D&T - Blockheads Year 7 Curriculum

ASPIRE – ENDEAVOUR - SUCCEED

Purpose and aims

Design and technology is an inspiring, rigorous and practical subject. Using creativity and imagination, pupils design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values. They acquire a broad range of subject knowledge and draw on disciplines such as mathematics, science, engineering, computing and art. Pupils learn how to take risks, becoming resourceful, innovative, enterprising and capable citizens. Through the evaluation of past and present design and technology, they develop a critical understanding of its impact on daily life and the wider world. High-quality design and technology education makes an essential contribution to the creativity, culture, wealth and well-being of the nation.

Design and Technology aims to ensure that all pupils; develop the creative, technical and practical expertise needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world; build and apply a repertoire of knowledge, understanding and skills in order to design and make high-quality prototypes and products for a wide range of users; critique, evaluate and test their ideas and products and the work of others.

Threshold concepts

The Design Process

- Analyse - Research purposefully: Using a range of sources showing selectivity and analytical skill.
- Design - Visual Communication: Demonstrate innovation and creativity in response to a client's need/problem, using a range of 2D and 3D techniques.
- Make - Safe working Practice: Select and use tools and equipment safely and accurately in order to manufacture a high-quality prototype that demonstrates a range of skills.
- Evaluate - Critical Reflection: Demonstrate the ability to reflect critically throughout the design process showing an understanding for modification and improvement.
- Technical Knowledge
- Mathematical knowledge
- Impact on Society: Understand developments in Design and Technology, their ecological and social footprint with an awareness of the impact on society.
- ACCEESSFMM

These threshold concepts appear repeatedly throughout the curriculum.

Sequence of learning

In line with the faculty guidance students will begin the project with the design process. This provides consistency and helps student link the wider areas of faculty and hopefully allow them to transfer knowledge between faculty areas more easily. Students will also be tested on Word Power in the first lesson to ascertain their current knowledge and understanding of key terms. Students will then be reminded of ACCEESSFMM and introduced the foci words of ACCEESSFMM for the project so that students now what to expect a deeper insight into during the project.

Students begin by looking at careers with design process links. This provides an insight into different employment opportunities and pathways to them.

Students move onto the main aspects of the material area – timbers, learning about the types of timbers, characteristics of the trees, workable timbers and product examples. Homework is integrated into lessons where word power definitions are introduced. This is explicitly taught, and homework is used to practice revision techniques and retrieval practice. Do Now activities are used throughout to check for understanding and address misconceptions.

The sustainability of resources, FSC and the environmental impact of the use of timbers is taught to ensure students are aware of the impact it has on society and the environment. The LCA of products is covered here, using a product example. From here, cost, economy, labour issues are also touched on to ensure students are aware of the unseen aspects of product design and manufacture, for example, energy use and employment.

Students are introduced to the concept of a design situation and brief to introduce the project and the user needs. ACCEESSFMM is used to analysis the project.

Maths is an integral part of the blockhead project. Prior knowledge is checked through work on area, perimeter, and dimension. (mm, cm) Numeracy is explicit through measuring and marking out of the pine blocks, understanding the orthographic projection, modelling using net developments and work on tolerance and quality towards the end of the project.

Modelling - Net developments, tabs, gluing and accuracy of cutting out basic shapes is taught and demonstrating – leading to a homework task to manufacture a cardboard model of the blockhead.

Error proofing and quality control are introduced through past project examples where errors are identified and suggestions to avoid errors are highlighted. Again this is linked to mathematical knowledge, accurate marking out and checking work. Measure twice, cut once!

Practical aspects of marking out timbers are intermittently taught after basic maths is covered, to ensure students can apply subject knowledge and demonstrate procedural knowledge accurately. Within this, the names of basic tools are introduced as well as demonstrations of their correct use.

The introduction to the workshop proceeds any practical tasks in this room. Students identify hazards and risks in A11 and are taught procedures based on general workshop use, basic tools and the machinery. (Pillar drill and belt sander) Students are tested on their knowledge of safety, tools and equipment through a SMHW quiz. They are also observed on each machine to ensure competence and build independence.

Students complete the practical element of the project intermittently between knowledge-based lessons. In some cases, explicitly linked with the practical task. I.e. understanding an orthographic projection and project measurements comes before the man section of marking out parts of the timber. They are then given the opportunity to evaluate the quality of their work through go/no go gauges and peer evaluation.

An end of unit assessment comprises of a written test and a M/C quiz.
Students are assessed during practical lessons on the quality of work as well as safe practices.

Subject knowledge

Subject knowledge Students should know that….	Procedural Knowledge Students should know how to…
Design is a process that is cyclical/iterative Careers/Employment in the industry are explicitly linked to all or some aspects of the design process. Different careers focus on key areas of the design process. Rotation 1: Architects Rotation 2: Head designer at BMW Rotation 3: Independent fashion designer Rotation 4: Engineers	
The order of the design process	
What the acronym ACCEESSFMM stands for. A – Aesthetics - The appearance of a product C – Cost - The money paid to cover materials, equipment, labour, buildings, and services so a product can be manufactured	Apply the terminology in several aspects of the design process i.e. product analysis. Describe products in relation to these words/definitions.

C – Customer - A single person or a target market group that a product or service is aimed at. **E – Environment - The positive or negative impact a product may have on the environment. Including the materials and energy used for manufacturing.** E – Ergonomics - the process of designing or arranging workplaces, products, and systems so that they fit the people who use them. Body measurement data is used. (Anthropometrics) **S – Safety - How safe a product is to manufacture and use** **S – Size - The physical dimension and measurement of a product and how appropriate it is for the user.** F – Function - What a product does and how it works M – Manufacture - Techniques and processes used to manufacture/make a product. **M – Materials - A resource used to manufacture a product.**	
M – Materials - A resource used to manufacture a product. What is timber? Origins – trees Timber is often referred to as wood Timber is sourced from trees. There are 3 types of timber: • Softwood – coniferous • Hardwood – deciduous • Manufactured boards Softwood has needles, takes 25-30 years to mature. Can have waxy leaves. Wider grain – less dense Hardwoods loose leaves, takes 100yrs approx. to mature – closer grain, denser. Manufactured boards are mainly made from waste or recycled wood, with the use of resin. The process of making timber available and ready to use for manufacturing. • Felling – cutting down trees • Seasoning – drying out, reducing moisture levels. • Stock forms = different sizes, shapes and conditions a material is available in.	Identify different types of wood/timber, based on their features. I.e leaves/needles and grain. Identify the materials used to make manufactured boards. Describe the process from felling to the start of production for a product.
E – Environment - The positive or negative impact a product may have on the environment. Including the materials and energy used for manufacturing. What 'Life cycle' means How this relates to a physical product. (Toy car) The stages of the life cycle. What sustainability is in D&T context – The level to which resources(timber) can be used without them becoming unavailable in the future. FSC = Forest Stewardship Council What they do and how they manage forests.	

C – Cost - The money paid to cover materials, equipment, labour, buildings and services so a product can be manufactured The price of a product is worked out based on the cost of different things a manufacturer has to consider and pay for. **Profit = money made after all costs have been paid.** **The economy is the way money is made, organised and used by a society.** Successful designs can have a positive impact on the economy. Successful companies = new factories, new jobs, money spent by paid workers in local economy. The more profit a company makes the more tax they pay. This funds public services, like healthcare. Materials can be bought in bulk and therefore cheaper.	How to cost up their project based on sizes bought and sizes used. (Maths in D&T) Identify and company/product successfully manufactured in the UK that benefits the economy.
Context / Problem & Analysis Context = general situations where there are problems – that need solutions. Blockhead context - - The BSI (British Standards Institute) are concerned about the quality of cheap toys available to young children. Toys must meet the safety and quality assurance standards for customers. Some toys bought online from other countries do not meet these British safety standards. Analysis is carried out to try and understand different aspects of a problem or product. ACCEESSFMM can help define this analysis.	Carry out an analysis of the context/product they are manufacturing, using ACCEESSFMM terminology. Independently carry out a product analysis, breaking down the product using ACCEESSFMM questions. <u>Assessment</u>
Design Briefs are used to provide a summary of the design opportunity. It should outline the context, problem, client needs and any constraints.	Write a design brief based on the context given.
Dimensions and size are used in similar contexts in D&T. **Dimension = a measurable part of a particular kind, such as length, breadth, depth, or height. Sometimes referred to as size.** **S – Size - The physical dimension and measurement of a product and how appropriate it is for the user.** Size also accounts for the 'appropriateness' of a product in relation to ergonomics. Why does a mobile fit easily in our hand? Rulers come in different types. Steel Rules are used in D&T for measuring dimension and size. In D&T we measure in mm because it is the most accurate. 10mm = 1cm and so on…. We are working to a 2mm +/- tolerance. Upper and lower limit. Tolerance is the required accuracy of measurement needed.	How to identify units of measurements and how to convert them. Label dimensions correctly on a steel rule. How to work out a +/- tolerance from a given measurement.

Quality Control – checks ensure products are manufactured to a high standard. These are carried out during manufacture. This includes checking the sizes/dimensions. If parts are not accurate, or within a specific tolerance they may not fit together properly. Samples will be taken from production and tests will be carried out. I.e. weight, measurements, hole sizes, printing quality. Go/No go limit gauges are used to check whether a size or part is within tolerance.	Identify errors with practical work Suggest improvements and methods to carry them out. Suggest error proofing ideas, how errors acan be avoided. How to use a no go/go limit gauge for blockhead.
Orthographic drawings/projection are used to show a 3D object in 2D, by drawing its front, plan(top) and side view. Third angle projection is used more commonly in UK. Plan view laid out above front view. Tolerances should be displayed on these drawings to show and upper and lower limit. 2D and 3D shapes are different – both with a purposeful use at different stages in D&T. Other manufacturing methods – 3D printing. How an orthographic project may be used to create a 3D CAD image.	Identify correct parts and dimensions on a given orthographic projection. Draw an orthographic image of the blockhead. Add dimension lines Recognise the difference between 2D and 3D shapes.
Modelling Modelling is used to show clients how products may look in real life and to error proof any issues that may occur. This eliminates mistakes in final manufacture which may cost money and time. Modelling materials can vary depending on what is made and have varying properties. Cardboard – ridged, easy to cut and fold. Can have finishes applied.	Homework – Make a cardboard cube from a net development. Extension – Make all the body parts for the blockhead and join with dowel/string.
Isometric drawing	Draw simple 3D shapes in isometric. I.e cubes. Draw a variety of different sized cubes to form the body parts of the blockhead.
Health and Safety. Risk v Hazard v Harm. Hazard = something that can cause you harm Harm = The physical injury caused. Risk = the likelihood of the hazard causing harm.	Practice safe working conditions in all practical lessons.
Tools and equipment Tools and equipment have specific functions and may be used a variety of different materials.	Complete the following practical tasks safely and efficiently: Sawing Drilling Filing

Each tool should be handled, carried and used correctly to be effective and efficient. The function of each tool is: Try Square - Steel Rule - Bench hook - Tenon saw - Triangular file - Hand drill - Sandpaper - Sanding block - Pillar drill - Belt sander -	Marking out, measuring and checking for accuracy/squareness. Sanding Assembling Testing Gluing
Measuring and marking out needs to be accurate and should always be done with the correct tools/equipment. Sharp pencil, try square and steel rule. Marking out should always be checked three times for accuracy. Before sawing/sanding/filing is carried out.	
Evaluating finished products is a key part of the design process. Feedback can be gained from clients/users and other designers. Evaluation and feedback is used to further improve product developments in the future and drive consumer markets.	

Curriculum links to careers

Unit: All – Lesson completed at beginning of each term/rotation.

Rotation 1 career: Architect
Rotation 2 career: Head of Design at BMW.
Rotation 3 career: Fashion Designer
Rotation 4 career: Engineers

Links: How careers across the industry link with the design process. Looking at the daily roles of specific people/careers and how their job is reliant on the iterative design process, an integral part of each project students' study in the rotation of D&T, textiles and food.

LCA – Jobs linked through the lifecycle of the material used – tree feller, production machinist, timber merchants, CAD designers, product testers, delivery drivers, advertising and marketing jobs, packaging designers etc.

Key Info document.

<table>
<tr><td>The Design Process</td><td>Context and Analysis
Modelling
Brief
Manufacturing – other possibilities – 3D Printing
Evaluation/testing (at end of product)</td></tr>
<tr><td>Word Power</td><td>
<table>
<tr><th>Word Power</th><th>Definition</th></tr>
<tr><td>Softwood</td><td>Wood from trees that keep their leaves or needles all year round. Sometimes called ‘Evergreen’.</td></tr>
<tr><td>Hardwood</td><td>Wood from trees that shed their leaves in winter. Usually slower growing and more expensive.</td></tr>
<tr><td>Sustainability</td><td>The level to which resources can be used without becoming unavailable in the future.</td></tr>
<tr><td>Dimensions</td><td>a measurable part of a particular kind, such as length, breadth, depth, or height. Sometimes referred to as size.</td></tr>
<tr><td>Orthographic Projection</td><td>A 2D drawing, showing a 3D product from its front, plan and side views.</td></tr>
<tr><td>Economy</td><td>How money is made, organized and used in society</td></tr>
<tr><td>Profit</td><td>The money made after all the costs have been paid.</td></tr>
<tr><td>Quality</td><td>The degree to which a product satisfies a specified set of attributes or requirements.</td></tr>
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</td></tr>
<tr><td>ACCEESSFMM</td><td>Cost
Environmental impact
Size
Manufacture
Materials
Safety</td></tr>
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