



International  
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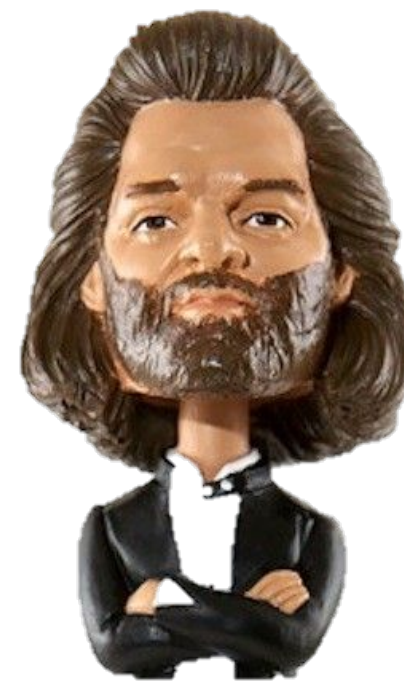
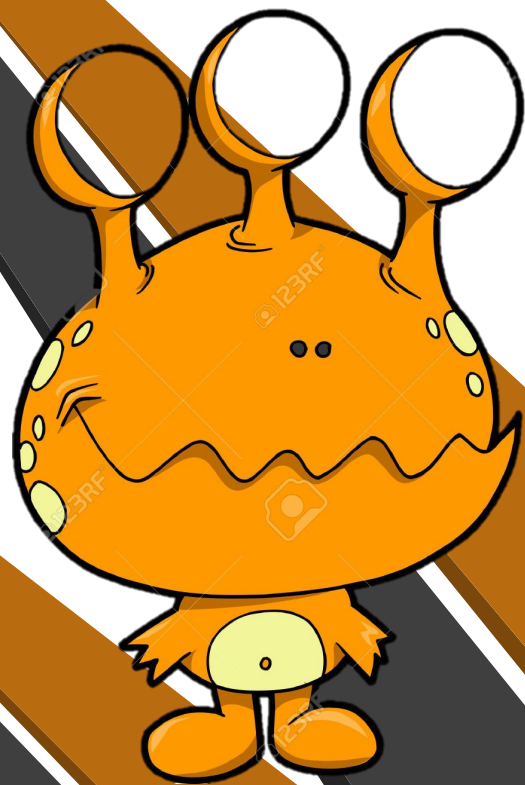
# G7

# Student

## 3D BOBBLE-HEAD PROJECT

Teacher: Mr Moneeb

Homeroom: 7C



# STATEMENT OF INQUIRY

3D Printing Manufacturing Allows for the Ability to Personalize Products According to Individual Needs and Requirements.

## INQUIRY QUESTIONS

- **Factual:**
  - What is 3D printing and how does it work?
- **Conceptual:**
  - How can we use CAD/CAM to design and make a Bobble-head figurine of high quality.
  - How are bobble-heads designed to attract the audience.
- **Debatable**
  - To what extent can a 3D printer be used to manufacture products on a large scale?

## LEARNER PROFILE

During your work you will have the opportunity to be inquirers, knowledgeable, communicators and open minded.

**Concept:** Communication

**Global Context:** Personal and Cultural expression

# Project Brief

You are a designer for a 3D printing company that creates personalised merchandise bobble-head PENS for consumers, where they print a 3D head of a monster and place it on a different body.

The head of the company is launching a new **monster theme** where the body and head will be that of a monster. The head of the company has asked you to design and make a new head/body for the monster theme

You are to do the following:

- Design and make the monster themed pen in 3D.
- 3D print your Monster Head to place on the pens body as a prototype example.



# DESIGN TASK

You will **Research**, **Design** and **Make** using CAD/CAM a prototype of a Bobble-head monster that can be sold online to consumers.

## AREAS OF ASSESSMENT

### Criterion A: Inquiring and Analysing

- i. Explain and justify the need for a solution to the problem.
- ii. construct a research plan, which states and prioritizes the primary and secondary research needed to develop a solution to the problem

### Criterion B: Developing Ideas

- i. develop a design specification which outlines the success criteria for the design of a solution based on the data collected.
- ii. present a range of feasible design ideas, which can be correctly interpreted by others
- iii. present the chosen design and outline the reasons for its selection
- iv. develop accurate planning drawings/diagrams and outline requirements for the creation of the chosen solution.

### Criterion C: Creating the Solution

- i. construct a logical plan, which outlines the efficient use of time and resources, sufficient for peers to be able to follow to create the solution
- iii. follow the plan to create the solution, which functions as intended explain changes made to the chosen design and the plan when making the solution.
- iv. present the solution as a whole

### Criterion D: Evaluating

- ii. explain the success of the solution against the design specification
- iii. describe how the solution could be improved



# Inquiring and Analysing

**Criterion A:**

# TASK 1A: (RESEARCH) ABOUT 3D PRINTING

Fill in the missing spaces using the words below. Use this link to help you:  
<https://www.3dhubs.com/what-is-3d-printing#a-brief-history-of-3d-printing>

3D Printing is an additive **manufacturing** process that creates a **physical** object from a **digital** design. There are different 3D printing **materials** and **technologies** you can print with, but all are based on the same principle: a digital model is turned into a solid three-dimensional physical object by adding material **layer** by layer.

Layer    manufacturing    digital    materials    physical    technologies

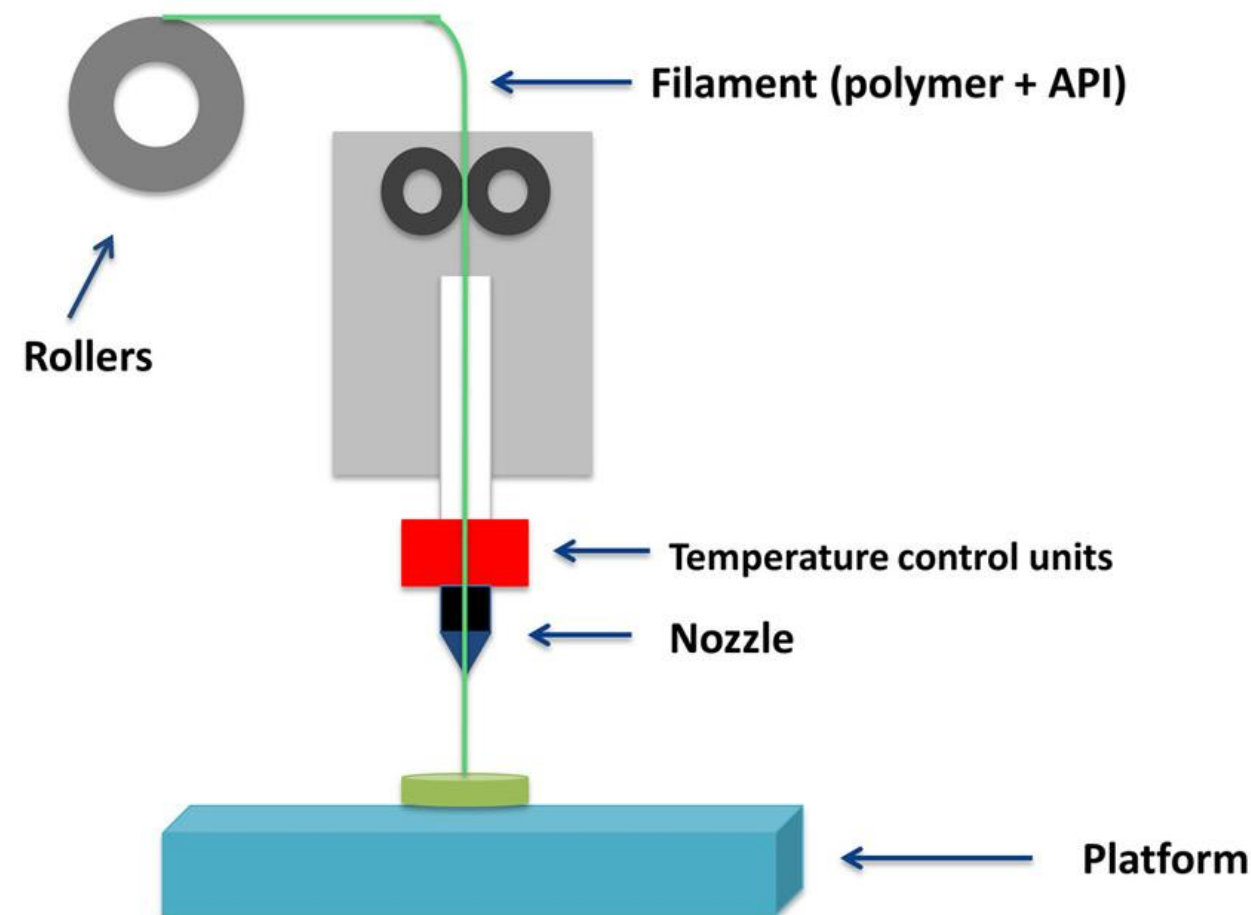
Below research and find 2 methods of 3D printing.

## NAME OF 3D PRINTING METHOD: Fused Deposition Modelling (FDM)

### DESCRIPTION:

FDM uses a spool of filament in the printer. The printer starts by the nozzle heating up to a certain temperature. When the nozzle reaches the temperature, the printer melts the filament by the motor passing through it. The printer lays down the melted material to its surface using its head. Once it solidifies and the layer is finished, the platform moves down and repeats its whole process until it is finished.

### IMAGE OF PRINTING METHOD:



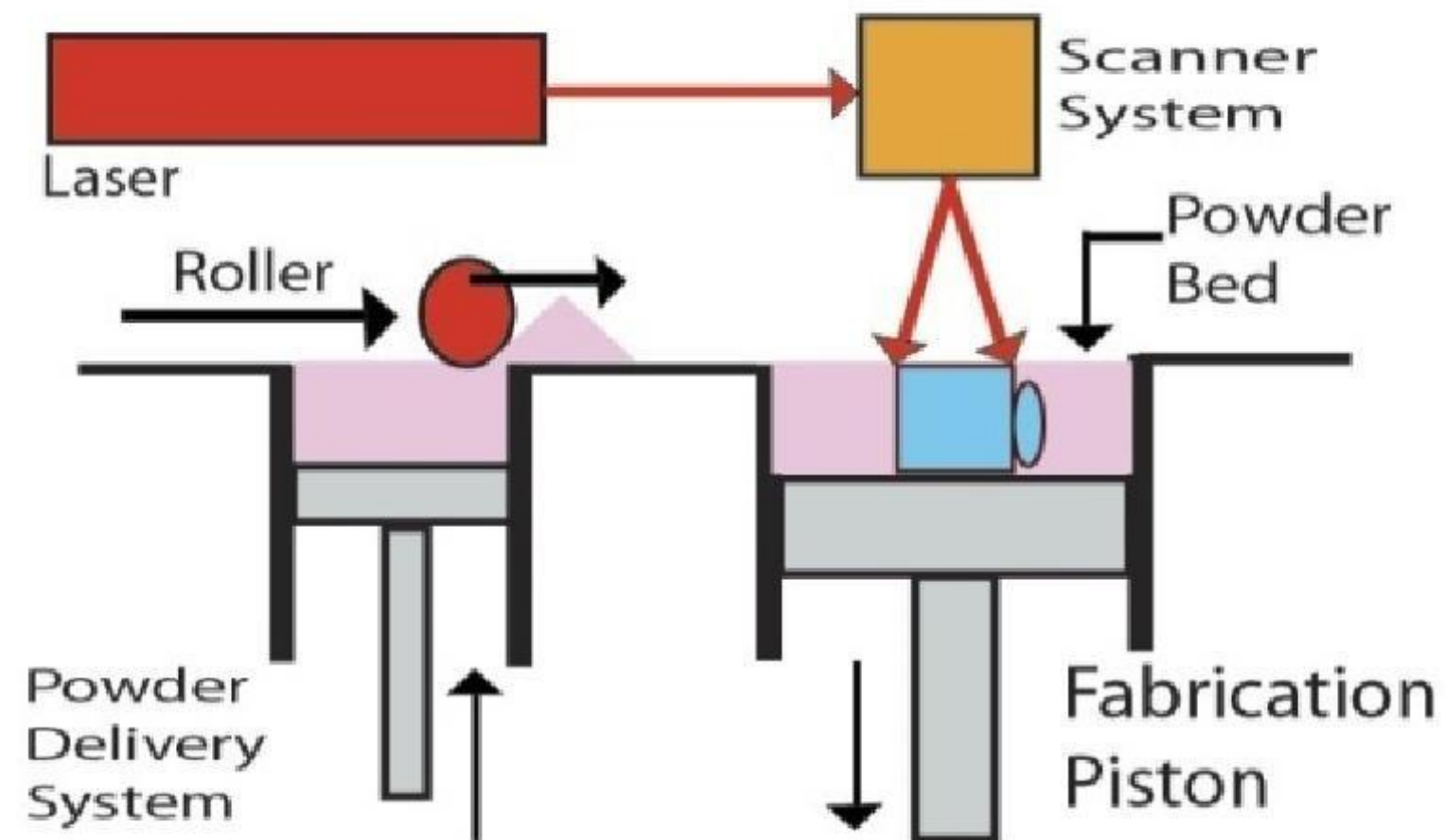
## NAME OF 3D PRINTING METHOD: Selective Laser Sintering (SLS)

### DESCRIPTION:

Selective laser melting is made by powdered material created layer by layer. The metal then solidifies, the layers are fused together by powerful lasers programmed by computers, creating high density objects. Selective laser sintering is used for creating objects and products using various materials especially metals.

### IMAGE OF PRINTING METHOD:

[https://www.researchgate.net/figure/Selective-Laser-Sintering-SLS-Source-entopmaxtechnet\\_fig12\\_307574898](https://www.researchgate.net/figure/Selective-Laser-Sintering-SLS-Source-entopmaxtechnet_fig12_307574898)





# TASK 1B: (RESEARCH) 3D PRINTING TO SOLVE PROBLEMS.

Find 3 products that were made using a 3D printer. Then answer the questions about them below:



## Describe the product in full sentences?

The Hero arm is a 3D printed product with multiple layers. The Hero arm has removable covers at the top, it also includes a long lasting removable battery, and on the side of the Hero arm there is something to adjust the arm to a right fit. The Hero Arm also uses a motor that controls the muscles on the remains of the limb (residual limb)

## How has the product benefitted the world?

This product has helped the people in the world such as children. These children who use the product are amputees. This bionic arm is called the Hero arm and it benefits children at the age of nine by helping them do many tasks as if the child had a normal real hand. The bionic arm boosts the amputees confidence

## What method or material of 3D printing was used to make the product?

The Hero Arm's assembly process takes about 40 hours.

## Could this product be made without 3D printing? Explain your answer

I believe that this product could be made without 3D printed, there are a few bionic arms that are not mainly made out of 3D printing. Even though I believe that the Hero arm be made without a 3D printer, I still believe that the Hero arm still needs a few small things to be 3D printed.

"Bionic 3D-Printed Arm 'Gives Confidence' to Young Amputees." *BBC News*, BBC, 10 Dec. 2018, [www.bbc.com/news/av/technology-46432642/bionic-3d-printed-arm-gives-confidence-to-young-amputees](http://www.bbc.com/news/av/technology-46432642/bionic-3d-printed-arm-gives-confidence-to-young-amputees).

"Hero Arm - an Affordable, Advanced and Intuitive Bionic Arm." *Open Bionics*, Open Bionics, 2018, [openbionics.com/hero-arm/](http://openbionics.com/hero-arm/).

Bionics, Open, director. *Hero Arm by Open Bionics*. *YouTube*, YouTube, 29 Mar. 2018, [www.youtube.com/watch?v=HUW\\_m7oYVP4](http://www.youtube.com/watch?v=HUW_m7oYVP4).

"Open Bionics Is Creating Hero Arm | The World's First Bionic Prosthesis." *Just Wow Me*, 29 Sept. 2018, [www.youtube.com/watch?v=W-eGaXD20b0](http://www.youtube.com/watch?v=W-eGaXD20b0).

**Describe the product in full sentences?**

This product is the 3D printed version of the faircap filter. The 3D printed water filter has 2 parts, the cap and the body. For the water filter to work activated carbon is needed. Before pouring the activated carbon in the water filter cap, place a makeup remover cotton swap. After pour the carbon. Then screw the cap on the bottom.

**What method or material of 3D printing was used to make the product?**

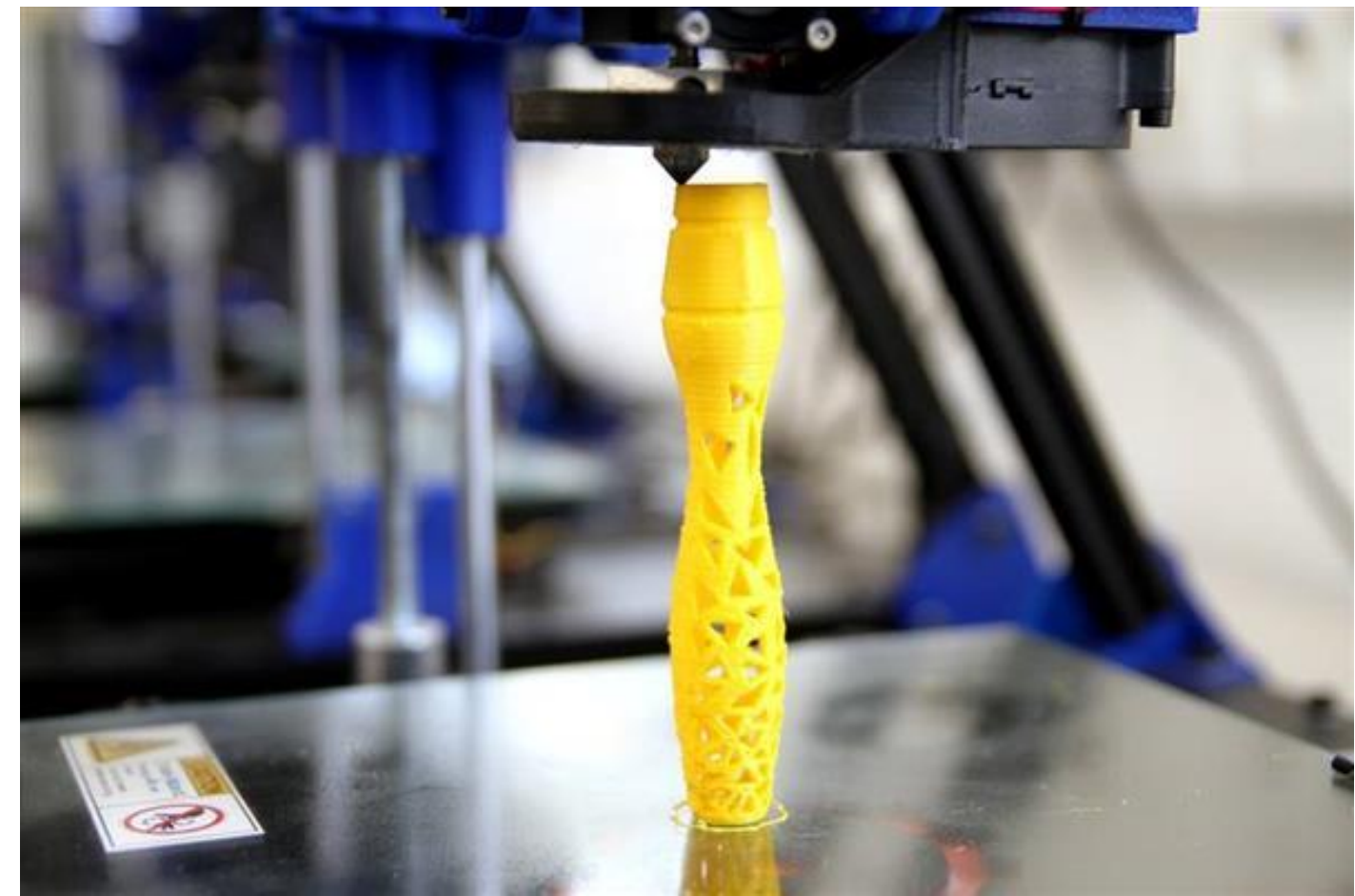
The 3D printed Faircap used STL files and a specific material called the PET Filament. The PET Filament is a material that is used to make plastic bottles. The benefits of the PET Filament is the 3D printed Faircap is safe to use for food and it is waterproof, and a disadvantage is it may be slower to print than other materials.

**How has the product benefitted the world?**

Many people in the world don't have a chance to drink clean and safe water. Because of this problem many people got diseases or even died because of the lack of clean water. This product has helped the world by filtering dirty water. This 3D printed product filters water that people could provide clean safe and drinkable water.

**Could this product be made without 3D printing? Explain your answer**

I believe that this 3d printed Faircap cannot be made without 3D printing because the 3D printed Faircap is approved by a specific material called the PET Filament. The PET Filament is safe to use for food. This material is used for 3D printing. There are other reliable life/filtering straws that do not use 3D printing. However, each filtering product is different, and I believe that this specific filtering product does need 3D printing.



Maker boat. "Faircap Project: Open Source 3D Printed Water Filter Aims to Solve Global Crisis for Just \$1." *3ders.Org*, Autodesk , 2018, [www.3ders.org/articles/20160212-open-source-3d-printed-water-filter-aims-to-solve-global-crisis.html](http://www.3ders.org/articles/20160212-open-source-3d-printed-water-filter-aims-to-solve-global-crisis.html).

Instructables. "Open Source 3D Printed Water Filter." *Instructables.com*, Instructables, 4 Oct. 2017, [www.instructables.com/id/Open-Source-3D-Printed-Water-Filter/](http://www.instructables.com/id/Open-Source-3D-Printed-Water-Filter/).

"PET Filament: Waterproof and Food-Safe Material Plastic for 3D Printing." *All That 3D*, 29 Aug. 2018, [www.allthat3d.com/pet-filament/](http://www.allthat3d.com/pet-filament/).

**Describe the product in full sentences?**

These prosthetic are made for Derby the dog. The product is made low, so Derby wouldn't have a huge change from what he is already used to. The designers scanned Derby's legs to find the exact measurements of the shoes

**What method or material of 3D printing was used to make the product?**

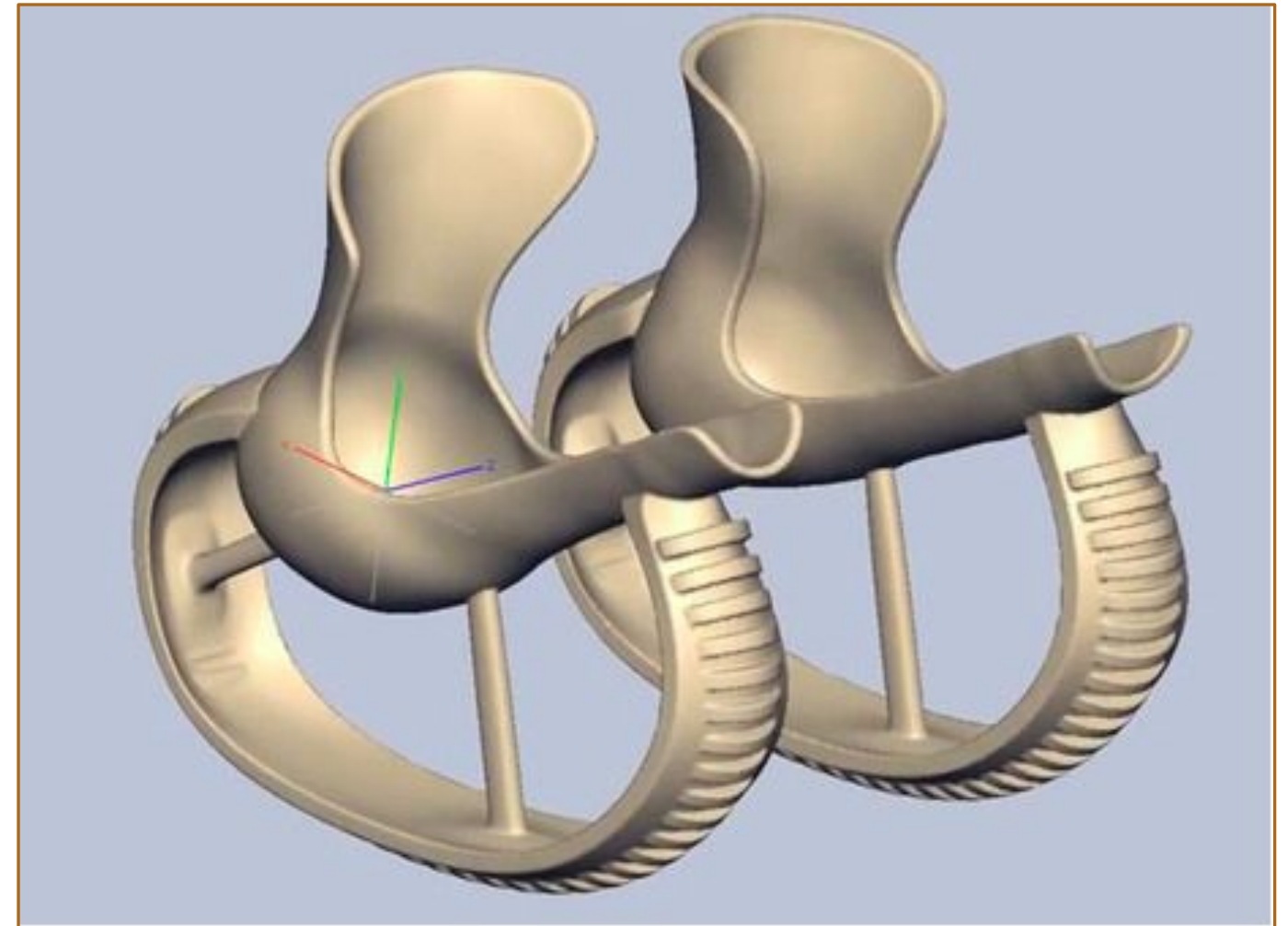
This 3D printed product uses the SLS 3D printer. SLS stands for Selective Laser Sintering. SLS used a powdered material created by layers by layers to make this product. This material solidifies and the layers become one by using a powerful laser that is programmed using a computer.

**How has the product benefitted the world?**

This products had benefited a dog called Derby. This product is design specifically for Derby because of Derby's disabilities. These 3D printed prosthetics have benefited Derby and his owners. Derby's owner felt bad for Derby and wanted to help him. After the people found a solution of making the 3D prosthetics it made Derby's owners super happy and allowed Derby to run around like other dogs. The first time Derby wore the prosthetic he was extremely happy and started sprinting around.

**Could this product be made without 3D printing? Explain your answer**

These prosthetics can be made without using 3D printing. INstead of 3D printing this product can also use clay. However, if the designers who made the leg prosthetics do use clay they would have to make a mold and measure the size of Derby's feet. 3D printing has no need to use a model which saved a lot of time and money.



Talltanic. "17 Incredible 3D Printed Objects." *YouTube*, YouTube, 3 Oct. 2016, [www.youtube.com/watch?v=FSu19nz7NIE&t=254s](http://www.youtube.com/watch?v=FSu19nz7NIE&t=254s).

ByCJARabia, and CJArabia. "Derby The Dog Gets New 3D Printer Prosthetic Legs." *Dogtime*, Dogtime, 28 July 2015, [dogtime.com/dog-health/general/21330-derby-the-dog-gets-new-prosthetic-legs](http://dogtime.com/dog-health/general/21330-derby-the-dog-gets-new-prosthetic-legs).

# TASK 2a: SITUATION ANALYSIS / RESEARCH PLAN

<u>Generic Area</u>	<u>What has to be Researched?</u>	<u>How will it be researched?</u>	<u>Is it Primary or Secondary Research?</u>
<b>COST</b>	<ol style="list-style-type: none"> <li>How much will it cost to make my bobble head?</li> <li>How much will it cost to make the bobble head prototype?</li> <li>How much will the materials cost?</li> <li>How much does the 3D printer cost?</li> <li>How much does it cost to make many copies of the prototype?</li> </ol>	<ol style="list-style-type: none"> <li>Internet Research/ Asking Experts</li> <li>Asking Experts</li> <li>Internet Research</li> <li>Asking Experts</li> <li>Asking Experts</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> </ol>
<b>AESTHETICS</b>	<ol style="list-style-type: none"> <li>What colors can be used with a 3D printer for bobble heads</li> <li>What shapes can be made using a 3D printer for bobble heads</li> <li>What color will the bobble head be</li> </ol>	<ol style="list-style-type: none"> <li>Internet</li> <li>Internet</li> <li>Testing it</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary</li> <li>Primary</li> </ol>
<b>FUNCTION</b>	<ol style="list-style-type: none"> <li>What shapes created by the 3D printer are the most stable?</li> <li>Does the weather affect the material of the bobble head?</li> <li>Is the head going to bobble?</li> <li>How does bobble heads work?</li> </ol>	<ol style="list-style-type: none"> <li>Internet/Ask Mr moneeb</li> <li>internet/Testing it</li> <li>Testing it</li> <li>Internet</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary/Primary</li> <li>Primary</li> <li>Secondary</li> </ol>
<b>MAKING (Software, Hardware)</b>	<ol style="list-style-type: none"> <li>How does the software work?</li> <li>How does the hardware work?</li> <li>Is the software trustable?</li> <li>Does the software work well?</li> <li>Does the 3D work well?</li> <li>How long does it take to make the final product?</li> <li>How many can of the final products can be made in an hour?</li> </ol>	<ol style="list-style-type: none"> <li>Internet Research</li> <li>Internet Research</li> <li>Internet Research/Asking Experts</li> <li>Testing it/Asking previous users</li> <li>Testing it/asking previous users</li> <li>Internet Research</li> <li>Internet Research</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Primary/Secondary</li> <li>Primary/Secondary</li> <li>Secondary</li> <li>Secondary</li> </ol>
<b>USER</b>	<ol style="list-style-type: none"> <li>Which gender will be buying my pen</li> <li>Who will use my pen when the final product is done?</li> <li>Which age range will buy my pen?</li> <li>How will I attract my user to buy my pen?</li> <li>Is it safe for children to use my pen after sold?</li> </ol>	<ol style="list-style-type: none"> <li>Testing it</li> <li>Testing it</li> <li>Testing it</li> <li>Asking advertisers</li> <li>Internet Research</li> </ol>	<ol style="list-style-type: none"> <li>Primary</li> <li>Primary</li> <li>Primary</li> <li>Secondary</li> <li>Secondary</li> </ol>
<b>ENVIRONMENTAL ISSUES</b>	<ol style="list-style-type: none"> <li>How does 3D printing affect the environment?</li> <li>Are there any 3D printers in the world that don't pollute?</li> <li>How much electricity does 3D printers use?</li> <li>Is it possible to remove the 3D printing out of the pen to recycle?</li> <li>Recyclable 3D materials?</li> </ol>	<ol style="list-style-type: none"> <li>Internet Research</li> <li>Internet Research</li> <li>Internet research</li> <li>Asking Experts</li> <li>Internet Research</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> </ol>
<b>SAFETY (e-safety)</b>	<ol style="list-style-type: none"> <li>How does 3D printing harm people?</li> <li>Can 3D printers explode if used many times?</li> <li>Types of toxic ink</li> <li>Types of non toxic ink</li> </ol>	<ol style="list-style-type: none"> <li>Internet Research</li> <li>Internet Research</li> <li>Internet Research</li> <li>Internet Research</li> </ol>	<ol style="list-style-type: none"> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> <li>Secondary</li> </ol>

# TASK 3: (RESEARCH) PRODUCT ANALYSIS

Analyse 2 different Bobble-head products. Get an image of your Bobble-head product on the next page and use the headings below to analyse it? **You will find and analyse 2 existing Bobbleheads using your CAFEQUES criteria below:**

These headings and questions should help you remember how to effectively analyse and evaluate products. Read through this slide then answer the questions on the next slide.

## Cost

- How much does the product cost and is it good value for money?

## Aesthetics

- Does the product look good?
- Does it make good use of colour and texture?
- Has it got a good quality finish?

## Function

- Does the product do the job for which it was intended?
- How well does the product work?
  - Could it be improved?

## Size / Ergonomics

- Is the product comfortable to use?
- To what extent has the designer considered human factors (ergonomics) in the product's design?
- If you increase or decrease the product's scale, would it work or look better?

## Manufacturing /Quality

- What is the product made from?
- Would another type of material work better?

## User

- Who is the product designed for (the target market)?
- Why would they use the product?
- What impact will it have on the consumers quality of life?
- How is the product promoted to attract its customers?

## Environment

- Can you think of any impacts the product or use of the product may have on the environment?
- Think about its manufacture, general use and final disposal when its not needed.

## Safety

- How has the designer considered the safe use of the product?
- Think about who may be using it (ages) and how different parts have been joined together?
- Does the product meet safety standards for children?

# EXAMPLE PRODUCT ANALYSIS



Homer Simpson Talking Plastic Desk Tidy

C: £11.99 which I feel is a fairly reasonable price considering the amount of detail in the design.

A: Very bright and colourful which interesting design ideas.

F: It is a fairly large product but the amount of storage space is quite limited.

E: Smooth plastic texture which will not knock over easily.

Q: Looks high quality and well manufactured.

U: Aimed at children under 16

E: Made from thermoplastic which can be recycled after use.

S: All pieces are firmly attached and there are no small gaps or choke hazards.



Lorry Loader Desk Tidy

C: £27.50 which I feel is a high price for this item.

A: Interesting design but the colours are a bit dull.

F: It has a calendar built into the windshield and good dividers for the stationery items, but limited space.

E: a bit lumpy and looks unstable

Q: Looks a bit cheap even though it is made form metal (steel) and plastic.

U: Aimed at a male audience probably for young adults upwards.

E: Made from metal and thermosetting plastic so tricky to recycle.

S: Has some quite sharp edges that could hurt a child.

# TASK 3A: PRODUCT ANALYSIS 1

## Cost

The cost of the bobble head depends on the used material. The cost of the material is quite expensive

## Aesthetics

The products shape is interesting and can attract the customers. However, writing with the bobble head is difficult and the shape of the bobble head takes a lot of space. The colors of the bobble head are dull and they could be painted better with brighter colors. Even though the colors are quite dull the colors give a old effect in the history. The texture of the used materials in the bobble head is rubbery and the material is kind of like clay, but if it drops it won't break. The quality of the bobble head is good because it won't break easily and it has a lot of creativity. The final look of the pen depends on the customer, if they want to buy a perfect pen or a pen that has a old effect that has been used over time.

## User:

This bobble head pen is targeted for children under 14. The children under 9 would like the pen to play with. Both girls and boys would use this pen for a toy and children over the age of 9 and under 14 will think this pen is cool and use it as a normal until the ink runs out. This pen can improve the children's life by education purposes. They can study the pen and 3D printing and they may find a new passion on 3D printing. This pen can also improve their creativity. The shape of this product can attract children. However, the product can be improved and promoted better by improving the paint job and details.

## Manufacturing

The material used to make this bobble head pen is air drying modeling clay (polymer clay). The top part is painted using nail polish and the polymer clay is painted with normal paint. I do not believe that any other material would be better to use to make this pen. The polymer clay is rubbery and if it falls it does not break like clay.



## Function

The product does the job for which it was intended. The product is a pen and it is still possible to write with the pen. The polymer clay does not cover the ink of the pen and it is still possible to write with. The pen does work well because the head bobbles and it is colorful and the shape is interesting enough to attract the customers (kids). This product can be improved by the handle being thinner because it is quite difficult to write with the pen because it is too thick. The colors of the pen can be brighter and the details can improve.

## Environment

This bobble head pens made from air drying modeling clay (polymer clay)

## Size / Ergonomics

The product is quite comfortable to use because the material is foamy and rubbery. However, the handle is too thick to write with and the wing get in the way while writing. The product would be better if the size and shape is decreased because the product is too big. Especially the wings are annoying and get in the way while writing.

## Safety

The product is quite safe because there are no really sharp edges where it can poke the smaller one. (the younger ones) The product also does not break and shatter if the product falls easily. Since the product does not shatter easily, there would be the less chance of the shattered pieces harming the consumers.

# TASK 3B: PRODUCT ANALYSIS 2

## Cost

The cost depends on the type of material is used to make the pen. According to Flipkart the Bobble Head Pen is ₹1,598. Converting ₹1,598 to Qatar Rials, ₹1,598 - QAR 84.10. I believe QAR 84.10 is expensive and a high price for this pen. Because this pen has a lot of small detail, the pen would not be very cheap. However, I believe QAR 84.10 is too much.

## Aesthetics

This pens shape is interesting and can attract a few customers, who are mostly children. The color is dark which are black, and this color may not attract the a few customers. Writing with the bobble head pen would be very difficult because the shape of the pen is awkward to write with and the body of the is too thick. The texture of this darth vader pen looks hard and smooth, which may be uncomfortable when writing with. The final look of the Darth vader pen is quite good because it has a lot of details and looks stable but also seems like it can break easily when dropped.

## User

This bobble head pen design is targeted for children. The age is mostly for children under 13. Adults and teenagers can still use this pen. The people who would use this pen can also be people who are fans of Star Wars or just Darth Vader. The smaller customers can use this pen for toys or action figures. The older customers can use this pen design for display or as a normal pen. As said in the other pen, the pen can be used for education uses. The children can study the pen or other uses. The shape of the pen can attract customers and the design can also be eye catching.

## Manufacturing

This Darth Vader bobble head pen material is plastic. I believe this pen is made from a factory. I don't this any other material would be appropriate for this pen because this pen was easily assembled by using a machine and adding all the details would be harder with other materials.



## Function

The pen does the job it is intended to do. I think this pen does write because it is hard to see, since the image is not clear. The pen might have cap to help keep the ink not dry. The pen probably works nice and well, However, it depends on the type of ink. The pen looks difficult to write with because the handle is very thick.

Star Wars Bobble Head Pen - Darth Vader  
<https://www.flipkart.com/comic-images-star-wars-bobble-head-pen-darth-vader/p/itmffrmnh4zgkbu2>

## Environment

The pen is made from plastic. This means the material is not environmental prof and not recycable. This material is very harmful to the earth and create many problems and issues to the

## Size / Ergonomics

As said multiple times the handle width could be thinner and decreased. The body of the pen is too thick. This makes the pen use less comfortable. The sizes of the pen is 4.57 cm. The weight is 113.4 g and the the width is 8.89 cm. Lastly, the product height is 4.57 cm.

## Safety

The product is quite safe. However, there are a few sharp edges. The pen material is quite harde and can hurt the younger ones. The pen is quite stable, but if it falls powerfully multiple times it can shatter and pieces can harm some of the customers.



# TASK 4: JUSTIFYING THE NEED

## Explain and Justify the need for your Bobble-head?

1. First explain the **Problem** (you must think of this yourself)...why does the company want to make a monster themed bobble-head?
2. Then explain and justify Why is it important for you to make a Bobble-head? What benefits will it bring to the company and the target user? (Below is an example of the command terms showing the difference between Explaining something and Justifying it.

### **Paragraph 1:**

The company had a problem which was their profit is too low and it is under their average amount. Since, the company needs to earn money to make more products, the company wants to create new designs and update their products. They change their products to suit the needs of the society. If the company stops making more products, then the customers/consumers will stop buying the company's products and they will lose their reputation and money. The business will stop running and not sell anymore products.

### **Paragraph 2:**

The solution to the company's problem is to make a products that suits the society. The product the company made to solve the problem are bobble heads. To make a perfect bobble head the company has to create many prototypes until the perfect example is made. After making the right prototype we make millions of copies of the prototype.

The benefits of the product will bring the company are they will earn money and their profit will higher. The company will also gain more popularity by their customers/consumers will still buy their product and the company will gain brand loyalty.

The benefits it will bring the consumer or target market are it will bring the customers/consumers more options and choices of products. The target market will have more choice of bobble heads to purchase.

# TASK 5A: (RESEARCH) HISTORY OF 3D PRINTING

Create a timeline showing the history of 3D printing. You can use images to help show it.

1964

The functions 3D printer was first described by Arthur C. Clarke  
[7779.jpg](#)



1987

In 1987, Chuck Hull released the first 3D printer using the stereolithography (SLA)  
[ChuckCharles-Hull-009.jpg](#)



1990

In 1990, the other 3D printed technology were released, such as FDM, SLS, DLP, etc. by the 3D Systems  
[1200px-3D\\_Systems\\_Logo.png](#)



1999

In 1999, the first 3D printed organ was implanted in humans.

2009

In 2009, the ASTM Committee F42 was published a document about standard terminology  
[1825f9332bc782d93c6d201cd1a002d9\\_L.jpg](#)



The first low prices were available for the FDM. The desktop 3D printer was made by RepRap project It used to cost \$200,00 and now it is \$2,000  
[Sxy-4040-sculptor-500x500.jpg](#)

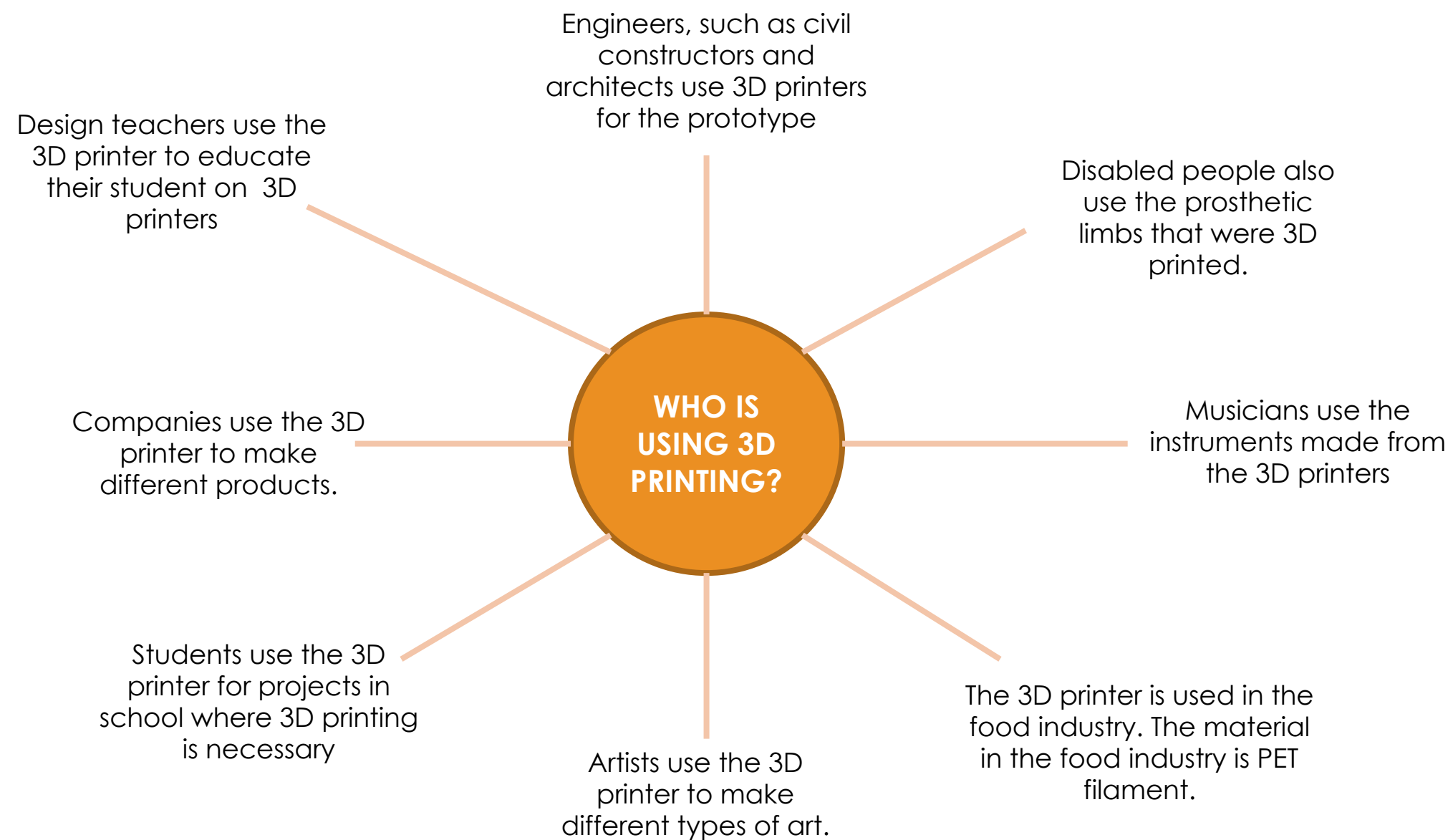
2009



3D printing keeps growing and developing. Between 2015-2017 the 3D printers were sold globally

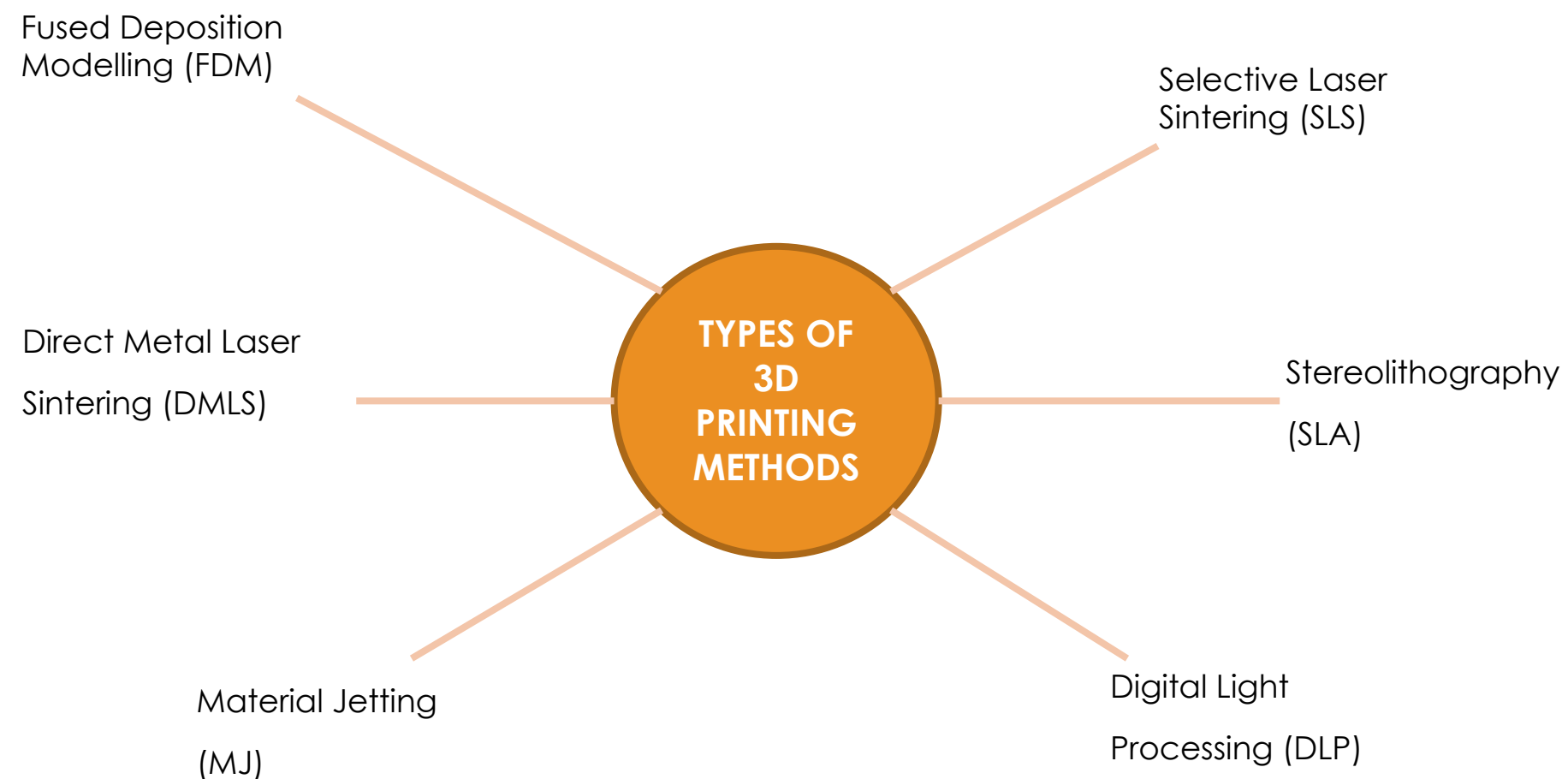
2015-2017

# TASK 5B: (RESEARCH) WHO IS USING 3D PRINTING?



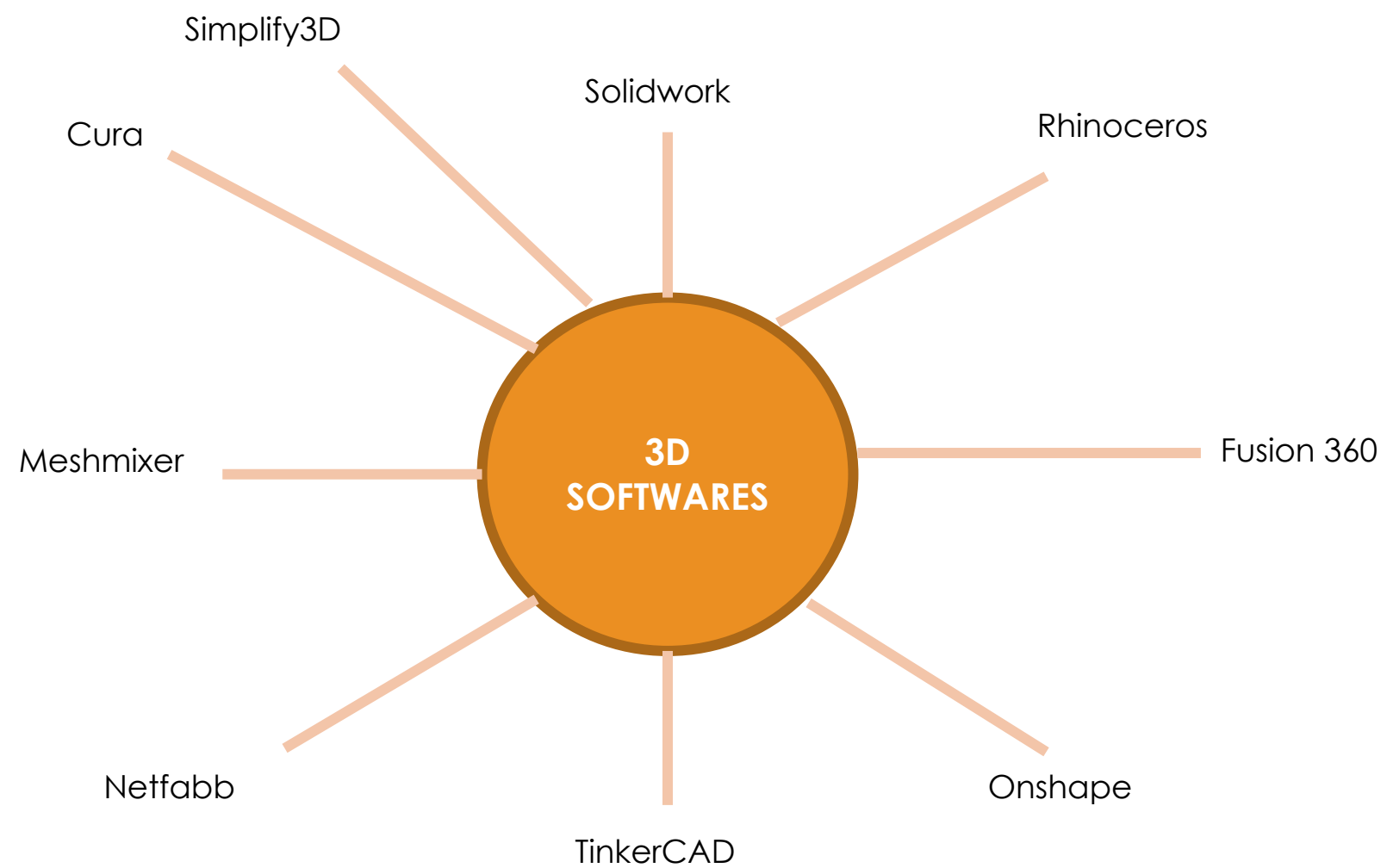
As shown in the mindmap, many types of people use the 3D printer. For example engineers, disabled people, teachers, Musicians, Companies, etc. As stated above all these different types of people use the 3D printer for different reasons.

# TASK 5C: (RESEARCH) TYPES OF 3D PRINTING



There are many 3D printing methods in this world. For example Stereolithography (SLA). SLA and DLP are a similar using the UV light source. To cure the resin, SLA uses single-point laser, and DLP uses digital light projector to flash each layer at once. The DMLS is similar to SML, however, the DMLS heats the particle to the point where it fuses together. The DMLS has a laser source that bonds together powdered particles layer by layer. Material jetting is similar to standard inkjet printing, but it prints multiple layers of material on top of each other and create a solid part. The many multiple print heads jet hundreds of droplets on to the platform. The droplets are then solidified by the UV light. After the platform moves down and repeats the whole process again. Lasly, supports structures are always needed in Material Jetting.

# TASK 5D: (RESEARCH) 3D SOFTWARES



For my bobble head pen, the plastic I will be using is Resin. I chose Resin because it has high detailed parts with a smooth surface. The plastic is thermoset photopolymer, where it solidifies with light. When it dries there would be high detailed parts. Resin can be used for prototyping o ideal for prototyping.

# TASK 6: WRITE A DESIGN BRIEF

## DESIGN BRIEF

My 3D printing company and I are making bobblehead pens for our consumers. These pens will be appealing for kids and children, since it is a monster or african themed bobblehead pen. The head part of the pen will be 3D printed and bobble, and the head will be attached to a different body with different materials. The pens are monster or african themed. The target market of the product are children who are about under 14. The children can use the pen as a pen and a toy, and the teenagers can use it as a normal pen and decoration. My 3D printing company and I are making bobblehead pens because the company wants to earn money. The company need to change their products to suit the needs of the society, and for people to buy more products. The deadline of the bobblehead and I will make the bobblehead pen by May I will make the bobblehead pen by using a 3D printer. The head of the pen will be made using the 3D printer and nail polish for the paint job. For the body of the pen, the air drying modeling clay (polymer clay) will be used to construct its shape. Lastly, for the prototype we will be using modeling clay.



# Developing Ideas

**Criterion B:**

# AREAS OF ASSESSMENT

## Criterion A: Inquiring and Analysing

iii. analyse a group of similar products that inspire a solution to the problem

iv. develop a design brief, which presents the analysis of relevant research.

## Criterion B: Developing Ideas

i. develop a design specification which outlines the success criteria for the design of a solution based on the data collected.

ii. present a range of feasible design ideas, which can be correctly interpreted by others

iii. present the chosen design and outline the reasons for its selection

iv. develop accurate planning drawings/diagrams and outline requirements for the creation of the chosen solution.

## Criterion C: Creating the Solution

i. construct a logical plan, which outlines the efficient use of time and resources, sufficient for peers to be able to follow to create the solution

iii. follow the plan to create the solution, which functions as intended explain changes made to the chosen design and the plan when making the solution.

iv. present the solution as a whole

## Criterion D: Evaluating

ii. explain the success of the solution against the design specification

iii. describe how the solution could be improved



# TASK 4:

## WRITE A DESIGN SPECIFICATION

Using your research and analysis of the products, write a list of criteria of what your product **must** have. You can use the questions below to help you. You must write in full sentences explaining what your product should do/have and could do/have.

**SUGGESTIONS:** A. Write a rough specification first and ask other pupils / teachers to read it. B. Look carefully at each statement and keep the English as clear and simple as possible. C. Limit the statements to between 7 to 12 points (maximum). D. Ensure most points refer directly to your research.

Remember your specification is a list of bullet points that will state what your product should be like or have.

For Example:

- The Bobble-head should have a good quality finish.
- The Bobble-head should accommodate and be spacious enough for 1 person.....etc

Your sentences should start with...

- The Bobble-head will....
- The Bobble-head Should...
- The Bobble-head Could.....
- The Bobble-head must....

# MOODBOARD

Find images of West african art from your book "Things fall apart" and bobble pens you like. Then create a collage of them here. Some key-words you could google are:

- Kente cloth
  - Djembe
  - Igbo
  - Yoruba
- West African Art
  - Ghanaian
  - Ashanti
  - Egwugwu
- Cote d'ivoire
- Things fall apart
- **Chinua Achebe**

# DESIGN SPECIFICATION

## AESTHETICS/SIZE

- According to advertisers, **my product should be colorful** because the colors of the pen will draw and attract the target market (consumers)
- According to my thoughts, **my bobble head must have an interesting shape** because as said before the children will get attracted by the shape
- According to my past experience, **my bobblehead pen must be appropriate for the theme** because if it isn't the theme, the product will not make sense.
- **My product should be detailed** because it should be recognized on what it is.
- According to research, **my product must be appropriate to write with** because if it's too big, it would be really hard to write with. The pen should be the size of a normal pen.

## FUNCTION

- As normal pens **my bobbleheads pen ink must work** because if the ink does not work, then the pen will be useless
- According to my brain cells, **my bobblehead could have refillable ink** because as shown above the pen would be useless without ink and the ink needs to be refillable after it is run out.

## MATERIALS

- According to my teacher, **my product's body should be made with soft air drying modeling clay (polymer clay)**. The clay is different from normal clay, and it is shatter resistant.
- According to my design teacher, (Mr Moneeb) **my bobbleheads pen's head must use the 3d printer** because only for prototyping because if making many copies the 3d printer would be too slow
- According to research, **my product should use the PLA plastic**, because the PLA plastic is non toxic and edible. The plastic is also recyclable
- According to Mr Moneeb, **my pen's head must use nail polish for the paint job** because real paint does not dry on plastic. Nail polish also includes a chemical called Acetone. Whenever Acetone touches plastic, it melts the plastic and infuses the nail polish color to the plastic ...
- **My pen's body will use paint for the paint job** because to paint the air drying soft modeling clay paint is used

**Make sure to start all your sentences with:  
My product SHOULD / COULD / MUST / ....**

## MANUFACTURE

- According to my teacher, **my product should not break easily** because when the pen breaks the pen won't work and be useless again
- According to research, **my bobble head pen must be stable** because if my pen is not stable, then it will break.
- According to the internet, **my pen should be quality good** because the pen will not break easily (as shown above), and the ink quality is also good.

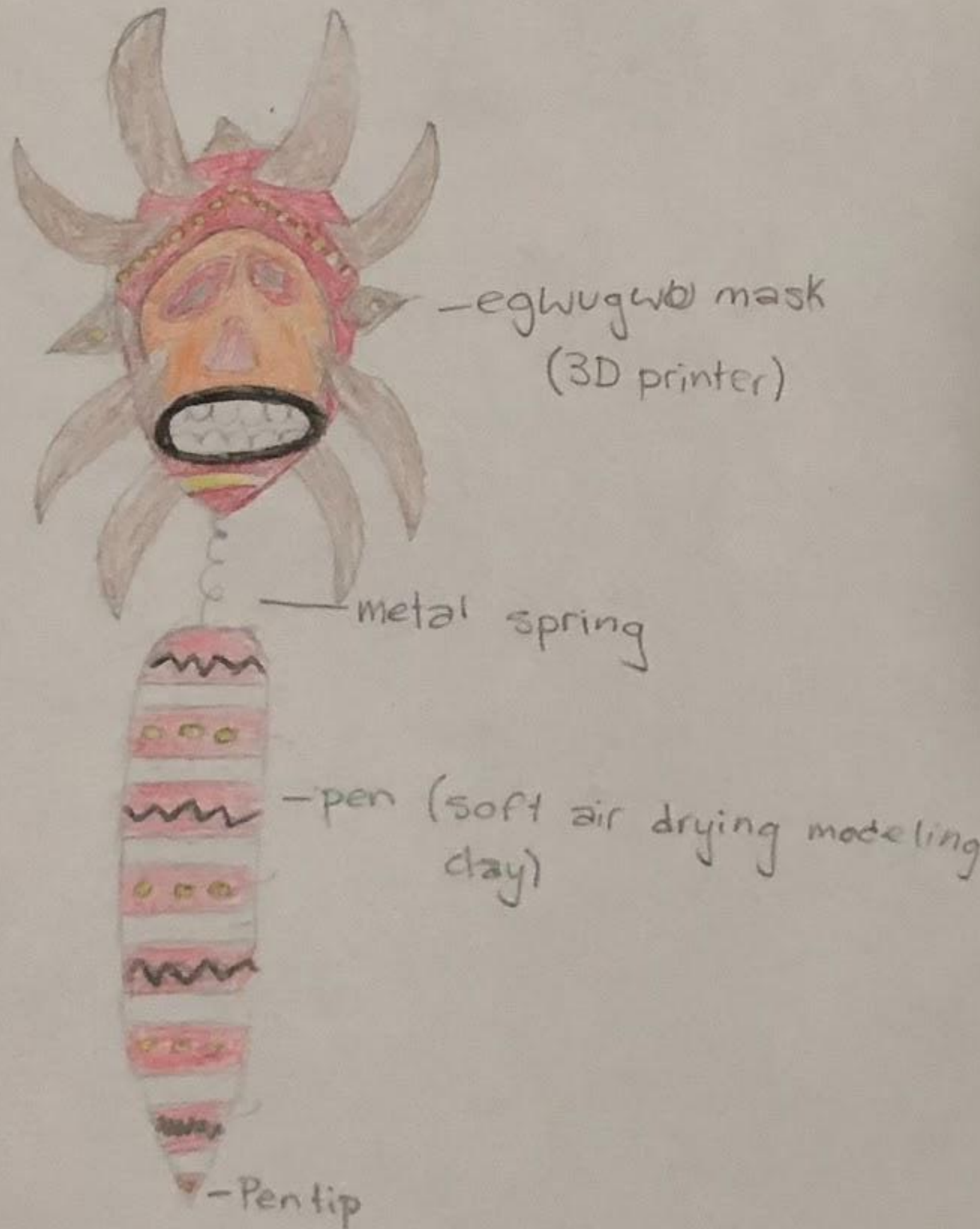
## USER

- According to myself, **my product could be used any age** because all ages can use the product if wanted.
- According to research, **the pen must be safe and appropriate**. It must be safe because depending on the age of the user, the pen should be appropriate

## SAFETY

- According to the information above, **the product must be safe** because I explained it all above.
- According to research, **my bobble head pen should have non toxic ink** because kids may be using my pen and the ink has to be non toxic.
- According to the internet, **the product could use the ABS plastic** because the ABS plastic is safe, non toxic and can be eaten.

# TASK 5: DESIGN IDEA 1



For my bobble head pen design, I like that it is an egwugwu mask. The mask is colorful and interesting, and the kids can be attracted by the pen. I also like that my egwugwu mask pen is african themed. Lastly, I like that both adults and small children can use this egwugwu mask bobblehead pen.

For my design, I dislike how I colored the Egwugwu mask and the colors I used for my mask. I also think the design is too colorful.

In my bobble head pen, I used many different colors. For example red, orange, brown, black, and a little bit of yellow for the dots. Most of these colors are bright and eye catching, the colors can attract the consumer.

To improve my design, next time I simple the colors a bit and not make it look too crowded. I also believe I can color better and more clearer.

My bobble head pen design meets many of my specifications. For example "**my bobblehead pen must be appropriate for the theme**". The theme of my pen is African, and my design is an African egwugwu mask. My pen is also "**my product should be colorful**" because in my product design there are many colors, maybe even too many. There are a few more points. My pen meets each of my materials specification points because according to my teacher, we will be using the materials for the pens.

# TASK 5: DESIGN IDEA 2

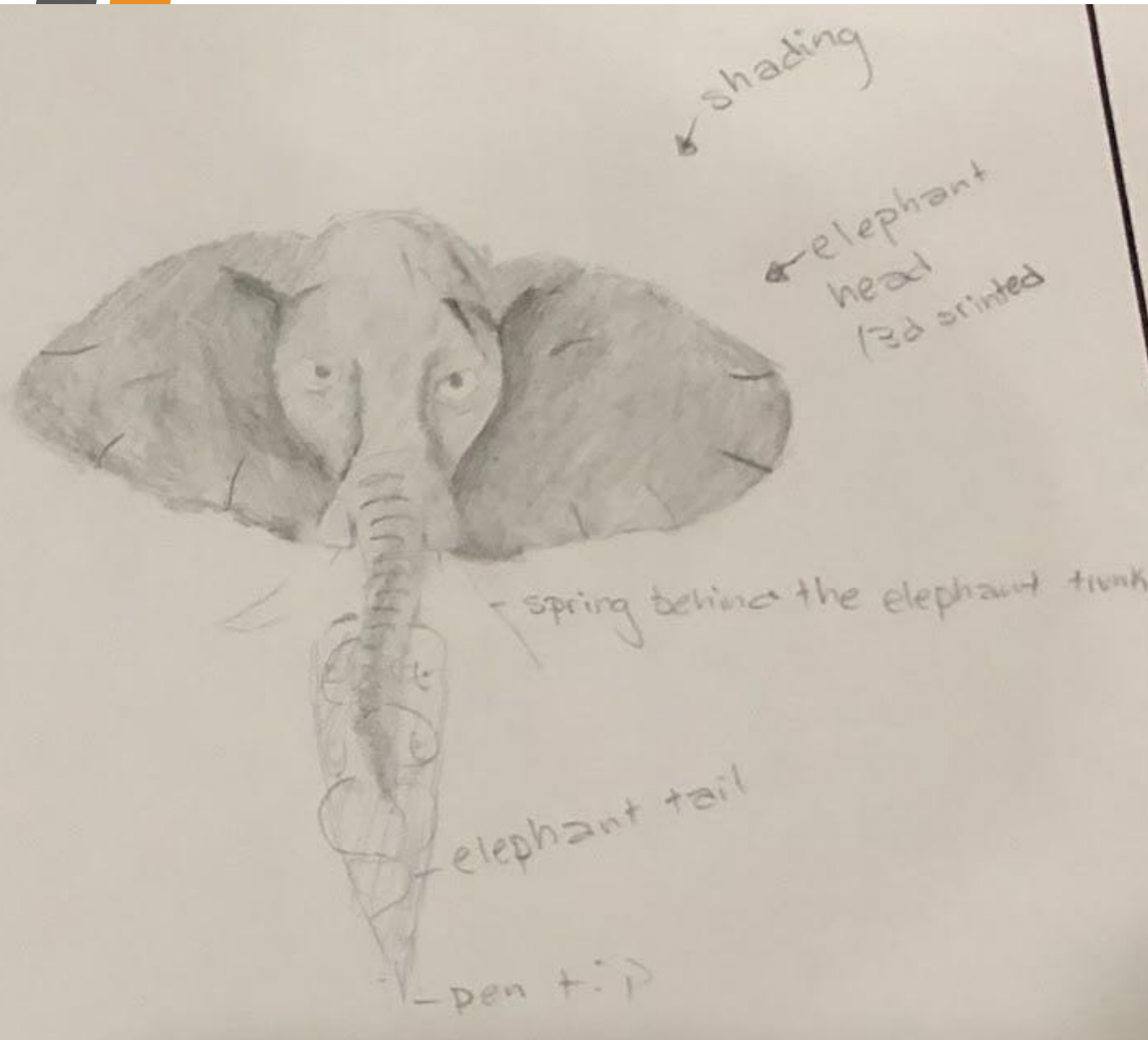
I like that my bobble head pen design is appropriate for the theme, which is African themed. My pen is an elephant, and I like that it is nice and simple, and somewhat realistic. I like the idea of any ages can use this pen. The kids may get attracted by the elephant and the ages above might find it interesting and realistic.

For my pen, I dislike the handle. The handle of the pen can be more interesting and detailed, but comfortable to write. I don't like the idea of my pen head being too heavy and create problems while using it.

In my pen design, I only used one color, GREY. However, the head is shaded with the grey and the color is not straight. The animal may attract the consumers, but the color is not eye catching.

To improve my design I can make the handle of the pen more interesting by using a different shape and adding color. However, the pen still needs to be comfortable to use with.

Just like my other pen design, my pen meets a few specification point. One is **"my product could be used any age."** As explained above my product can be used in any age (adults and kids). My pen meets the **"my bobblehead pen must be appropriate for the theme."** My pen is an elephant which is an African animal. Lastly my pen uses all the material specification points. However, for this specific pen, I may use spray paint for the paint job.



# TASK 5: DESIGN IDEA 3

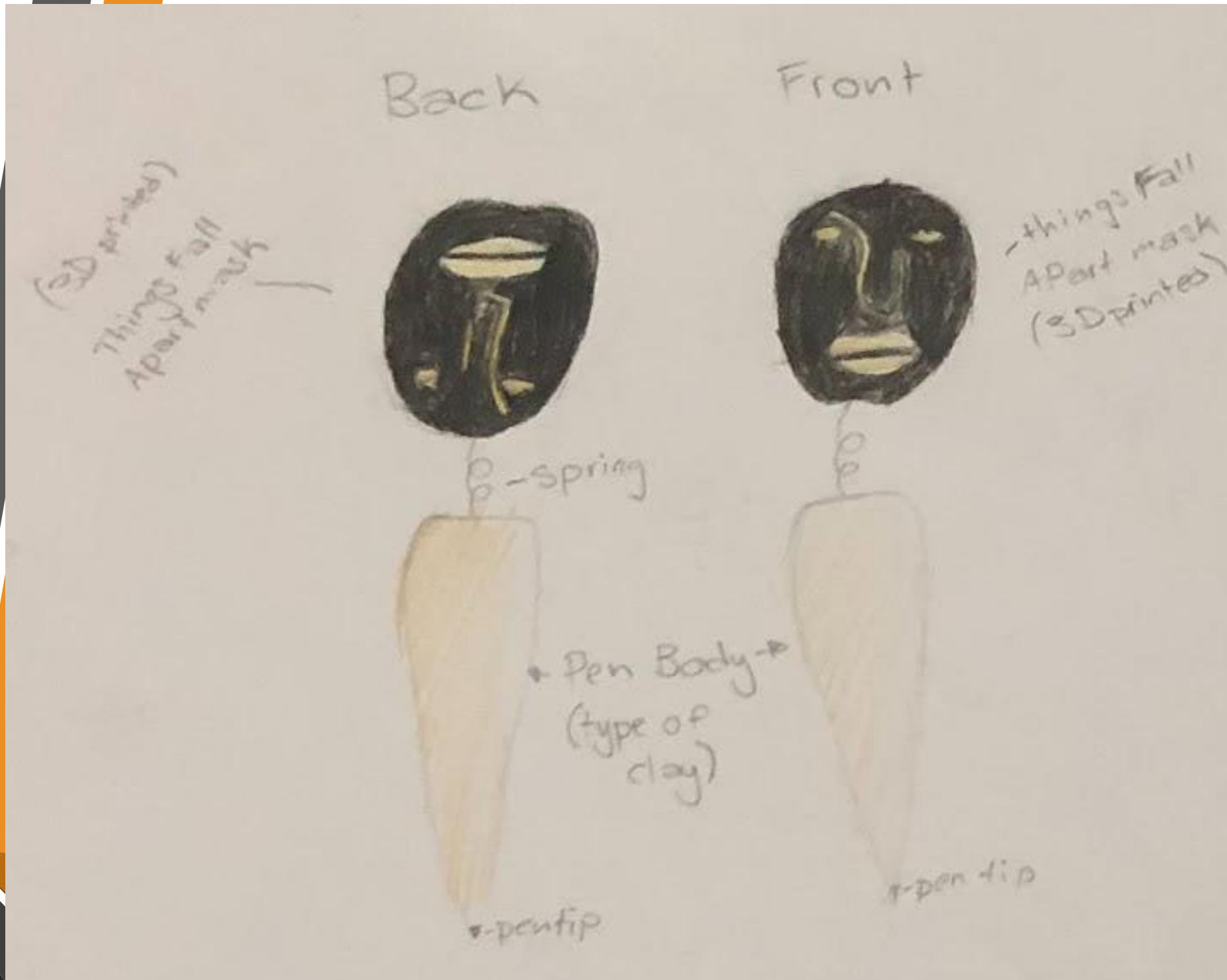
For pen design, I like the idea of it having two faces on each side. (front & back) I think the idea is interesting. Additionally, one side of the head is upside down and one side it the right side up. This mask (face0 in the design is from the book Things Fall Apart.

I dislike the strategy I used to color this design. The colors don't match the actual mask (face) in the book title of Things Fall Apart.

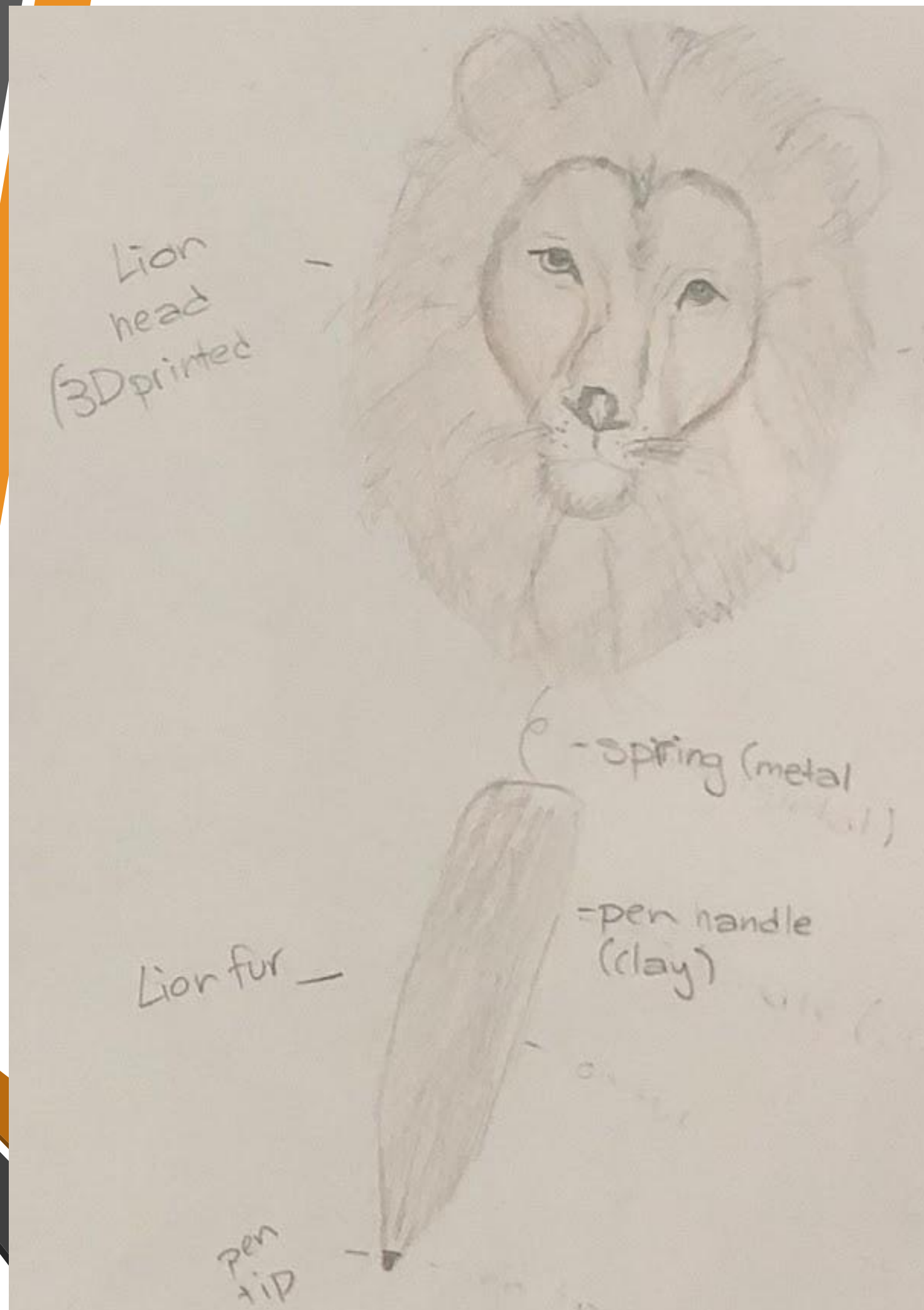
In my bobble head pen design, I used 2 colors. The 2 colors are blackish-brown and yellowish-orange. (sand color) These colors are old colors and color scheme is appropriate and suits Africa.

In my african mask design, I can improve on coloring my design better and more accurate. The colors should match the original mask in the book. Furthermore, I can make the handle of the pen more interesting, but not too complicated.

The main specification point this design reached was **“my bobblehead pen must be appropriate for the theme”** because this design is from an African themed book called Things Fall Apart. Also, another point is **“my product must be appropriate to write with”**. This product is simple and the handle of the pen is not too thick to write with, and the handle is smooth and comfortable.



# TASK 5: DESIGN IDEA 4



For my design, I like the idea of the pen being a lion. The drawing of the lion is realistic and I did not trace anything. The bobble head pen is an african themed animal. All ages can use this pen. The same thing is explain with the elephant plane for the ages.

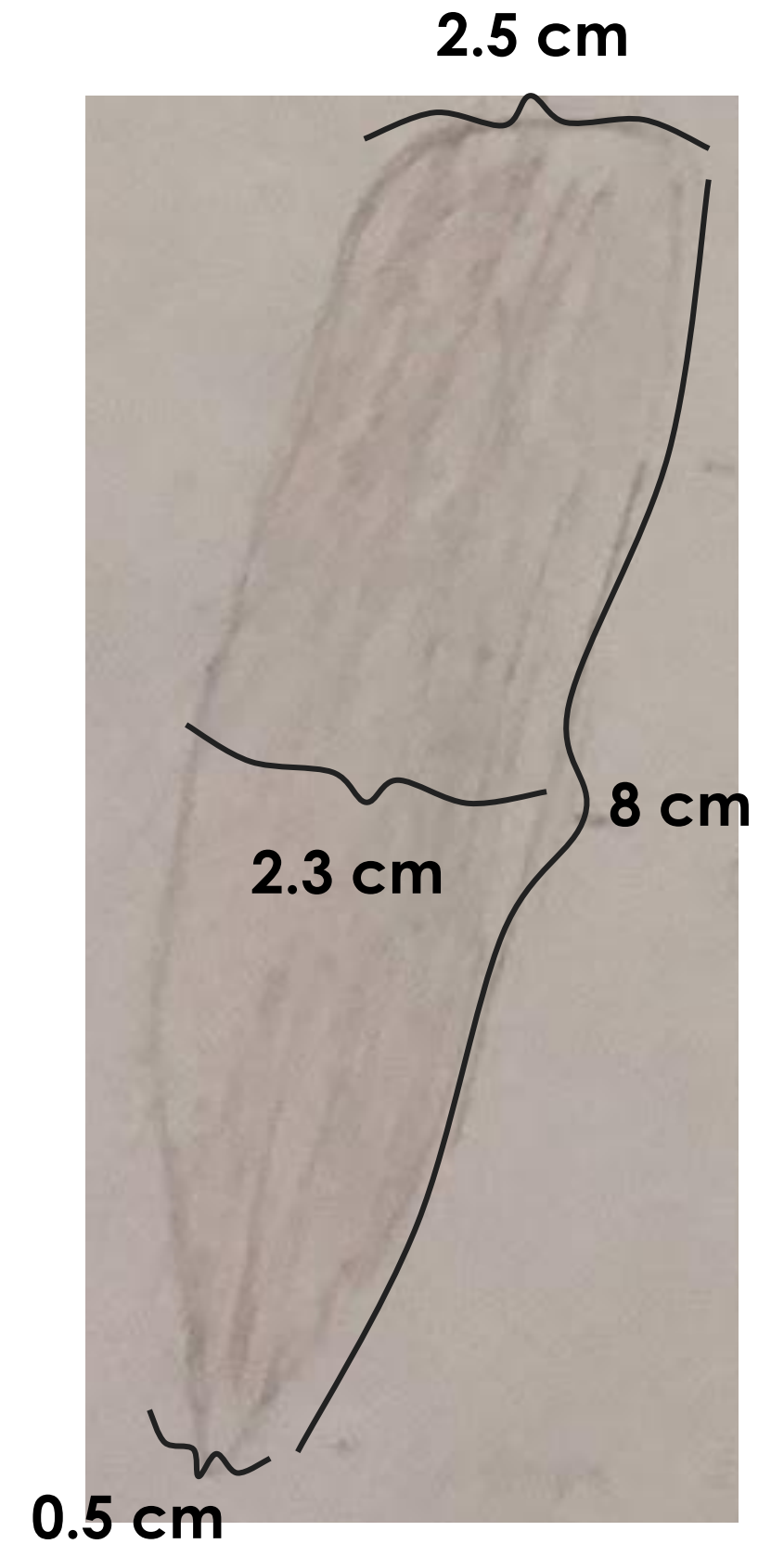
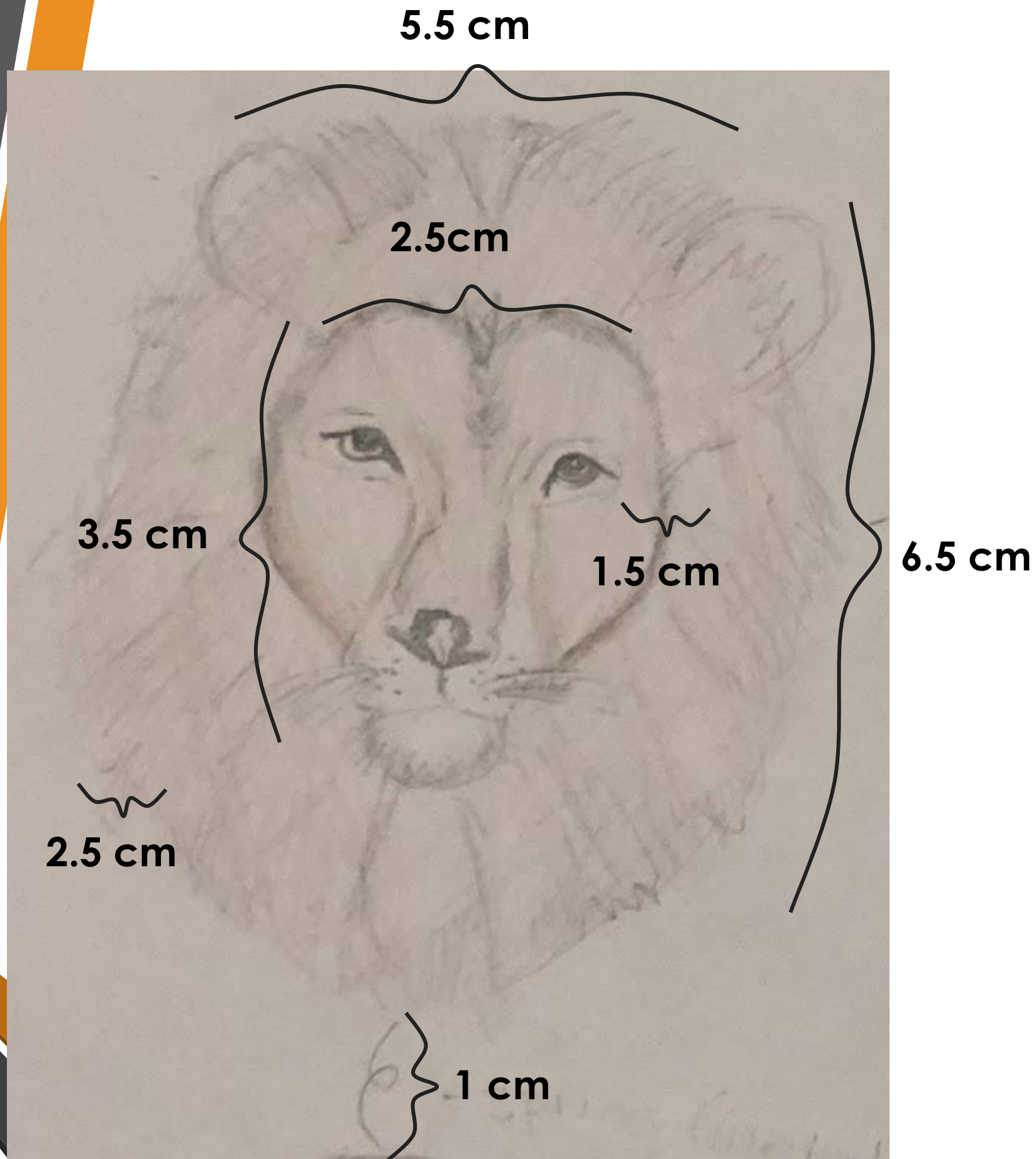
In my pen design, I dislike idea of my pen being top heavy and not comfortable to write with because the lion's mane is too big.

In my bobble head pen, I use not many color, which are different shades of brown and orange. The colors are african themed and lion themed. The colors of the pen is not very eye catching for the consumers.

To improve my design I can improve my coloring. The colors can be darker and bolder. I should also next time shade the pen more with colors. The pen handle can also be more interesting, but comfortable to use.

The used specification points in the elephant design bobble head pen, is similar to this pen design. The pen is african designed because lion is an african animal. However, my pen is not very colorful. I need to add more color.

# TASK 6A: Presenting your Chosen design





# TASK 6B: REASONS FOR SELECTION AND REQUIREMENTS FOR CREATING YOUR DESIGN.

## ANALYSIS OF DESIGN

Explain the reason you chose your design over the other 3 design, with reference to your specification.

I chose design number 4. I chose this design because the design is african themed and realistic. All my made designs are african themed. However, some design weren't as interesting and realistic than other design. My design number 4 is the lion bobble head pen.

My egwugwu designed bobble head pen is african themed. However, the colors are too much and do not, and the colors can be more simple. The Things Fall Apart bobble head mask idea is really cool. Where the mask is the rightside up, in the front of the pen, and the mask is upside down, in the back of the pen. Even though this idea is really cool and interesting, the pen is a bit simple and more could have been done. This pen is not also colorful enough to attract customers, especially children.

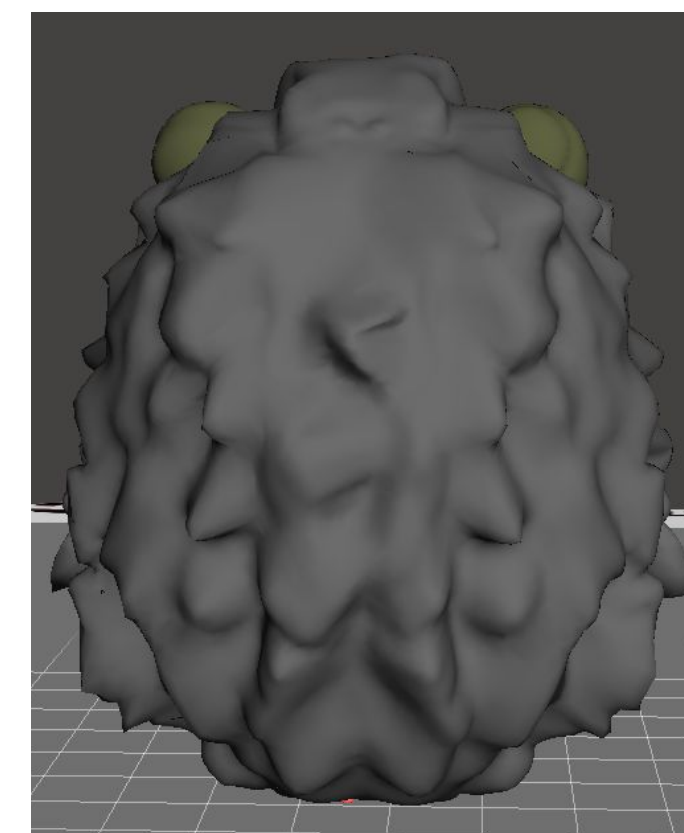
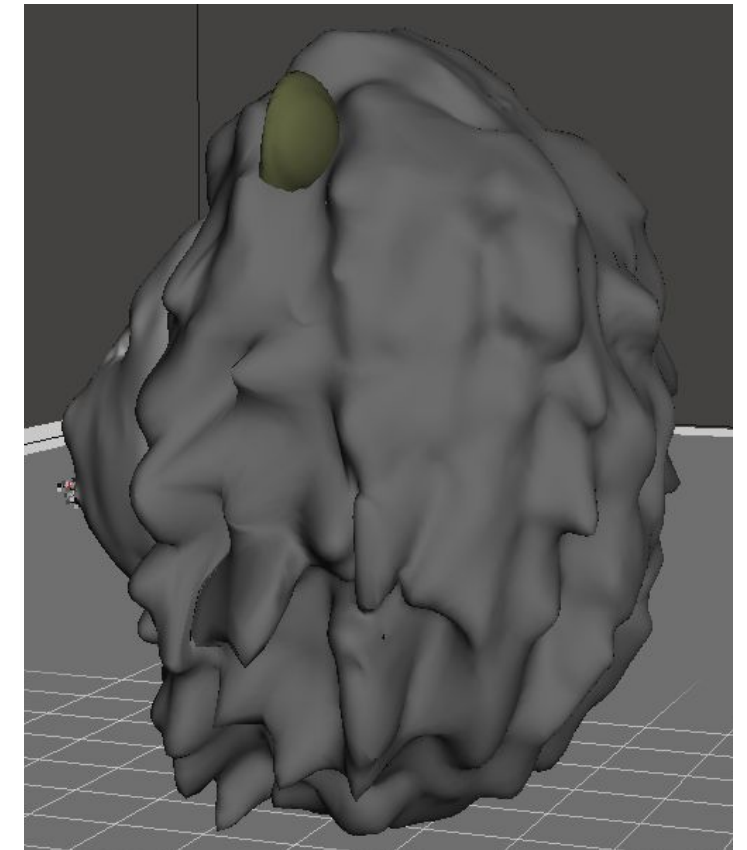
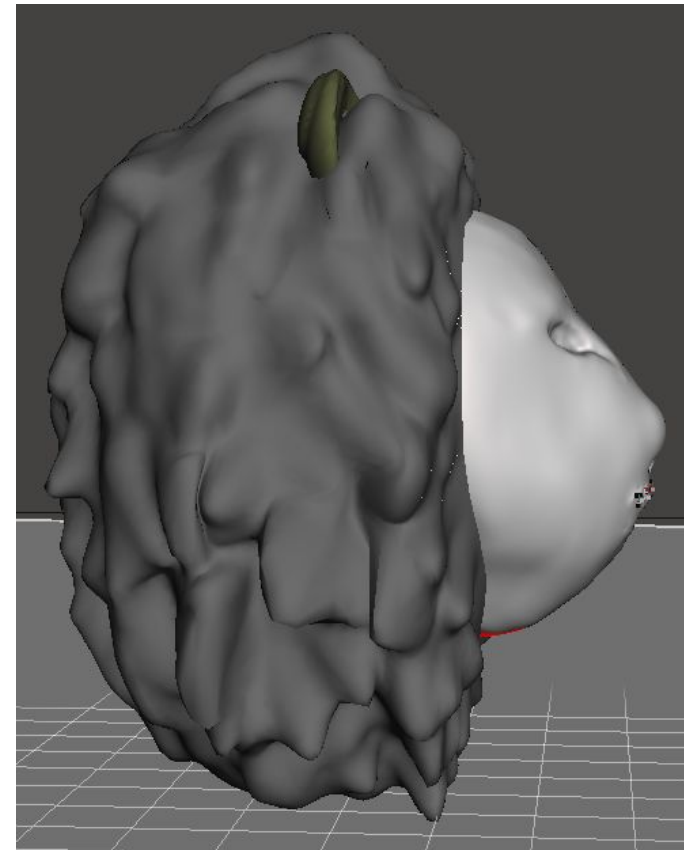
After eliminating the first two options, (egwugwu mask and Things Fall Apart mask) I had two more options. (elephant and lion pen) I really like these to ideas because they were both realistic and interesting. Both of the pens would be eye catching and attractive to all customers, maybe even children. I had a really hard time decide on which pen to work on. I asked many people to vote on which pen design they liked the most. However, I had equal amount of votes for each pen. I almost decided to chose the elephant because the lion's mane would be difficult to work with. However, I wanted to have challenge, and challenge myself. And a challenge it will be.

## LIST OF REQUIREMENTS AND RESOURCES

You need to outline or list the different things you will need to create your design. State everything from the tools, materials used to the softwares you will use to make it. One has been done for you. State what you will use them for.

Resources	Used for
Metal Spring	For the bobble head to rest on and allow it to move easily.
Pen	For the clay to go on, and hold on to it while writing. For the metal string to stand on.
Ink	Its at the end of the pen. Helps write on paper by leaving marks.
3D printer	A printer to print the head of the pen, the chosen bobble head design
Air drying modeling clay	Almost like clay. On the pen, where multiple designs can be made. Kind of squishy, and not esy to break. Comfortable to use with.
Nail Polish	To add color to the head of the design, which is 3D printed
Paint	To add color to the handle of the pen, (the actual pen) which is air drying modeling clay.
Cutting utensils	To cut the air drying modeling clay, and create texture if needed.
Glue	To stick the metal spring to the pen, To keep the metal spring table
Spray paint (maybe)	To create shading on the bobble head design.
PLA plastic	Using a 3D printer, the type of plastic to print with c
Meshmixer	Software to create the design of the head of pen
Computer	To use the software in the computer
Mouse	To make it easier while using Meshmixer

# TASK 7: DEVELOPMENT OF CHOSEN DESIGN IN 3D (HEAD IN MESHMIXER)





# Creating the solution

**Criterion C:**

# AREAS OF ASSESSMENT

## Criterion A: Inquiring and Analysing

iii. analyse a group of similar products that inspire a solution to the problem

iv. develop a design brief, which presents the analysis of relevant research.

## Criterion B: Developing Ideas

i. develop a design specification which outlines the success criteria for the design of a solution based on the data collected.

ii. present a range of feasible design ideas, which can be correctly interpreted by others

iii. present the chosen design and outline the reasons for its selection

iv. develop accurate planning drawings/diagrams and outline requirements for the creation of the chosen solution.

## Criterion C: Creating the Solution

i. construct a logical plan, which outlines the efficient use of time and resources, sufficient for peers to be able to follow to create the solution

ii. demonstrate excellent technical skills when making the solution

iii. follow the plan to create the solution, which functions as intended

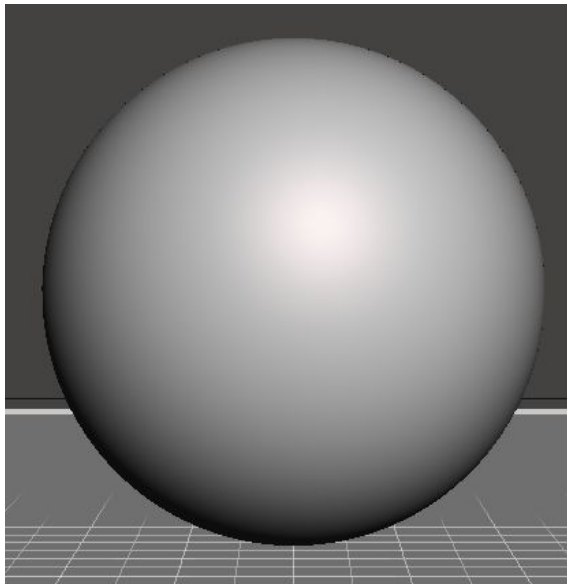
## Criterion D: Evaluating

ii. explain the success of the solution against the design specification

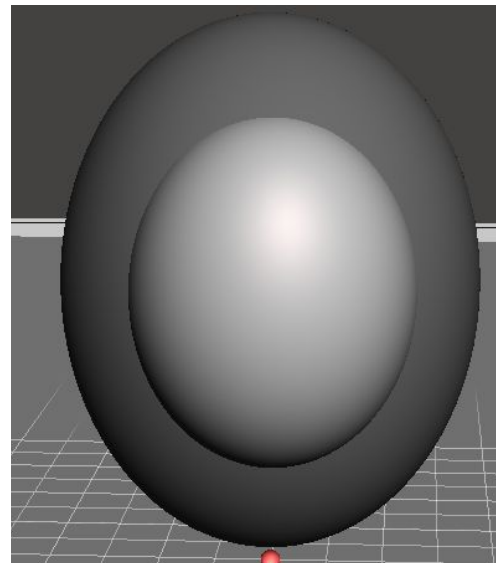
iii. describe how the solution could be improved

# TASK 9: PLAN FOR MAKING A BOBBLE-HEAD

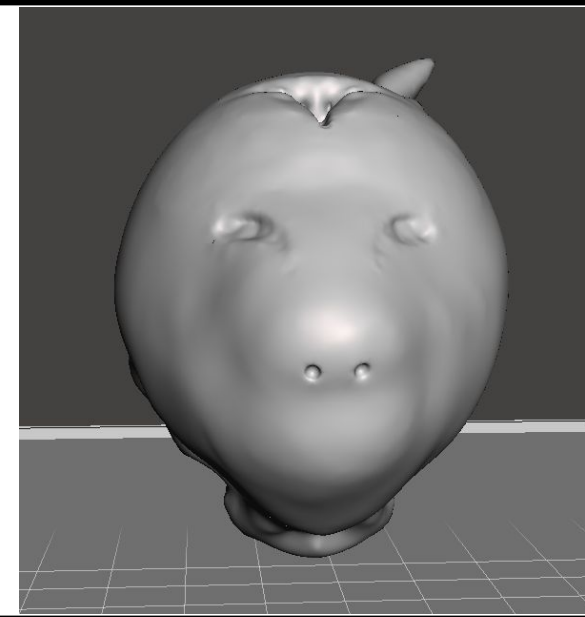
1



2



3



## What do you do?

I started with a sphere to begin with

## How do you do it?

You open Meshmixer. After, there are different options, press the sphere. Later, a sphere appears and you have to move the sphere upwards.

## What tools do you use and how long does it take?

The tool needed is the meshmixer app. You also have to transform the sphere by pressing the 'T' on the keyboard and transform the sphere upwards

## What do you do?

I added another circle and enlarged it by stretching the circle. After I added both circles together to make that shape

## How do you do it?

You have the circle you started with. Later on, you have to add another circle (by using 'meshmix'). In 'meshmix' you find the circle and drag it to your designing mat. Using the method as before press 'T' for transform and stretch the circle. With transform move the new oval behind the circle (it should look like the picture above)

## What tools do you use and how long does it take?

You need to press 'meshmix' which is at the side. You go to the circle. You also use the transform to stretch the circle, and to move the circle.

## What do you do?

I shaped the smaller inner circle to look more like a lion face

## How do you do it?

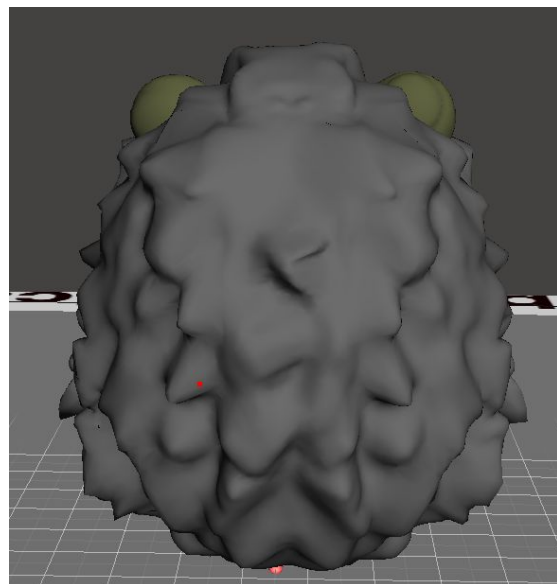
Start by shaping the oval/circle into more like a heart shape, morph the top to look close to the top of the heart. Later on, morph the cheeks inwards a little as well. After, for the snout, sculpt the nose outwards and smooth out the creases, to make it look like a snout. Lastly, add two nostrils. For the eyes mold and sculpt the eyes inwards, and smooth it out to make it not look too rough.

## What tools do you use and how long does it take?

The tools used in meshmixer are 'draw ++' (Draw 2), 'Bubble smooth', 'inflate, in the 'brushes' 'sculpt area'.

To deflate you have to press 'shift' and do what you would do as normal. 'Shift' will do the opposite of what the brush is intended for

4



## What do you do?

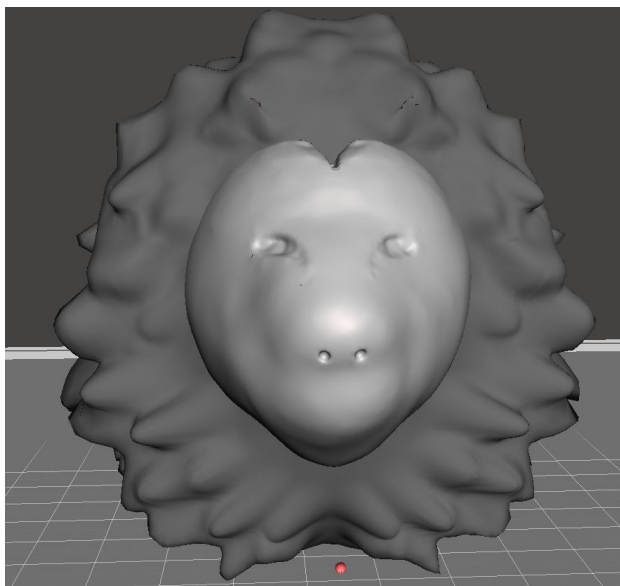
I got the bigger oval on the outside and shaped it into the mane of the lion

## How do you do it?

I got a thick brush and kept morphing and sculpting the mane outwards. Then, I used a smaller brush and morphed/sculpted the mane even more. However, before I started sculpting I used symmetry to make sure anything I do on one side, the same thing happens on the other side.

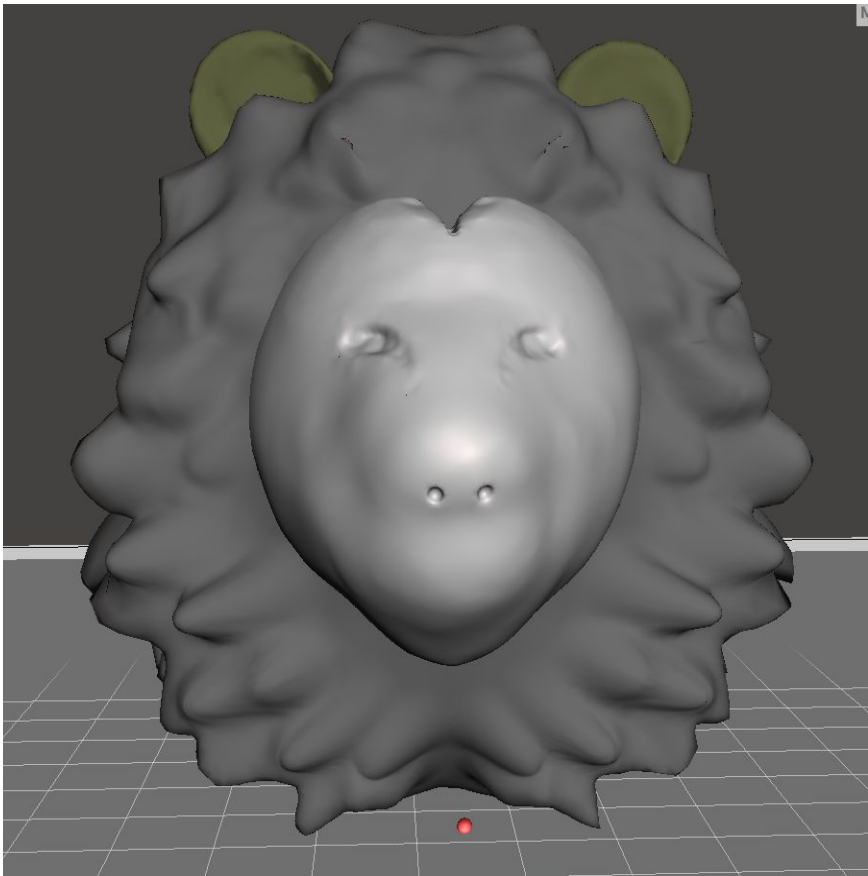
## What tools do you use and how long does it take?

The tools I used to make the mane are 'move', 'inflate', in the 'brushes' - 'sculpture'. Lastly, I used symmetry.



## TASK 9: PLAN FOR MAKING A BOBBLE-HEAD

5



### What do you do?

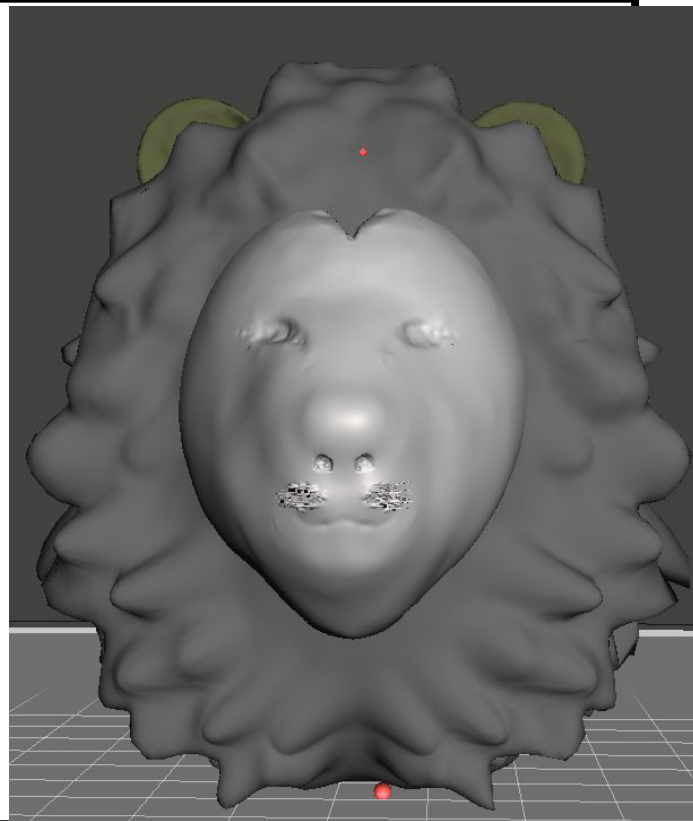
I added ears to my lion, in the mane

### How do you do it?

I went to 'meshmix' and dragged the ear to the designing mat. After I dragged the ear towards the top, in the mane. Lastly, I duplicated and mirrored the ear to the other side of the mane

### What tools do you use and how long does it take?

The used tools in this step is 'meshmix', you need to pick the ear. You also got to 'edit', and to 'duplicate' and 'mirror'



### What do you do?

I added whisker to my meshmixer lion (to the inner smaller oval)

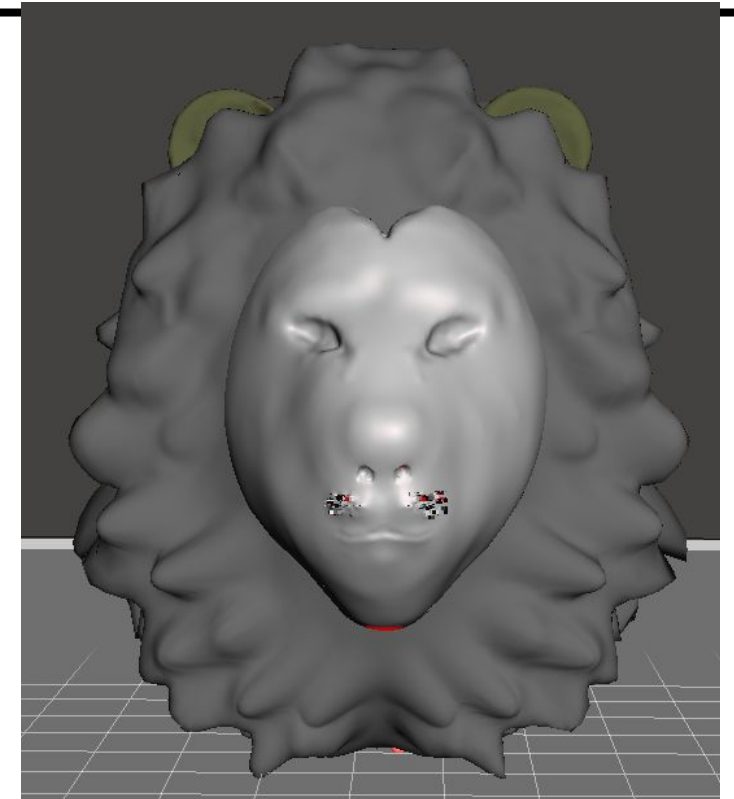
### How do you do it?

I picked a really thin brush, and sculpted out little pieces to create whiskers. But before anything i used symmetry to help with the whiskers.

### What tools do you use and how long does it take?

The tools I used for the whiskers are, 'inflate', and 'draw ++ (draw 2), in the brushes in sculpt. Additionally, I used symmetry for support

7



### What do you do?

I finished up my lion by fixing the messed parts and with detail checking over the lion sculpture. Additionally, I made the lion's face longer and thinner

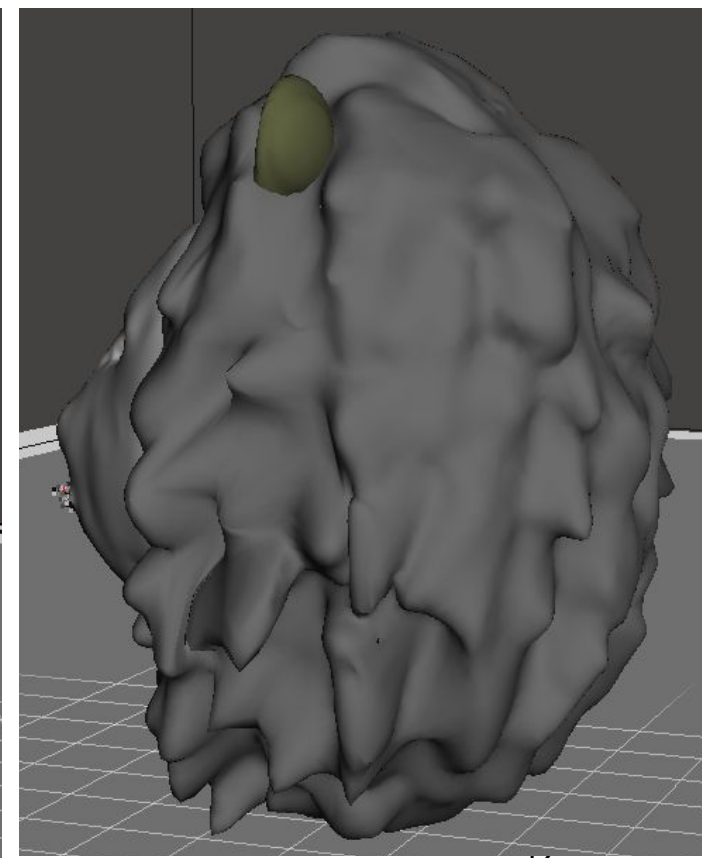
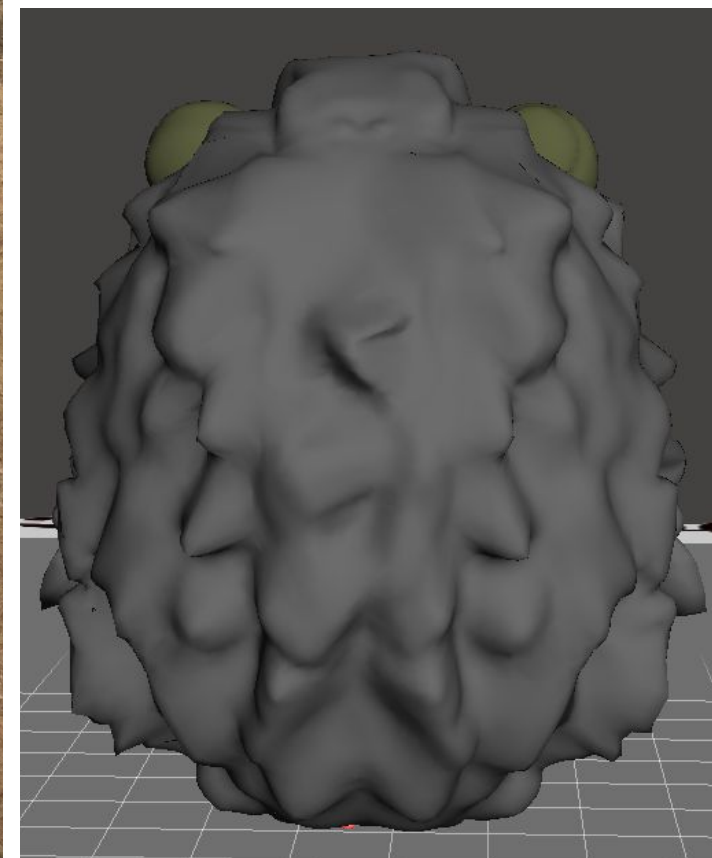
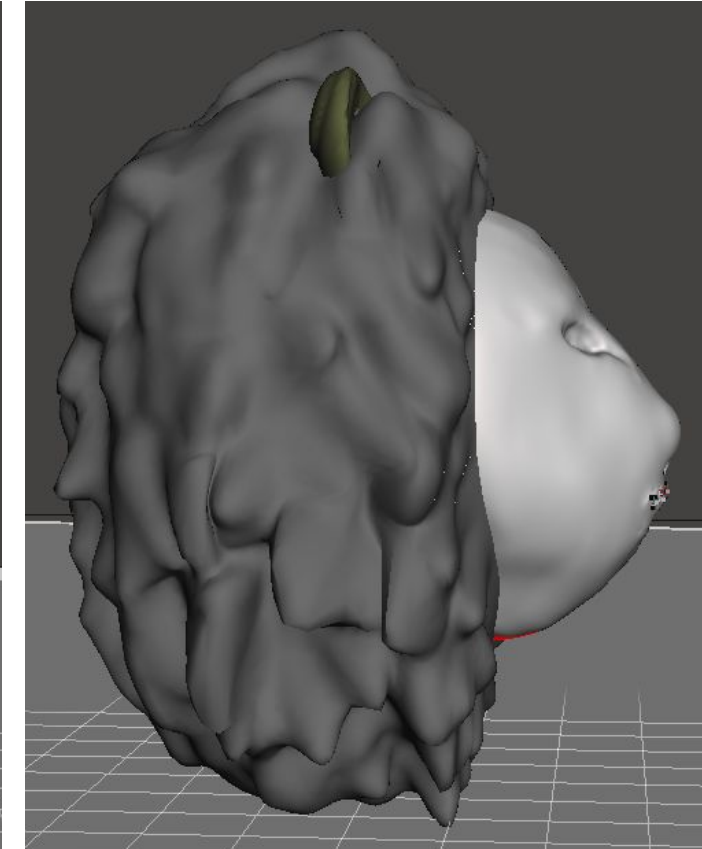
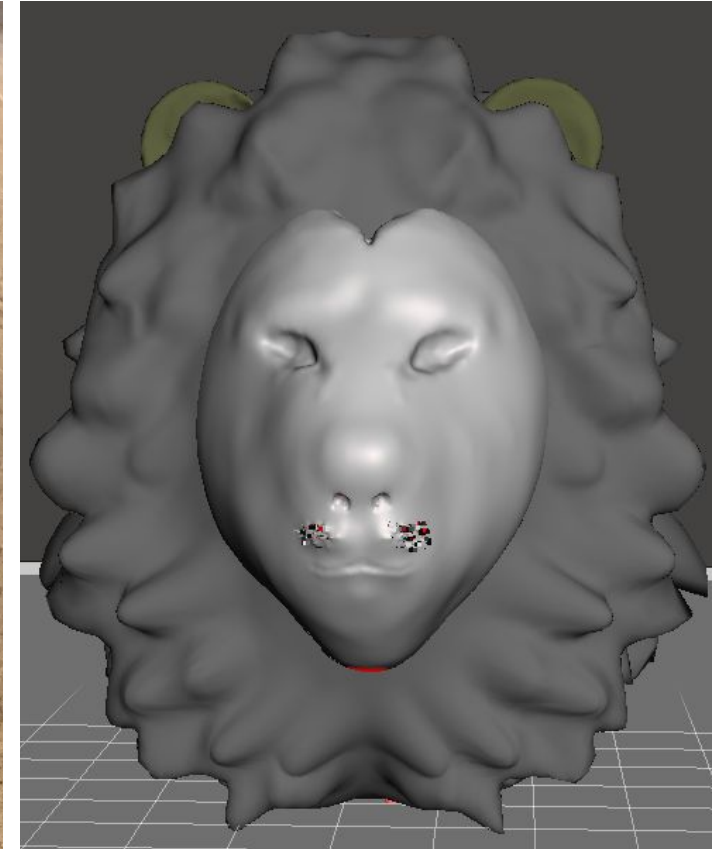
### How do you do it?

I went over the lions face, and deepened the eyes more, shortened the whisker, adding little eyebrows, and overall made it look better. I did this by smoothing some areas, Inflating, deflating, and sculpting.

### What tools do you use and how long does it take?

The tools I used to finish up my lion are, 'bubble smooth', 'inflate', 'draw ++' (draw 2), in the brushes for sculpt. Lastly, I used transform, and my teacher's and friends support.

# TASK 10: CREATING THE SOLUTION (BODY AND 3D PRINTED HEAD)



# TASK 11: FINAL DESIGN







# Evaluation

**Criterion D:**

# AREAS OF ASSESSMENT

## Criterion A: Inquiring and Analysing

iii. analyse a group of similar products that inspire a solution to the problem

iv. develop a design brief, which presents the analysis of relevant research.

## Criterion B: Developing Ideas

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i. construct a logical plan, which outlines the efficient use of time and resources, sufficient for peers to be able to follow to create the solution

iii. follow the plan to create the solution, which functions as intended explain changes made to the chosen design and the plan when making the solution.

iv. present the solution as a whole

## Criterion D: Evaluating

ii. explain the success of the solution against the design specification

iii. describe how the solution could be improved

# TASK 12: EVALUATION AGAINST SPECIFICATION

Design Specification points	Did your final design meet the specification point?	How can the design be improved to meet the success criteria
According to advertisers, <b>my product should be colorful</b> because the colors of the pen will draw and attract the target market (consumers)	<b>No</b> , my pen does not meet this specification point because my pen is not colorful, since the colors of a lion are neutral colors, such as, different shades of brown. A lion is not necessary to be colorful. Additionally, Mr Moneeb did not have a grand variety of nail polish in good condition, and with the correct colors. However, I was only available of using the colors in the class.	For next time to meet this specification point, I can add colorful african designs to the handle/body of my bobble head pen. This will add more color to the overall bobblehead pen, and attract the customers more. However, adding more color is not necessary for a lion bobble head pen.
According to my past experience, <b>my bobblehead pen must be appropriate for the theme</b> because if it isn't the theme, the product will not make sense.	<b>Yes</b> , my pen does meet this specification point because my pen is an african animal, a lion. A lion represents strength in the african culture. However, I could have added more african elements to the bobble head pen by adding african design. (as stated above)	It is not necessary to change anything about my pen to meet this specification point because my bobble head pen is african themed. It is a lion, which is an african animal. However, I could look at the different types of lions in the african culture
According to research, <b>my product must be appropriate to write with</b> because if it too big, it would be really hard to write with. The pen should be the size on a normal pen.	<b>Yes</b> , my product is appropriate to write with because the handle of the pen is not too thick, or too thin. Additionally, the handle of the pen is much more comfortable to use because the air drying modeling clay is soft and a bit squishy. The size of my pen's head is also appropriate. It is not too heavy, but it also does not have a huge or small lion head.	I believe there is no need for improvement, and I have successfully met the specification point. The bobble head pen is a normal size, and it is appropriate to write with. However, before 3D printing my bobble head, I could ask my classmates to try writing with the clay prototype and test it.
According to my brain cells, <b>my bobblehead could have refillable ink</b> because as shown above the pen would be useless without ink and the ink needs to be refillable after it is run out.	<b>No</b> , my pen does not meet the specification point. My bobblehead pen's ink does work, However, it does not have refillable ink. Hence, If the ink of the pen runs out, the pen would not be available to use, and it would just be used as decoration	To meet this specification point, I can change the pen, by getting a new type of pen that allows it to change a refill the ink because this certain type of pen does not allow to change and refill the ink.
According to my teacher, my product's body <i>should</i> be made with soft air drying modeling clay (polymer clay). The clay is different from normal clay, and it is shatter resistant.	<b>Yes</b> , my bobble head pen's body/handle is made out of soft air drying modeling clay because it is shatter resistant. Using this type of clay also makes the pen more comfortable to write with as it is softer than regular clay. Additionally, the teacher explained we had to add a few layers of a mixture with water and school glue, to the body. This is because the special clay has a sticky texture and material, and the water, glue mixture prevents the stickiness of the clay.	I believe I met this specification point, and I don't have to change the handle of my pen because it is made with air drying modeling clay. I also added the water, glue mixture to my handle to prevent the stickiness. However, I can improve the handle by smoothing the clay, but since the pens are stored in a box it get squished and squashed, and it ruins the clay/body of the pen.
According to my design teacher, (Mr Moneeb) <b>my bobbleheads pen's head must use the 3d printer only for prototyping</b> because if making many copies the 3d printer would be too slow	<b>Yes</b> , my bobble head pen used a 3d printer to print the head. The printer was only used for prototyping because making copies with the 3D printer would take long. After finishing our meshmixer in class, we installed our head to a USB. This USB was given to Mr Moneeb. Since, Mr Moneeb had many different copies of different heads, for each student to print with a 3D printer It took long. Therefore, only the prototype used a 3D printer.	I met this specification point. I believe I don't have to change anything about my pen to meet this specification point because the prototype used a 3d printer.

Design Specification points	Did your final design meet the specification point?	How can the design be improved to meet the success criteria
According to research, <b>my product should use the PLA plastic</b> , because the PLA plastic is non toxic and edible. The Plastic is also recyclable	<b>Yes</b> , My pen meets this specification point because the head is printed with the non-toxic PLA plastic. This plastic is recyclable, non-toxic, and safe	There is no need for improvement to my bobble head pen because it meets the specification point. The head is 3D print with the PLA plastic
According to Mr Moneeb, <b>my pen's head must use nail polish for the paint job</b> because real paint does not dry on plastic. Nail polish also includes a chemical called Acetone. Whenever Acetone touches plastic, it melts the plastic and infuses the nail polish color to the plastic	<b>Yes</b> , my pen meets this specification point. It is painted with different shades of nail polish color, but the shades weren't too close to a lion's head colors. However, to improve the head, I also used two different shades of brown spray paint to the main. It made the lion look more realistic, and more like a lion.	My pen does meet the specification point. Therefore, I don't need much to improve. But I can try to improve my colors by getting some nail polish with different colors from home, and even if I have spray paint.
<b>My pen's body will use paint for the paint job</b> because to paint the air drying soft modeling clay paint is used	<b>No</b> , my pen did not use paint for the paint job because my air drying modeling clay, was already the needed color for my lion's body. However, in order to find the right color, I had to mix different colors of the clay to find the color.	Even though I did not meet this specification point, I still believe I only have one thing to improve on the body of my pen. If I wanted to add paint, I could paint on fur to make it look more like a lion.
According to my teacher, <b>my product should not break easily</b> because when the pen breaks the pen won't work and is useless again	<b>No</b> , my pen is not super stable, and does break easily. The head fell once off my spring, and the clay of my body got messed up sometimes. This mostly happens because as said before the pen is stored in a box and it ruins the pen. Additionally, students, from other classes are not as careful and they keep touching the pens for fun.	To meet the success criteria, we can store the pens in a more careful area where the pens would not break easily, and use a hot glue gun to hold the head more in place. Secondly, I can add more layers of the water, glue mixture to stabilize the body.
According to myself, <b>my product could be used any age</b> because all ages can use the product if wanted.	<b>Yes</b> , my pen meets this specification point because I believe any age would like to buy an animal. Animals are popular for almost all ages. However, it mostly depends on the consumer's likes and personality.	As my bobble head pen is appropriate and suitable for any age, my pen does not need any improvement to reach this specification point.
According to research, <b>the pen must be safe and appropriate</b> . It must be safe because depending on the age of the user, the pen should be appropriate	<b>Yes</b> , my pen is partially safe and appropriate. For older ages the pen is appropriate and safe because they don't get harmed easily, but for kids it is partially safe because the pen has some sharp and pointy edges in the main. Additionally, I am not aware if the pen's ink inside is toxic or not.	To improve this pen for it to meet the success criteria, the ink inside the pen should be non-toxic and I can round up the edges in the main to make it safer.

# TASK 13: EVALUATION

## What skills did you use when designing your Bobblehead figurine? Explain briefly how you designed your bobble head pen and why you did what you did?

To design my bobblehead pen, I started off by researching about different types of 3D printers and how they work. Later on, I drew 4 different types of african themed design ideas. There was a variety of good options. The final decision was difficult as I was stuck between 2 ideas, but I ended up choosing the lion because I wanted to challenge myself. After that I started learning about meshmixer and "how it works", for about a lesson. Once I learned the basics, I started off my meshmixer design. I started by importing a sphere, and ended with fixing some details. I used different brushes such as inflate, deflate, draw 2 (draw++), etc. I also transformed the imported shapes such as ears, spheres, etc. by using the arrows. My lessons past and I finished my lion meshmixer design. I saved it, imported to a USB and gave it to Mr Moneeb to 3D print. While I was waiting for Mr Moneeb to print my lion head, I started making the pen's body. To make the body I mixed different clay colors. I stuck the clay to the pen for the body. I added layers of the water, glue mixture to prevent the stickiness. Eventually, my lion head printed. Since, my pen printed black, I spray painted a layer of white for the nail polish to show. Then I struggled on finding the right colors, but I eventually found something. I painted the face of my lion and the mane, different shades of brown. However, the colors ended up being similar. Therefore, Mr Moneeb came up with the idea to lightly spray paint the mane brown. Once my head dried, I chose a spring for my pen. Mr Moneeb, drilled a hole to the bottom of my lion head in order for the head to stay on. I hot glue gunned the spring to attach the head and body. I got a small piece of clay and wrapped it around the top of my body and the bottom of the spring to hide the glue gun residue and to secure it. My pen was officially finished.

The skills I used during the process of designing my bobble head pen were communication and collaboration since I had to communicate and collaborate with my teacher and friends, for any needed help and guidances. Secondly, I used creative skills to come up with a few creative and imaginative design ideas. I also had to be creative to find ways on how to create the shape I want in Meshmixer.

## Did you have any problems whilst making your 3D Bobblehead? Explain them in detail and how you overcame them?

The main problem I faced whilst making my bobblehead pen, was to find the right colors for my lion. The class didn't have suitable colors for a lion, for both nail polish and spray paint. There were a few shades of brown. However, they were either too light, too dark, too red, too pink, etc. there were no proper neutral colors. I didn't overcome this problem, but I had to make something with the available materials. Additionally, to improve the colors Mr Moneeb helped me lightly spraypaint the mane to make it look more realistic. Another problem I had was my whiskers did not print out. Only one sided printed, but instead it printed out as a blob. I was going to add wires for the whiskers, but I didn't have enough time and the printed blob of whiskers would be dangerous to remove.

## How could you improve your design if you were to do it again?

Even though my pen is good and ok, there are few bits I would like to improve. Since, I could not find the exact colors of a lion for the entire bobble head pen. To improve this problem, I would try to find my own nail polish or even spray paint in the right colors of a lion. Next time, I can also try shading my lion head by using darker shades of brown in the nail polish. Additionally, for next time I would try to fix my whiskers. I can do this by not adding whiskers to my meshmixer model design, since it did not print well, and add small wires to the area where the whiskers would go. I would also like to improve the body of the pen. To make it more aesthetic looking, I can try to add fur, by painting on it or cutting small pieces. Furthermore, I would like to make my body more sturdy by adding more coats and layers of the water, glue mixture but before it already started to damage. For my function, I believe I do not have to improve anything about my bobble head pen because the pen does work as a normal pen. I also believe the size of my pen is good because it is not too heavy, and not hard to write with the pen. However, I can say this only in the perspective for my age or even above. This is because the pen may be too big for younger children and kids. To improve this, I can ask many people with a variety of ages to test my prototype, and ask them if the pen is comfortable to use. Finally, I think some used materials need to change, such as I can use refillable and reusable or a never ending ink, so I can keep using the pen for longer. Additionally, I can use reusable and recyclable materials that are eco-friendly to this earth.

# TASK 13: EVALUATION

**What are the best things you like about your design? Explain why? You can talk about the following:**

I have a few parts I want to improve from my pen. However, there also some bits i really like and I don't want to change. I am proud of my final look, even though it did not look exactly how I drew it. I did have trouble finding the colors for my pen. However, I love how the final look is. My favorite part is the light streams of spray paint in the mane of lion, to add more color and different shades of brown. I also generally like the idea of a lion and not every lion is the same. Therefore, my lion can look a bit different and it it ok. Despite the smudges in the body of the pen, I like how the pen is not exactly perfect and smooth, but instead it is rough because lions are not smooth and perfect. As said before I believe the quality finish of my pen is good. My bobble head pen works and its functionality is good. For my age or even above, the size of my pen is plesent because it is comfortable when you hold it and comfortable to write with. The handle starts from being a bit more thicker, too little more skinnier. This makes it easier to write with as it is not too thick. Additionally, The pen is not top heavy. However, the pen's size may still work for younger children, as I have not tested. The materials used were also good because the 3D printed PLA plastic is very light, non-toxic and recyclable, Lastl, the clay is soft, smooth, not heavy, and when you drop the clay, when it is dry it does not shatter.

**How do you think you performed in this project overall?**

Overall, in the project I believe I did very well. My pen ended up to be a success, even though there were some challenges. However, I had trouble concentrating in class because I got distracted by my classmates, but I ended up finishing my work in time. I also end up wanting everything to be perfect even though life is never perfect. Additionally, I believe in design and art I normally like to take my time, but I end up rushing my work. Lastly, I aim to finish my work with success and try my best, I try to do what I can.