GCSE
Product Design
(Edexcel Design & Technology)

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GCSE Product Design

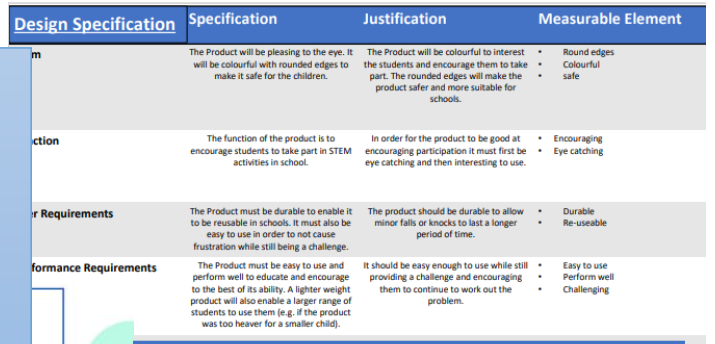
Whilst studying Product Design you will be learning and developing critical life skills, these skills will ensure that that you are adaptable through any problems with a critical eye and develop innovative ideas in exploration of real life situations. You will be actively be making out world and future a better place!

A Product Design student will be developing all of the skills that will make you desirable to sixth form and college courses as well as universities and careers that you choose.

Analytical – the ability to analyse things first.
Open minded – thinking of things nobody has thought of before.
Problem solving – ability to solve important issues.
Creative thinking – to think outside the box.
Communication – communicating verbally and through design.

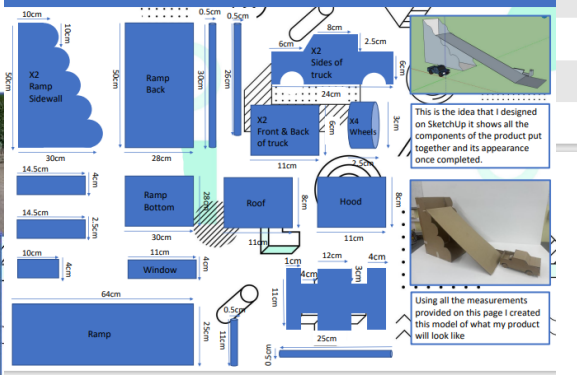
GCSE Product Design

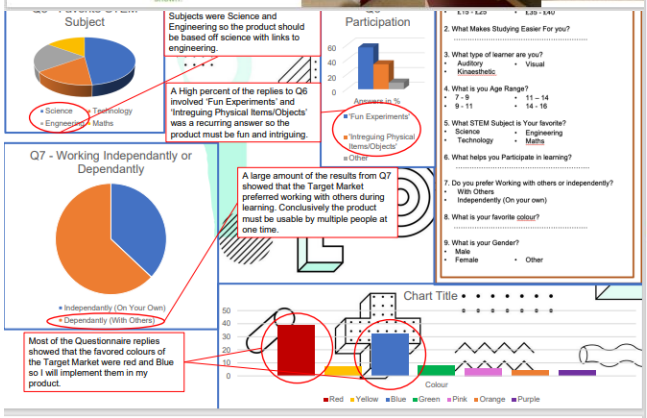
In Product Design you will be working with and understanding a range of materials such as woods, metals, plastics and you will also be working with electronics. You will work to a range of briefs, using CAD/ CAM technology to solve real world problems, combine materials to design and make innovative products and work as a true designer.

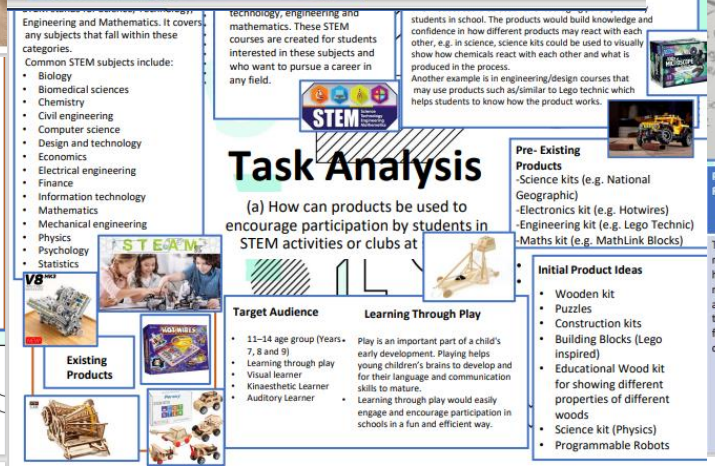


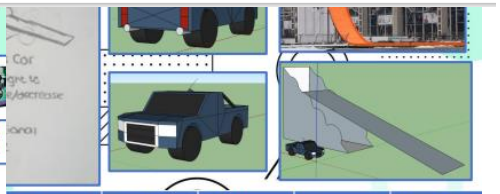
Design Specification	Specification	Justification	Measurable Element
m	The Product will be pleasing to the eye. It will be colourful with rounded edges to make it safe for the children.	The Product will be colourful to interest the students and encourage them to take part. The rounded edges will make the product safer and more suitable for schools.	• Round edges • Colourful • safe
ction	The function of the product is to encourage students to take part in STEM activities in school.	In order for the product to be good at encouraging participation it must first be eye catching and then interesting to use.	• Encouraging • Eye catching
r Requirements	The Product must be durable to enable it to be reusable in schools. It must also be easy to use in order to not cause frustration while still being a challenge.	The product should be durable to allow minor falls or knocks to last a longer period of time.	• Durable • Re-useable
formance Requirements	The Product must be easy to use and perform well to educate and encourage to the best of its ability. A lighter weight product will also enable a larger range of students to use them (e.g. if the product was too heaver for a smaller child).	It should be easy enough to use while still providing a challenge and encouraging them to continue to work out the problem.	• Easy to use • Perform well • Challenging

Working Drawing:









Performance Requirements	Material and component requirements	Scale of production	Cost	Sustainability
The product must be safe and have wheels that rotate smoothly and don't cause too much friction on the car itself.	The product should be durable and strong to survive minor knocks and years of use. It should also be fairly eco-friendly and sustainable.	One off production	The product should be affordable to allow schools to buy the product while still covering the production costs.	fairly eco-friendly and sustainable.

Why Product Design?

THE HOUSE YOU LIVE IN • THE BED YOU SLEEP ON • THE TRAINERS YOU WEAR • THE CAR YOU DRIVE TO SCHOOL IN • THE CHAIR YOU SIT ON • THE WINDOW YOU LOOK OUT OF • THE PHONE YOU USE • THE CONSOLE YOU PLAY • THE BIKE YOU RIDE • THE CLOTHES YOU WEAR THE BOTTLE YOU DRINK FROM • THE TV YOU WATCH • THE SCHOOL YOU LEARN IN • THE HEATING THAT KEEPS YOU WARM • THE PLANE YOU FLY ON • THE FOOTBALL YOU KICK • THE HAIRDRYER YOU USE • THE SOCIAL MEDIA YOU USE • THE LEGO YOU BUILD • THE BOOKS YOU READ • THE FORK YOU EAT FROM • THE TOYS YOU PLAY WITH • THE LIGHTS YOU USE AT NIGHT • THE COOKER THAT COOKS YOUR FOOD • THE COATS THAT KEEP YOU WARM • THE SPEAKERS THAT PLAY YOUR MUSIC • THE WATCH YOU WEAR • THE MIRROR YOU LOOK IN

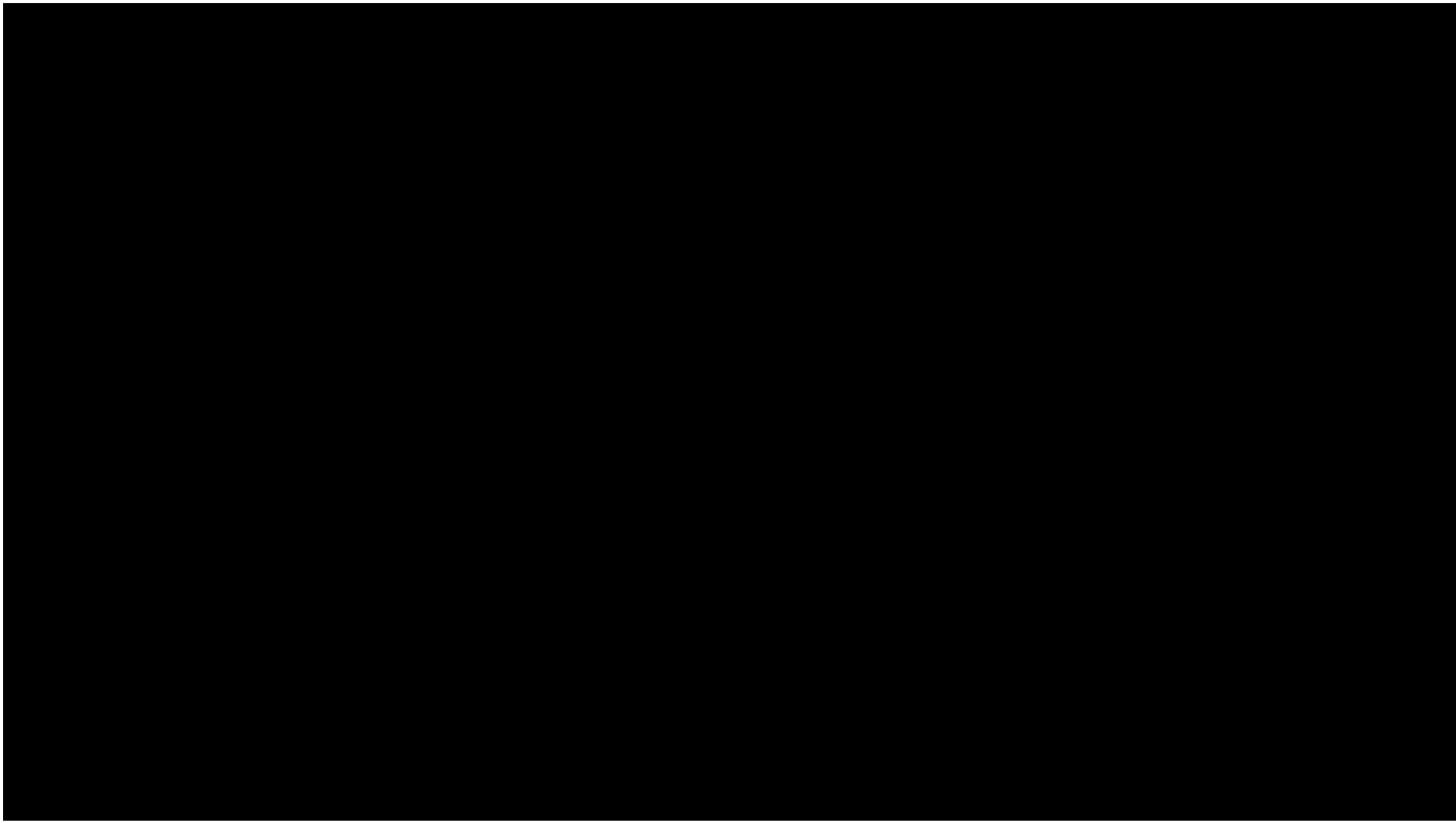
Without Design,
they wouldn't exist.

Drive change

- Tesla cars electric vehicles are safer, faster and more fun to drive than gas powered cars
  - Tesla also make solar energy systems to charge cars at home
  - Video Clip (3mins 53secs)

Reinvent the wheel

- This collapsible wheel transforms lives
  - British designer, Duncan Fitzsimons was contacted by many wheelchair users when he unveiled his folding bike wheel
  - Folding wheels allow users to fit their wheelchair into car boots and luggage racks easily



Light up lives

- 1.2 billion people live without electricity
  - The world's most affordable solar light (SM100) can replace dangerous and unsustainable light sources e.g. kerosene lamps
  - Video Clip (3mins 24secs)

It’s out of this world

- Would we have made it into space without design and technology?
    - Space suits integrate communication and breathing apparatus, provide a stable environment and protect against micrometeorites

GCSE Product Design – Course Content

This GCSE will equip you with a range of transferable practical and theoretical skills

- Generate creative solutions to benefit people and the planet
- Communicate and develop ideas through sketches, models and computer aided design
- Learn how products are manufactured in industry
- Manipulate materials and use tools to create your ideas
- Work with leading edge technology and manufacturing techniques such as 3D printing and other computer aided design and manufacturing skills

GCSE Product Design – Year 10

Projects

Projects include:

- Stool modelling
- Animal Fan
- Ear phone wrap

We are also modifying our projects so there will be some new projects for next year!

Theory

Includes:

- New and emerging technologies
- Informing Design Decisions
- Energy, materials, devices and systems
- Material types
- Designing principles
- Timbers (our specialism)

GCSE Product Design – Course Content

GCSE Product Design – Year 11

Non-Exam Assessment (NEA) 50%

On the 1st June of Year 10 you will be issued with a choice of contextual challenges from the exam board and you will choose one.

This will then be the framework of your NEA which will take you through to Year 11. This is 50% of your final grade.

Your NEA includes:

- Finding a problem linking to your contextual challenge
- Writing a specification
- Design ideas
- Using CAD, sketching and modelling as part of developing your ideas.
- Review your ideas
- Making your final product
- Texting and evaluation

Exam 50%

Based on the theory work in Year 10 you will have one exam at the end of Year 11 which is 50% of your final grade.

The paper is split into:
40% - all material areas
60% - Timbers (this is our chosen material area).

This is **one paper** and we will do revision for this in Year 11.

How Does Product Design Link to Other Subjects?

RELIGIOUS ED

Develop awareness of how products are designed for different cultures.

ENGLISH

Analysing, communicating and Evaluating designs.

PSHE

Develop presentation skills to build confidence.

ART

Develop creativity and visual communication

GEOGRAPHY

Sustainability of materials and the impact on the environment,

MATHS

Calculating product measurements, 3D Skills, Geometric shapes.

SCIENCE

Development understanding of material properties. How biomimicry influences design development.

HISTORY

Historical world events drove design innovation

GCSE Product Design – Example

We will now go through an example of an NEA from last year.

Contextual Challenge:

Theme 3 a) How can products be used to encourage participation by students in STEM activities clubs at school?

Conclusion this breaks up my task into smaller pisces and lets me know what i could base the product on

Task Analysis

how can products be used to encourage participation by students in STEM activities clubs at school.

Target Audience

The target audience of the product will be young kids or older kids/teenagers in order to get them to participate in STEM.

How to get children to be involved in STEM

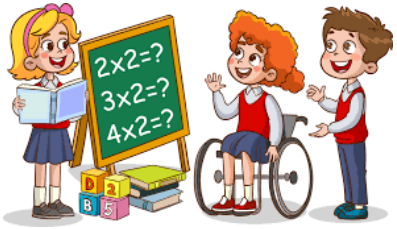
Children may not want to take part in STEM activities as they may be seen as boring or not interesting ways to get children to participate include :

- Making the activities engaging and fun
- Have clubs afterschool
- Explain how STEM will be useful in their future – jobs etc
- Advertise the clubs and activities in a fun way to gain students attention
- Don't just do theory work do hands on and practical work

What does a STEM classroom look like ?

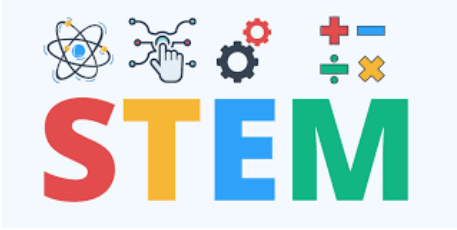
Classrooms for STEM (especially in primary schools) need to have
-interactive displays
-space for brainstorming and working with others
-tool that will be used on display
-poster displays

26% of students in the UK graduate with a degree in a STEM course



Science
Technology
Engineering
Maths

Many careers use stem in daily life some careers include:
-software developer
-nurse practitioner
-IT manager
-dentists
-anaesthetist



How to effectively teach STEM

Some ways to effectively teach STEM to students is by

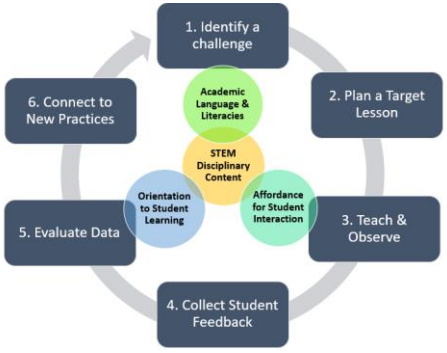
- Doing project/problem based learning , this lets students use the knowledge that they have learnt
- Inquiry based learning , encourage students to be curious and ask questions
- Let the students make mistakes and lead their own learning this is one of the best ways for students to learn

Why is STEM important for children in school?

In STEM activities children can gain skills such as problem solving , critical thinking , creativity , curiosity , decision making , leadership , entrepreneurship and acceptance of failure . These are all important in the development of a child.

Positive effects of afterschool activities

Afterschool activities enable students to interact with new students , develop skills and learn from each other , they allow students to make new friends , they help to grown talent , they boost confidence and explore their abilities

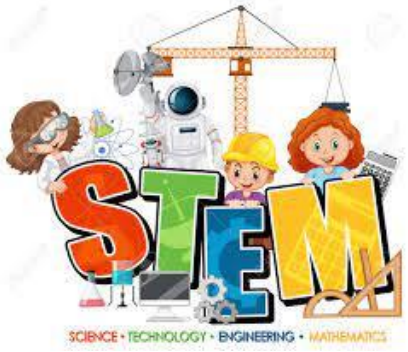


Examples of STEM activities

- Making lava lamps
- growing their own food in different conditions
- Building different structures e.g. using paper straws to make it earthquake proof.

It is estimated that by 2030 11.3 million people in the us will work in STEM

Target Market / User Audience



Customer profile

-High school students aged 11-16
-Any gender
-interested in STEM subjects
-Needs motivation to learn
-Enjoys practical, hands on learning

The product needs to

-help and encourage students
-Be cheap and accessible for students and schools
-Be easy to use while still being challenging

User wants and needs

-help with learning in STEM subjects
-wanting to get involved at school
-hands on work

Conclusion:

I have made my target market for my product-high school students. I have looked at interests, hobbies And who would most benefit from the product.

Questionnaire

1. How old are you / what year group are you in?
2. What is your gender?
3. Do you participate in any STEM subjects in school ?
   A) Yes
   B) No
4. Do you take part in any STEM activities outside of school ?
   A) Yes
   B) No
5. If yes to q2 or q3 , what is your favourite STEM subject ?
   A) Science C) Engineering
   B) Technology D) Maths
6. If no to q2 and q3 is there any specific reason you don't participate in STEM subjects ?
7. What helps to motivate you at school ?
8. Do you have a form of income
   A) Yes
   B) No
9. Why do you enjoy participating in STEM subjects ?
10. Do you do STEM activities/classes with friends ?

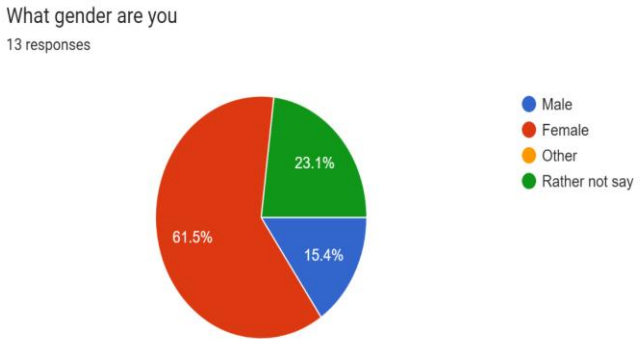
Conclusion:

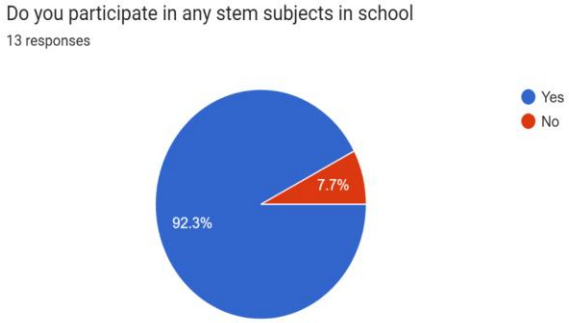
I have created this questionnaire to help with the development of the product and to further develop my target market. This also help me fund out what people are looking for from the product

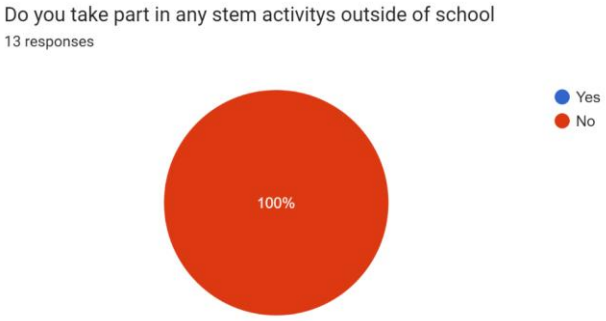
Questionnaire Results

1 - I got 13 responses to my questionnaire.

- All of these responses were from my target audience.
- 12 of the 13 were from Year 10 and 1 from year 7







Questionnaire Evaluation

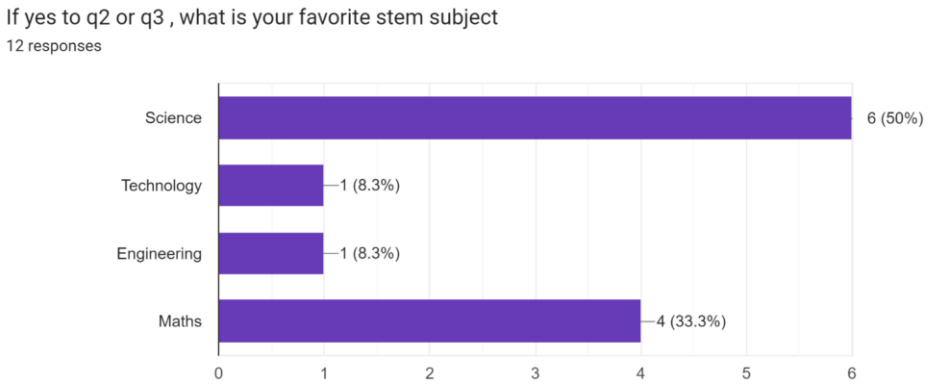
1. From this you can see that my target audience is high school students mainly the older year groups

2. This shows that my target audience is mainly females however some males
This most likely won't have an impact on my product

3. The majority of my target audience participates in at least 1 STEM subject in school , this is most likely as they have to so my product should make this enjoyable

4. None of my target audience participate in STEM subjects outside of school E.g.Clubs or groups
My product should increase the number of students in clubs and involved with stem

Questionnaire Results



6 - If no to q2 and q3 is there any specific reason you don't participate in STEM subjects ?

7 - What helps to motivate you at school ?

Questionnaire Evaluation

5. This shows that my target audiences favourite STEM subject is science followed by maths. This shows that i should theme my product around science or maths

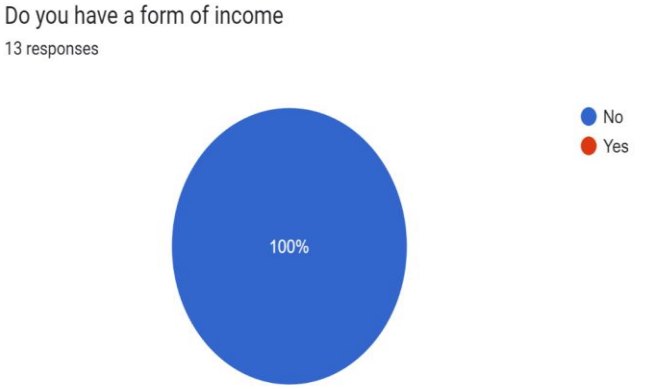
6. The main reason people don't participate in STEM subjects inside or outside of school is because they have no time or because of a lack of information about where to sign up or attend this means that my product should be interesting and factual

7. The main thing that motivates my target audience in school is getting good grades , friends, gaining new knowledge and future employment this means that my product should promote/ help people to get good grades and should be something multiple people can work on with friends

Questionnaire Results

Conclusion this gives me info about my target market and lets me know what they could need

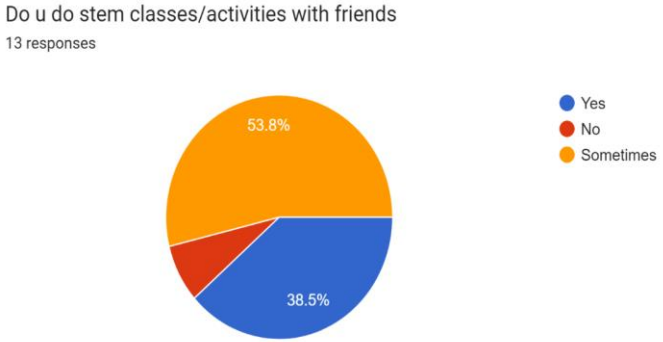
Questionnaire Evaluation



8. None of my target audience have a form of income meaning that price may have to remain as low as possible

9 - Why do you enjoy participating in STEM subjects ?

9. The main reasons that people enjoy participating in STEM subjects is because they are engaging , interesting and hands on. This indicates that my product should be engaging and hands on.



10. Most of my target audience often has STEM subjects with friends , however some always have them with friends. This means my product should be something multiple people can work on together with friends etc.

Product analysis: existing products

STEM kits

Main features:

These STEM kits come with everything that you need to do experiments. These kits are mainly geared towards science projects they are mainly targeted towards young children

Cost :

The coast of these STEM kits can Vary based on where they are sold. These kits are mainly priced at around £30. this is expensive however it includes everything that it is needed inside. However in a school setting more than one of these kits would be needed which would cost a lot

Materials / properties :

The packing is mainly made out of plastic and some paper/cardboard. The products inside are also mainly made out of plastic and it is almost fully single use plastic .

Target market :

The main target audience for this product is young children aged 6-10 This product would most likely would not work for my target audience as my target audience is aged 11-16 students who most likely don't have an income, and the school would be unable to afford several of these kits.

Overall summary :

Overall I do not think that this would be a great product to encourage participation by students as it does not meet the criteria of my target market and the materials its made of are not sustainable. It would also be expensive to implement into schools as each student would need their own kit.it also isn't open ended. It does not allow students to be imaginative it is a step by step project

Lego / Lego technic set

Main features :

The Lego technic sets are like classic Lego sets however they include electronic features. They can come in sets or you can come up with you own ideas.
These are for everyone to use

Cost :

The price of Lego technic sets can Vary however the main price of many is £30-£100 depending of the size however they don't have to be bought in sets to be bought as a tub of Lego including technic pieces costs around £20

Materials / properties :

The packaging is made of cardboard with plastic bags inside containing the pieces. The actual Lego pieces are also made of plastic however they are not single use. Lego pieces are durable and can be used several times.

Target market :

The target market of this product is for 9 years and up on most sets. This works with my target market. The only problem would be implementing these into schools. The kits are expensive and they would need several however they could buy the large tubs instead of the kits.

Overall summary :

Overall I think that this product would be a pretty good product to encourage students . it is hands on and imaginative. The only problem would be the price however there are ways it could be made affordable. This meets the requirements of my target market

Pack up physics lab

Main features:
This is a physics lab that fits into a box. It comes with everything needed to conduct experiments

Cost :
This specific set costs £190 however they can cost anywhere from £50 to £200. this is most likely to much for schools to pay however students could buy them theirs selves. And not each individual student would need their own they could be shared between 2 or 3 students.

Materials/properties :
The main material used for this kit is plastic however it is not single use plastics. The plastics can be reused over and over again. Nothing is individually wrapped as it comes in the box instead which does save single use plastics.

Target market:
The main target audience for this product is any one of any gender that is over the age of 11. this perfectly fits my target market. However students aged 11 most likely don’t have an income making this a difficult product for them to buy.

Overall summary:
This product is really good the only problem is the cost of the product.my target market mostly don't have an income. However this product is great it is imaginative and hands on. It is open ended and creative.

Modelling kit

Main features:
This is a wooden modelling kit with electronics and it is able to be painted afterwards

Cost:
The specific set costs £50 , however others like this cost anywhere from £10-£60.these prices aren’t to bad for schools to pay especially as many projects are included per kit, meaning about 1 kit could be used per 4-5 kids.

Materials/properties :
The main material of this product is wood , most likely plywood or balsa. And the box is made of cardboard and there are electronic components included. This is a sustainable product.

Target market :
The target market of this product is people over 10 years of age. This works well for my target market. However schools or students would have to buy Many and they may not be able to afford it.

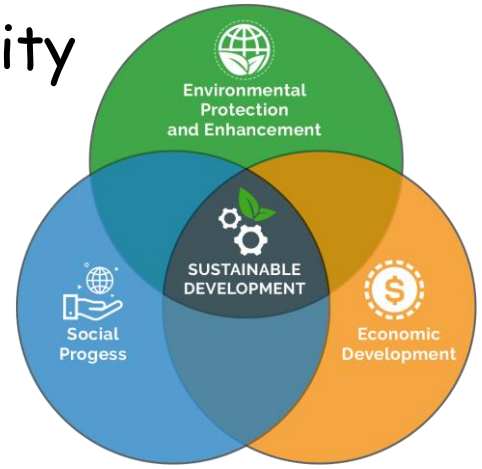
Overall summary :
This product is really good. It is sustainable and includes parts from many STEM subjects , it is hands on and creative. The only problem is the price of the product, it isn’t to bad however many would have to be bought.

Conclusion :
I have researched existing products to help me find out what my target market would most benefit from. It also help me to look at price points of other products and gives me ideas for my own product.

Materials research and sustainability

Materials : for my product I am more likely to choose woods or plastics to work with as they are easy to work with and are durable and long lasting which is what you need in schools. They can be made in different colours which is important in schools as you can easily identify whose is whose

Bioplastics : bioplastics are biodegradable materials that come from renewable sources and can be used to reduce the problem of plastic waste. They are made from natural materials



Sustainability : sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations while ensuring a balance between economic growth , environmental care and social well being.

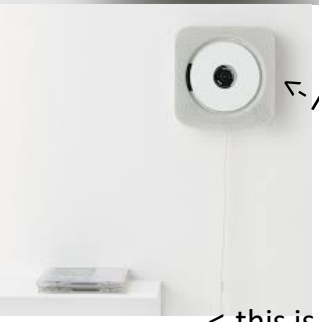
Conclusion :
From this I can see what materials would be best to use for my product based on sustainability and properties of the materials. This is useful to ensure I'm using the best possible materials based on my target market

Materials	Advantages	Disadvantages	Properties
Bioplastics	Easily recycled , low carbon emissions , food safe , less plastic pollution	Doesn't biodegrade in landfill , more expensive than regular plastics	flexible , durable , heat resistant
Wood - plywood	Resistant to warping and cracking , less susceptible to damage.	Can be expensive , splinters easily , difficult to cut	High impact resistance, moisture resistance , very durable
Wood – beech	tough, , durable polishes well , bends well	Easily warps , not good for outdoor use , expensive	Hardwood , heavy , solid, durable ,
Wood - birch	good resistance to decay , stains and polishes well	Easily breaks , easily warps	Fine grained , durable
Wood – pine	easy to work with , pretty cheap , durable	Easily scratches , easily dents , maintenance is required	Lightweight , resists shrinking , easy to work with

Designer research

<- chair

Naoto Fukasawa

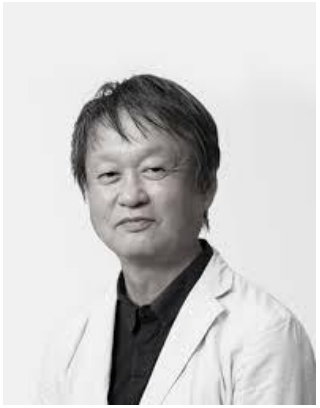


<- mounted cd player

Naoto Fukasawa was born in 1957 and he is 67 years old
He is a Japanese designer , author and educator working in the field of product and furniture design

Padded chair ->

<-this is a mounted cd player , it is a cd player that you are able to put anywhere on your walls and it doesn't take up any surface space and is minimalistic which looks good in most environments



Juice peel packaging ->

This is juice peel packaging ->
It is a juice box made out of juice peels which is sustainable and looks really good , it is unlike any of his other designs

I really like the minimalistic style of Naoto Fukasawa and I feel it would work well for my product as it is not distracting and is suitable for the classroom setting

He is most known for his work with the Japanese retail company muji as well as other collaberations

InfoBar mobile telephone (2007) ->

I would like to implement sections of Naotos minimalistic design into my product however maybe using more subtle pastle colours to make it more exciting for a classroom environment

Conclusion: from this I can see that I like the style of Naoto Fukasawa and would like to incorporate it into my product as it will work well in the classroom setting

Design brief

I intend to design and make a product that helps students in schools with stem subjects.

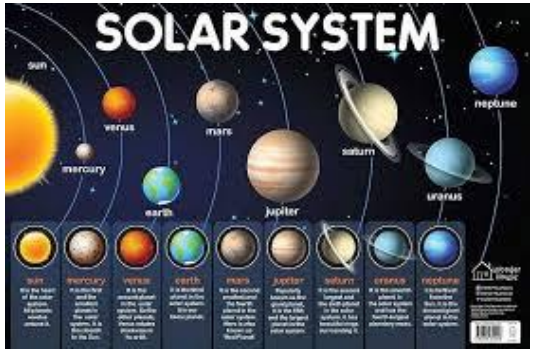
I would like my product to be informational to help students with their understanding of the subject.

I also would like the product to make learning science fun and exciting for students

I would like my product to be geared more towards science as I found that most people struggle with science mainly physics

Because I am making the product to be used in schools it needs to have certain safety measurements such as no sharp pieces and it needs to have a sturdy build.
It also means it should be cheap/affordable for schools to buy for its classrooms

The problem I would like to solve with this product is the lack of participation and understanding of stem subjects mainly science



From my research I have found that students don't participate in stem subjects as they don't have time to do any extra curricular and because they don't understand certain aspects of the subjects.

I would like the product to be used in classrooms to help students with their learning and GCSE's
It could also be used as a revision tool

Conclusion:
From this I can see that I would like my product to be informational and safe for a school environment

Design specification

Conclusion: from this I can see that I should include my measurable elements to suit my target audience

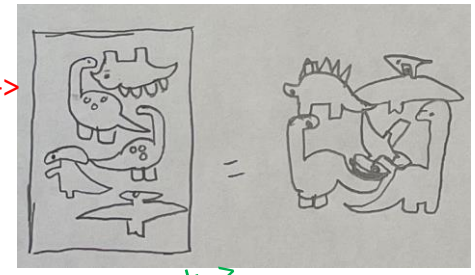
	specification	justification	Measurable element
form	The appearance of the product will be eye catching and pleasing to look at. It will have no sharp pieces to make it safer for young people to use in classrooms.	I want the product to be eye catching to draw attention to the product however I don't want it to be distracting. I don't want it to have any sharp pieces to ensure it is safe for younger people to have / use in a classroom.	1. Bright coloured 2. no sharp pieces included 3. pastel colours
Function	The function of the product is to be informational and inspire the brain to be creative and think. It needs to be relatively easy to use yet still challenge the brain or give information.	I want the product to help stimulate the brain and help give information about stem subjects that would help in exams etc. and I want it to put the information in a way that is easy to remember.	1. Clear easy to read writing 2. Lots of pieces 3. Colourful
User requirements	The product needs to encourage participation in stem and be safe to use in a school environment	The product will be used in schools and therefore the product needs to be safe for schools and be appealing for students in a high school environment	1. Looks exciting to use 2. meets school safety requirements 3. eye catching
Performance requirements	The product must be accessible to everyone and simple to use. It must be sturdy and well made. It also must be eye catching in order to encourage students to take part	The product needs to be accessible to that everyone can use it and understand the subject. As it will be made to be used in schools it will need to withstand damage that may be done.	1. No bright lights / sounds 2. sturdy materials 3. Tactile
Materials and components requirements	The materials need to be easy to clean in case the product gets dirty however the material also needs to be sturdy.	Ideally the materials should be eco friendly and sustainable. It also needs to be able to withstand water or any dirt that may get on it.	1. Sustainable materials 2. sturdy materials 3. Easy to clean coating / materials
Scale of production	This product will be mass produced in order to ensure that everyone that needs one will get one.	The product should be mass produced to fulfil all needs , and it should be well packaged to ensure there is no damage in transport	1. Packaging 2. Line of production 3. Transportation
cost	The cost of the product should remain affordable to ensure that schools can afford the product for its classrooms	If the product is to expensive schools wont be able to afford it and have it in its classrooms	1. Cheap price 2. good quality 3. Affordable
Sustainability	I would like for my product to be mainly made of sustainable materials	This is to ensure that there is limited impact on the environment	1. Sustainable materials 2. Sturdy materials

Thumbnail sketches

Doesn't have to be dinosaurs ->

<- hands on

to young ->



<- not challenging

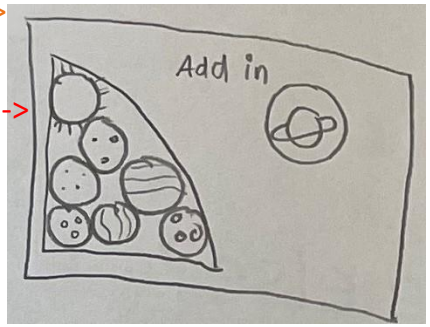
<- Simple once you know what to do

Puzzle / makes you think ->

Simple once you know what to do ->

<- Challenging

Would be easy to loose pieces ->



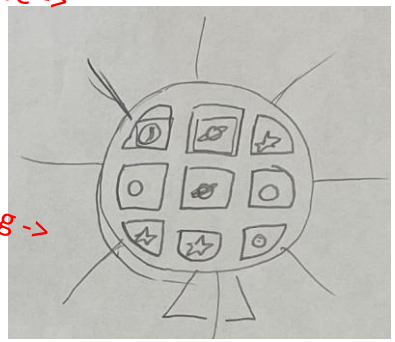
Interactive ->

To young ->

<- Not really educational

Not interactive ->

<- Educational



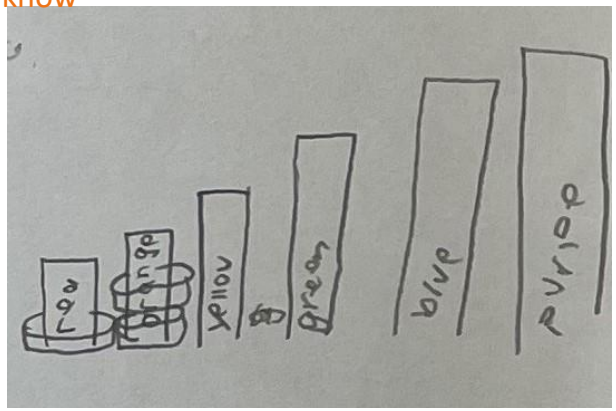
Isn't interesting ->

<- sort of suitable for schools

Brightly coloured ->

<- Space themed

Simple once you know what to do ->



<- Colourful

To young ->

<- easy to loose pieces

Sturdy materials ->

<- Challenging

Conclusion:
From this I can see that my product should not be to young, it should be challenging and educational as it will work best for my target market

Individual research

When designing my product I will need to take into account sizes and measurements of my target market to make sure that the product is the correct size for them

I will also need to take into account the average size of a classroom and a desk to ensure that the user requirements are met and the product will work as well as possible

The average teenage girl is 162 cm tall. this should be taken into account when designing my product.

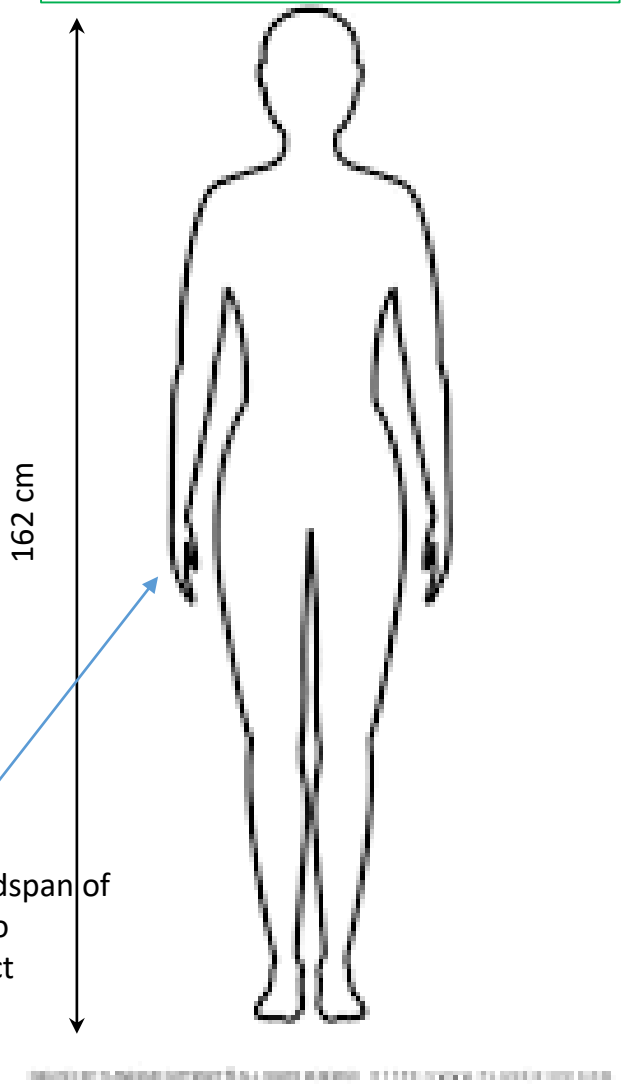
These are the measurements of many science lab desks and desks in homes

150x75x100)mm

This tells me that my product needs to be smaller than this to ensure that it will fit onto most desks

The average size of a classroom is 800 to 1000 square feet

This is also what the average science classroom looks like

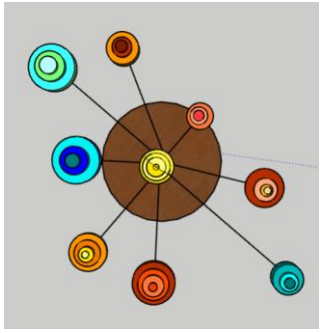


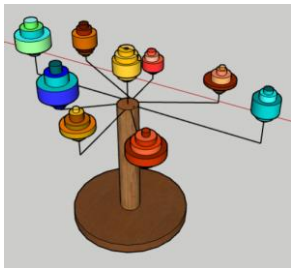
The average teenage girl has a handspan of 16 cm this should also be taken into account when designing my product

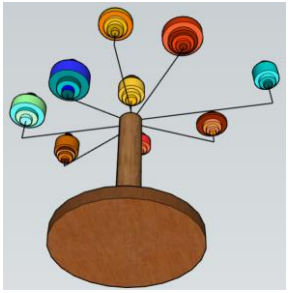
Conclusion: from this I can see that I will need to take measurements into account when making my product so it best suites its environments and works best in its environments so it works well for y target market

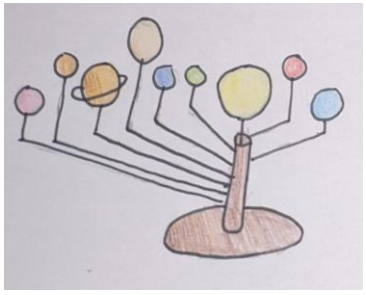
Initial idea 1

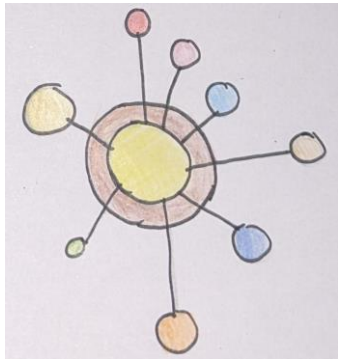
Inspiration :
I got inspiration from planetarium kits and models. They show the plants and their order and distance from the sun. The sun is in the middle with the planets coming of in either direction



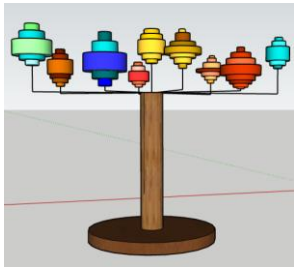








Solar system model

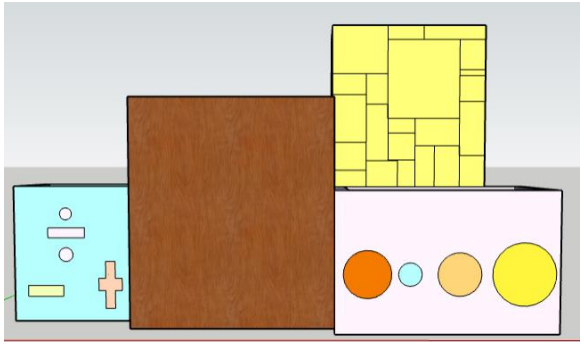


Conclusion: from this I can see that this product suites my target market well however it could do with being more hands on and easier to clean

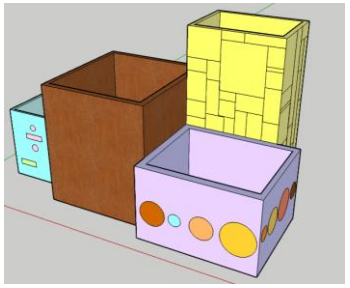
Cost	form	function	Sustainability	Performance requirements	User requirements	Materials and components	Scale of production
The result of my research shows that my product should cost no more than £40. this is to ensure that it is affordable for schools to purchase and have in their classrooms	My product has a wooden circle as the base with a wooden pole coming up from the middle. There is then a wire going up with the sun on top. Then wire coming out of the sides with all the other planets on.	My product is made to be used in classrooms or at home for high school students. It is used to tell students the order of the planets in our solar system. The materials make it safe to be in a classroom.	The main material used for my product is wood which is biodegradable. It will also use wire which is not sustainable but could be substituted for something else.	There are no sharp corners on my product which makes it safe to be in a classroom. However as the main part of the product is made of wood there is a chance of splinters so I will ensure I correctly sand the product	The product is easy to set up meaning it can be used by many ages.it is educational and interesting however it isn't a challenging product and it isn't hands on. However this will be appealing for high school students	The materials used for this product are sturdy and will hold up with the use in a classroom. However they are not easy to clean if anything was to spill on it . and the majority of materials are sustainable	For this product I will start of with batch production and then if the product does well I will change to mass production to ensure that the product is accessible for everyone.

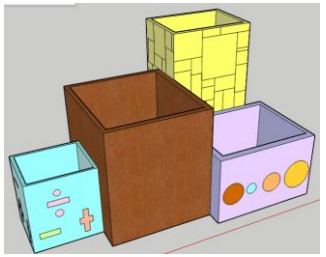
Initial idea 2

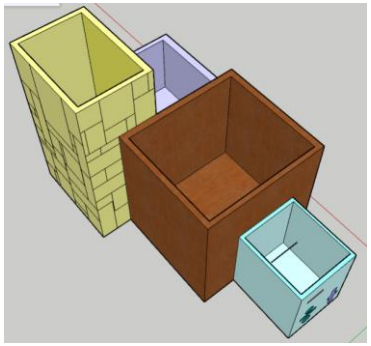
Inspiration:
I got inspiration for this from pen pots and combined it with the STEM subjects to make a product useful for STEM classrooms

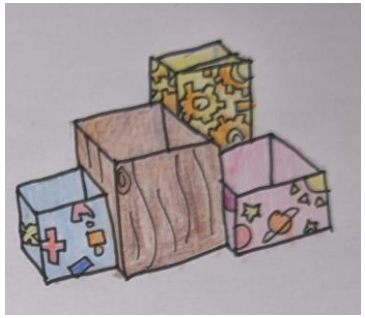


STEM themed pen pot









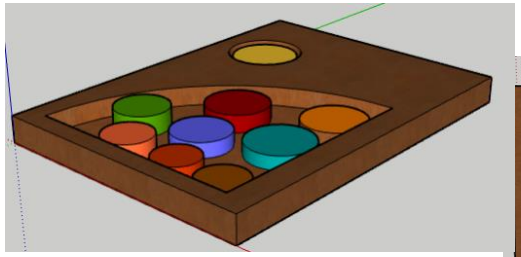
Conclusion: from this I can see that this product does not meet many of the requirements however it would be useful to have in a classroom

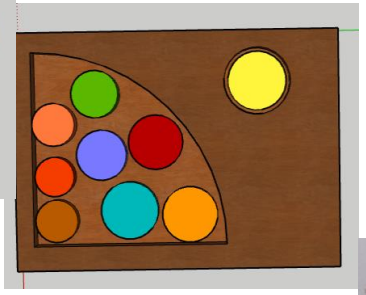
Cost	form	function	Sustainability	Performance requirements	User requirements	Materials and components	Scale of production
The result of my research shows that this product should not cost any more than £15 to make it accessible for schools to have in their classrooms.	This product is made entirely out of wood that is hollowed out in the middle to make space for stationary. The pots are all at different heights and widths.	My product has been made to ensure tidiness in classrooms whilst being appealing in classrooms. It includes all of the STEM subjects so it can be used in any kind of classroom	the entire product is made out of wood and 3 of the pots are painted. The wood is sustainable however the pain wont be making the product less sustainable.	There are multiple sharp corners on this product meaning it may not be completely safe for all classrooms. And the main body is made out of wood so I will need to make sure i fully sand it down	This product requires no setting up however it may not be safe for younger years due to the sharp corners. This product is not educational and not hands on however due to its bright colours it will be appealing	The materials for this product are sturdy and will last in a classroom and the amount of usage it will endure . however the materials are not easy to clean if anything were to spill.	As with the last product I will start with batch production and if the product is doing well I will switch to mass production. This is to ensure it is accessible to all schools.

Initial idea 3

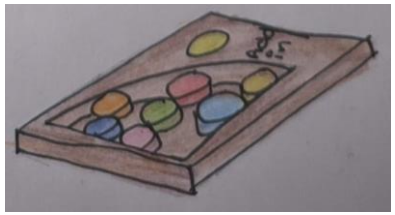
Add in the planet game

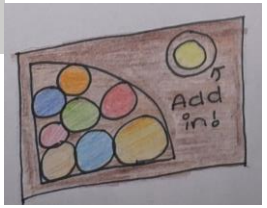
Inspiration:
I got inspiration for this from the classic game add in the penny but made this one planet themed. However it could be themed to fit anything





Conclusion: from this I can see that this product works very well for my target market apart from the fact that it is not educational





Cost	form	function	Sustainability	Performance requirements	User requirements	Materials and components	Scale of production
The result of my research shows that this product should cost not more than £20. this is to make it accessible to all schools so that every child is able to use one .	This product has a wooden base with a quarter of a circle and a mini circle cut out. It also then has 9 small wooden circle which are the planets. These are painted to show which planet is which.	My product is used to teach about planets in high school classrooms. It is a hands on product that is challenging. It is a game where you have to find a way to insert the sun in with the other planets. It is appealing to students due to its colour	This entire product is made of wood and painted wood. The wood is fully sustainable however the painted wood is not as sustainable.	There Are many sharp edges on this product meaning it is not completely safe for all ages. This product is hands on however not really educational however it could be made to be educational. As it is made of wood there is a risk of splinters so it needs to be correctly sanded down.	This product requires very little setting up making it useful for a classroom. However due to all the small pieces students would need to be careful to not loose any of the pieces making it not fully suitable for the classroom. However it is hands on and exciting to have in the classroom.	The materials used in this product are sturdy and will withstand use. They are not easy to wipe down however the materials are sustainable. I will also paint the planets to make them look more like the correct planets.	As with the other products I will start of with batch production and if the product doe well I will change to mass production this ensures that every child will have access to the product and there is little wastage.

Review of initial ideas

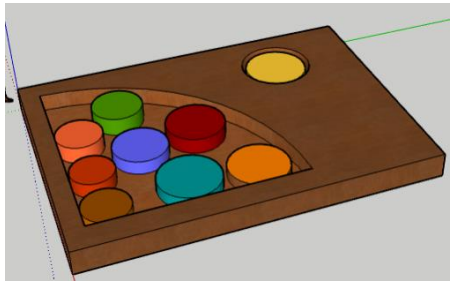
Specification point	Design idea 1	Design idea 2	Design idea 3
form	10/10 the product is eye catching and pleasing to look and has no sharp corners to make it safe	5/10 the product is pleasing to look at and eye catching however it has sharp corners making it unsafe	7/10 the product is eye catching and pleasing to look at however it has a few sharp corners
function	5/10 this product is informational and educational however it is not creative or challenging it is easy to use	3/10 this product is easy to use however it is not educational or creative and challenging	5/10 this product is creative and challenging however it is not educational it is easy to use while still being challenging
User requirements	8/10 this product will encourage participation and is safe to use in a school environment	1/10 this product probably won't encourage participation and it is not fully safe to use in a school setting	6/10 this product will encourage participation however it is not fully safe to use in a school setting
Performance requirements	9/10 the product is simple to use and accessible to everyone.it is sturdy and eye catching	7/10 the product is very simple to use however not accessible to everyone the product is sturdy and eye catching	8/10 the product is not easy to use but that is cause it is challenging.it is accessible to all and is sturdy and eye catching
Materials and components requirements	5/10 the product is not easy to clean if anything spills however the materials are sturdy	5/10 the product is not easy to be cleaned if anything spills however the materials are sturdy.	5/10 the product is not easy to clean if anything spills however the materials are sturdy
Scale of production	6/10 the product is made of mainly widely available parts however it would be difficult to quickly put together	9/10 the product is made of widely available materials and would be easy to put together	9/10 the product is made of widely available parts and would be easy to put together
Cost	7/10 the product is not very affordable however the reason the price is high is because of the quality and there is only 1 per class	7/10 this product is mainly affordable price and the quality is good however multiple are needed per classroom	8/10 this product is mainly affordable and the quality is good but you might want more than 1 in the classroom but no more than 3

Review of initial ideas

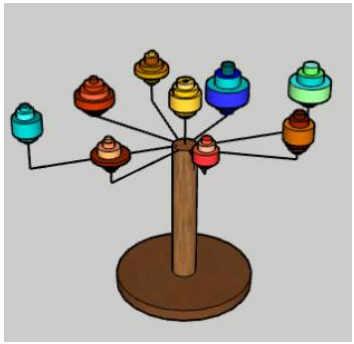
sustainability	9/10 this product is made mainly of sustainable materials however I the wire isn't very sustainable	9/10 this product is made of sustainable materials but the paint isn't the best for sustainability	9/10 this product is made of sustainable materials but the paint isn't the best for sustainability
Client feedback	9/10 This was my clients favourite product. They said that it was helping them with the revision of the planets and it also looks nice in their room they just said it's a shame its not hands on	4/10 this was my clients least favourite product. They said that is was useful to have on their desk for organisation however it isn't helping them with their revision or learning but it looks nice in their room	7/10 The majority of clients did like this product however some said it wasn't helping them revise as it is not educational however most have said that it warms their brain up at the start of the day and it looks good in their room
Evaluation	this product fits my specification the best. It still needs some work but hits most of the specification points and the client feedback shows that this is the favourite	this product does not hit many specification points. It needs a lot of work done. The client feedback shows that this product isn't the best and needs a lot of development.	this product has potential ,work needs to be done however client feedback shows that it doesn't need much work. It meets most specification points and has potential with a few developments

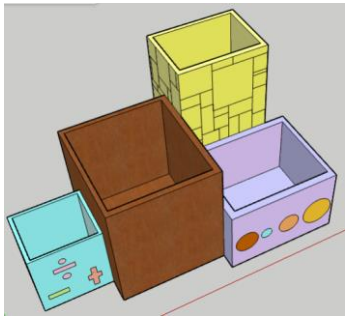
Conclusion : the review of initial ideas has really helped me. I know now what I can do to improve each product and which product may work best based on my target market. It also allows me to know which areas are strong and which areas need some work to ensure my product is as good as possible. It also shows me that idea 1 is the client favourite .

Idea 3 ↓



Idea 1 ->

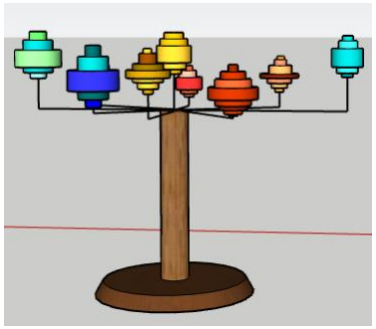




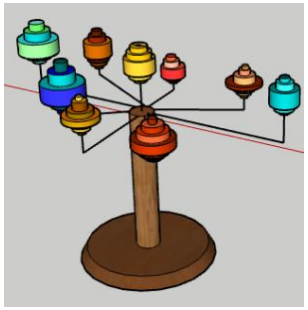
<- Idea 2

Design development

Why I have chosen this design idea : I have chosen to develop this idea because it fulfils most of my specification points and was my clients favourite.



Idea 1



Adjustments that need to be made : although this idea fits most of my specification points there are still adjustments that should be made to fit my specification. From my review of initial idea I can see that some of these adjustments are making the product challenging and hands on and making it as sustainable as possible.

Conclusion this tells me info about my product and what i am aiming to achieve

Further design brief:

My main problem : my target with my product is to encourage students (11-16) to participate in STEM in schools.
Things to think about : there will be multiple thing to think about when designing my final design, the main things are

- Ensuring the product will suit its environment (colour schemes , size)
- Making sure that the products are strong enough to withstand classroom usage
- Making sure that the product is interesting and hands on to encourage participation

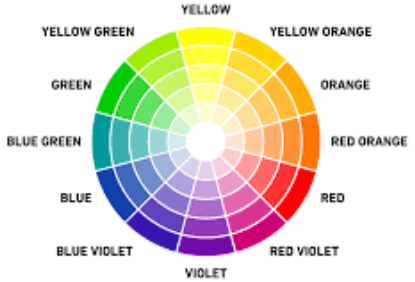
Inspiration:

Idea 1

I took inspiration from models like these for my product.

However I feel like these are made for younger children and not for teenagers who may need help with revising the planets for their gcse's .
So I would like my product to be designed for teenagers who are in high school , to either have at home or in school . This has to be taken into account when designing my product

Colour schemes:



The colour scheme of my product needs to complement the environment well. It needs to be bright and eye catching however However not to distracting for the classroom environment so that it does not draw attention away from work. I would also like for the colours of the planets to be as accurate as possible.

The main colours used in my product are going to be shades of brown orange and yellow as those are the main colours in the solar system.

However other colours will be used such as blues and greens

I would like the colours to be complementary of each other

Design development

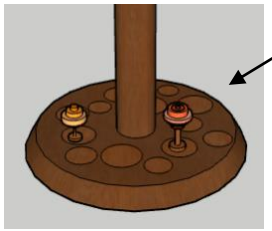
Conclusion this tells me what additions to make and the sustainability of my product

Things to add

To make the product fit the specification as best as possible I need to make it hands on and challenging and as sustainable as possible.

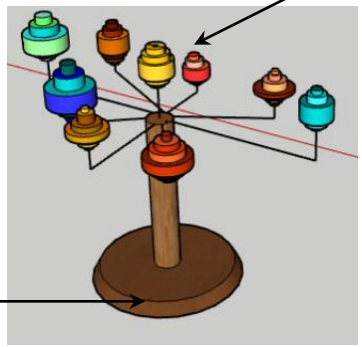
Making it hands on

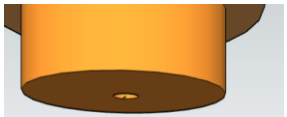
I need the product to be challenging and hands on to well fit the specification. This means that it needs to be interactive and could include an almost game aspect.

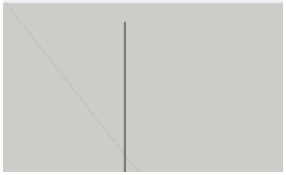


This would also mean that to could be a group games as from the earlier questionnaire we know that most people have classes with their friends

The planets could be made to be detachable to help with the memorising of the order of the planets







Something could be added to the base of the model. Such as a board game with questions

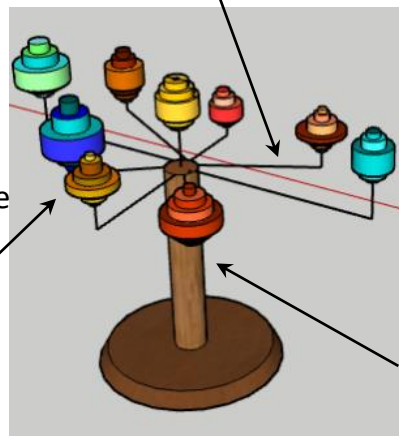
As I am not planning on using wire the hole would need to be thicker and same for the wire it would be thicker this is to ensure the planets are held up and it is a sustainable as possible

Sustainability

The product needs to be as sustainable as possible to ensure it is the best it can be and that it fits most of the specification points. This is to ensure that it has a very limited impact on the environment

Steel wire is sustainable however if I don't use sustainable wire I should use another material such as wood as otherwise the product wont be as sustainable as possible

Many paints can have a very negative impact on the environment so I would need to use water based paints as they have the least impact on the environment



Not all wood is sustainable so I need to use a wood that is. Most hardwoods are not sustainable due to the amount of time it takes them to re grow

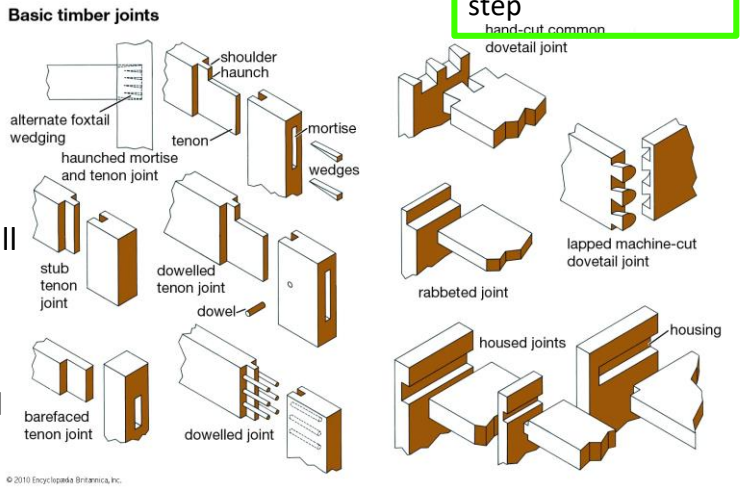
And so I will be better using soft woods such as balsa or pine. As these are more sustainable therefore meeting my specification points better

However a problem with potentially using soft woods is that they are weaker and less durable as a posed to hardwoods this is due to its lower density

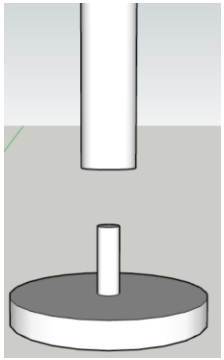
Design development

Conclusion this breaks up the making of my product step by step

Joints

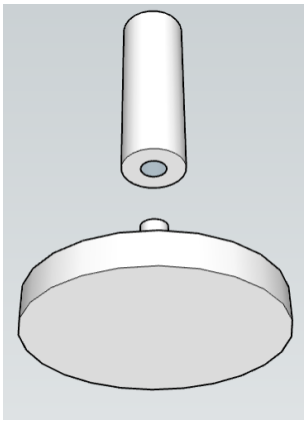


For my product I will need to use many different joints based on how strong I need it to be and what I need it to do



I think that the most suitable joint to use to connect the middle pole onto the base is the dowel joint due to its strength and security when mixed with glue.
However glue is not completely sustainable and that is part of my specification

A dowel joint will off stability up the middle of the pole and it will be able to stand straight. The only thing i will need to check is that I align it correctly and assure that the dowel is inserted straight and not side ways so that the pole is directly upwards and straight so that it is secure and stable



This will be done by placing a hole at the bottom of the middle pole and a hole on the base in the centre and place the dowel into it then hammer the pole onto the dowel whilst the dowel is coated in glue to ensure that is securely in place

I also believe that It would be best to use a form of dowel joint to attach the planets but use a dowel joint that would be removeable so not using glue. This is as my clients think that have the planets be removeable is an amazing idea an like how it means the product is then engaging and hands on.

Materials

The main material I will be using in this product is wood, this will most likely be a softwood as they are better for the environment and are more sustainable which is a main factor that my clients have pointed out.

Pine would be a good wood to use for my product. It is a softwood and so is quite sustainable , and it has many useful properties such as it has good strength and durability making it useful for classrooms it also holds paint and finishes well with means that it will be good for the planets.

The only problems are that it can contain knots and can scratch easily. However the positive outweigh the negatives and believe pine is a good material to use for at least the planets

Plywood was also be a good alternative as it is a more widely available material and cheaper

Design development

Conclusion this tells me things needed to make my final product

Materials

Pine wood could also be a good wood to use for the base as it strong and durable.
This could also be because it is lightweight and easy to work.

I would not like to use the wire as I initially planned as sustainability Is important to my clients and most wires are not sustainable , also I don't believe that the wire would be strong enough to support the planets and hold them up well.
A better material to use may be bioplastics or hardwoods
Bioplastics are plastics made from natural resources

The only problem with using bioplastics is that they can be expensive and the also may not be strong enough to support the wooden planets . Acrylic would be a good alternative to bio plastics as they are more durable, these could be used for the planets

Another better material to use may be plywood.
plywood is a manufactured board that is strong and durable and so it will support the planets and it is not an expensive material to purchase.

I think that I will use pine for the main stand and for the planets and then use wooden rods instead of the wire .
Another material to consider for the planets is acrylic as it is a lighter material for the wooden rods to hold up

Finishes

To add the colour to the planets I need to add finishes to them. For the planets I am going add paint to make them the colour that I need. I am going to use acrylic paint as they will make the planets the correct colour. Acrylic paints aren't completely sustainable however it is the only way to make the planets the correct colour to a good standard.

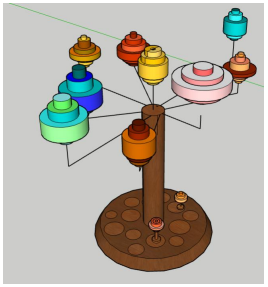
Using paints means that I have control over the colour of the planets. It also means that I can add designs to them sus as I can add the land to earth. It also means that the planets will be stain resistant and wont appear cloudy over time like wood stain would. It would also be easier to clean

For the base and the main pole I would like to use a clear varnish to protect the wood. A clear varnish can protect the colour of the wood and can make it last longer
Than it normally would last

However some varnishes can turn yellow over time so I should use a good quality one , it can also stain the wood if not applied correctly and so I need to ensure I apply it correctly and carefully to ensure it does not stain.
Neither of these finishes are sustainable or environmentally friendly however they are necessary to make the product the best quality it can be

Final design concept

Conclusion this tells me the details of my final product and all updates made



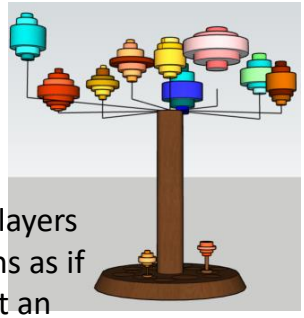
updates

This is the updated version of my design, it has incorporated the addition of removable planets and the addition of the games at the bottom.

The games has been added at the bottom to make the product hands on and engaging as that was part of my clients specification this is also why the removable planets have been added to help with the memorisation of the order of planets.

This also means that the product can be used by more than one person at a time which from the previously completed questionnaire we can see that a large percentage of my target market have science lessons with their friends and this product can help them to work together as many students work better when working with others

This also shows the materials and finishes that I will be using for the product , it shows that it will be finished using a paint and that the main body will be made out of wood.



The game at the bottom has a max of two players to ensure that everyone gets asked questions as if there are more than 2 not everyone may get an equal chance to move forwards

It also means that the revision is effective because if there are more than 2 people students are more likely to be distracted and that can be very distracting for everyone in a classroom making it difficult for a teacher to teach their class.

The game – how it works :

-Each player is assigned a piece

-they then place their piece on the same spot as each other

-players decide who then goes first , the player that goes first rolls the dice and then asks a question according to the number on the dice

- 1 means the question should be easy as the player only moves one space if they get it right and 6 should be difficult as it means they move six spaces if they get it right.

-Players then take turns asking each others questions and moving around the board.

-They can then keep going until they cant think of any more questions the first person that runs out of questions to ask looses or if someone asks a question that has already been asked in that round.

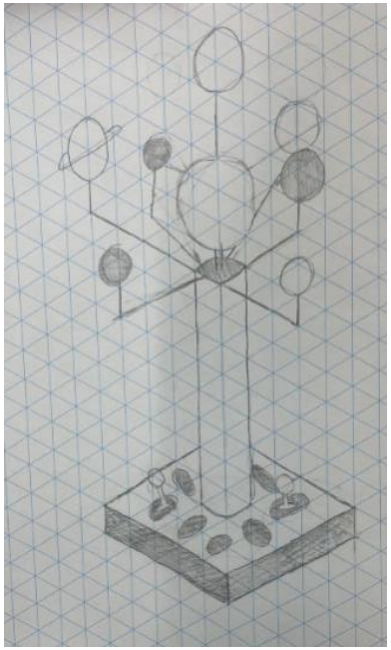
The reason that the players have to think of their own questions to ask is because it is shown that it will help with the memorisation of the answer and they may learn something new every time they play from then other person as they may get asked a question that they have not been asked before as there are no set questions. This will also test what you know about the planets and can give you areas to revise if you don't know the answer to a question or can't think of questions to ask.

Review

Overall my design concept on CAD shows a realistic view as to what my final product will look like , it also provides different viewpoints of what it will look like.

The addition of new concepts has really improved the design, the only worry is how long it will take to be produced to a high standard, however I am very happy with the final design idea .

Final design concept



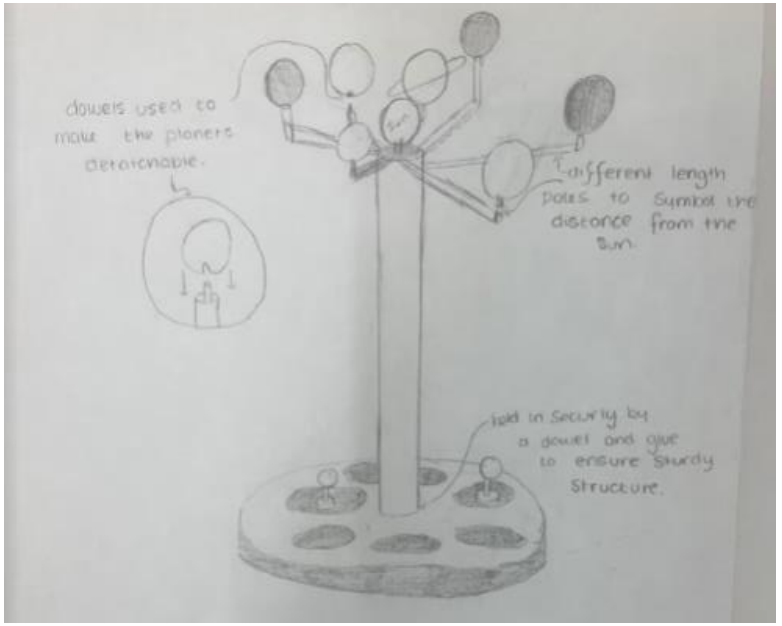
Isometric drawing

This is an isometric drawing of my design, you can see the placement of the planets and the general idea of the design. The drawing however does not show the accurate shapes of the design ,it makes the base and the pole look like squares when they are meant to be round for safety reasons , it also does not accurately show the distances from the centre.

It does however show the game on the base of the planetarium and the little game pieces.

I think that the isometric drawing does show the main idea of my design however it does show a couple of things incorrectly and could be improved

Conclusion : the isometric drawing does not show my design idea very clearly however it provides a rough idea of what my final product will look like . However there are easier and better ways to show my final idea



3D Drawing

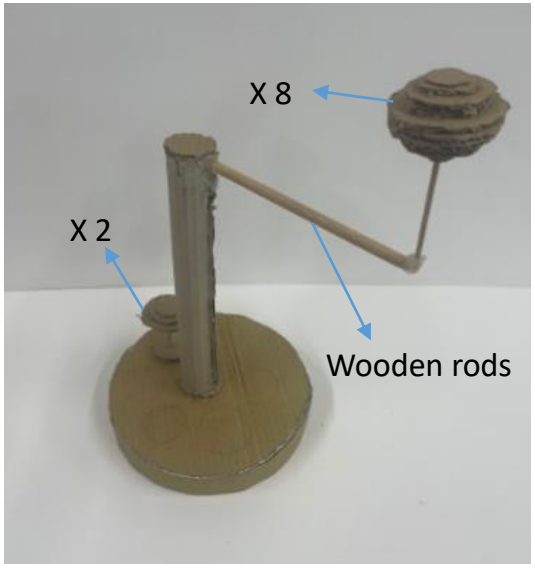
This is a 3d drawing of my design , it clearly shows the placements of the planets and shows the design in depth.

The drawing show the game that is on the base and the detachable planets and how that will work. It also shows that the base and pole are round and not square.

From this drawing you can see that from my first design concept I have added in the game and detachable planets to make the game hands on and to make science more fun for students.

Conclusion : This drawing is successful in showing my design well and it shows all of the details well and clearly.

Final design concept

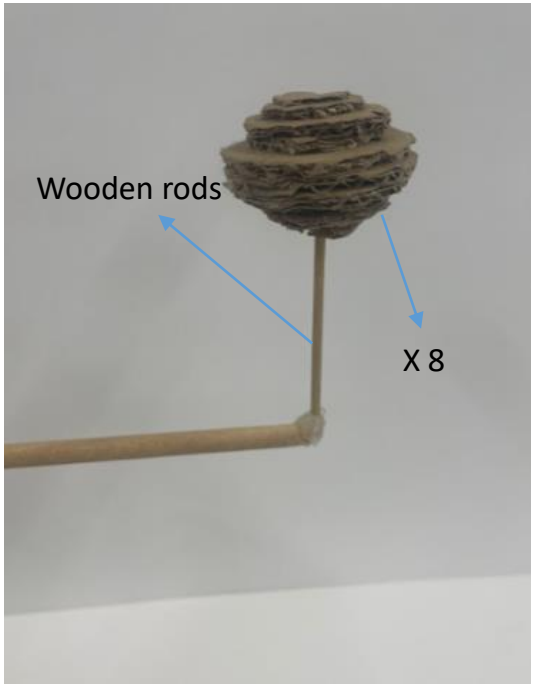


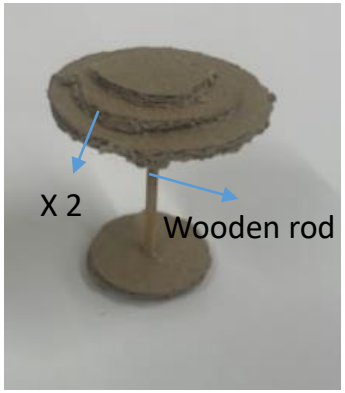
3D modelling

This is a 3D model of my final design , to make the model I used cardboard and wooden rods.
I used the wooden rods for the poles supporting the planets as cardboard was not strong enough to hold up the planets.
I then used cardboard for everything else held together by hot glue.
I think that the model has successfully shown my idea an it is built to size so it shows accuracy , it shows the game on the base and the fact that the planets are detachable.
It also shows how the game pieces will look.

I only modelled one game piece when there will be 2 game pieces and I only modelled one planet when there will be eight one to represent each planet, This was due to time.

The game that has been added in the design development has not been clearly shown on the model however it is there , this shows that on my final product needs the game to be shown clearer than it Is on the model otherwise it won't be clear and accessible to everyone

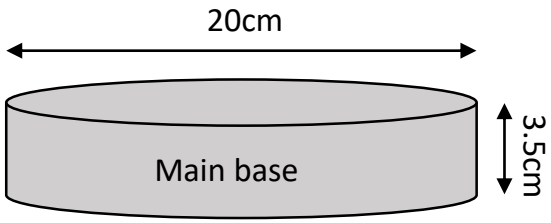




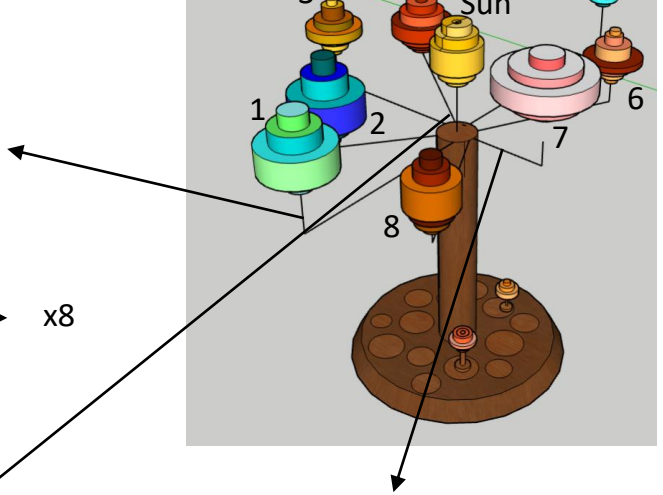
The model is well built and sturdy showing that my connection methods should work for my final design

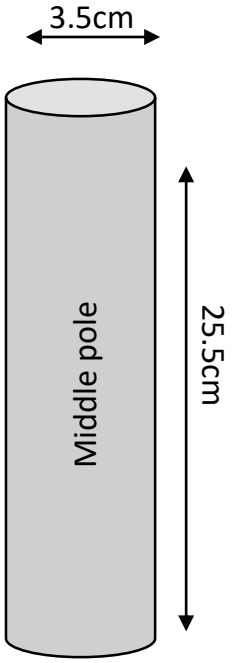
Conclusion : my 3D model shows my design very well it shows the details and it also shows what types of joints I am planning on using. it is the best way of showing my design and what it will look like and it also helped me get accurate sizes since it is built to size

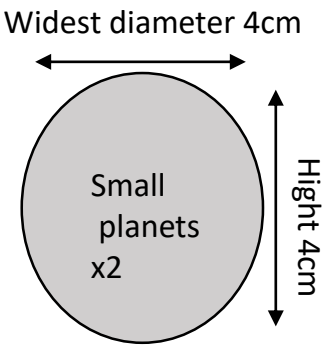
Working drawing

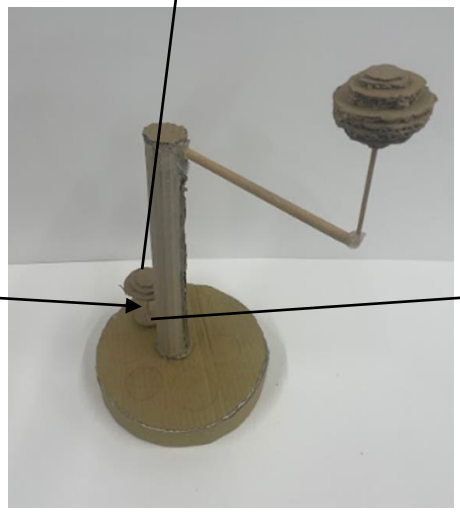


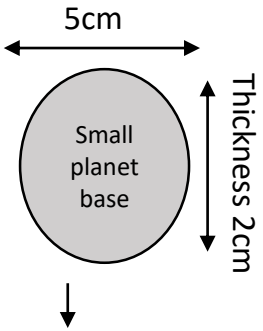
These are the measurements of my product , this shows me how big the product is going to be when finished it also shows me the pieces that will be needed

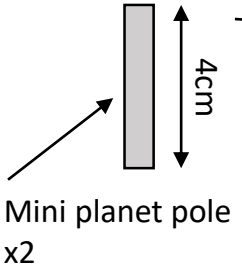












The poles showing distance will vary in length depending how far away the planet is

1. Neptune, diameter: 6cm height: 6cm
2. Earth , diameter: 6cm height: 6cm
3. Jupiter , diameter: 9cm height: 9cm
4. Mars , diameter: 4cm height: 4cm
5. Uranus , diameter: 7cm height: 7cm
6. Saturn , diameter: 8cm height: 8cm
7. Venus , diameter: 5cm height: 5cm
8. Mercury , diameter: 4cm height: 4cm

Sun. diameter: 11cm height:11cm

Conclusion: this shows me what pieces I am going to need to build my product this is useful because it will make building the product a lot easier

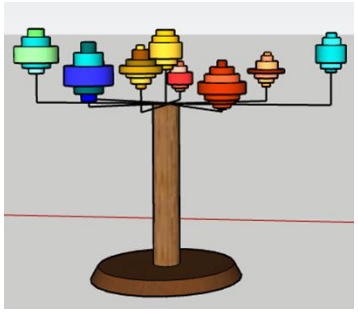
Cutting list

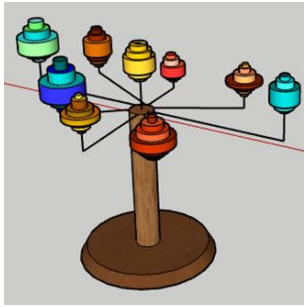
material	Part name	measurements	number	colour	finish
plywood	Main base	20cmx3.5 cm	1		varnish ?
	Middle pole	3.5cmx25.5cm	1		varnish?
	Mini planet pole	4cm long	2		varnish?
	Planet middle poles	7cm long	8		varnish?
	Sun middle pole	9cm long	1		varnish?
plywood	Small planet base	5cmx2cm	2		Varnish ?
acrylic	Small planets	4cmx4cm	2	Red/orange	
Acrylic	Neptune pole	6cmx6cm 18cm	1 1	blue	
acrylic	Earth pole	6cmx6cm 8cm	1 1	Blue/green	
acrylic	Jupiter pole	9cmx9cm 12cm	1 1	Brown/white	

Cutting list

material	Part name	measurements	number	colour	finish
acrylic	Mars pole	4cmx4cm 10cm	1 1	red	
acrylic	Uranus pole	7cmx7cm 16cm	1 1	blue	
acrylic	Saturn pole	8cmx8cm 14cm	1 1	Brown/ yellow	
acrylic	Venus pole	5cmx5cm 6cm	1 1	Orange	
acrylic	Mercury pole	4cmx4cm 4cm	1 1	grey	
acrylic	Sun	11cmx11cm	1 1	Yellow/ orange	
vinyl	Planet names	All different	9	multi	

Conclusion : this tells me the measurements that are needed for each individual piece of my product this is useful because it breaks my product up into sections .





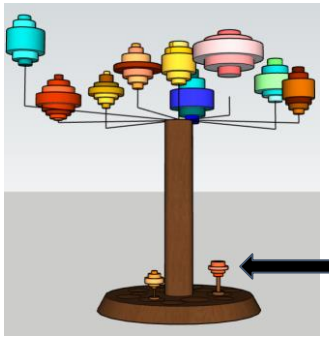
Changes to my final design

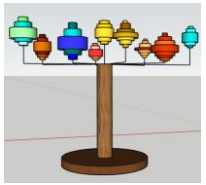
I have decided to make a minor change to my final product , i have decided to remove the game from the base of the planet model . this is in order to keep costs down and make the product look more aesthetically pleasing for my target market. Upon reflecting my model and sketch up model i believe that the product would look and work better without it and would save materials and money especially since the product works without the game at the bottom.

It is important to me that my user group are happy with all aspects of my product and i don't believe they will be with the game at the bottom. I like the aspect of having the game at the bottom to help with the learning of facts and memorisation of information however with the game at the bottom i can't possibly meet all of my user groups specification points

Conclusion:

This shows me how to modify my product in order to make it as good as possible and have it hit all of my user groups specification points , this is important to me as my target markets opinion matters to me and i want to make the product as close as possible to how they would like it.





This is what the product will now look like without the game at the bottom now meeting the target markets specification

I will be removing this part of my product to keep costs low and meet my target markets needs

Review of chosen design

	User group feedback	My analysis
Form 1. It should be brightly coloured 2. It should have no sharp pieces 3. It should include pastel pieces	1. The product is brightly coloured which is great for in the classroom and at home which helps with memory 2. It has no sharp pieces which also makes it great for younger children and safe for classrooms 3. It has no pastel pieces which can make it a bit distracting because of the bright colours	My user group had lots of positive feed back about the form of my product, it has all the things asked for apart from pastel colours as I found hat difficult to incorporate into the colour pallet. However they are overall happy with the form of the product as it fulfils most of their requirements.
Function 1.It should be easy to read any writing 2.It should include lots of pieces 3. It should be colourful	1. There is no writing incorporated into the product as the distance is portrayed in different ways 2. The product does include many pieces which helps to stimulate young peoples brains 3. The product is very colourful and includes many colours	My user group love the function of the product it meets all of their requirements , the product does what it is meant to do which is great because it will encourage more people to use my product
User requirements 1. It should look exciting to use 2. It should meet schools safety requirements 3. It should be eye catching	1.The product looks very exciting to use especially with the addition of the game pieces on the base 2. The product meets the safety requirements it just has small pieces which could be a choking hazard if used with smaller children 3.The product is eye catching due to the bright colours and the interesting shape	My user group are very happy that most of there requirements were met. They just wish that there were no small pieces which could be chocking pieces however they were needed to make the product the best it could be.

Conclusion : this tells me that the user group is happy with the product as a whole

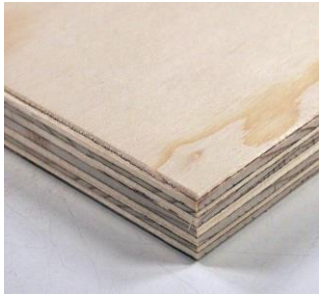
Review of chosen design

Conclusion : this will help me when making my product and how my clients feel about the product

	User group feedback	My analysis
Performance requirements 1.No bright lights/sounds 2.Sturdy materials 3.Tactile	1. this product fully meets this requirement , they are very happy about this 2. The product is made out of very sturdy good quality materials 3. This product is unfortunately this product is not tactile	My user group had mainly positive feedback about the performance requirements of my product however they were disappointed that it will not be tactile
Materials and components 1.Sustainable materials 2.Sturdy materials 3.Easy to clean coating	1. The customers are mainly happy with the sustainability of this product however there are some parts that could do with work 2. The customers are very happy with the materials of the product 3. Customers are happy with the coating of the product.	My user group is happy about the materials and components of the product and understand that some of the materials needed to be changed to make the product as good as possible.
Scale of production 1. Packaging 2. Line of production 3. transportation	1.my product will come packaged in a corrugated card box as it will absorb and damage during transport 2. The product will be batch produced to fulfil needs but keep a high quality 3. It will be transported with other items to limit carbon emissions	My user group are happy with the scale of production of my product as the quality will be high however demands will be met and the transport is as environmentally friendly as possible and the packaging will protect the product from damage.
Cost 1. Cheap price 2. Good quality 3. Affordable	1+3. The customers are slightly disappointed with the cost however they understand that it is worth it because of the quality and the materials 2.The customers are happy with the quality of the materials used and the overall product	My user group are not happy about the price however they understand why it is as high as it is And they are very happy with the quality of everything
Sustainability 1. Sustainable materials 2. Sturdy materials	1. The customers are mainly happy with the sustainability of the materials used and understand that it wasn't possible for them to all be sustainable 2. The customers are happy with how sustainable the materials are	My user group are happy with the sustainability of this product and are understanding about the sustainability of the materials .

Plywood

I have used plywood as the main material for my product. This is because it is a sustainable material and it fit the needs of my target market. It also has all of the properties i need my product to have , these include sturdy, affordable , sustainable and good quality. It is also a lightweight wood which is good for my product as it means it will be easier for the user to hold and carry. It is a durable and sturdy wood which means it won't break under the pressure and weight of the planets and will remain a good quality. It can also be coated with a varnish when finished to make the product as long lasting as possible. Finally plywood is relatively inexpensive compared to other woods and so this will keep the cost of the final product as low as possible, making it accessible to everyone



Acrylic

Acrylic is another main material that i am using for my product , the acrylic is going to be sued for all the planets. This is because acrylic comes in many colours which is great for the product, it is also a sturdy material which meets the clients needs for the product which is that it is easy to clean and wipe down which acrylic is,. Acrylic is also light weight which means that it won't be to heavy for the plywood to hold up making the product very high quality

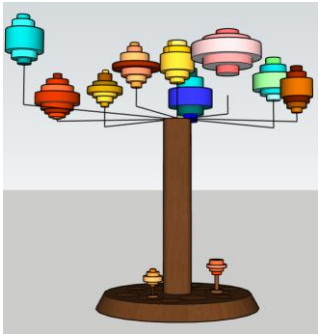
Selection of materials

Conclusion

This shows me all the materials that are going to be needed during the manufacturing process , it is important i use the best possible materials

Wood glue

I will be using wood glue to ensure the product is well held together, the reason for choosing wood glue is because it is invisible upon drying and creates a sleek finish



My product

Plywood finish

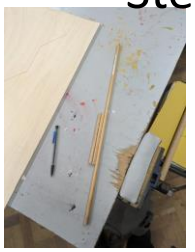
I will be using a plywood finish on my final product to make it water resistant and durable , this will make the product last even longer and prevent it from being damaged, adding a finish also makes the product look more attractive

Manufacture skills and process

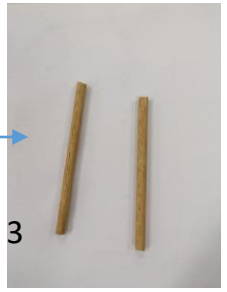
step	process	Tools and machinery	Safe working
1	Selection of materials and making the outlines for the base and poles, using a compass to make perfect circles and using a ruler to select the correct pole lengths	Compass Ruler pencil	Working carefully with the compass
2	cutting the bases to size using a coping saw leaving rough edges to sand down later	Coping saw Vice	Being cautious when using coping saw
3	Cutting the poles down to size using the measurements used earlier	Coping saw Vice	Being cautious when using coping saw
4	Sanding down the ends of the poles to make them smooth and safe to use	Sanding file Vice	
5	Sanding down the game base piece to be round and smooth and safe	Electronic sander	Wearing goggles , keep hands away
6	Inserting the wooden dowels into the bottom of the main pole by drilling 2 small holes and inserting wood glue and the wooden dowels	Handheld drill Wood glue Wooden mallet	Caution using drill and mallet



Step 1



Step 2


Step 3




Step 4


Step 5



Step 6


conclusion

This tells me the first 6 step of my manufacturing of my final product

Manufacturing skills and process

step	process	Tools and machinery	Safe working
7	Drilling holes into the center of the base to insert the main pole ensuring the holes are directly downwards	Hand held drill Pencils to make markings	Keeping hands away from the drill
8	Inserting the middle pole into the base using wood glue to ensure it is as sturdy as possible and sanding down the bottom to ensure it is flat	Wood glue Vice	not getting glue on hands or anywhere else
9	Made markings on the main pole for where the poles to support the planets will be placed	Pencil Ruler	
10	Cut out the middle supports for the planets at varying lengths	Coping saw Pencil Ruler	Hands away from the blade on the coping saw
11	Cut out the length planet poles to show the distance away from the sun	Coping saw Ruler Pencil	Hands away from the blade on the coping saw
12	Cut out a tester model planet and glued it together to see how it works and looks	Laser cutter Uhu glue	Watching the laser cutter closely for errors

Step 12

Conclusion: this tells me where i am upto and what is needed to do next

Manufacturing skills and processes

step	process	Tools and machinery	Safe working
13	Using the laser cutter i cut out the rest of the pieces needed to make my planets ensuring the hole was central and wide enough to fit the poles up	Laser cutter Computer	Watching the laser cutter closely for any flames or issues
14	Building the planets using glue and the poles to ensure they are vertical so the pole fits up them	Uhu glue	
15	I marked on the holes for where i was going to drill i then drilled the holes into the main pole which i will insert the planets into and checked the poles fitted	Hand held drill Vice pencil	Do not miss the marked holes as it may crack the wood or other holes
16	Using a small needle file i sanded down the holes just drilled to make them safe and smooth	Needle file	
17	I sanded down the ends of the planets poles to be slanted then glued them together using a strong wood glue.	Gorilla wood glue Sanding file	Do not spill the glue as it is very strong and will damage surfaces
18	I used my phone in order to design some sticky vinyl for the planets names to make it a good learning tool	Phone	Make sure it is the correct size as to not waste materials

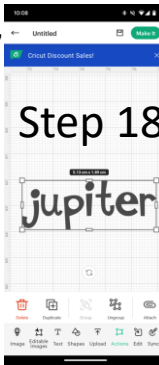
Step 13

Step 14

Step 15

Step 16

Step 17



Step 18

Conclusion
This tells me what needs doing and what i have done

Manufacturing skills and processes

step	process	Tools and machinery	Safe working
19	I cut out the vinyl using a cricut machine and then removed any extra material however there was little waste material as i used as small a pieces as possible	Cricut maker 3 A cutting mat Phone Weeding tool	I watched the cricut for any errors and was careful with weeding tool as it is sharp
20	I then used transfer tape to transfer the names onto the planets carefully without them becoming wonkey or ruined	Transfer tape Scraper Cutting mat	
21	I then did this with all of the planets to make the product more accessible for people and to make it a greater learning tool	All materials listed steps 18-20	
22	I then glued the poles into the drilled holes there was a small issue with this as some planets did not fit into their original holes so i had to move them around to place the planets on this was the final step of making my product before testing it	Gorilla wood glue	Do not spill the glue as it is very strong and will damage surfaces

Step 19

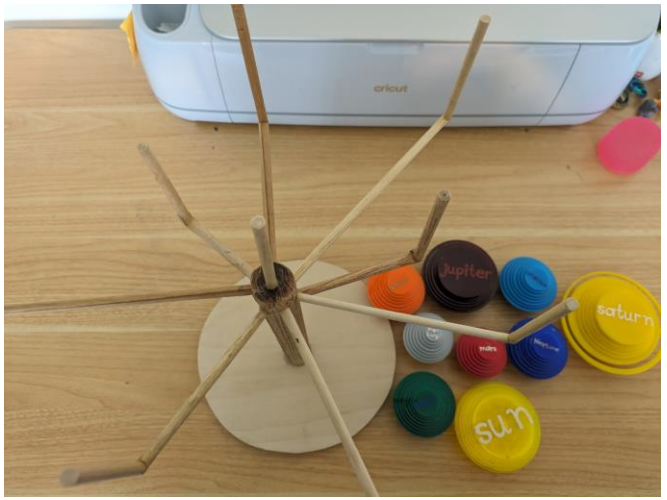
Step 20

Step 21

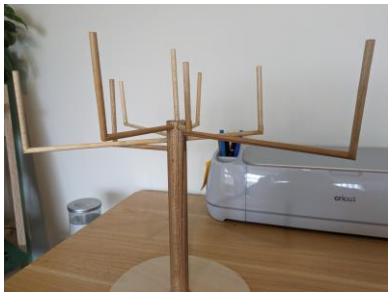
Step 22

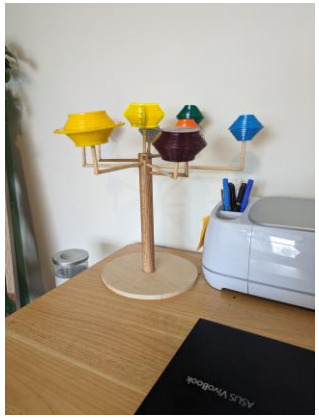
Conclusion : these are all the steps that were taken during the manufacturing of my product this makes it clear how things were done what was used and safety measures that had to be taken and it lets me know what steps were taken to avoid issues

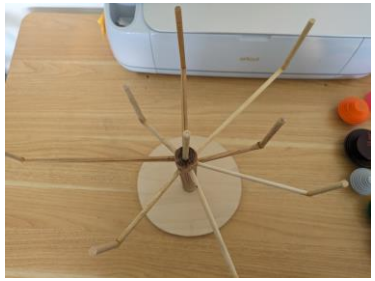
My finished product

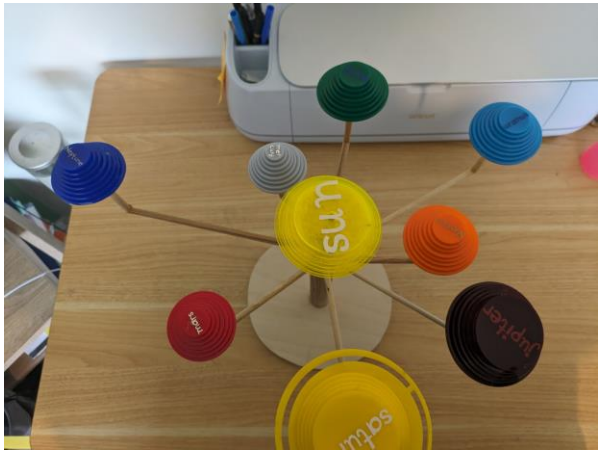


This is my final product from many angles and the components of the product









Conclusion

This is my final product on a desk which is its correct environment. This shows you the product from many different angles and with the planets on and off to show all of the aspects

Testing my product

‘ you can rearrange the planets to be in the right order which makes the product challenging and engaging , or you can use it to make notes which helps me with the memorisation of the order ‘

User feedback

‘You can tell the product is well made and uses good quality materials however the pole for jupiter could do with being slightly sturdier as it can be quite wobbly and it doesn't feel safe . however this is still a great product that i enjoyed using . it is a great revision tool and has boosted my confidence in this topic , it fits very well on my desk which means that it is easy to store and it looks good. This is a product i would recommend to others’

Conclusion

This is a member of my target market aged 13 testing out my final product in its correct setting. They have told me what they think and improvements they believe should be made which is useful for future development , however they also told me what they thought was good and what they think makes the product unique to others. This is important to me as it lets me know my target markets opinions.

Life cycle assessment

Conclusion : this tells me the impact that my product will have on the environment Which is useful as it may help my target market

Raw materials	**Acrylic** is made from crude oil which is a finite resource this has a negative impact on the environment however there were no other materials which could work **plywood** comes from trees however it is not a finite resource **uhu glue** made from resin which is awful for the environment.
Materials Processing	**Acrylic** is made into sheets using toxic chemicals which releases toxic vapours which must be caught and treated before being released , this releases co2 into the environment **plywood** is bonded together using phenol formaldehyde which means it releases co2 during manufacture .
Manufactu-ring	**Laser cutting** this releases toxic gases which may be pollutants and must be correctly ventilated or filtered or can have an effect on human and environmental health.
distribution	If the product is distributed in the uk this would be done via lorry which releases co2 and particulates into the atmosphere , however if the product were to be distributed world wide planes would be used which means lots of fuel is used meaning co2 is release also.
Product in use	When the product is in use no damage should be done to the environment and should not have any impact.
Repair and maintenance	Although this hopefully shouldn't happen Overtime certain pisces may need replacing and this will use up extra materials and add additional cost to the product.
End of life	**Acrylic** is made from poly methyl methacrylate which means it can be recycled however it is a long process or it can be melted to make new products **plywood** is fully biodegradable which is very good for the environment and it is also easily recyclable
sustainabili-ty	The acrylic is not good or very sustainable since it is sourced from raw materials however it wont need replacing as often as a wood would and it can be recycled. However the plywood is much better for the environment however may require a layer of coating to protect it. The manufacture and transport of this product both release co2 and harmful gases however the product has no impact when in use

Evaluation of final product

Conclusion this is an indpeth look at how my product does or dosnt meet the specification

Specification point	Rating 0-5 0-very bad 5-great	User group comments	My comments
Form Brightly coloured	4	This product has elements that are brightly coloured without it being overly distracting which is great	I really like the way which the product is coloured i feel it makes it more 'grown up'
Form No sharp pieces	2	The product does not include may sharp pisces, however the joints of the poles is a bit sharp and so are the sides of the planets	Whilst it is annoying that there are a few sharper pieces it could not be helped , everything is as blunt as possible
Form Pastel colours	0	The product includes no pastel colours however it doesn't matter as it is more accurate this way	There are no pastel colours meaning it doesn't hit the specification point
Function Clear writing	5	The planets names are very easy to read a good font and colours used	I made the names using a cricut machine meaning it is very clear
Function Lots of pieces	5	The product come with all of the planets which are detachable and are safe for kids	The planets are all detachable pisces making the product challenging
Function Colourful	4	The base and main pole are not colourful but the planets are and it makes them stand out	The product is colourful without being distracting and to much
User wants Exciting to use	3	The product is a great revision tool which can be fun to use but i wouldn't say it is exciting	The product is exciting and fun to use especially for younger people
User wants Safety requirements	5	This product is completely safe to use in schools and outside of schools due to its mainly dull corners and how sturdy it is built	The product is safe and well built with big pieces so little risk of losing pieces corners also are not really sharp

Evaluation of final product

Conclusion : this is an indepth look at my product agains the specification

Specification point	Rating 0-5 0-very bad 5-great	User group comments	My comments
User wants Eye catching	5	This product looks really good especially on a desk and it does catch you eye due to the pretty colours	The product should look good in any location but not distracting
Performance No bright lights	5	This product contains no lights or sounds at all meaning it is not distracting or overwhelming	I didnt want this product to be overwhelming or inaccessible for kids so i avoided sound,light
Performance Sturdy materials	4	Almost all parts feel sturdy although i wish the poles showing distance where stronger but they work anyway	I used the sturdies materials possible however this wasn't always perfect
Performance Tactile	3	No parts seem to be intentionally tactile however the planets can be tactile as the sides are bumpy	Unfortunately none of the pisces are tactile as it was not possible
Material requirements Sustainable materials	3	Most of the materials used appear to be sustainable especially the wood	Most materials used are sustainable but acrylic depends
Material requirements Sturdy materials	4	Almost all parts feel sturdy although i wish the poles showing distance where stronger but they work anyway	I used the sturdies materials possible however this wasn't always perfect
Material requirements Easy to clean	2	Most of the product cant be wiped clean as it is wood and has no finishing however the planets can be as they are plastic	The plywood can not be wiped clean as it will warp however the acrylic can be wiped clean
Scale of production Packaging	4	The packaging of this product is a cardboard box and biodegradable packing peanuts which protect the product well	The product comes in a corrugated card box with biodegradable peanuts.

Evaluation of final product

Specification Point	Rating 0-5 0-very bad 5-great	User group comments	My comments
Scale of production Line of production	5	The product is always available in stores and online	The product is mass produced to fulfil demands and to keep the product as cheap as possible
Scale of production Transportation	3	The product is available world wide however is more expensive in some places than others	The product is transported in the uk via lorry and worldwide via plane which means it costs more abroad
Cost Cheap price	2	The cost is more than we originally expected however it is still pretty low at £40 as it is good quality	The costs were left as low as possible however i understand that it may be too expensive for some
Cost Good quality	4	The product feels like it is very good quality and uses good quality materials which is why the price is high	The product is the best quality possible i used the best materials and the best joint techniques possible.
Cost Affordable	1	The product is i imagine as affordable as possible however it it pretty costly and many cant afford it	The product has been kept as affordable as possible for the quality of materials used and time took to make it
Sustainability Sustainable materials	3	Most of the materials used appear to be sustainable especially the wood	Most materials used are sustainable but acrylic depends on the disposal and where it is disposed of
Sustainability Sturdy materials	4	Almost all parts feel sturdy although i wish the poles showing distance where stronger but they work anyway	I used the sturdies materials possible however this wasn't always perfect

Conclusion : this is an in depth look at how my final product meets/ fails to meet the specification and gives feedback from my user group

Examination – Example Questions: -

SECTION A – CORE

Answer ALL questions. Write your answers in the spaces provided.

1 The materials that products are made from are chosen because of their characteristics.

(a) Figure 1 shows a table of products.

For each of the products shown, give a property of the material it is made from that makes the material suitable for the product.

The first one has been done for you.

Picture of product	Description of product	Property
 (Source: © Feng Yu/Shutterstock)	A polystyrene coffee cup	Good insulator of heat
 (Source: © 3DMAVR/Shutterstock)	A balsawood toy boat	(1) (i) _____
 (Source: © Anteromite/Shutterstock)	An aluminium paint tube	(1) (ii) _____
 (Source: © Morphart Creation/Shutterstock)	An acrylic bath	(1) (iii) _____

(b) Figure 12 shows a stand for a handheld electronic tablet.

The stand must hold the tablet in different positions.

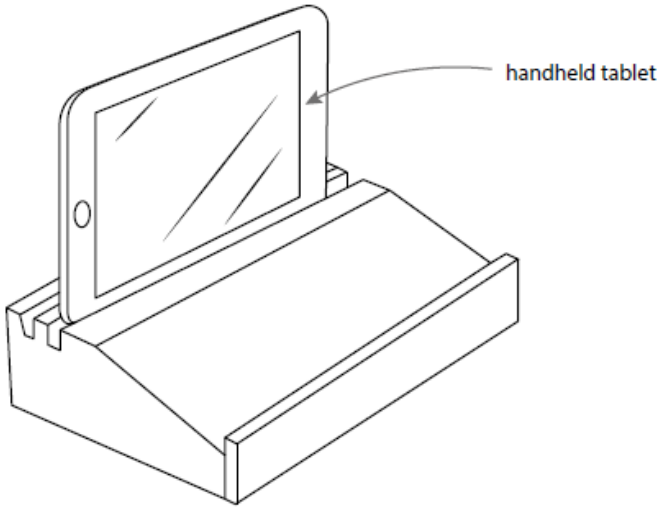


Figure 12

Analyse the stand.

Explain **two** ways in which the stand meets or fails to meet the criteria of holding the tablet in different positions.

(4)

1 _____

_____

_____

_____

2 _____

_____

_____

_____

(Total for Question 5 = 10 marks)

Useful Website Links…

- Edexcel GCSE D&T - https://qualifications.pearson.com/en/qualifications/edexcel-gcses/design-and-technology-2017.html
- https://successatschool.org/advicedetails/335/Why-Study-Design-and-Technology%3F
- The Design and Technology Association
- BBC Bitesize design and technology

If you have questions or want to know more, please contact me ask your Product Design teacher or email Miss Corry:
acorry@phs.cheshire.sch.uk