



An Introduction to 3D Printing

Starter task



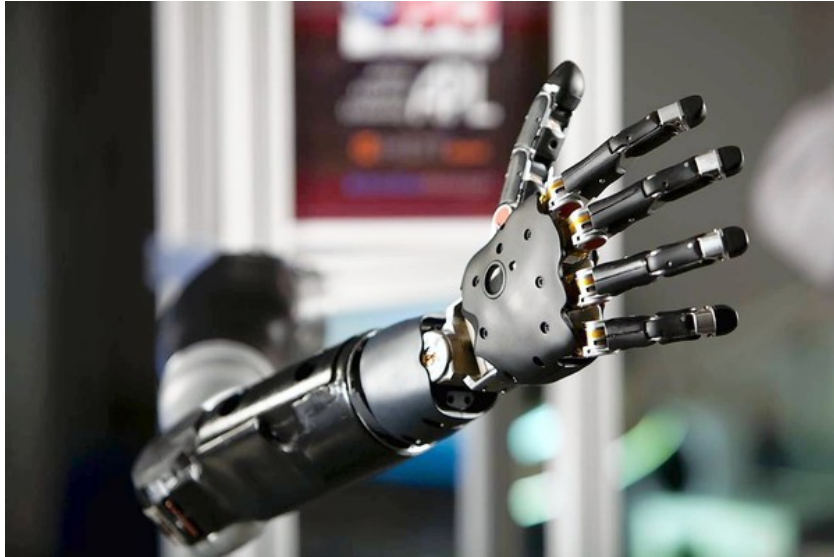
<https://www.fastcompany.com/1725799/darpas-mind-controlled-prosthetic-arm-could-be-market-four-years>



<http://enablingthefuture.org>

- The right robot hand is made by a 3D printer that cost \$25, the one on the left cost \$100 million.
- What differences and similarities can you see in the images. Be prepared to give feedback.

Possible answers



<https://www.fastcompany.com/1725799/darvas-mind-controlled-prosthetic-arm-could-be-market-four-years>



<http://enablingthefuture.org>

- They both look functional
- The left hand looks stronger than the 3D printed version
- The right hand looks more attractive as it has different colours
- Both have the same features e.g. knuckle joints
- The left hand looks more complex and has more parts

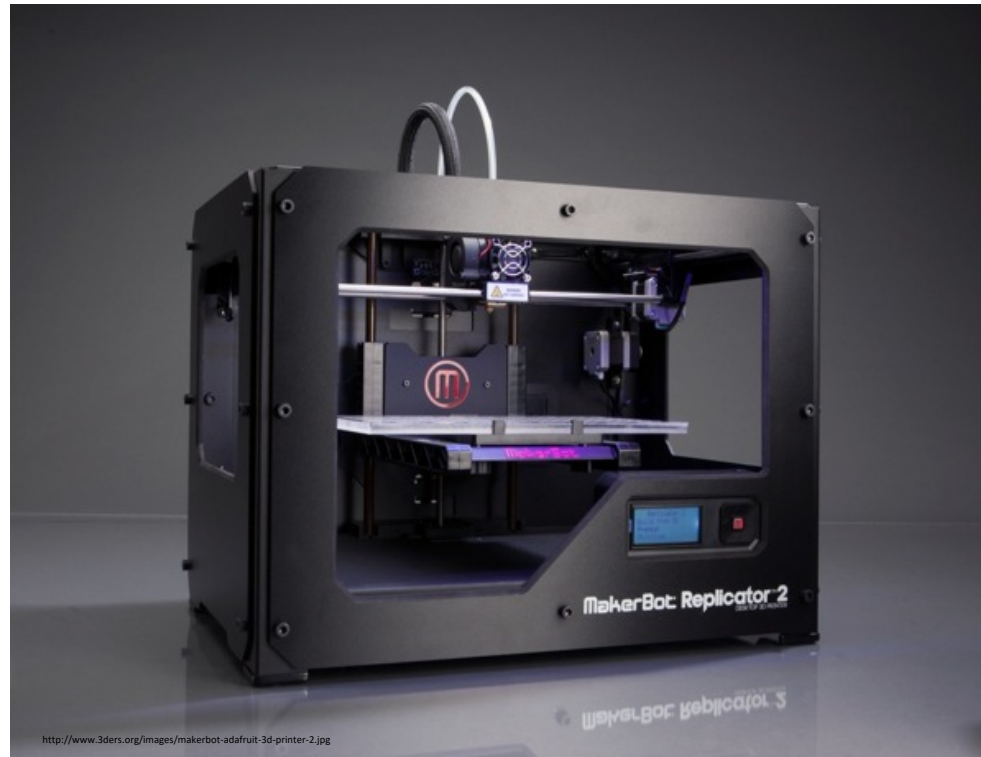


Lesson objectives

- Recognise what a 3D printer looks like and discuss why they are being used in society
- To understand how a 3D printer works and recognise the key components

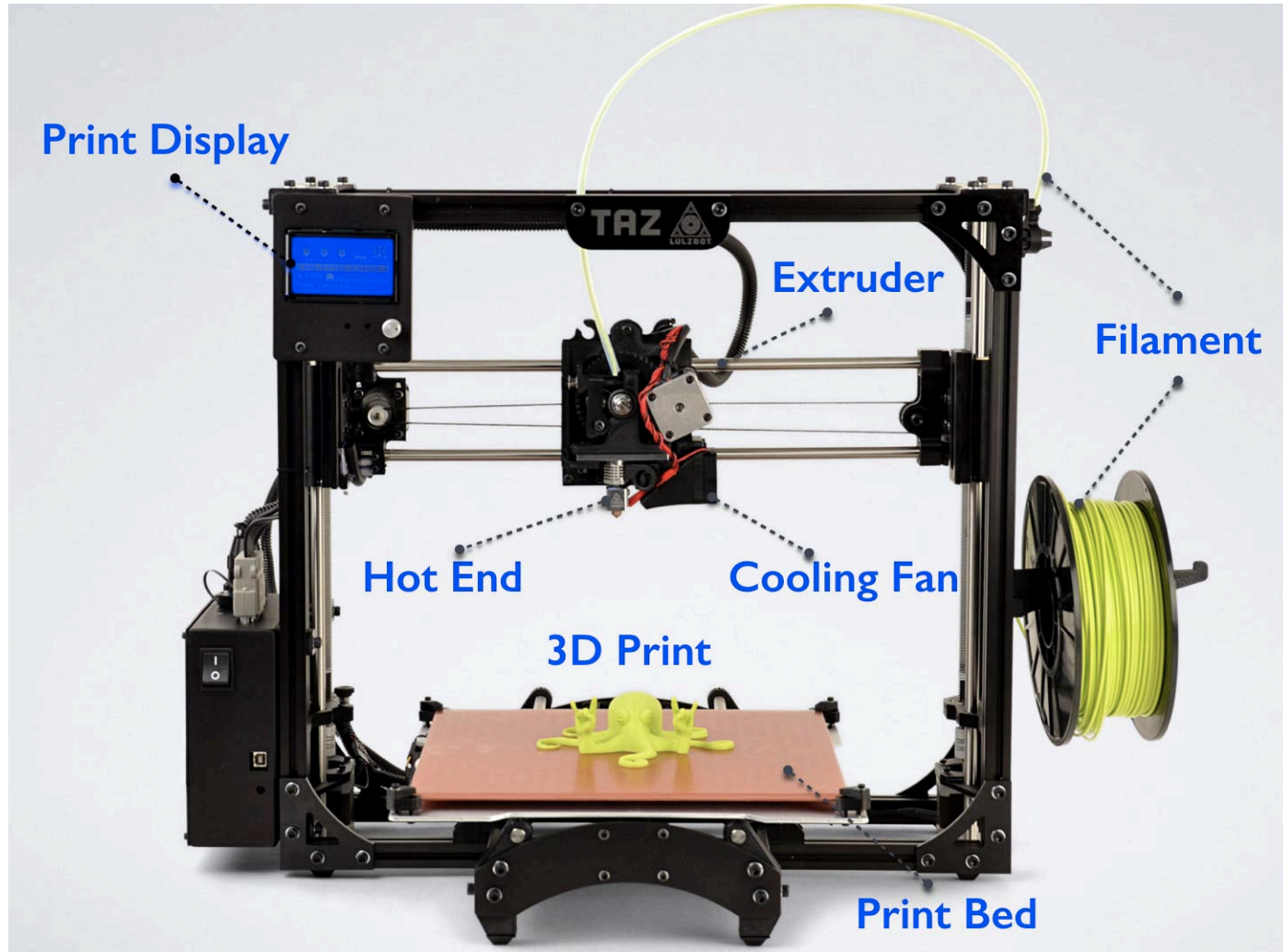


- Below shows a 3D Printer that is common in many schools.



<http://www.3ders.org/images/makerbot-adafruit-3d-printer-2.jpg>

- These are the basic parts of a 3D Printer



Uses of 3D Printing in society

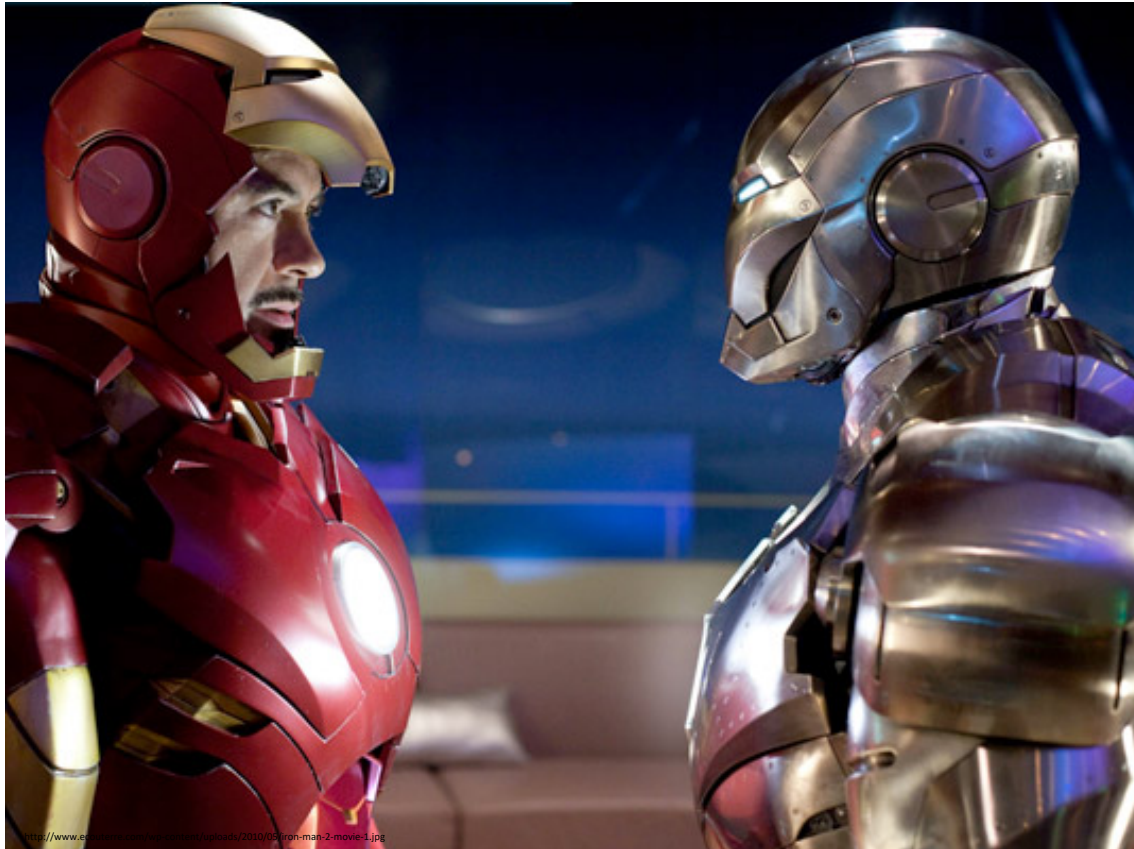
- What are the advantages of using a 3D printed arm cast over a traditional arm cast?
- Has anyone in the class broken a bone before? How did it feel to wear a cast?



- TurboRoo - The Two-Legged Chihuahua.
Without 3D printing would this dog have lived?



- The Iron man costume was 3D Printed.
- Could Ironman really do all those stunts if the suit was real metal?



Click the
image

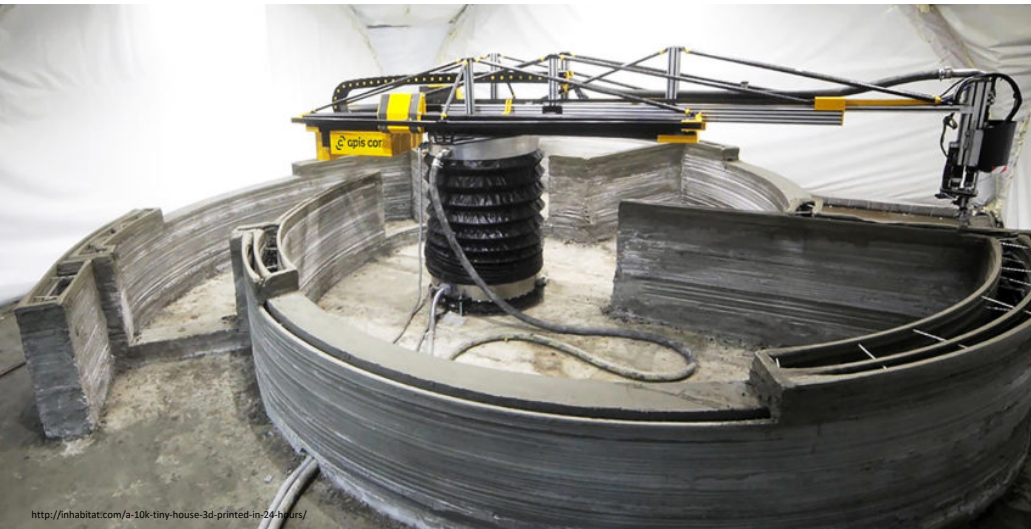
- James Bonds classic Aston Martin was blown up in he Skyfall movie. It was a mini 3D printed version.
- Why would the producers not just use the original car?



- This woman is blind and can't see the scan of her baby. 3D Printers have been used to print out a 3D physical scan so she can experience the scan through touch.
- Without a 3D Printer how could she learn about her baby?

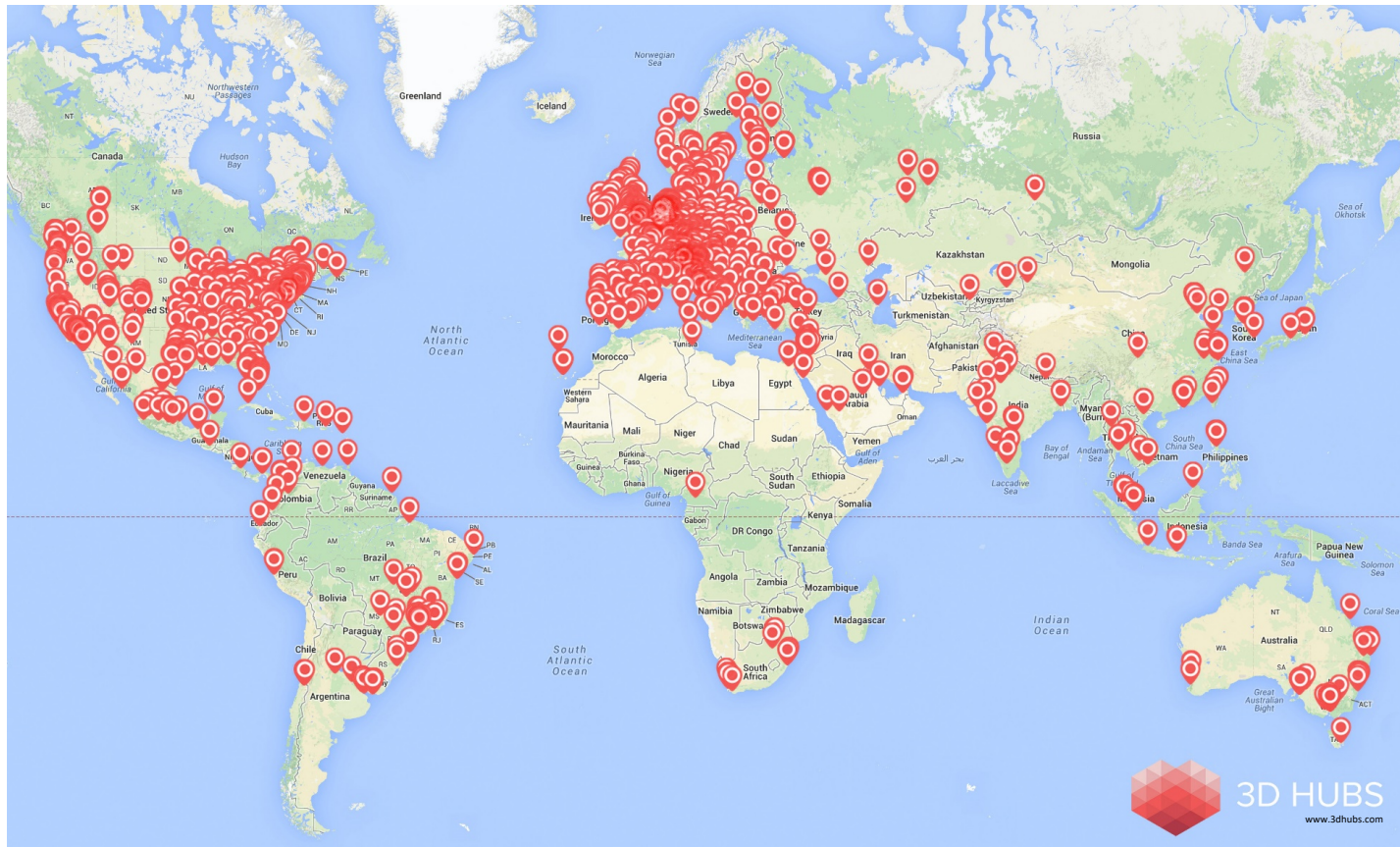


- This house was 3D printed in 24 hours by a huge concrete 3D Printer.
- How might this benefit people?



- Each red marker is a 3D Printer. What does this map tell you about 3D printing?
- What type of countries use 3D printing?

(Discuss in pairs for 1 minute. Be ready to feedback)



3D PRINTING INTRODUCTION

3D printing is a fantastically exciting new technology, considered a genuinely disruptive technology, because it has the potential to completely turn on its head the way in which modern manufacture is operated across the globe.

In the world of manufacturing, plastic based components are mass produced by a process called injection moulding; forcing liquid plastic into an enclosed cavity and allowing it to cool to form a solid component. This is an excellent process when making 1000's of matching components, both in colour and shape, but financially unsuited to the bespoke and specialist making of components in single numbers.

3D printing allows for one off and small batches of plastic components to be made, creating unique solutions with specialist functions and abilities thanks to not only unique parts, but potentially hollow parts that the process allows for.

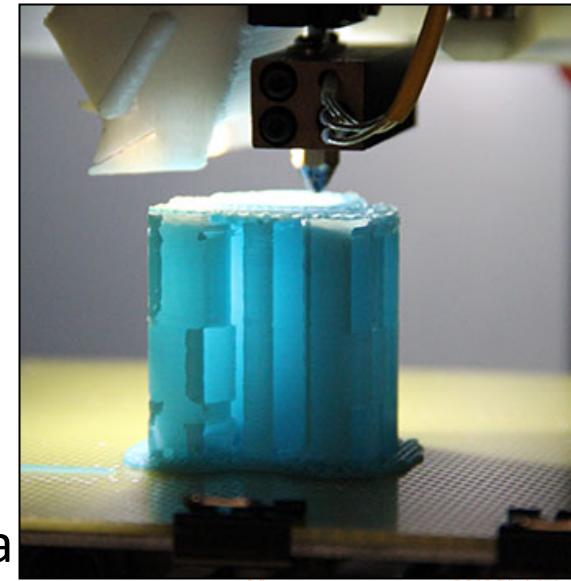


INTRODUCING 3D PRINTING

Process: 3D Printing

Facts about 3D printing

1. It was developed in the 1980's
2. It was originally called Rapid Prototyping (RP)
3. It was hoped to be a fast and cost effective process for industry to make parts
4. It was never patented by the person who invented the process in 1980, Dr Kodama from Japan (which was surprising considering he was a patent lawyer at the time)



INTRODUCING 3D PRINTING

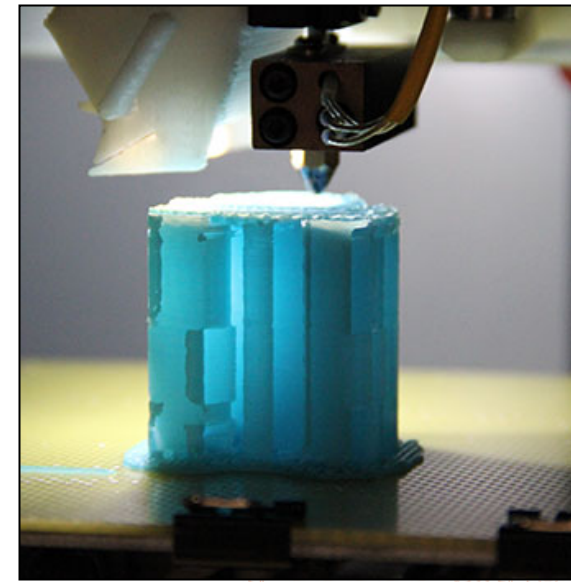
Process: 3D Printing

Facts about 3D printing

5. It was subsequently patented by Charles Hull in 1986 who set up the company 3D Systems Corporation which is the largest 3D printing company today

6. In 2012, the first crowd funded printers became available to market using the platform Kickstarter

7. Today, it is unknown, given the pace of how the technology is developing, how many different types of printers and brands exist.



INTRODUCING 3D PRINTING

Process: 3D Printing

What is 3D printing?

- 3D printing is an additive process.
- This means you are adding material to the part you are making, rather than taking it away (known as subtractive)
- The material is built up in layers using an extruder, onto a bed, so that it builds up, with each layer bonding to the previous.
- The process is controlled by computer (CNC) using data from an STL file.

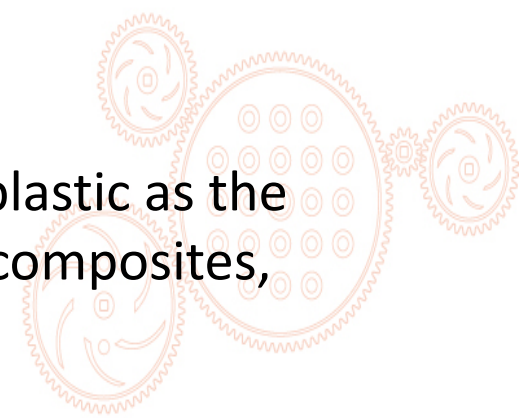


INTRODUCING 3D PRINTING

Process: 3D Printing

What is 3D printing?

- When complete, the part is removed from the bed, and is either
 1. finished and ready to be used
 2. cleaned up to remove support material
 3. cleaned up by removing raft material
 4. heat treated prior to use
- In the case of common school printers that use plastic as the material, options 1-3 apply. For metals or other composites, option 4 also applies.



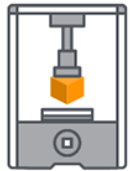
INTRODUCING 3D PRINTING

Process: 3D Printing



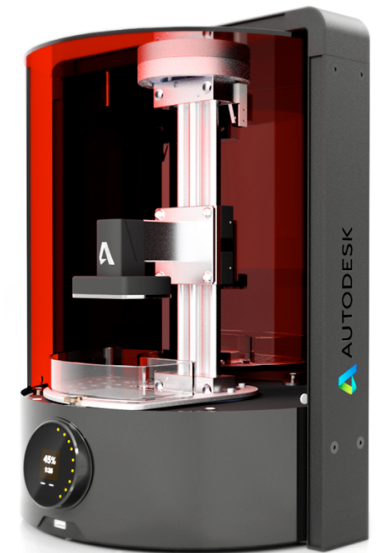
Different 3D Printing iterations

3D Printing, or rapid prototyping, can come in many different forms.



Additive machine

In this form, material is heated into a softened state and extruded from a nozzle. This can be onto a heated bed, bed coated in adhesive or contact paper, or straight onto a glass or textured metal plate.



INTRODUCING 3D PRINTING

Process: 3D Printing

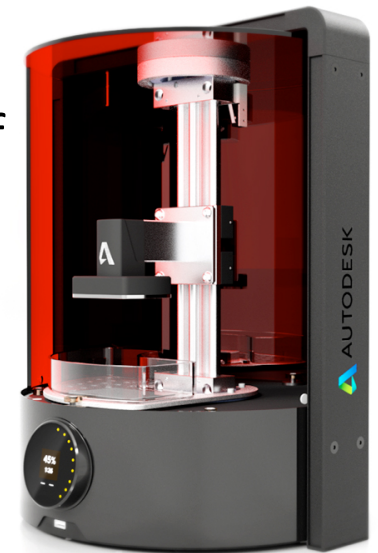


SLA/DLP machine (Autodesk Ember example right)

In this form, a bed is lowered into a volume of liquid polymer, and a laser or focused light cures the material to a hardened state in layers as the bed moves away from the liquid.

SLS machine

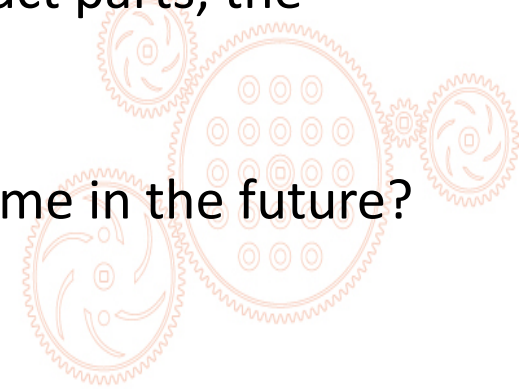
In this form, a powder is used in place of a liquid or a solid polymer, and a laser “sinters” or cures the powder in layers which are added by a sweeper.



LET'S CONSIDER....

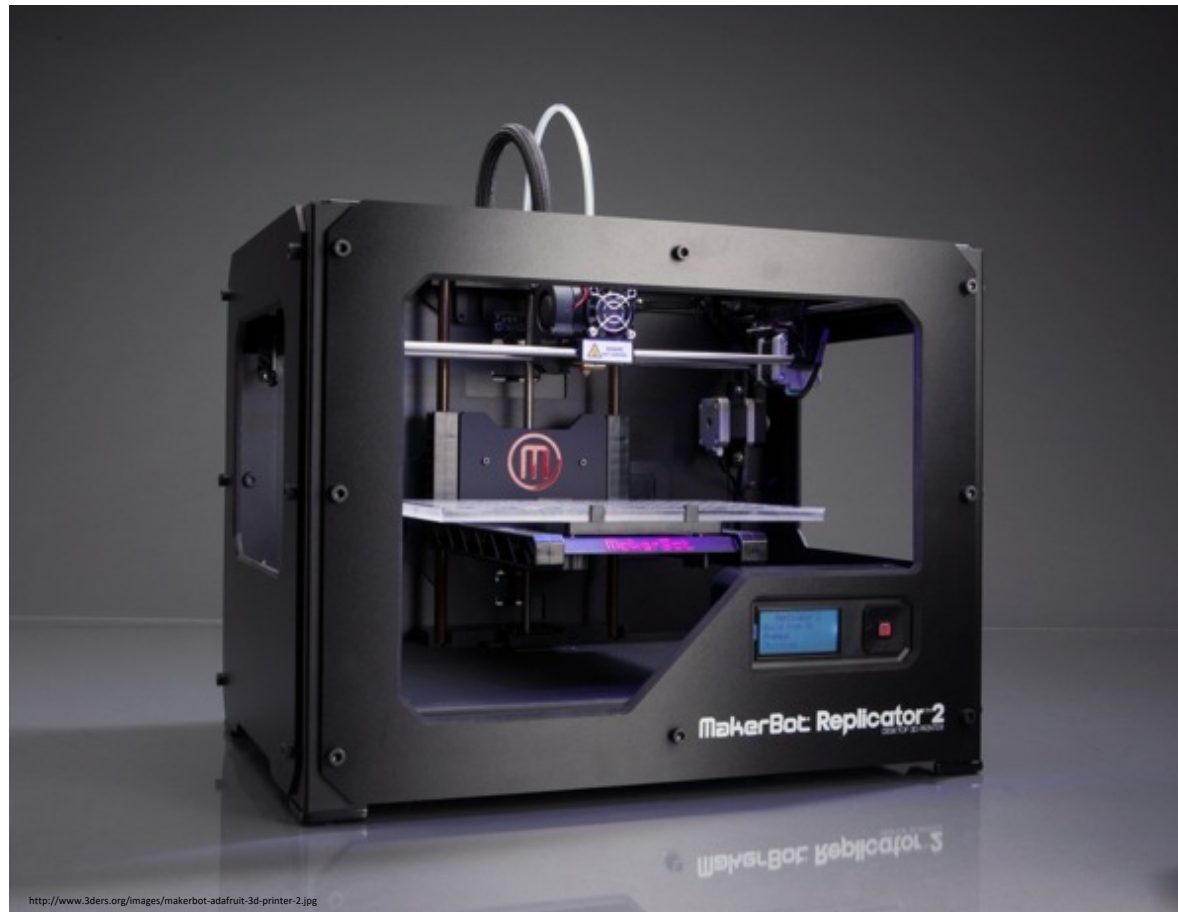
As a class, let us consider the following questions?

- A. How is 3D printing so different from subtractive technology?
- B. How could 3D printing make a positive impact on the environment?
- C. Who should be allowed to print out detailed product parts, the customer or the manufacture?
- D. Do you think there will be a 3D printer in every home in the future?





Keywords – Extruder, Filament, Nozzle, Motor, LCD screen, Build platform, Cooling Fan



Click the
image

Plenary – What have you learnt today?

- What is a 3D Printer?
- List 3 advantages of making products from a 3D Printer.
- Summarise your learning from today's lesson.



3D Printed Houses

<https://safeYouTube.net/w/nk6l>



Awesome Prints

<https://safeYouTube.net/w/AI6I>



Introduction to 3D Printing

<https://safeYouTube.net/w/Ze6l>