



A Level **PRODUCT DESIGN**

Do you enjoy?

Being creative?

Being inquisitive?

Solving problems?

Experimenting?

Using CAD?

Working with your hands?

Developing skills for life?



A Level PRODUCT DESIGN

Could be the course for you!

Reasons to study A Level Product Design

- An opportunity to be creative, imaginative and hands on.
- To offer a very different type of A Level – that will compliment more formal subject areas.
- To develop a range of sort after skills for your university applications such as;
 - Problem solving – thinking on your feet,
 - Ability to adapt and change to ongoing situations,
 - Working independently and as a team,
 - Creative
 - Communication – verbal and graphical
 - ICT skills

Requirements to study A Level Product Design

6+ in GCSE D&T including
Graphics, Resistant Materials or Textiles
or
Distinction in Engineering

Due to the maths involved in the course
we also require the following additional
grades;

5+ in Mathematics
5+ in English

***In addition the most important aspect
that we require is for you to be
Motivated and committed to the course!***

GCE A Level Course breakdown

UNIT 1 EXAM 1	Written exam: Technical Principals: 2 hours and 30 mins 120 marks - 30% of A-level
UNIT 2 EXAM	Written exam: Designing and making Principals: 1 hour and 30 minutes 80 marks - 20% of A-level
UNIT 3 NEA	Substantial design and make project. Written or digital design portfolio and photographic evidence of final prototype - Set by Student. 100 marks - 50% of A-level



A LEVEL PRODUCT DESIGN – Examination Question Examples

Paper 1 – Technical Principals

0 1 Explain why 'potatopak' is a suitable material for the manufacture of disposable cutlery. **[3 marks]**

0 2 Explain how BSI certification impacts on the purchase of a child's car seat by a consumer. **[6 marks]**

0 5 Figure 1 shows a children's climbing frame.

Figure 1



Explain why powder coating is an appropriate finish for the climbing frame shown in Figure 1.

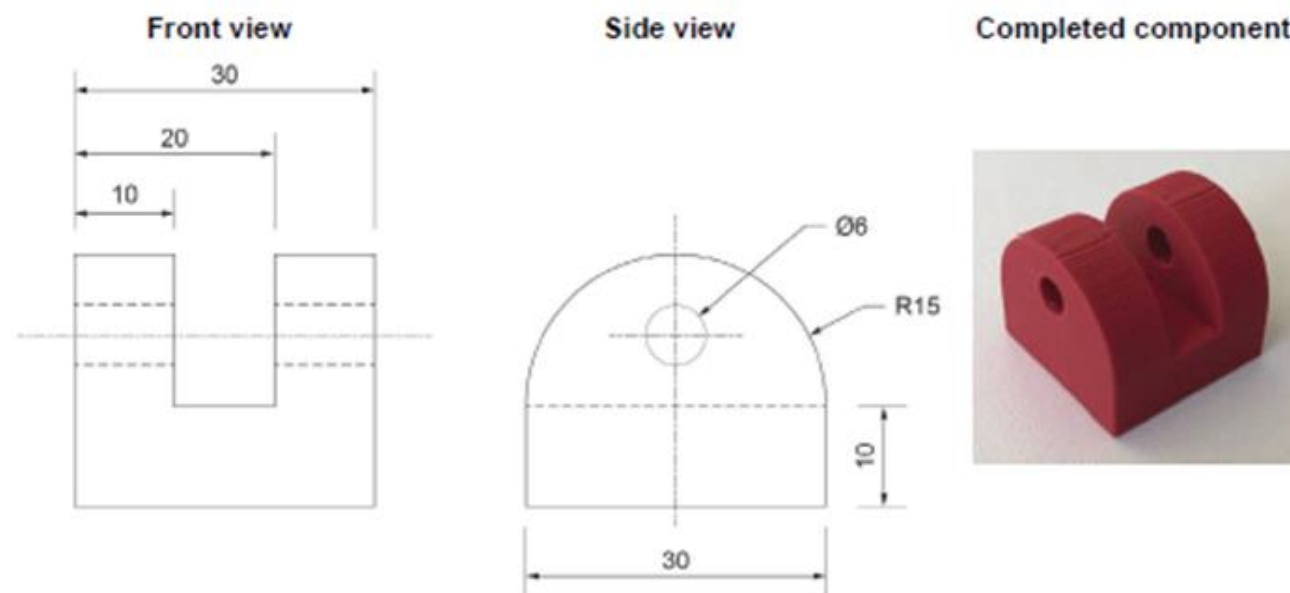
[6 marks]

A LEVEL PRODUCT DESIGN – Examination Question Examples

Paper 1 – Technical Principals

0 8 Figure 4 shows the dimensions of a component to be made using 3D printing.

Figure 4
All dimensions in mm
Not drawn to scale



Material costs		
Material	Printed density (grams per mm ³)	Cost per 500 g
ABS	0.000 448 g	£18

Calculate the material cost of manufacturing 50 units.

Show your working out.

[5 marks]

Mathematics style
question

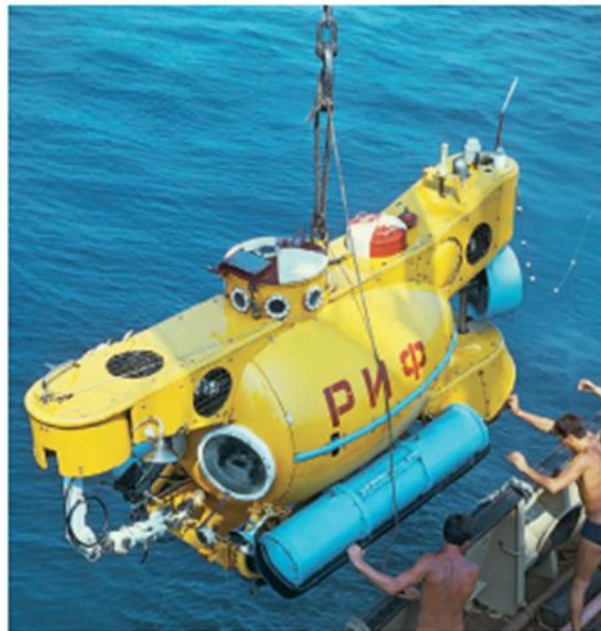
15% of the exam paper will
be made up of maths
questions.

A LEVEL PRODUCT DESIGN - Examination Question Examples

Paper 2 - Designing and making principals

07 Figure 3 shows a submarine.

Figure 3



Explain the specific virtual modelling techniques that may be used to test the design of a submarine before production.

[6 marks]

08 Define the term Total Quality Management (TQM).

[2 marks]

09 For a specific application, give two reasons why a go no-go gauge would be used.

[3 marks]

10 State three characteristics associated with products from the Memphis postmodern design group.

[3 marks]

1

2

3

A LEVEL PRODUCT DESIGN – NEA

This is an opportunity for students to become creative and inventive in developing their personal skills. It enables students to explore and learn new skills or enhance and further develop their pre-learning from GCSE to develop a product.

This is an independently led project where the students design and develop a product for a client of their choice – students will create their own design brief with their client and develop the product to meet the client's needs.

The product will be manufactured from a mix of resistant materials and can incorporate a range of engineering skills, could include electronics and/or motorised mechanisms.

The final product should be made to a shop standard in that it could be potentially sold to a customer.

Throughout the design process students will research and explore a range of different avenues to solve the problem of the brief. This will involve regular intervention meetings with the client to ensure the design of the product meets their needs.

A LEVEL PRODUCT DESIGN – NEA

Pool table primary research/product disassembly



Firstly there is a mechanism in order to open up the table in order to view the slate plate and the pockets, the are in which has been lifted contains the outside edge of the table and also the outline of the pockets and cushions which are attached to the edge. This makes it easier to maintain and assemble which is something that I'm looking to take through to my own product. As you can see going 45° up from the table are the high tensile metal wires which are used to help hold the lid up and open while you are maintaining it. Although this is a good feature I don't believe it would be necessary within my table as it is only for recreational purposes, however it helps me identify other features which are crucial to the pool table.



This is a photo of the ball return area which has been created using a simple sheet of medium density fibre board with a slot cut into it for balls to flow through into it from the middle green section and into a almost box like piece. With the table shut and slate put back on this part of the table then becomes discretely covered while maintaining it functionality.

To the left I took a photo of the intricate gutter system which helps funnel the balls down into the middle section and basically into a box at the centre with each of the 6 pockets doing the same each with their individual hole into said box. This means the balls using their own gravity roll down the gutter into the box, which is on a slight tilt, therefore continuing to roll in one direction down to the previously described box. As you can see the inner workings of the pool table are very basic in a sense and only require the cheap materials such as mdf as they remain covered.



A - The table has a green felt which is traditional and works well with the darker toned wood. It also has metal corner and edging plates with the branded logo upon which helps add to the aesthetic appeal of the table. It is a fairly deep set table which adds to its stocky appeal and allows for a more easily functioning inner working.

C - tables such as this one vary between £500 and £1000 as I found out and this is mainly due to their size and intricacy to construct as they use a variety of materials and processes with obviously the given complexity of the inner workings.

C - these tables would appeal to majority male customer although some women too both of which will have an interest in the sport and appreciate the aesthetic appeal of the table in their homes. Alternatively from a business view a pub or restaurant could have such an item and it would be used more frequently by multiple people.

E - its environmental effect will vary from table to table although this particular table consists mainly of flat sheeted wood which can be easily recycled although also has a lot of mdf and slate which is harder to sometimes re-purpose.

S - this product is measured at roughly 7ft by 3.5ft which luckily is the same size that I intend to make my own table, and it also has a fairly stocky and durable appeal to it which is the kind my client would like to see.

S - safety features surrounding this table include locking mechanisms on the left hand side lock and keep the lid shut tightly so as not to alter the heights of the cushions and pocket rims mid game. It also has smooth rounded corners which I assume are constructed from plywood.

F - as a pool table it functions very well, with that function being maintaining a flat surface throughout the table, returning the balls easily and consistently and finally be able to play the game of pool fairly.

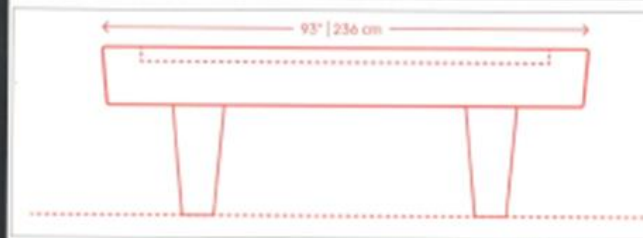
M - materials used in this pool table include a lot of pine, but also mdf some of which has been veneered although majority of the mdf used on the inner of the table and then there's also the plastic guttering used as the ball returned along with the felt used in the felting of the table.

Students identify their brief with their client.

Carry out research relating to the brief gather information to help them develop their design proposals.

Secondary pool research

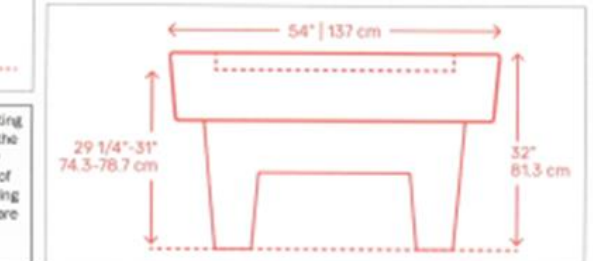
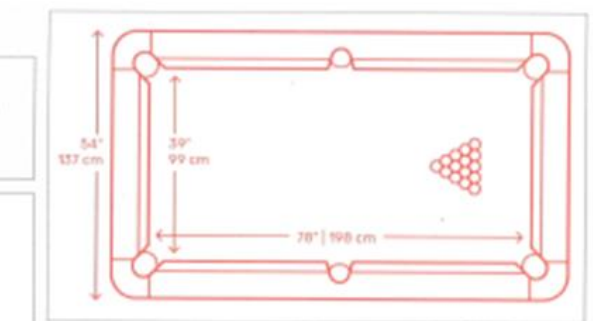
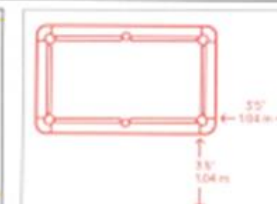
7' Billiards / Pool Tables are sized smaller than professional regulations for private usage in tighter spaces such as bars and small homes. 7' Tables have playing surfaces measuring 78" / 198 cm in length, a width of 39" / 99 cm, and have beds set at 29 1/4" - 31" / 74.3 - 78.7 cm from the floor. A standard 7' Pool Table has an overall size of 93" x 54" / 236 x 137 cm and a height of 32" / 81.3 cm. A clearance space of at least 11'3" x 14'6" / 3.42 x 4.42 m should be provided for a 7' Billiards/Pool Table.



These are generic orthographic images of a 7 ft. pool table, from which I can now begin estimating costs etc. I must also try and find a happy medium between the average pool table height and the average dining table height. Therefore some of these measurements will be changed or slightly altered so as though the table fits my clients preference of a pool/dining table. Other specifics of my table can be played about with although certain things are set in stone for example the playing surface area, the setting of the pockets but also the pool cushions or rails as some say. These are an important factor of the table as it ensures the game works properly and so the balls can rebound off the table correctly.

Pool cushions specifics

Through some in depth research into the dimensions of my 7ft pool table it has become clear that the necessary pool cushioning required will be the u-23 rubber type as the angle created by this cushion is the ideal size for a 7ft table. The fitting of this cushion is difficult although manageable it requires you to fit the rubber u-23 cushion onto the table rails but they each require a different cut depending whether they are centre pocket based or end pocket based to ensure the angle of entry to the pocket is correct. The bumpers vary depending on the size of the table because this is crucial as to how the balls react with each hit.

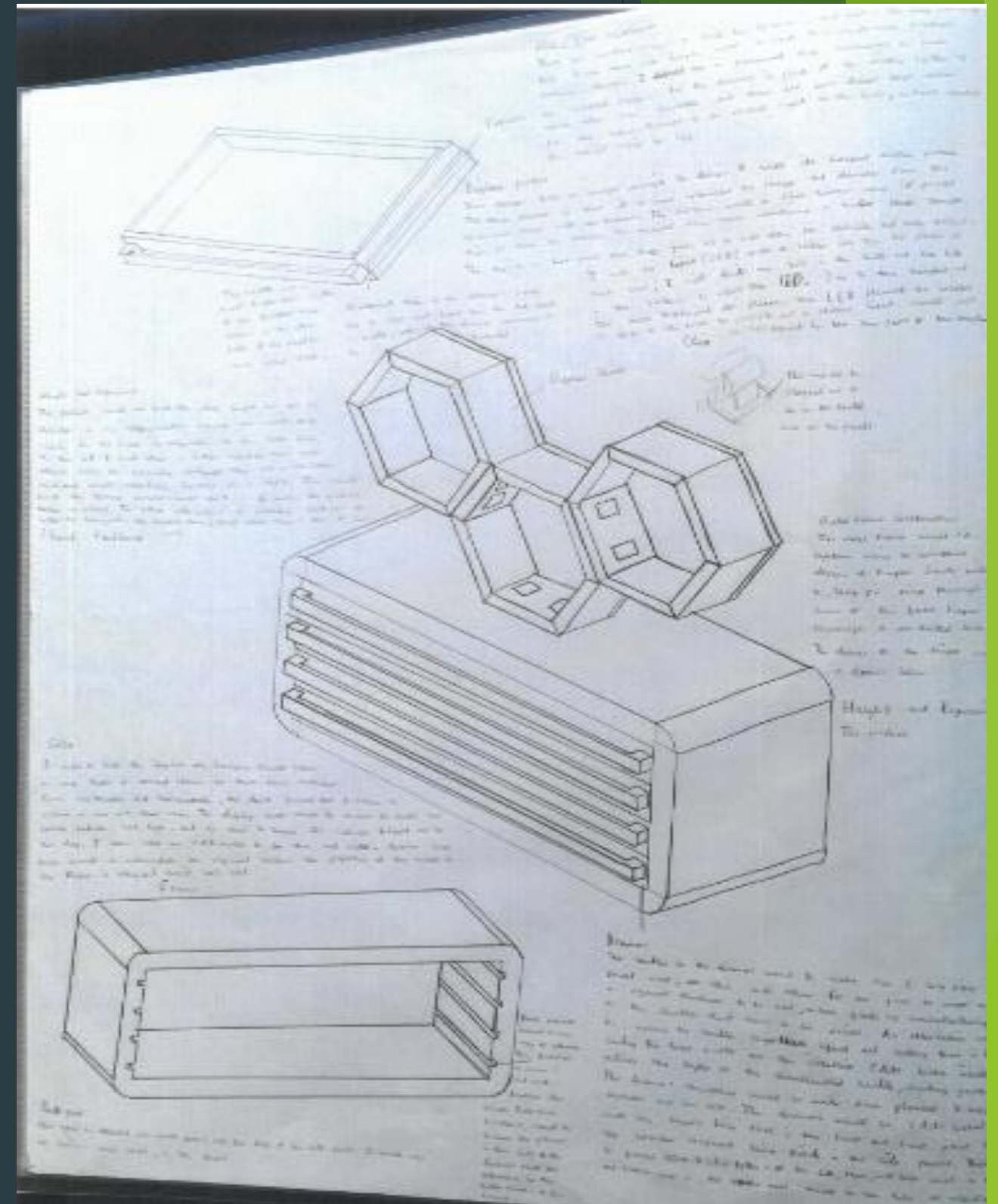
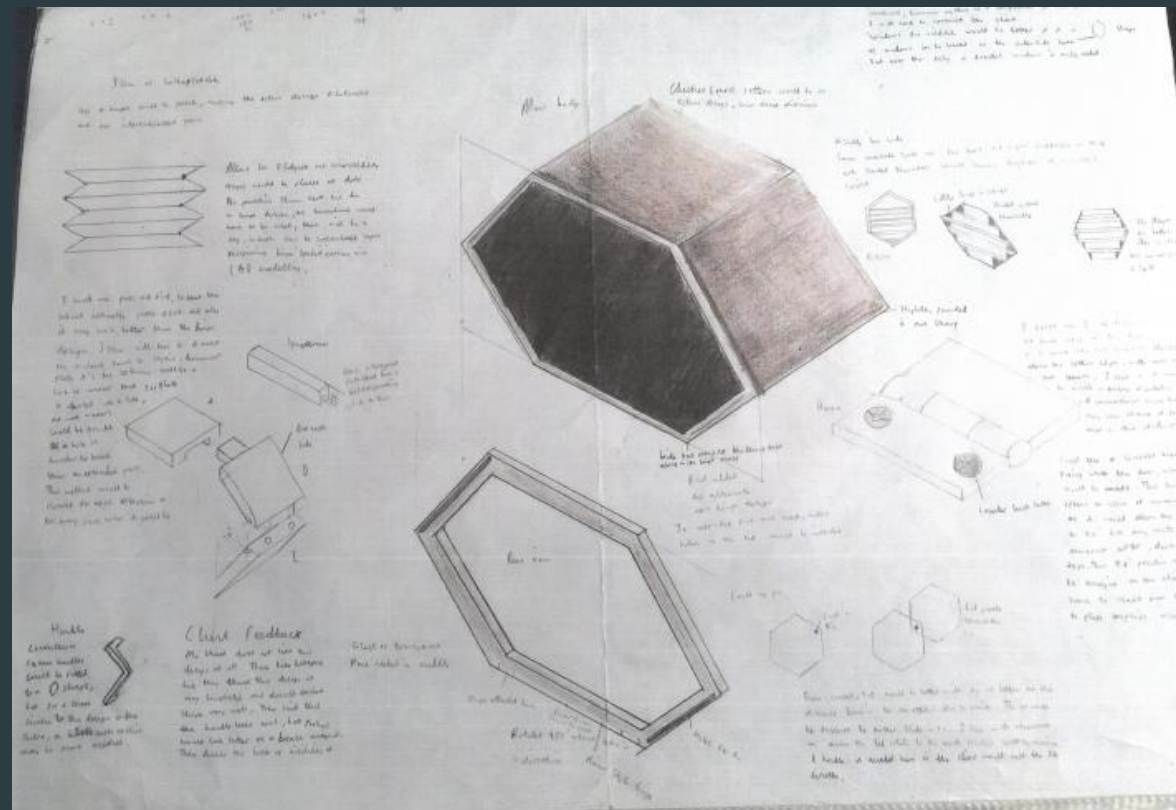


58" Cue: 12'11" x 16'2" | 3.93 x 4.92 m
52" Cue: 11'11" x 15'2" | 3.63 x 4.62 m
48" Cue: 11'3" x 14'6" | 3.43 x 4.42 m

Room size
Room size is an important aspect of building a pool table and in this case when as it's a 7ft pool table and as my client uses a 52" the room size will need to be 3.63m X 4.62m as a minimum in order to ensure there is a suitable loci surrounding the table and make sure the cues do not intrude into the wall.

Research Includes;
Survey of target market groups
Product analysis, disassembly,
research of materials, components.
Research will be interwoven
throughout the designing and
development of the product.

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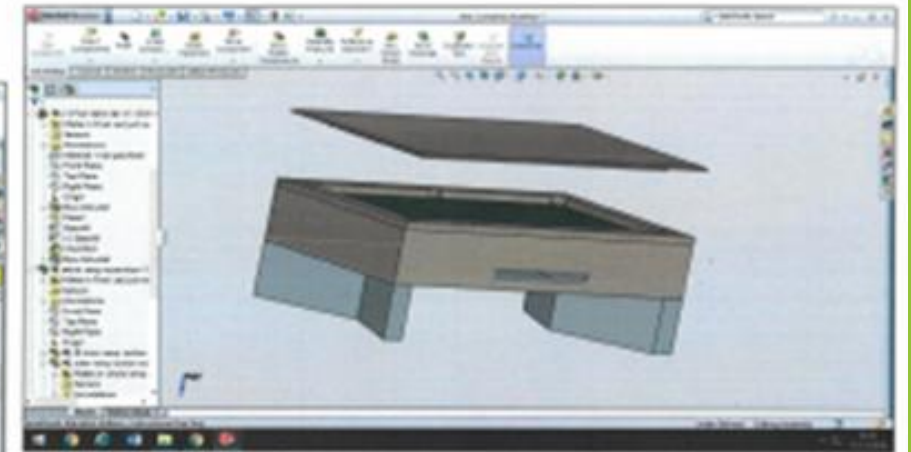
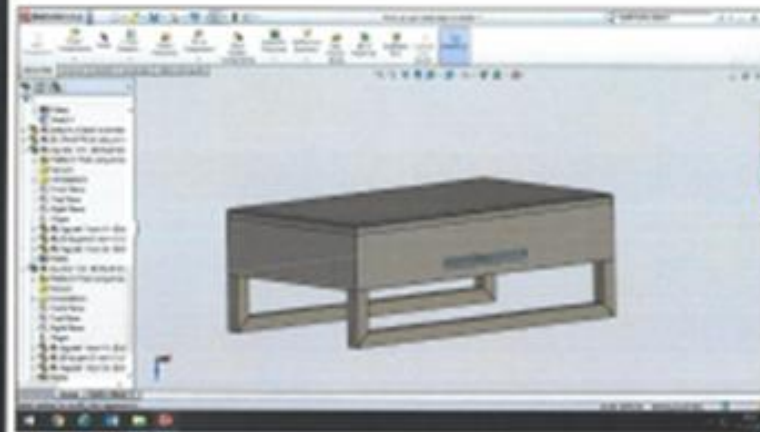


Students will be expected to design and develop their products through hand generated designing. The pages are required to be detailed and busy explaining the design as clearly as possible.

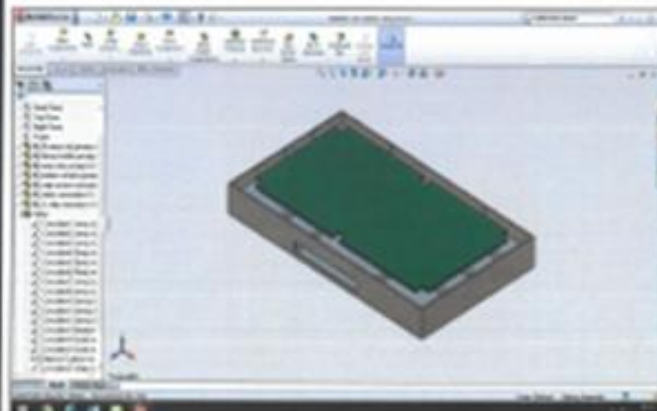
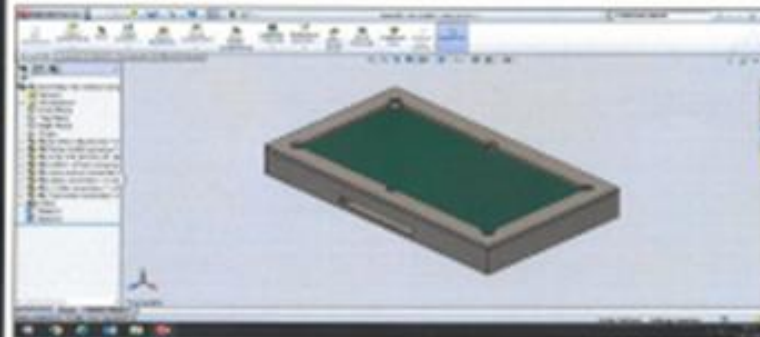
A LEVEL PRODUCT DESIGN – NEA

Students can also develop their designs through the use of CAD either 2D or 3D.

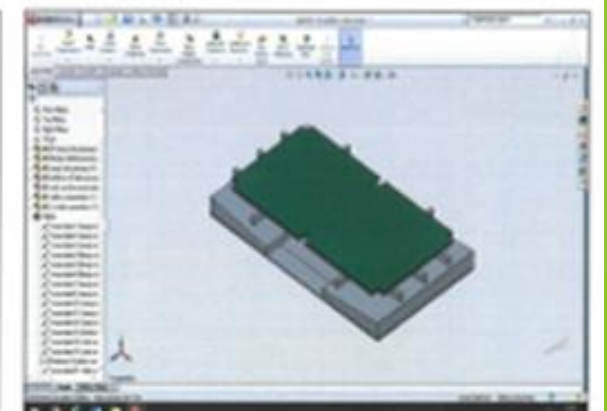
CAD development analysis



Here I began creating assemblies of all my parts to make multiple final designs of the product and understand which kind of proportions worked well and in accordance to pool regulations with respect to its length. This helped me alternate various leg concepts and find the ones which best suit my designs. In the top left I made a leg concept using very box like sections to create a stocky look but also have it flowing through the table. The issues began to arise when it required to be a dining table as well because due to the leg design it was unable to have any chairs underneath the table therefore, I reiterated the CAD designs to alter the legs. This leads me onto the design above where I used two large V shapes to construct the legs either end of the table. The benefit of this was its structural integrity and it meant it freed up the underside of the table allowing for seating to be put in place. Although this table worked very well, I felt as though it was inconclusive in the search for a perfect design because of the sheer size of the leg sections it meant the unit cost would be much greater and the weight, due to these legs would increase dramatically. In order to reduce the weight of the legs and table, I will reiterate the designs for the legs and reduce the material but maintain the structural integrity of the product and its stocky appeal.



To the left and right are iterations of my assembly as I began to build up the table and I brought together the lattice, slate and crate section. By doing this I was also able to break down the manufacturing process into stages and understand the different orders in which I could construct the final product. I also added colouring to the wood to give a polished pine effect using the colour tool to the right of the window. And applying the same effect to the slate section to give it a beized top and give the design a more realistic look for my client to see.



A LEVEL PRODUCT DESIGN – NEA

Students will develop a range of prototypes, where they will explore and test their potential ideas.

Modelling

V legged table:

I have continued modelling various leg sections of my product as I was unsure as to the best option and in doing so I have created this model by which the legs are a V shape and sit at either end of the table. These legs in my opinion help open out the table and allow for room underneath as well as keeping the slim aesthetic of the top section. I think the thickness of the legs adds to the stocky appeal but also as it is in a V shape it means the table has much better strength and sturdiness. Which is ideal given my clients needs

Although functionally the model is correct, I believe in manufacture it would pose difficulties as the size of the timber required to create the legs out of whole pieces is very large which therefore has an implication on the price of my product which ideally, I would have preferred to keep down. To combat this I could make the leg sections out of pieces of wood making box sections for each in order to reduce the amount of wood I need to use therefore reducing costs as well. Unfortunately, this would arise an issue as the structural integrity of the legs would be significantly reduced, but I could do further research into the joints used to fight this.

Ramp modelling:

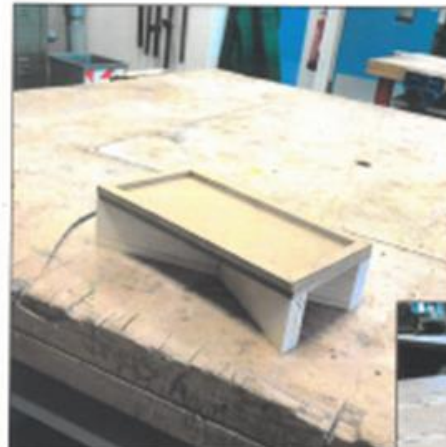
This was a model of a three-point ramp in which the balls can move from each pocket down into the middle section from either side as this then drops to the lower middle section in which the balls can then roll towards the side of the table to the flat ball collection point. The model itself was very easily manufactured and when tested works very well with smooth movement of the ball from the entrance of a pocket all the way through to the collection area. The only issue that arose was the velocity of the balls when they were coming through the system which I believe is a minor fault so in my designs I will be able to lower the angle at which the ramps are placed at in order to slow the flow of the balls down to allow for that rolling noise which is very popular with pool and snooker players.



To the left I modelled another type of legs in which I used a simple top piece and two smaller outcrops of pine and mitred them to either end of the table each at a tilt in order to provide the correct height for the table. In retrospect I believe the table design is in some ways flawed as the legs would not hold up in relation to the realistic size and weighting of the product due to the joints used the mitre would have a higher likelihood of collapsing



Modelling

Crossover leg joint table:

I began the modelling process of this table similar to the rest whereby I have used the thin 6mm sheet of MDF to create a table top section then using the scroll saw made 4 individual bordering pieces to represent the cushions and rails to the top of the pool table. Once cut I sanded at a 45 degree angle using a jig attachment to the belt sander, this ensured the pieces were all correct to the angle and would piece together into a perfect rectangle. This completed the top section to which I then moved onto the legs where I used two pieces of pine each going diagonally across the underside of the table alternatively, I then marked each point onto each other and cut half way down each piece for them to slot together and be attached to the table top. I personally think it's a fairly simple design yet is very effective aesthetically because its neat and hides the 'underneath' of the table.



I believe there is very limited way to improve on this design as its sheer simplicity is its key feature and by tampering with its shaping would lose the flush finish of the corners and geometric appeal. I would however experiment with adding detailing or patterning onto the legs for example routing designs through the legs or simple patterns e.g. Celtic, or Maori designs. Due to its scale the legs are fairly easy to construct and attach whereas in a life size product with length of 7ft the legs would also scale up becoming huge and un viable to source sustainably meaning slimming them down and adding more may be an option as you cannot purchase stock material in such a size. Overall I really like this model as it's effectively put across the idea of simplicity yet maintaining a bulky appearance due to its height which I think is another key factor to this piece as the height works well in the process of pool too.

Flipping table top model:

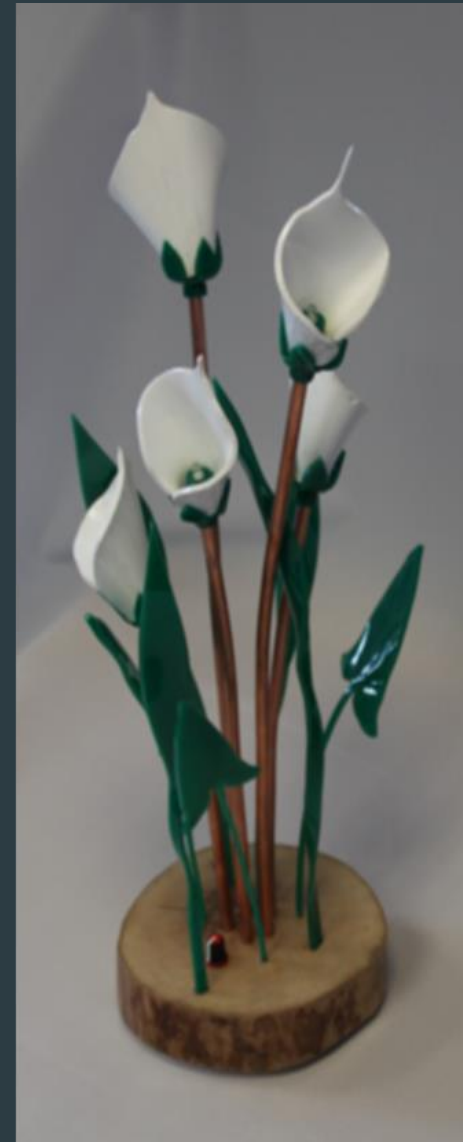
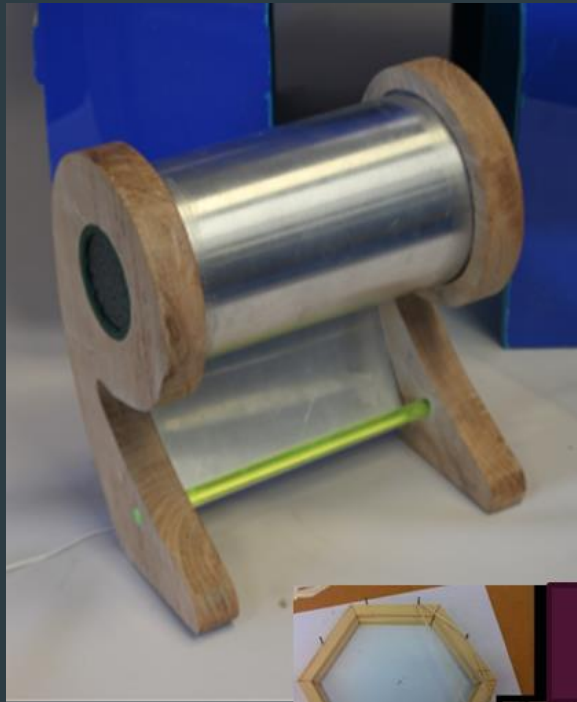
Within this model I took into consideration the idea of a alternating table top in order to best incorporate the different games and concepts. Personally it worked very well although did pose an issue in terms of space as the table only had two variations in which I would be required to fit 4 different table top games and a plain table top to discretely hide said games. As successful as the spinning motion was I had to question the strength in which this would supply the table with in which case I had to discard the idea as my client peter, insisted on a bulky sturdy table in which he could trust its structure. On the other hand this has helped me understand the need for a new idea in order to discretely hide the game tops in which case I will develop further in order to maybe stack or alternate the tops.

The legs I used to create this table were sturdy although with force shook and tilted slightly and I would personally question their ability to uphold the table characteristics of supporting various items including different game boards. As my client has requested a bulky and stocky style to the table I will investigate further ways to lower the table height and potentially thicken the main section in which games and other pieces are contained.



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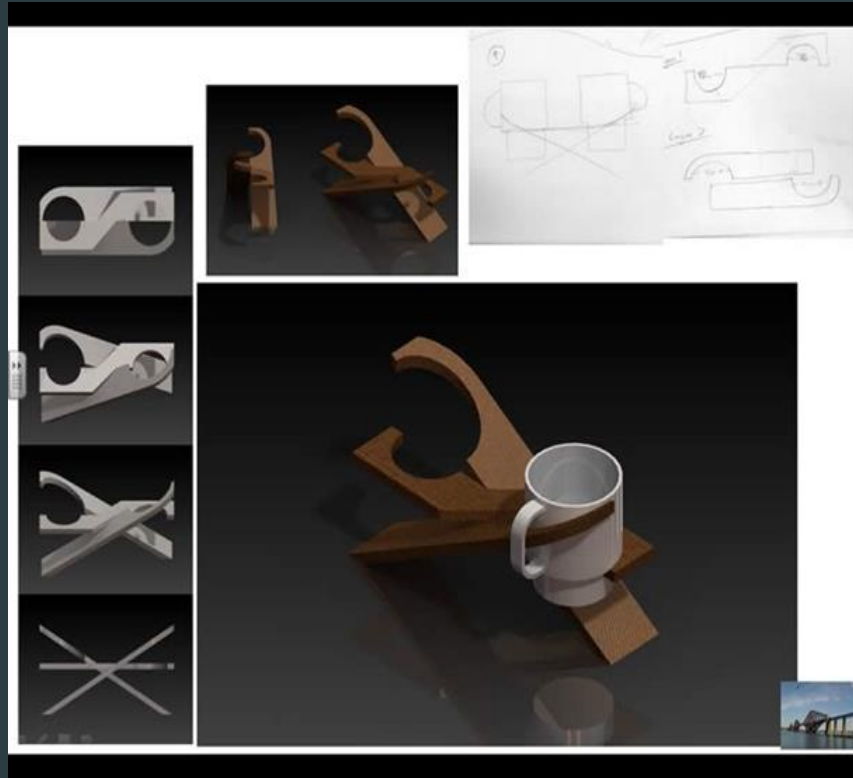
EXAMPLES of Outcomes



Students can make use of a range of combinations of different materials, processes and skills to develop their final product.

A LEVEL PRODUCT DESIGN – NEA

EXAMPLES of Outcomes



Students can make use of a range of combinations of different materials, processes and skills to develop their final product.

Where next?

This course develops many skills and will support students who wish to go onto further education either in design, engineering or non design related subjects.

Furniture Design

Architecture

Sport equipment and Design

Project Management

Town Planning

**Software and Games
Designing**

Automotive Design

Industrial Design

Engineering Design

Landscape Design

Fashion

Etc...Etc...