Design and Technology

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

"*You have an abundance of workers: stonecutters, masons, carpenters, and all kinds of craft persons without number, skilled in working gold, silver, bronze, and iron. Arise and work! The Lord be with you!"* - Chronicles 22:15-16

Intent statement

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.

Research the curriculum is based on

The Design and Technology (D&T) curriculum is informed by a variety of research areas that collectively aim to provide students with a robust, relevant, and forward-thinking educational experience. Constructivist Learning Theory emphasizes learning through doing and the importance of active engagement in constructing knowledge. Project-Based Learning (PBL): Research supports that PBL enhances student motivation and improves problem-solving and critical thinking skills. The Double Diamond Design Process which has been developed by the Design Council, this model emphasizes the importance of divergent and convergent thinking in the design process. Digital Literacy emphasizes the need for students to be proficient in using digital tools and understanding the impact of technology on society. Design and technology association (DATA)

Powerful knowledge

In GCSE Design and Technology, powerful knowledge encompasses key concepts, skills, and understandings that students need to master to excel in the subject. This knowledge not only helps students develop practical skills but also fosters critical thinking, creativity, and problem-solving abilities. Here are the key areas of powerful knowledge required by students:

- **Design Thinking**: Understanding the iterative process of designing, including stages such as research, ideation, prototyping, testing, and evaluation.
- **Human-Centered Design**: Knowledge of designing products that meet the needs, wants, and limitations of end-users.
- **Aesthetics and Functionality**: Balancing visual appeal with practical usability in product design.
- **Material Science**: Understanding the properties, advantages, and limitations of different materials (e.g., metals, polymers, ceramics, composites, and smart materials).
- **Sustainability**: Knowledge of sustainable materials and practices, including recycling, upcycling, and selecting environmentally friendly materials.
- **Traditional and Modern Manufacturing**: Proficiency in a range of manufacturing techniques, from traditional hand tools to modern digital fabrication methods (e.g., 3D printing, CNC machining).
- **Quality Control**: Understanding the importance of precision, accuracy, and quality control in manufacturing processes.
- **Technical Drawing Skills**: Ability to produce accurate technical drawings and sketches, including orthographic projections, exploded views, and assembly drawings.
- **CAD (Computer-Aided Design)**: Proficiency in using CAD software to create detailed and precise digital models of designs.
- **Mechanisms and Mechanical Systems**: Understanding basic mechanical principles such as levers, gears, pulleys, and linkages, and their applications in product design.

- **Electronics and Control Systems**: Knowledge of basic electronic components (e.g., resistors, capacitors, transistors) and systems (e.g., microcontrollers, sensors) used in designing functional products.
- **Creative Problem Solving**: Skills in generating innovative solutions to design challenges through brainstorming, lateral thinking, and prototyping.
- **Trend Analysis**: Understanding current and emerging trends in design and technology, and how they influence product development.
- **Lifecycle Analysis**: Knowledge of the environmental impact of products throughout their lifecycle, from raw material extraction to disposal.
- **Eco-Design Principles**: Implementing design strategies that reduce environmental impact, such as energy-efficient manufacturing, minimizing waste, and designing for disassembly.
- **Human Factors**: Understanding the principles of ergonomics and anthropometrics to design products that are comfortable, safe, and efficient for users.
- **User Testing and Feedback**: Skills in conducting user tests and gathering feedback to refine and improve product designs.
- **Planning and Time Management**: Ability to plan and manage design projects, including setting goals, creating timelines, and meeting deadlines.
- **Collaboration and Communication**: Skills in working effectively within a team, communicating ideas clearly, and collaborating with others.
- **Ethical Design**: Understanding the ethical implications of design choices, including issues of accessibility, inclusivity, and social responsibility.
- **Global and Cultural Awareness**: Knowledge of how cultural differences and global contexts influence design preferences and practices.
- **Product Analysis**: Ability to critically analyse existing products, understanding their strengths and weaknesses, and drawing insights for new designs.
- **Reflective Practice**: Skills in evaluating one's own work, reflecting on successes and areas for improvement, and learning from feedback.
- **Intellectual Property**: Understanding the importance of protecting design ideas through patents, trademarks, and copyrights.
- **Market Research and Feasibility**: Skills in conducting market research to understand consumer needs and assess the feasibility of design ideas in terms of cost and market potential.
- By mastering these areas of powerful knowledge, students in GCSE Design and Technology will be well-equipped to tackle complex design challenges, create innovative and functional products, and make informed decisions about materials, processes, and the broader impact of their designs. This comprehensive understanding prepares students for further education and careers in design, engineering, architecture, and related fields.

KS3 Curriculum Rationale and Sequencing

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.
- 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

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

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 textbooks. 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 of 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.

Key Stage 4 Rationale and Sequencing

Examination Rational

AQA is one of the largest and most well-respected exam boards in the UK, known for its rigorous and fair assessment processes. AQA provides extensive resources for both teachers and students, including detailed specifications, past papers, mark schemes, and examiner reports. These resources help in preparing students effectively. AQA offers professional development opportunities, training sessions, and a robust support network for teachers. This includes online communities and access to subject advisors who can assist with any curriculum-related queries. The specifications provided by AQA are clear and detailed, outlining exactly what is required for each component of the course. This clarity helps teachers plan their lessons effectively and ensures that students know what to expect. AQA's assessment structure for Design and Technology is well-balanced, combining both practical and theoretical elements. This allows students to showcase their skills in a variety of ways, catering to different strengths and learning styles.

Year 10

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. The subject content has been split into three sections as follows: Core technical principles, specialist technical principles and designing/making principles.
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.

Year 11

GCSE Design and Technology specification sets out the knowledge, understanding and skills required to undertake the iterative design process of exploring, creating and evaluating. It is delivered through the practical application of this knowledge and understanding.

Students must know and understand the impact of new and emerging technologies on contemporary and potential future scenarios in relation to the following areas: Industry, Enterprise, Sustainability, People, Culture, Society, Environment, Production techniques and systems, how critical evaluation of new and emerging technologies informs design decisions. Additionally, developments in new materials including an awareness of modern materials, smart materials, composite materials and technical textiles.

Furthermore, energy generation and storage including fossil fuels, nuclear power, renewable energy, energy storage systems including batteries. Consideration of a systems approach to designing where students should consider electronic systems including programmable components to provide functionality to products and processes and enhance and customise their operation.

Term 1a

Students develop skills to produce their portfolio based on their chosen design brief from the examination board. 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 final outcome is developed through prototyping. Preparation for mock examination 1.

Term 1b

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Assessment in Design and Technology

Assessment Rationale

The assessment rationale in Design and Technology (D&T) focuses on evaluating students' practical skills, creativity, problem-solving abilities, and theoretical understanding of design and technology concepts. The assessments in Design and Technology within St Cuthbert's will help students understand their strengths and areas where they need to develop further, encourage creativity and innovation by fostering an environment where students feel encouraged to experiment and innovate. This will prepare them for future learning by laying the groundwork for more advanced study in design and technology at KS4 and beyond. This further promotes lifelong skills by developing practical skills, problem-solving abilities, and a creative mindset that students can use throughout their lives.

KS3

Assessments will include key assessed tasks with some having a focus on different types of designing. Reviews of learning at the beginning of each lesson. Low stakes testing in knowledge tests. Peer assessment of work. Live feedback within practical lessons.

KS4

Assessments will include key assessed tasks with some having a focus on different types of designing. Reviews of learning at the beginning of each lesson. Low stakes testing in knowledge tests. Peer assessment of work. Live feedback within practical lessons. Examination questions.

Assessment Strategies in Design and Technology

Live feedback, questioning, reviews of learning, self-assessment, peer assessment, low stakes testing, summative assessment: Key Assessed Tasks

Multicultural and Diversity statement

Our Design and Technology curriculum is built on the foundation of **inclusion, equity, and diversity**, ensuring that all students—regardless of background, ability, culture, or identity—feel recognised, respected, and empowered to succeed. We believe that design is for everyone, and through creative, hands-on learning, students develop the skills, confidence, and awareness to shape a more inclusive and sustainable future.

We are committed to **representing and valuing all students** through a curriculum that draws on a diverse range of designers, inventors, materials, and global design traditions. Students explore the contributions of individuals from different ethnic, cultural, gender, and socio-economic backgrounds, past and present. We challenge stereotypes in design and engineering, promoting equality of opportunity and ensuring that all learners see themselves reflected in the subject.

Design and Technology also plays a key role in developing **global citizenship and intercultural understanding**. Students investigate how products are designed and made in different parts of the world, considering the environmental, ethical, and social impacts of design decisions. They learn to respond to real-world challenges—such as climate change, resource scarcity, and inclusive design—with empathy, creativity, and responsibility. In doing so, they gain not only technical skills but also a deep appreciation of the interconnected world we live in.

Through this approach, our Design and Technology curriculum fosters **respect, collaboration, and innovation**, enabling all students to engage as active, informed, and compassionate citizens. It is a curriculum where diversity is celebrated, every voice matters, and the designers of tomorrow are shaped by the values of inclusion, justice, and global awareness.

Cultural Capital

Study of iconic inventions: Exploring the history of inventions such as the wheel, the printing press, and the light bulb helps students understand the impact of design and technology on society.

Famous buildings and structures: Analysing architectural marvels like the Eiffel Tower, the Great Wall of China, and modern skyscrapers introduces students to different design styles and construction techniques.

Biographies and contributions: Learning about influential figures such as Leonardo da Vinci, Isambard Kingdom Brunel, and Steve Jobs can inspire students and highlight the diverse paths within the field of design and technology.

Global craftsmanship: Studying traditional crafts such as Japanese origami, Indian textile design, and Scandinavian furniture making can broaden students' understanding of global design practices.

Environmental impact: Exploring sustainable design principles and practices, such as renewable energy sources, recycling, and eco-friendly materials, teaches students about the importance of sustainability in modern design.

Technological advancements: Comparing how different cultures have approached technological challenges and innovations helps students appreciate the diversity and creativity in technological development worldwide.

Influence of art on design: Studying how art movements like Bauhaus, Art Deco, and Pop Art have influenced product design, architecture, and fashion can enhance students' aesthetic sensibilities.

Global cuisines: Exploring the culinary traditions and food technologies from various cultures can enrich students' understanding of food preparation, nutrition, and the cultural significance of food.

Ethics and social responsibility: Discussing ethical issues such as fair trade, labour practices, and the social impact of technology encourages students to consider the broader implications of their design choices.

Catholic Social Teachings

Research used and questionnaires generated to identify cultural opinions on proposed design ideas – key stage 4. Fostering teamwork through group/team design tasks – tasks linked to participation and human dignity. Impacts and risk of modern technology discussed. Recyclable material involved in research tasks, sustainability discussed when designing and making products – all key stages. Costings of products analysed, profit against wages discussed. Design tasks can focus on peace, symbols and the development of the existing to fit pupils' expression of peace. How technology can help the grassroots. What are the needs, and what are the risks?