

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 whilst taking into account the improving local economy and labour market.

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 such as Dyson and IKEA 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 Health and Safety in the workshops which leads in to two small skills projects. This unit is covered in the first stage of year to ensure all students are aware of the dangers and safety requirements within the workshop setting. They will develop an awareness of the key principles of Hazard, Risk and Control Measures. The two focused practical tasks are a keyring and Pastry/Cookie Cutter. Students will develop skills using mainly hand tools and as well as developing understand of more complex machines such as the pillar drill and vacuum former. This is taught first to give students a good foundation of skills to build on and to encourage enthusiasm for the subject making it practically based as much as possible. These first projects being practical in focus have limited designing 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.

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

Students will then develop more design and research skills through the next project using a wider range of skills and techniques that are more in-depth and complex such as internet research and using text books. This is taught at this stage to encourage students to develop creativity and design skills such as sketching, more extensive research and analysis. These will be utilised throughout the rest of the key stage; especially for a longer extended project in year 8. Students will develop an understanding of the key concepts related to the acronym "AccessFm" and will enable detailed specifications to be created using these key words about design requirements. This is introduced here to encourage students to set criteria for products to be designed and evaluated against. This is an important part of the design process and gives students a good awareness of how designers work in industry such as the work of IKEA and especially what skills and knowledge is essential for a career in design. The final project for the year is an extended design and make task of a Point of Sales display. This incorporates lots of the skills learnt through the year with the addition of electronics. Students will learn about simple circuits and components and their uses as well as soldering components together to create a working outcome. 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 will then 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 (2b for group change)

Students in year 8 start the year with an extended design and make task of a CAD designed USB Case. This unit develops on the design skills from year 7 and broadens students' knowledge and understanding of D and T by focusing on use of new technologies (computer aided design and computer aided manufacture via use of laser cutting). Understanding how designers work and the skills and knowledge required, e.g. attention to detail, working to a timeframe and solving real world problems is built on in this unit. 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 develop a wider range of research and analysis skills and techniques through the project by extensive use of internet research and use of questionnaires. This helps them to focus their specification in more depth and detail and is part of the 'big write'. 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 Design). 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 such as Dyson; making use of new technology to design and manufacture products i.e. CAD/CAM (computer aided design/ computer aided manufacture)

Term 2b (3b for group change)

The students then go on to study a focused practical task unit based on a Desk Tidy which is mainly a making task to set requirements. This final project will help students develop a wider range of skills using hand tools and machines in the workshop, and recalls on work covered in year 7, such as files, saws and the pillar drill to help mastery of these skills. The project helps students develop an understanding of how jigs and templates are used to help accuracy in manufacturing and that of batch production of an item. 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 (2b for group change)

During year 9 students will develop a wide range of skills and knowledge through short and extended projects.

The first project is a Bike Safety light where students will develop a more in-depth understanding of circuit diagrams and electronic components. This builds on work covered in year 7 and helps mastery of this area of work. The key concepts of systems approach is covered in this unit and students are encouraged to develop use of Inputs, Processes and Outputs in the circuits and future designs created. The unit involves use of circuit simulation software to test and model circuit designs. Students will then develop on soldering techniques from year 7 by soldering of components onto a PCB rather than on copper track. This technique is very similar to how products are made in industry. This work is quite technical in nature and is taught here as skills should be fully developed over the key stage.

Term 1b (3a for group change)

The next unit is a natural progression on from PCB soldering and it links well with the teaching about PICs (Programmable Integrated Circuits). The second unit of work develops student's awareness of computer control and programming, including PICs. The work involves programming solutions using software simulation to set criteria e.g. log flume and automated car park barriers. This can be a demanding and technical unit and is left toward the end of the key stage for this reason. It will also give students insight to the work of engineers on robotics such as the Mars Rover and the knowledge required by engineers within other curriculum areas like mathematics and physics. Having this awareness of careers can help students to aspire to a wide range of careers. The topic also includes how PICs can be programmed from a computer and how they control input and output devices and components. The unit develops on ICT skills previous covered and broadens the range of software students can use.

Term 2a (3b for group change)

The last unit of work in year 9 will develop student's skills in the workshop using a range of more complex tools and equipment. It also encourages students to recall those used in year 7 and 8. The Wooden Robot project will challenge students to be accurate and work to set tolerance levels. It will make wider use of marking out tools, jigs and machines such as the disc sander. Students will be encouraged to be more independent in their work, and work in teams to organise the making of the robot. This unit gives students a good insight into the joinery unit that is covered in Year 10 Construction course.

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 in order 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 in order 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 in order 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.

Students will have a greater understanding of careers within design where students make use of skills such as crating through working from a brief and specification and the STEM sector which includes links to science and mathematics, by studying and having an interest in these subjects students can aspire to a variety of different careers within engineering where the sky is the limit.

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 e.g. Techsoft 2d design
- 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.