

Curriculum Intent

'The expert at anything was once a beginner.' Helen Hayes

Design and Technology is an inspiring, rigorous and practical subject. Using creativity and imagination, students design and make products that solve real and relevant problems. The students are taught to combine their designing and making skills with knowledge and understanding in order to solve problems given to them. They learn to use traditional techniques, equipment and processes alongside current technologies such as laser cutting and 3D printing. They learn to think creatively and are encouraged to evaluate the impact of designing and making on the environment around them. Design and Technology allows students to apply knowledge and skills learned in other subjects, particularly Mathematics, Science and Art within their work. Skills learnt in this subject area help develop the creative, technical and practical expertise needed to perform everyday tasks confidently and it helps them to participate successfully in an increasingly technological world and for future careers as designers of products that are innovative and as engineers to help develop industry by incorporating new emerging technologies.

Design and Technology

In Design and Technology students will combine practical and technological skills with creative thinking to design and make products and systems that meet human needs. Students learn to use current technologies and consider the impact of future technological developments. They learn to think creatively and intervene to improve the quality of life, solving problems as individuals and members of a team.

Throughout KS3 students will undertake a range of focused practical tasks and extended units of work to develop a wide range of skills and techniques. This is underpinned with theory of the subject area and relevant topics covered are explained below. This interleaving of skills and knowledge throughout each year group, ensures that they are consistently revisited and built upon, leading to improved knowledge and a stronger mastery of the skills required.

When designing and making, students are taught to:

Design

- To use research and exploration to identify and understand user needs
- To identify and solve their own design problems and understand how to reformulate problems given to them
- To develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations. This area of work is used as part of the extending writing focus. (Big Write)
- To use a variety of approaches to generate creative ideas and avoid stereotypical responses
- To develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools such as 2D design software and Logicator.

Make

- To select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture.
- To select from and use a wider, more complex range of materials and components, taking into account their properties

Evaluate

- To analyse the work of past and present professionals and others to develop and broaden their understanding. This to include peer review of work.
- To investigate new and emerging technologies such as smart materials.
- To test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups. This is also part of extended writing tasks.
- To understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists. This to include pollution and waste materials and its impact on the planet e.g. plastic waste

Technical knowledge

- To understand and use the properties of materials and the performance of structural elements to achieve functioning solutions
- To understand how more advanced mechanical systems used in their products enable changes in movement and force
- To understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]
- To apply computing and use electronics to embed intelligence in products that respond to inputs and control outputs using programmable components. E.g. programming simulation software and PIC downloads.

Sequence of Learning KS3 Design and Technology

The year groups are split into two and groups change at February half-term with the D and T cohort from the first half of the year moving to Food and vice-versa. The sequence outlined below is repeated for the new half of each year.

Year 7

Term 1a (2b for group change)

In year 7 students will understand and apply principles for designing and making products. They will start the year looking at constructing products using cardboard for their first design project. This unit is covered in the first stage of the rotation to introduce design skills, different types of drawing; including isometric and the importance of design and colour. The design artist Ben Eine is inspiration for their designs. Attachment techniques are investigated and demonstrated in the construction of their own cardboard letter.

Term 1b and 2a (3a and 3b for group change)

The children's block bot toy is the project where the workshop and tools are being introduced. Students will develop an awareness of the key principles of Hazard, Risk and Control Measures. Students will develop skills using mainly hand tools and as well as developing understand of more complex machines such as the pillar drill. These year 7 projects have a design focus and a practical focus to establish a good grounding of technical skills. These are then recapped and developed further in years 8 and 9 to promote mastery of the skills. Students will also make an initial study of material groups to give them background knowledge of the types of materials that can be used and where they come from. Again, this will be developed through the key stage.

This unit will recall skills, knowledge and understanding from previous work. Student will showcase their learning and record evidence both on paper and through practical making. This will help them get a better understanding of the bigger picture of the whole design and make process.



All units of work will also be evaluated by individual students as well as by peers. Students complete a knowledge test every half term and a KAT. They also complete a full hour examination test based on the work covered in the two units for the year before moving on to Food or vice-versa.

Year 8

Term 1a and 1b (2b and 3a for group change)

Students in year 8 start the year with an extended design and make task of a trainer point of sale. This unit develops on the design skills from year 7 and broadens students' knowledge and understanding of D and T by focusing on the use of new technologies (computer aided design and computer aided manufacture via use of laser cutting). Use of design and looking at other people's work is used for inspiration. This unit is taught at the beginning of year 8 as the technical nature of the design package needs the groundwork of work done in year 7 to underpin its teaching e.g., basic sketching and design strategies, such as 'addition and adapt'. The project encourages the students to consider a broader target audience than previously done by 'designing for others'. Students also develop on year 7 designing and graphics skills in the build up to making by use of computer aided design software. Students develop skills and techniques of use of ICT using CAD software (2D sketch up). This is taught after students become more competent at sketching on paper and this helps them develop on their initial designs created. This module of work gives students a good background of how designers work in industry, making use of new technology to design and manufacture products i.e., CAD/CAM (computer aided design/computer aided manufacture). Students will develop an understanding of the key concepts related to making when using the laser cutter. They will peer assess work after the final assembly.

Term 2a (3b for group change)

The students then go on to study a focused practical task unit based on mechanisms. This final project will help students develop a wider range of skills relating to mechanisms and the design and production of a pop-up card. Annotation and adaptation of the final design relating to ACCESSFM and the original specification takes place at this point. The work covered in year 8 leads on to more complex skills and techniques in year 9 and this underpins the teaching of them.

Year 9

Term 1a and 1b (2b and 3a for group change)

During year 9 students will develop a wide range of skills and knowledge through an extended project that involves a variety of techniques.

The 'flat packed light box project' is where students will develop a more in-depth understanding of a range of finishing techniques. This builds on work covered in year 7 and 8 and helps mastery of this area of work. The key concept of the project is to produce a different side of a flat packed cube using a different technique. The techniques used are weaving, tinsmithing and CAD with the use of the laser cutter to produce a Mackintosh inspired lid. The next side focusses on the 6Rs and the use of recycled plastic by layering to produce a pattern and finally an own choice side.

Term 2a (3b for group change)

The light that will be placed inside the light box is a light circuit board and requires the students to develop their soldering skills. They will then build on previous workshop skills to drill the base of the light box and attached the USB. Peer assessment and evaluation of the project.

Assessment Opportunities

Each unit will begin by ascertaining the students' prior knowledge and any connected knowledge held in their long-term memory. Any misconceptions that arise throughout the unit are identified and addressed appropriately. Students continue to recall their knowledge throughout a unit to ensure an alteration in long term memory.

An end of topic assessment takes place in the form of a KAT (usually a test), further recalls take place approximately six weeks and then twelve weeks later to ensure that the knowledge is embedded in the students' long-term memory.

An integral part of D and T is fostering the students' ability to develop practical skills by making products. These products are photographed and are used as part of their evaluation of work. Feedback is also given verbally to students to support them to progress within and across lessons.

By end of KS3 students will have gained

Progression has been built into the SOL to enable students to acquire, develop and secure knowledge and skills over the three years.

Throughout KS3 students will:

- be able to design and make a range of products using a wide range of tools, equipment and CAM machines e.g. laser cutter.
- be able to design using hand drawing techniques as well as using CAD packages 2D sketch up
- be able to recognise different material groups and their properties.
- be able to recognise a wide range of tools and equipment and use them safely
- be aware of new technologies and materials including the impact that these have on the environment.
- be able to reflect on their work and the work of others and the impact that designs have on society and the planet.

How the curriculum will address gaps in students' knowledge and skills.

- Differentiation in class activities
- Regular testing/ questioning by in class practice exam questions/ topic questions/ formal testing etc.
- Targeting gaps – whole class gaps and individual students by lesson planning, after school intervention, parental contact, etc.
- Knowledge retrieval and low-stakes testing.

Year 10 GCSE Design & Technology

GCSE Design and Technology will prepare students to participate confidently and successfully in an increasingly technological world. Students will gain awareness and learn from wider influences on Design and Technology including historical, social, cultural, environmental, and economic factors. Students will get the opportunity to work creatively when designing and making and apply technical and practical expertise.

The GCSE allows students to study core technical and designing and making principles, including a broad range of design processes, materials techniques, and equipment. They will also have the opportunity to study specialist technical principles in greater depth.

Design and develop prototypes in response to client wants and needs. Note the term prototype can be used to describe either a product or system.



How the development of prototypes:

- satisfy the requirements of the brief
- respond to client wants and needs
- demonstrate innovation
- are functional
- consider aesthetics
- are potentially marketable.

Students should know and understand how to evaluate prototypes and be able to:

- reflect critically, responding to feedback when evaluating their own prototypes
- suggest modifications to improve them through inception and manufacture
- assess if prototypes are fit for purpose.

Term 1a

To begin the GCSE, students develop skills to produce a portfolio based on street furniture, specifically benches. The portfolio will build up to include all the elements of the design process from existing users, target markets and user needs to research, ergonomics and anthropometrics which leads to sketches for their initial designs. Construction of the benches is initially in cardboard to learn prototyping techniques.

Term 1b

Students use their bench evaluations to address a specific user need and develop their next ideas using 2D sketch up for CAD. They will focus on iterative design whilst considering the properties on materials that would/could be used in the real world. Knowing the properties of timber and timber stock forms and possible distortion techniques is utilised here. Students learn about surface techniques, manufactured boards and the properties of polymers in industry.

Term 2a and 2b

The properties of metals; an understanding of how metals are manufactured and casting and joining is covered in depth within this half term. Learning about automation and the work of IKEA with their extensive use of flat packed items is utilised when the students must design and make their own lamp in the lamp project. They are given a set of criteria to fulfil. Different types of fastenings are explored and how parts are measured to include tessellation and nesting of shapes to reduce waste. Use of electric tools versus traditional hand tools in the production of the light and the benefits of using both.

Term 3a and 3b

Energy and resources with the impact on the planet are all explored in detail in this half term. Students will learn how energy is generated and stored. Which material is the best to use for different purposes and how that material is accessed/produced with the effect on the environment and how that links to ecological and social footprints. This will then lead to the impact some products have on the environment. Understanding of safe working conditions and legislation needed to protect workers. The year ends with the introduction of the NEA task that is set each year by AQA.