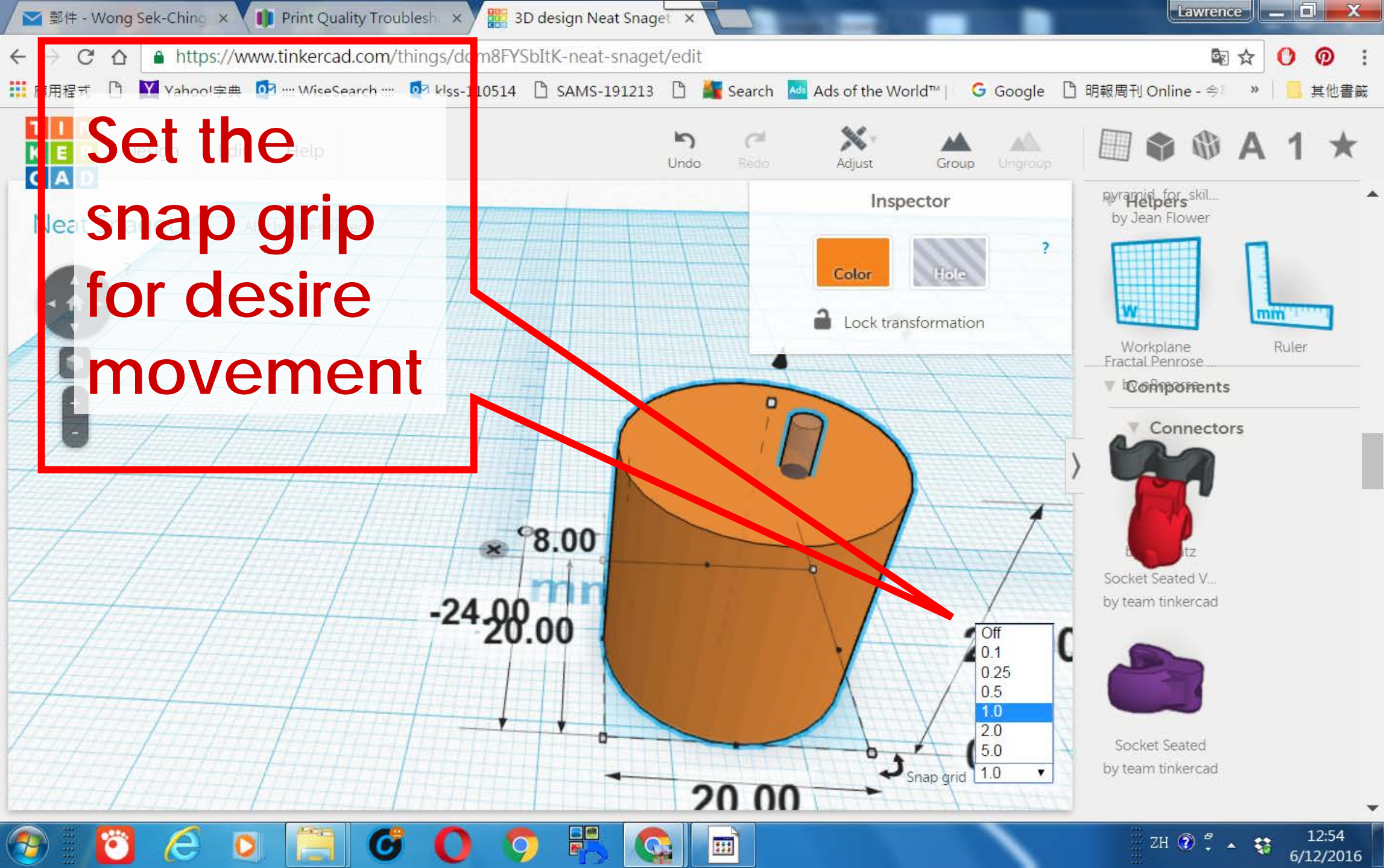
Edit grid

Snap grid 1.0 ▾

Convert it
as hole



Set the
snap grip
for desire
movement



All changes saved

Dismiss ruler

Inspector

Color

Hole

 Lock transformation

pyramid for skill...
Helpers
by Jean Flower



Workplane
Fractal Penrose



Ruler

▼ Components

Connectors

Socket Seated V...
by team tinkercad



Socket Seated
by team tinkercad

Edit grid

Snap grid 1.0 ▼



Design Edit Help

Undo Redo Adjust Group Ungroup

Grid 3D View A 1 Star

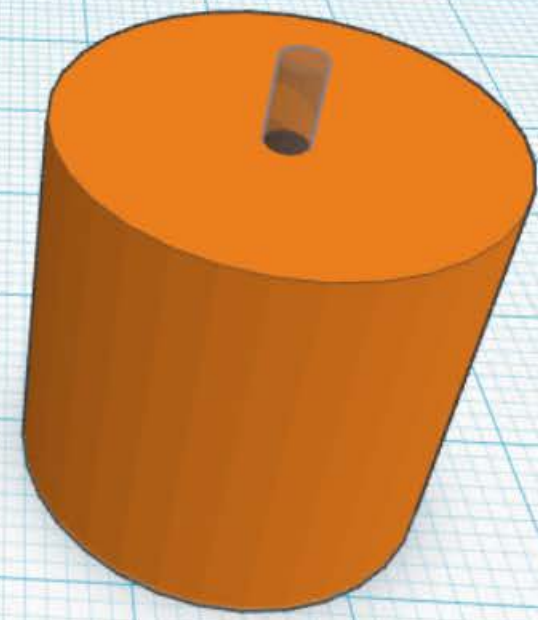
Neat Snaget

All changes saved



Adjust the alignment

Align...
Mirror...



Edit grid

Snap grid 1.0

Helpers

pyramid for skill... by Jean Flower

Workplane Fractal Penrose...


Ruler

Components

Connectors

Socket Seated V... by team tinkercad

Socket Seated by team tinkercad



Design | Edit | Help

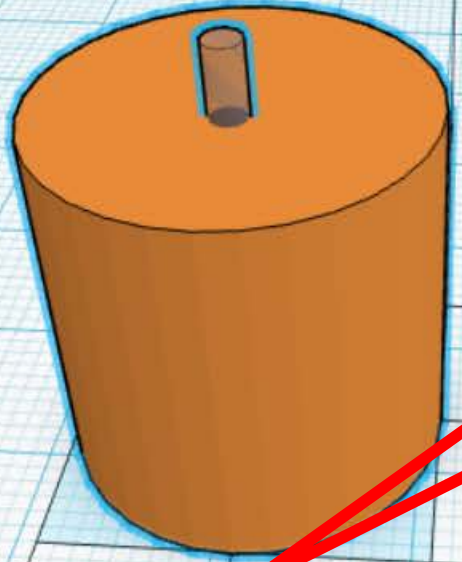
Undo ↶ Redo ↷ Adjust ✂ Group ▴ Ungroup ▴

Grid 📏 3D Box 📦 3D Cylinder 📌 A 1 ★

Neat Snaget

All changes saved

Navigation: Home, Rotate, Zoom In (+), Zoom Out (-)



Inspector

Color [Orange] Hole [Hatched] ?


🔒 Lock transformation


Workplane

Fractal Penrose...

▼ Components

▼ Connectors


Socket Seated V...
by team tinkercad


Socket Seated
by team tinkercad

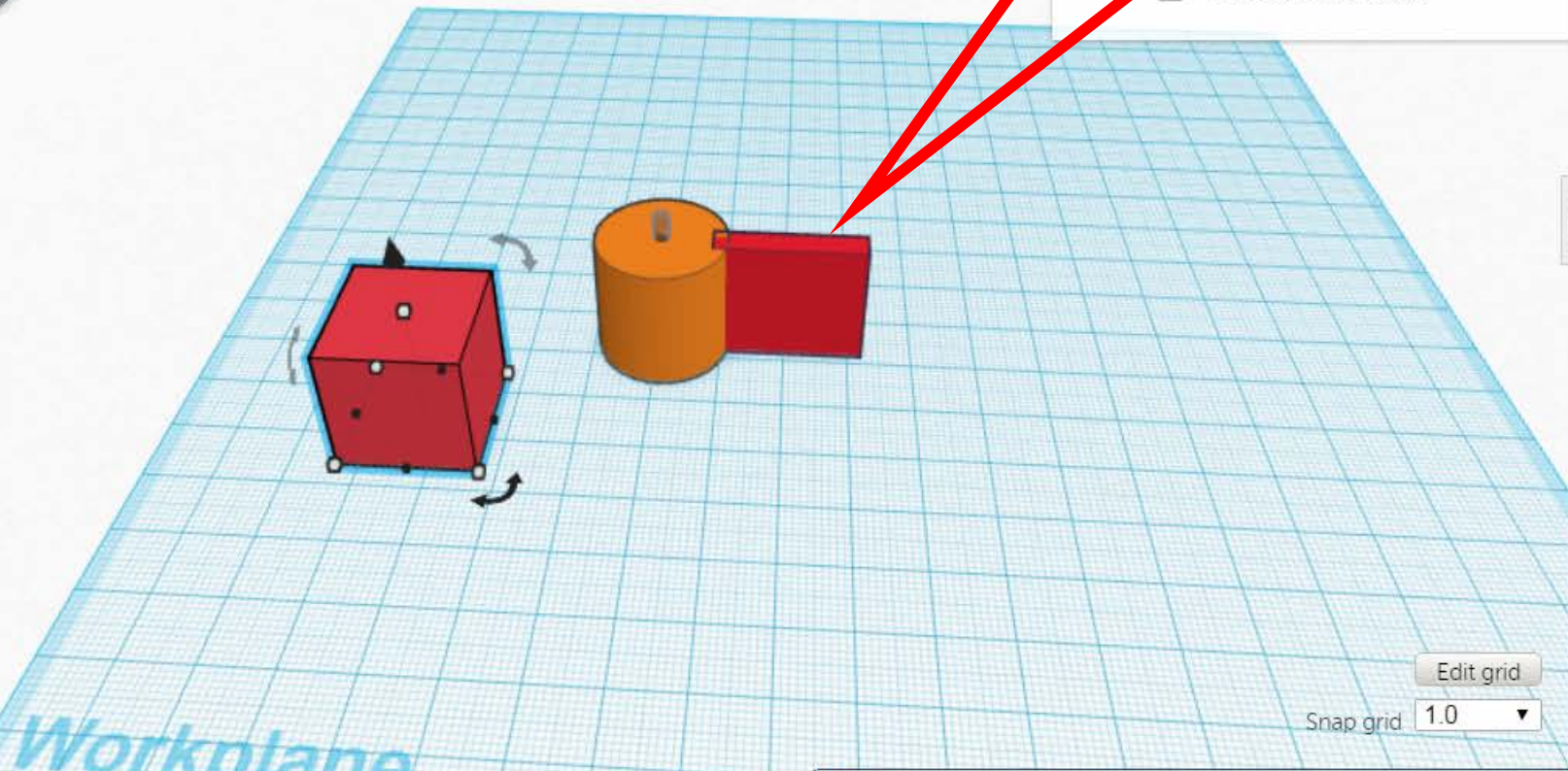
Dismiss Align Tool

Snap grid 1.0 ▾

centre
alignment

TINKERCAD
Design Edit Help

Neat Snaget All changes saved



Inspector

Color Hole

Geometric

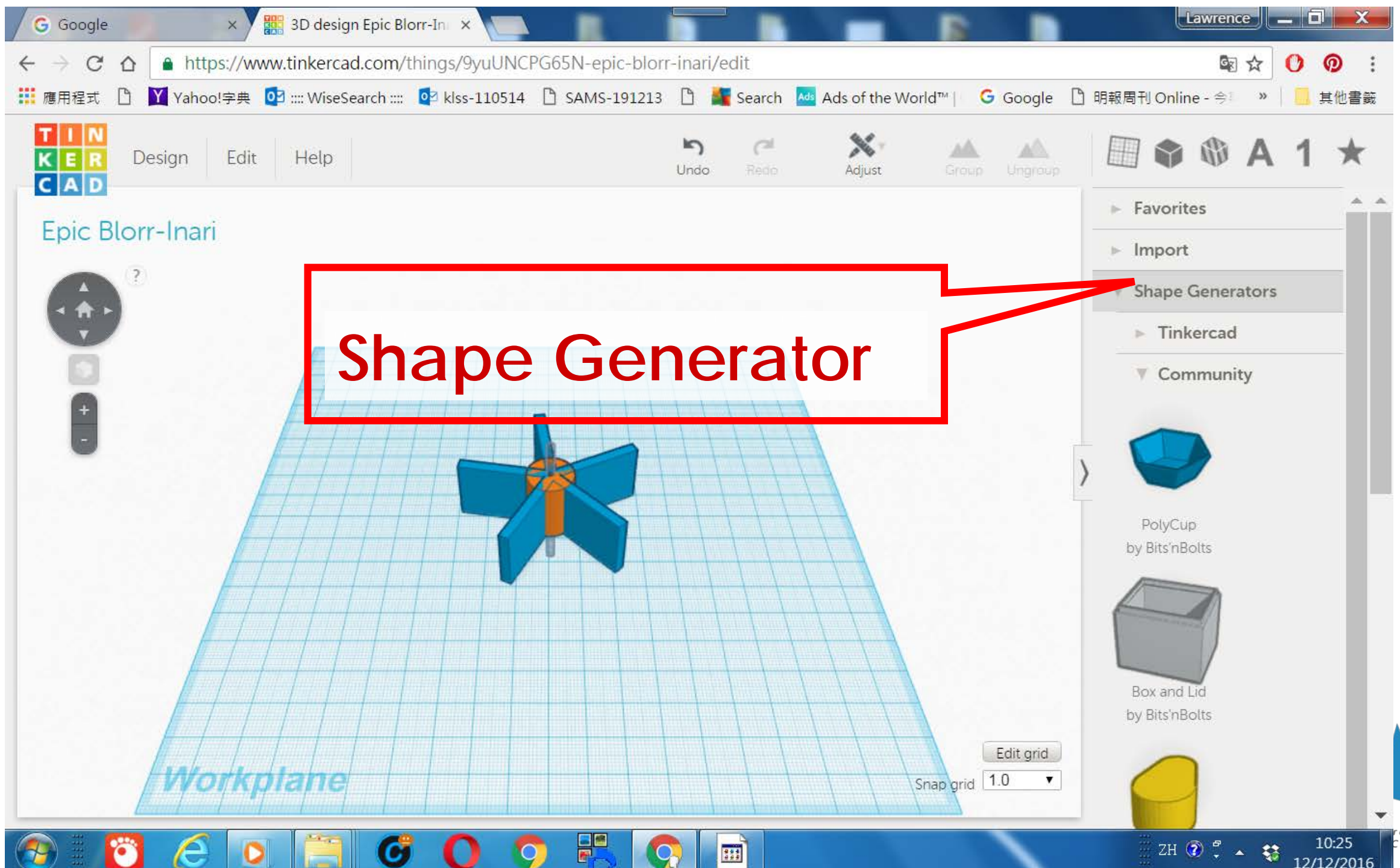
- Box
- Cylinder
- Pyramid
- Roof
- Round Roof
- Sphere
- Wedge
- Cone


Edit grid

Snap grid 1.0

Shortcut:
make use of Shape Generator.









Design | Edit | Help

Undo | Redo | Adjust | Group | Ungroup

by adrian blascarr
Variable Tube
by jenna appleton
Shape
Generators
Radial Fins
by Selebian Kora...
Helpers
Components
Holes
pyramid_for_skil...
by Jean Flower
Letters
Number
Syn

Epic Blorr-Inari





Select a suitable shape and star it for ease of use.

Workplane

Edit grid | Snap grid 1.0



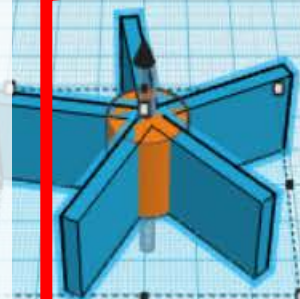
Design Edit Help

Undo Redo Adjust Group Ungroup

Grid Cube Sphere A 1 Star

Epic Blorr-Inari

Set the
parameters
for the
turbine



Inspector



Lock transformation

Parameters for Radial Fins

Height 20 mm
Fin Length 30 mm
Inner Radius 0 mm
Wall Thickness 3.02 mm
Gap Thickness 0.5 mm
Fins 1
Sections 5

Edit grid

Ratings for Radial Fin Snap grid 1.0

All (43 Reviews)

Favorites

Import

Shape Generators

Tinkercad

Community



PolyCup
by Bits'nBolts

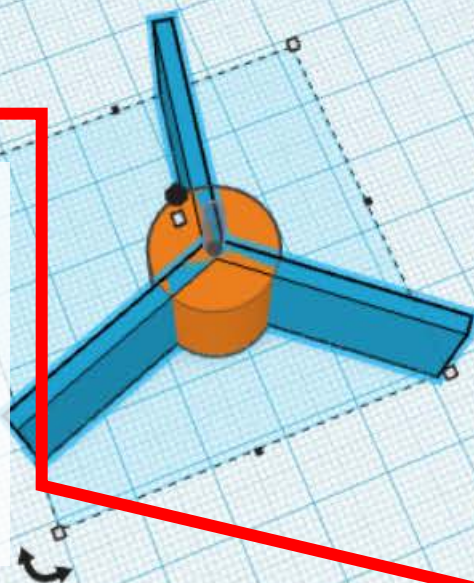


Box and Lid
by Bits'nBolts



AK

Sections:
Numbers of
fins



Inspector



Lock transformation

Parameters for Radial Fins

Height

20 mm

Fin Length

30 mm

Inner Radius

0 mm

Wall Thickness

2.04 mm

Gap Thickness

1.98 mm

Fins

1

Sections

3

Edit grid

Ratings for Radial Fin Snap grid 0.1

All (43 Reviews)



PolyCup
by Bits'nBolts



Box and Lid
by Bits'nBolts



Circular Trapezoid
by adrian blascarr



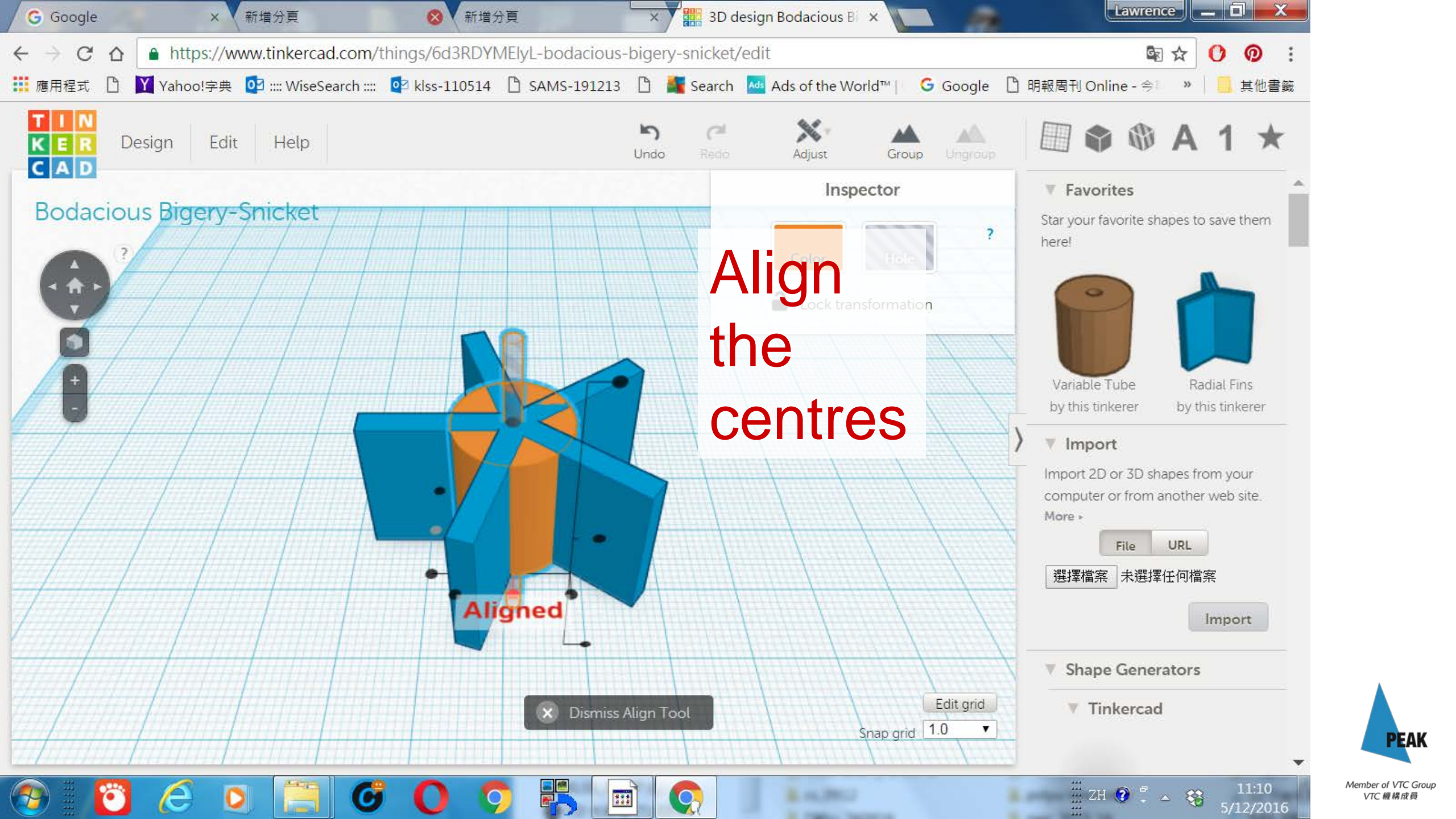
Variable Tube


PEAK

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ZH

10:36
12/12/2016

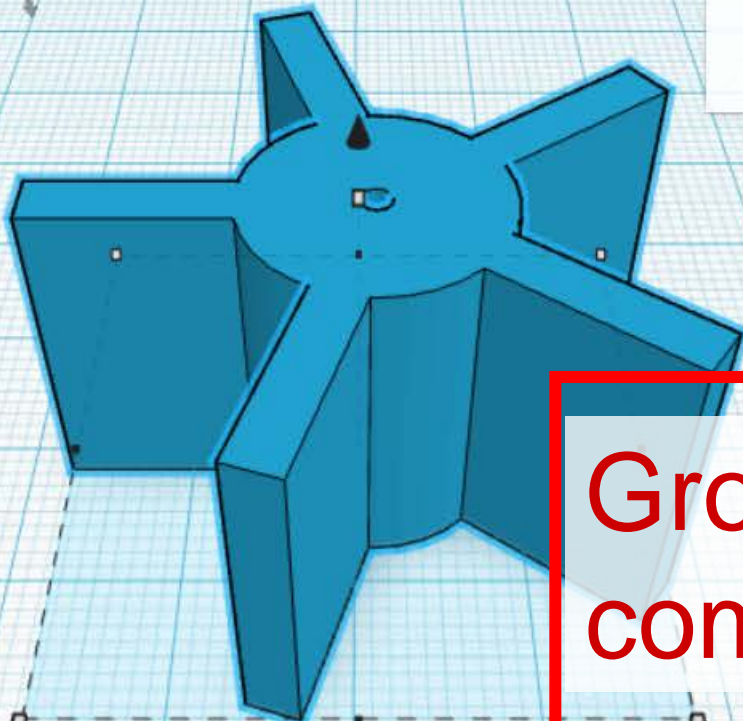


Design Edit Help

Undo Redo Adjust Group Ungroup Grid 3D View 2D View A 1 Star

Bodacious Bigery-Snicket

All changes saved




Color Texture ?
Lock transformation

Group two components


Edit grid
Snap grid 1.0

▼ Favorites

Star your favorite shapes to save them here!



Variable Tube
by this tinkerer



Radial Fins
by this tinkerer


▼ Import

Import 2D or 3D shapes from your computer or from another web site.
[More >](#)

File URL
選擇檔案 未選擇任何檔案
Import


▼ Shape Generators

▼ Tinkercad

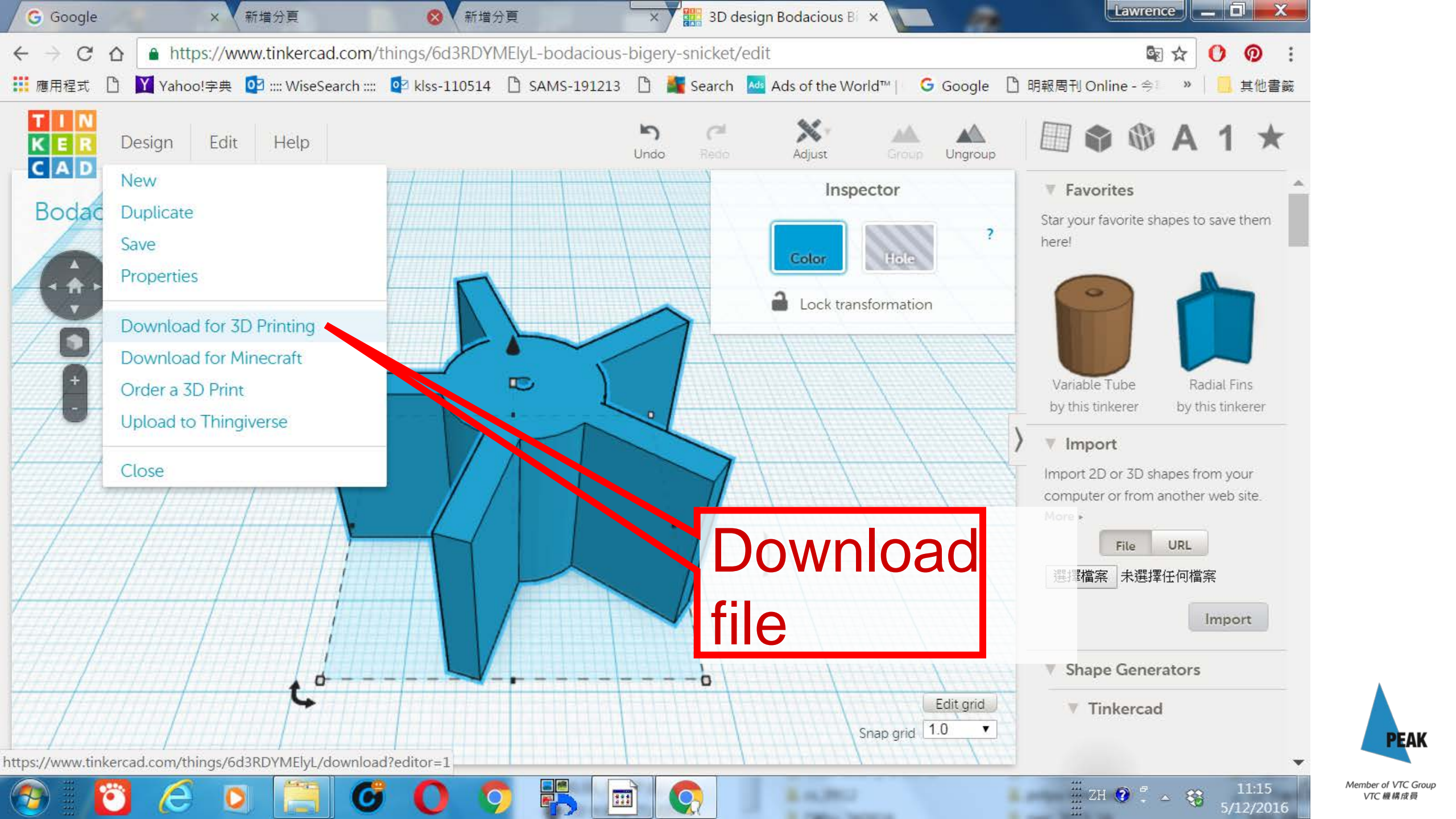


ZH ? 🔍 🔊 🌡️ 🔌 📶 🕒

11:13
5/12/2016



of VTC Group
機構成員



Design Edit Help

- New
- Duplicate
- Save
- Properties
- Download for 3D Printing
- Download for Minecraft
- Order a 3D Print
- Upload to Thingiverse
- Close

Undo Redo Adjust Group Ungroup

Inspector



Lock transformation

Grid 3D View A 1 Star

Favorites

Star your favorite shapes to save them here!



Variable Tube by this tinkerer



Radial Fins by this tinkerer

Import

Import 2D or 3D shapes from your computer or from another web site.

More

File URL

選擇檔案 未選擇任何檔案

Import

Shape Generators


Tinkercad

Download file

https://www.tinkercad.com/things/6d3RDYMElyL/download?editor=1



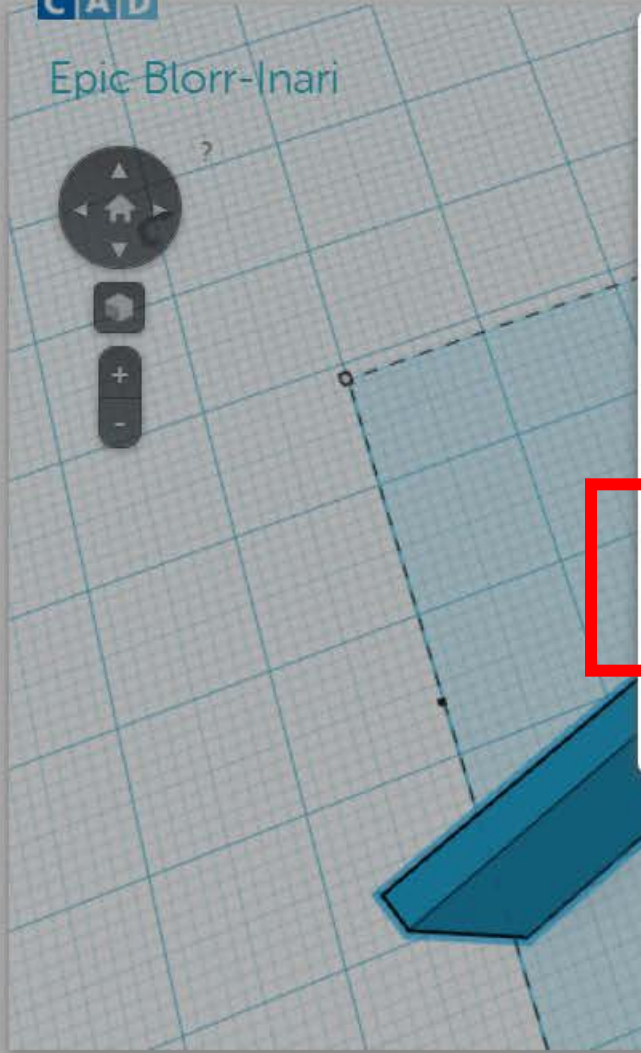
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Design Edit Help

Undo Redo Adjust Group Ungroup

Grid Cube Cylinder A 1 Star

Epic Blorr-Inari



Download for 3D Printing

Download this model as an STL, X3D or VRML97 file if you want to use external services or 3D printers.

.STL .OBJ .X3D Colors .VRML Colors


☐ Download the selected shapes (1 shape selected)

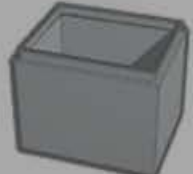
Download for laser cutting


The 2D file contains cross section of the model on workplane suitable for laser cutting. Use the preview button to see the results.


Preview SVG

is the download taking a while? Your model might be too complex.
[Check out the FAQ for help.](#)


PolyCup
by Bits'nBolts

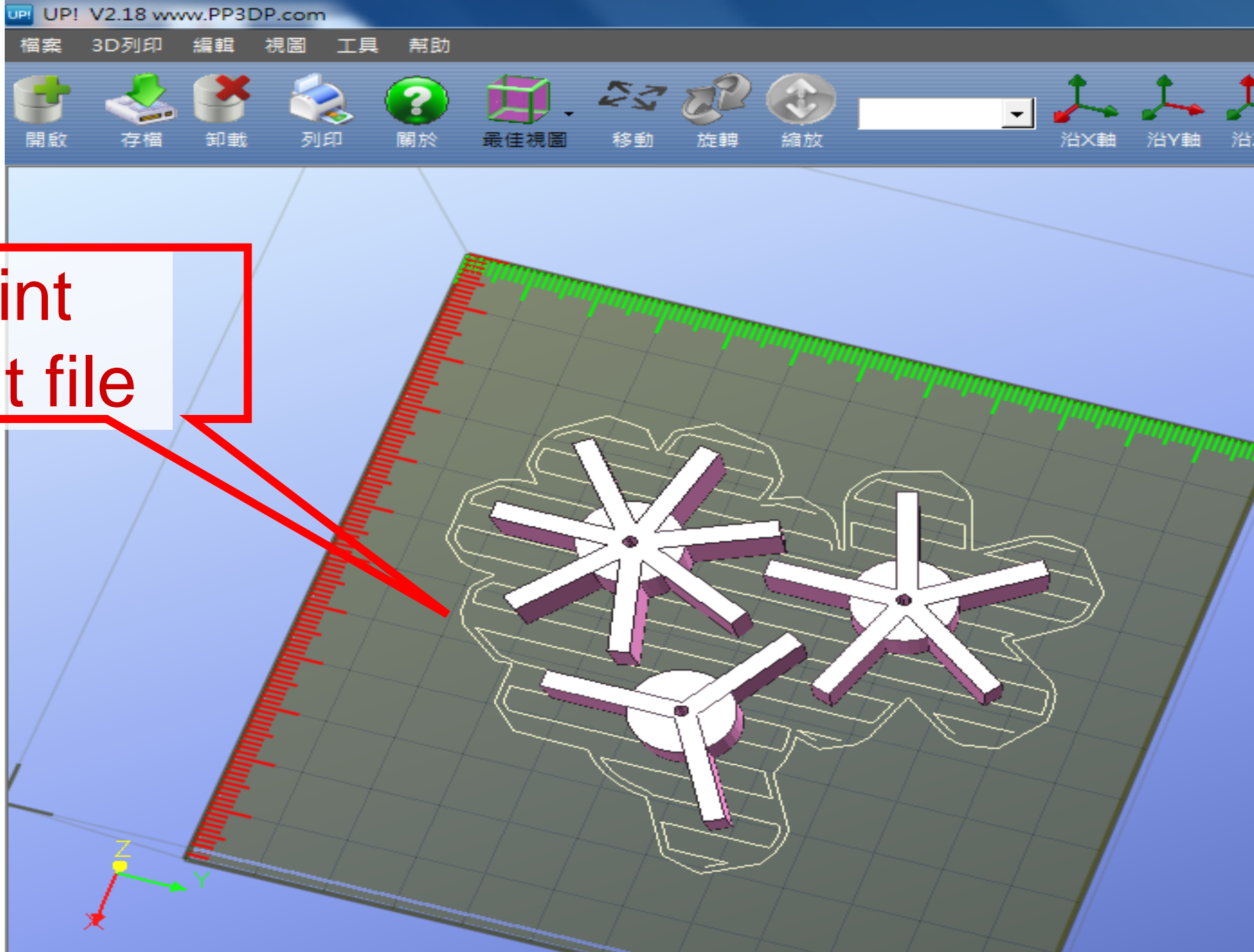

Box and Lid
by Bits'nBolts

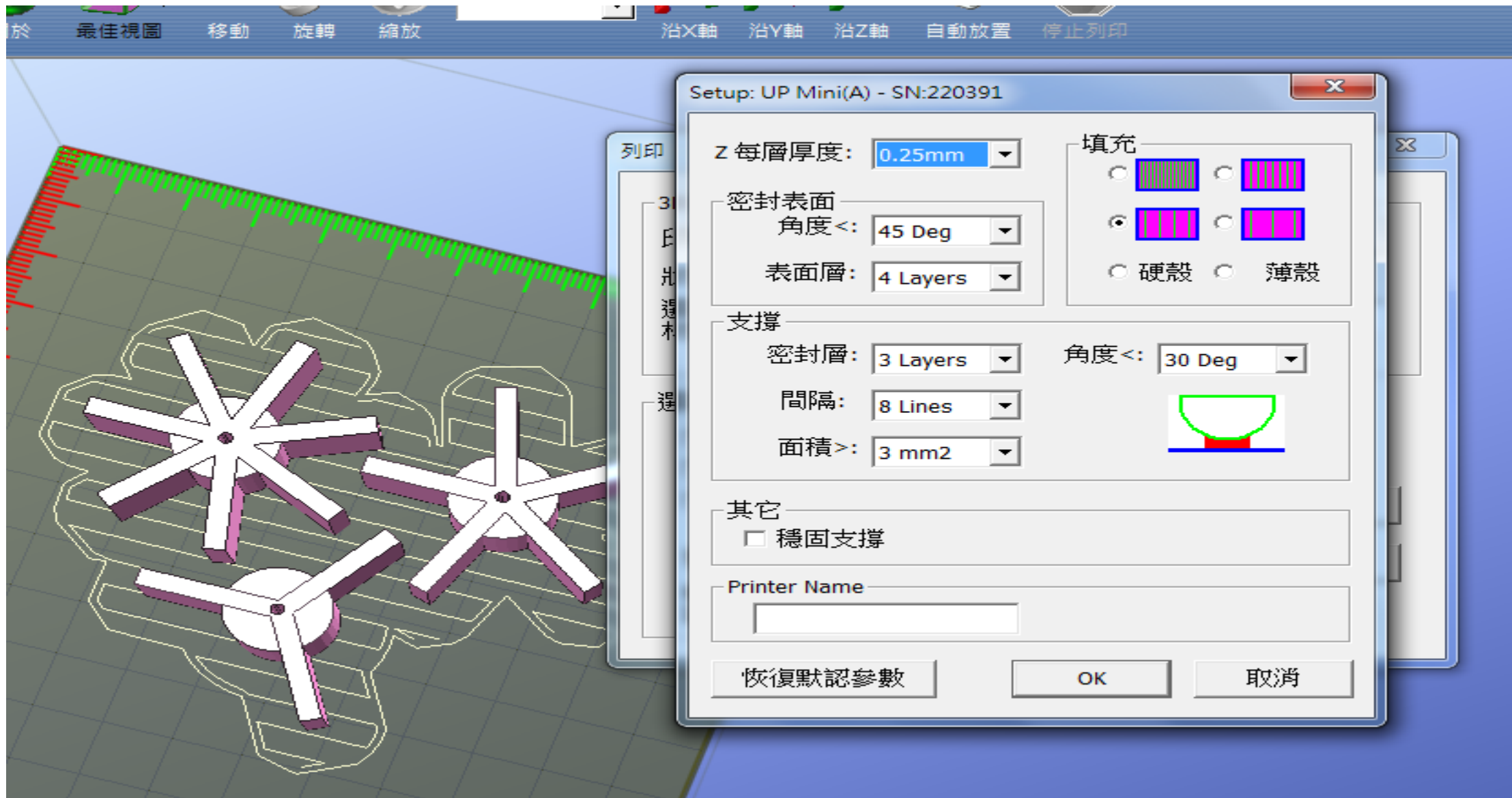

Circular Trapezoid
by adrian blascarr

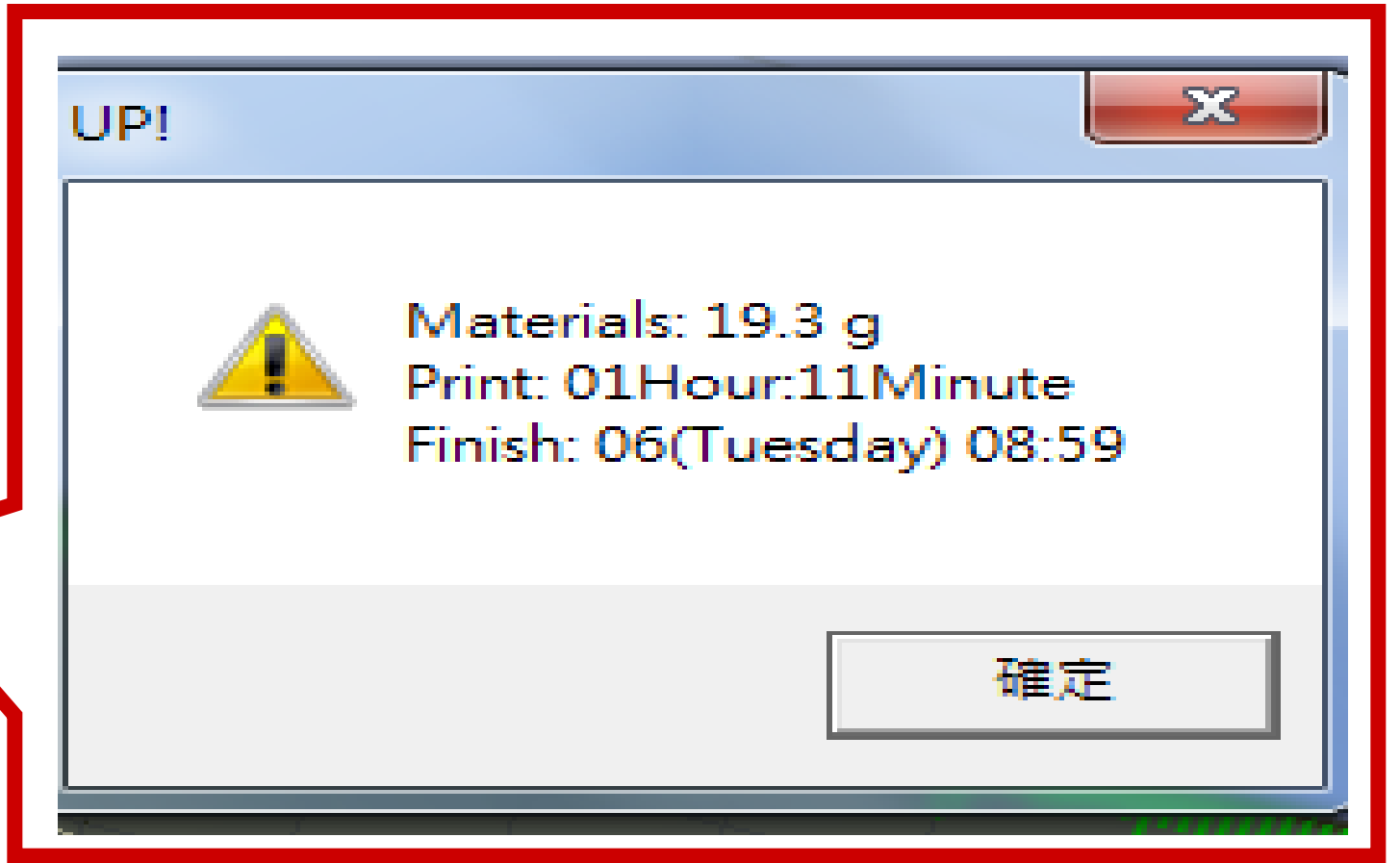
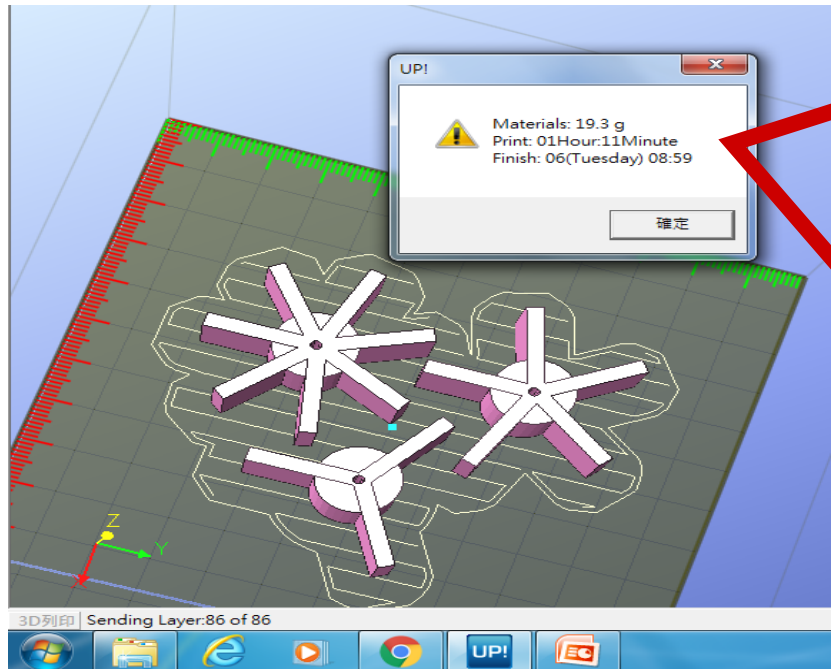

Variable Tube

Edit grid
Snap grid 0.1

Choose .STL file







3D 模型: 3xfins-20

文件: C:\Users\wsc\Downloads\3xfins-20.stl

面:840 頂點:420

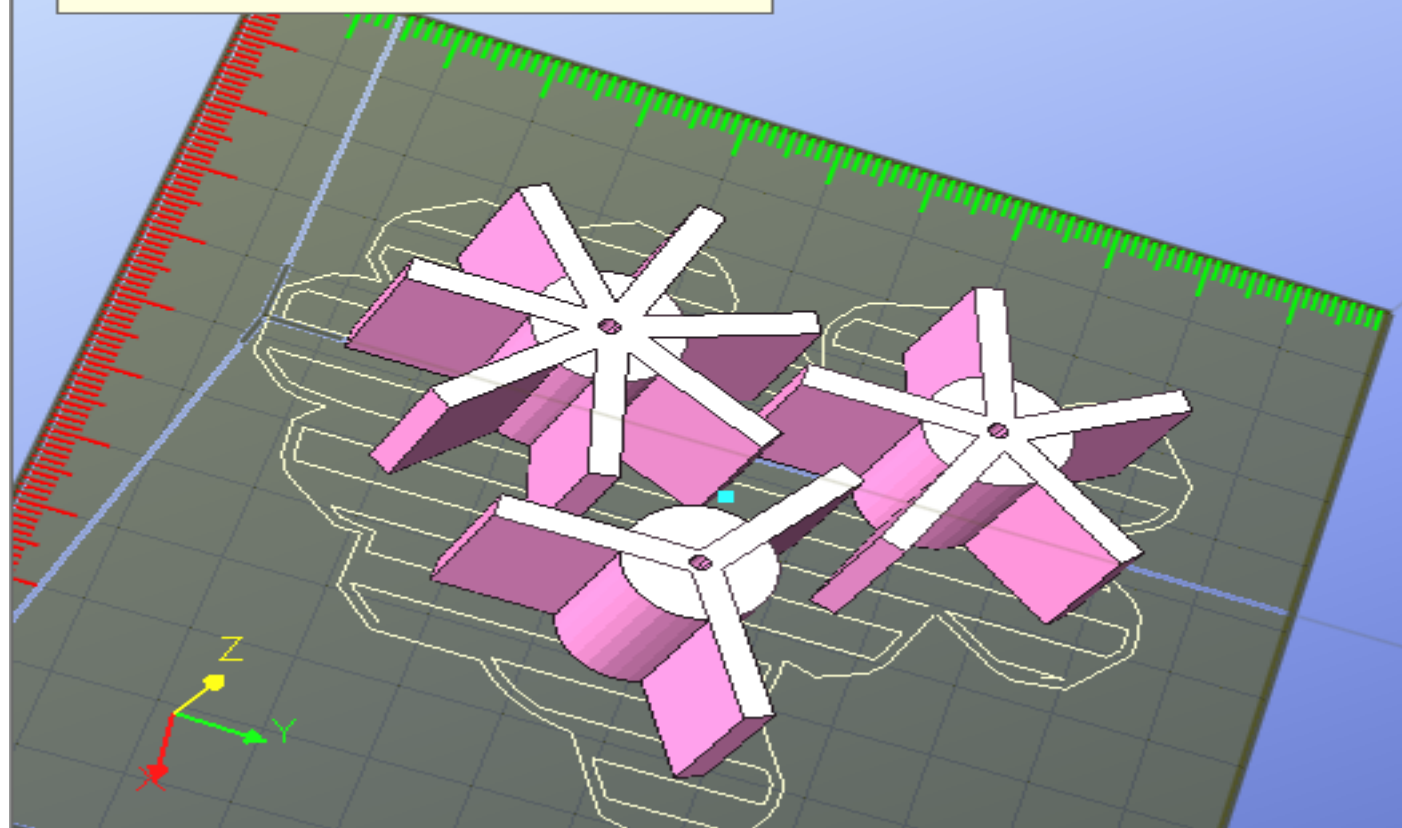
體積:21.77(CM3) 表面積:129.65(CM2)

尺寸: 65.98 X 75.68 X 20.00 mm

最小: -92.99 X 22.16 X 2.00 mm

最大: -27.01 X 97.84 X 22.00 mm

格式:二?制



3D列印 就緒

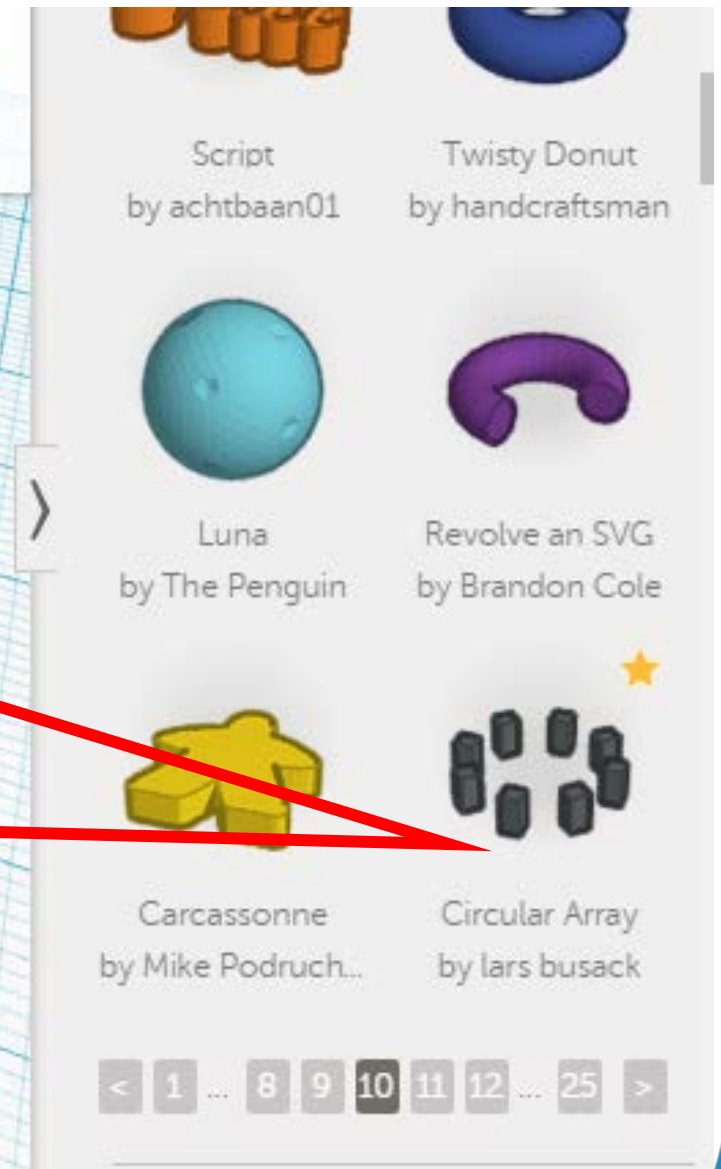


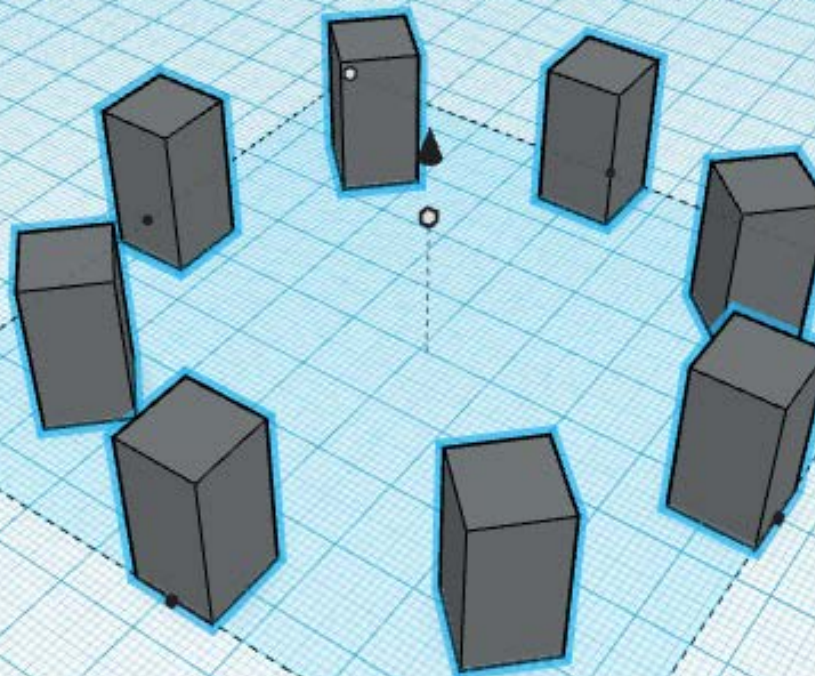
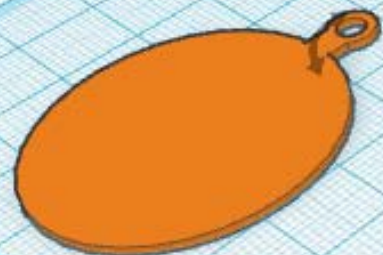
Member of VTC Group
VTC 機構成員

Shortcut:
make use of Shape Generator
design circular array.



**Find circular array
(in page 10) and drag
it to the drawing.**





Inspector



Color



Hole



Lock transformation

Parameters for Circular Array v. 1.1.2

Object

Square

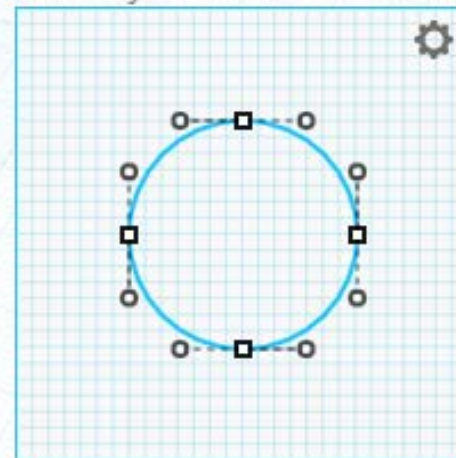


Direction

Point inside



Choose your custom Profile!



Copies

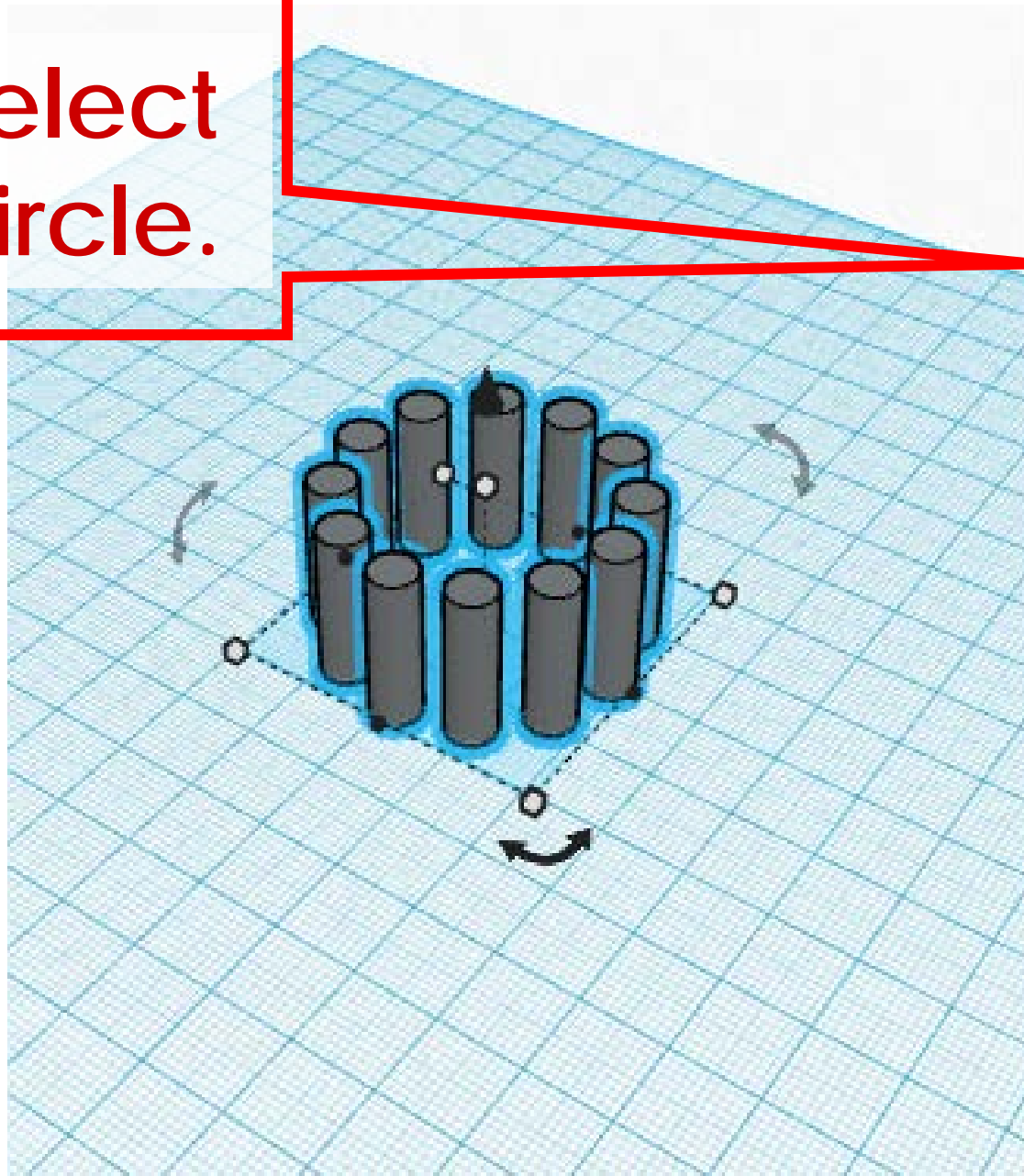


Edit grid

Snap grid

1.0

Select
circle.



Lock transformation

Parameters for Circular Array v. 1.1.2

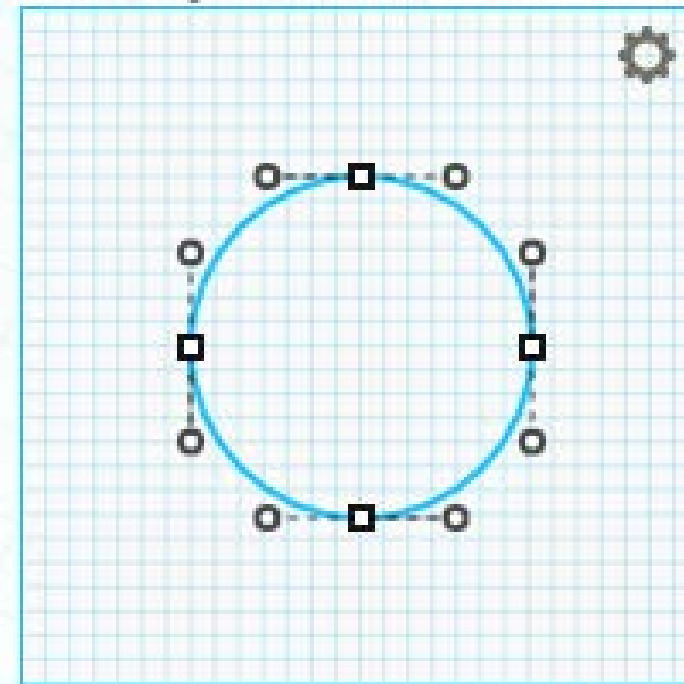
Object

Circle

Direction

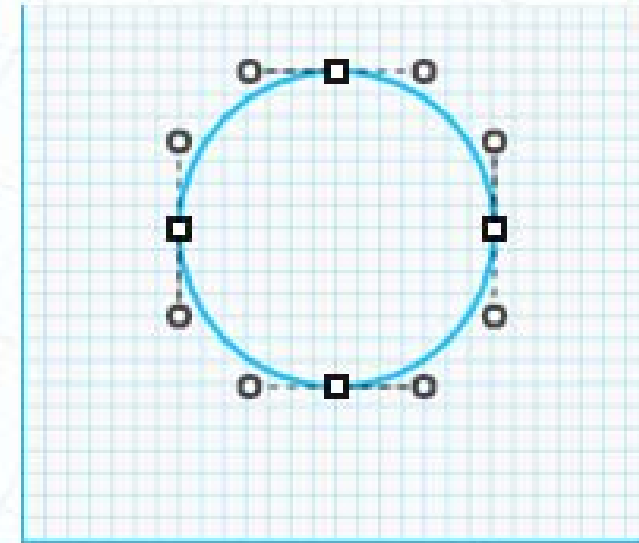
Point south

Choose your custom Profile!



Select
copies, size
and radius.

Parameters for Circular Array v. 1.1.2



Copies

10

Angle

360

Size

2.62

Radius

9.87

Edit grid

Ratings for Circular Array grid 1.0

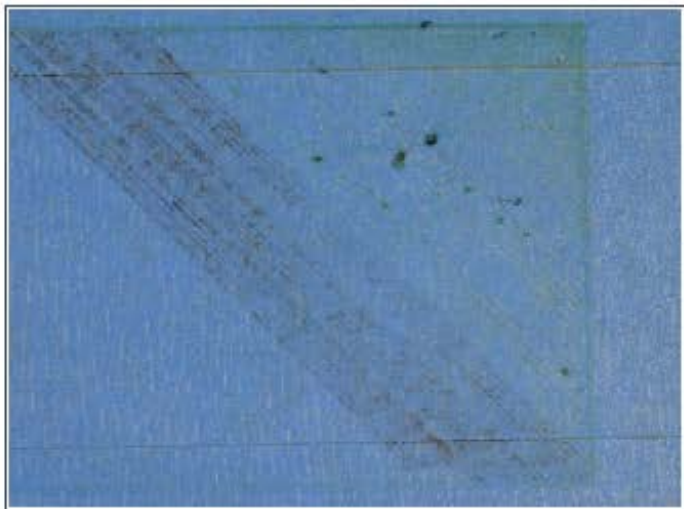
All ★ ★ ★ ★ ★ (21 Reviews)

Print Quality Troubleshooting Guide

This guide is a great place to start if you are trying to improve the quality of your 3D printed parts. We have compiled an extensive list of the most common 3D printing issues along with the software settings that you can use to solve them. Best of all, the guide uses a large collection of real-world images to make each issue easy to identify when examining your own 3D printed parts. So let's get started!

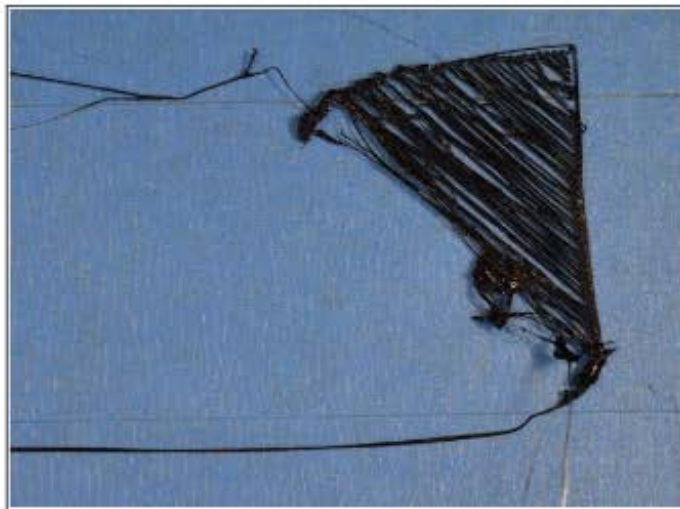
<https://www.simplify3d.com/support/print-quality-troubleshooting/>





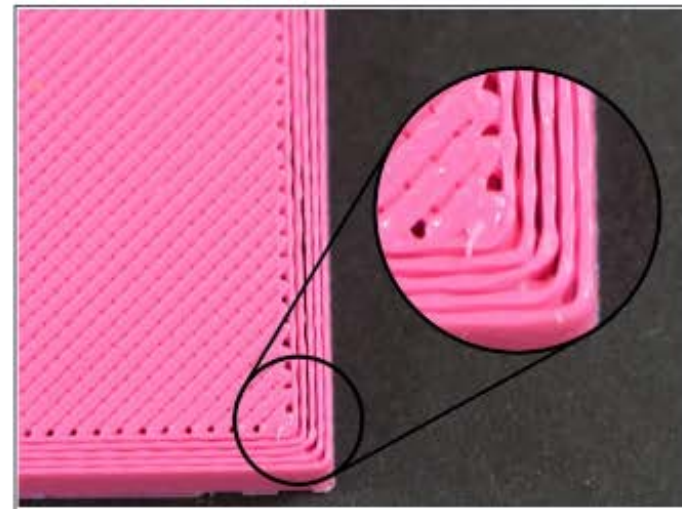
Not Extruding At Start

Printer does not extrude plastic at the beginning of the print



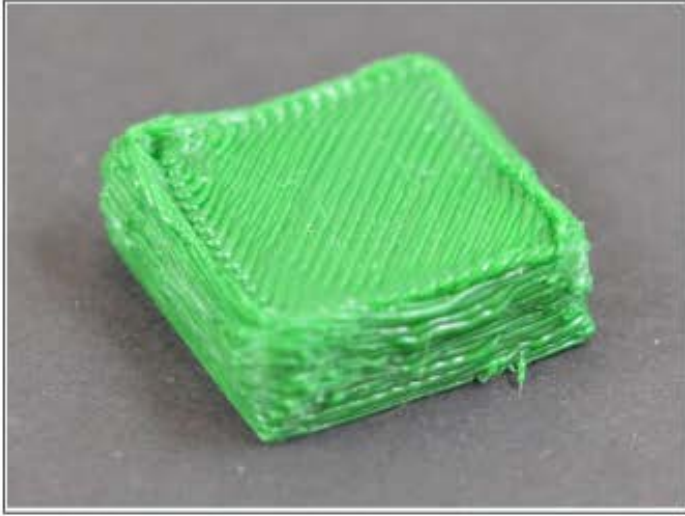
Not Sticking To Bed

The first layer does not stick to the bed and the print quickly fails



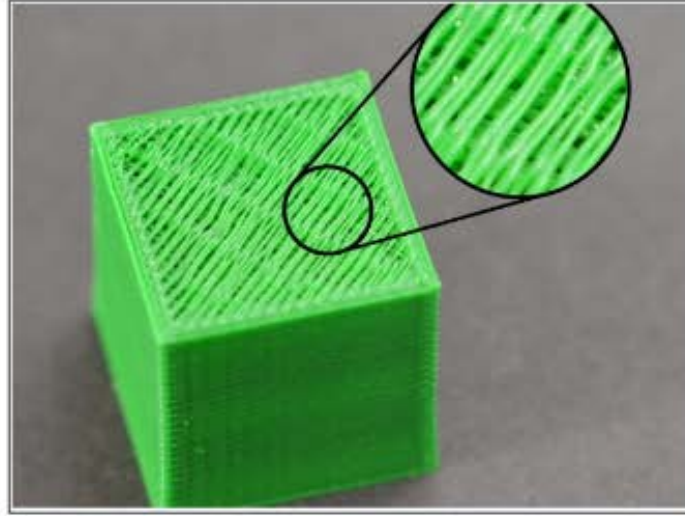
Under-Extrusion

Printer does not extrude enough plastic, gaps between perimeters and infill



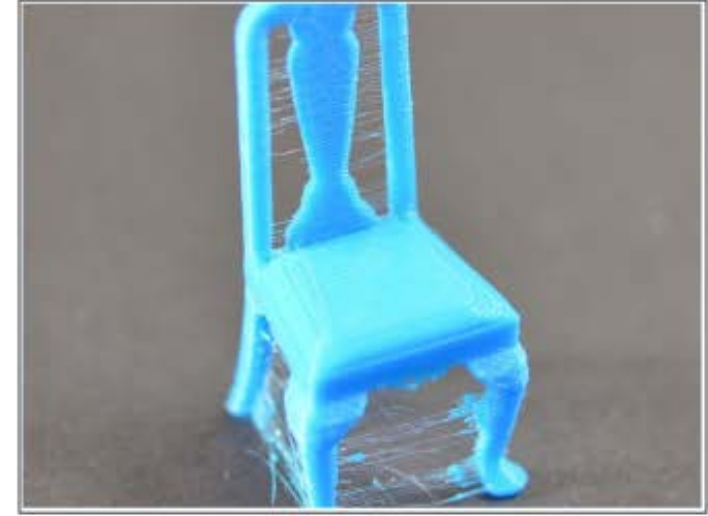
Over-Extrusion

Printer extrudes too much plastic, prints looks very messy



Gaps in Top Layers

Holes or gaps in the top layers of the print



Stringing or Oozing

Lots of strings and hairs left behind when moving between different sections of the print

Teachers' DIY teaching kit

