

Intent

The GCSE Design and Technology course has been designed to prepare students to work confidently and successfully in an increasingly technological world. Students gain awareness and learn from wider influences in 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 throughout the 7 years.

The D&T key stage 3 curriculum at Swindon Academy supports the National Curriculum for Design and Technology by ensuring all students:

- develop the creative, technical and practical expertise needed to perform everyday tasks confidently and to participate 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.

Due to the broad range of content of the new DT specification, several theory lessons and quizzing are done in KS4 to embed the residual knowledge needed.

The scheme has been designed to inspire and challenge all students throughout the key stages. There are a number of skills that are developed from KS3 up to KS5 that require students to build on existing knowledge. Students are given an opportunity to attend extra-curricular sessions where they can catch up with course work. As a DT Department, we also offer lunch time sessions for those that wish to catch up with their GCSE coursework.

There is a significant amount of primary and secondary research that students need to conduct which involves reading the work of others. Students must demonstrate mathematical and scientific knowledge and understanding, in relation to design and technology. At least 15% of the exam will assess maths and at least 10% will assess science. This is covered in theory lessons and practiced during manufacturing lessons through dimensions and tolerances.

The ethos of the school is to nurture and build the students to be able to succeed. Creating a culture to change the mindset of the community and not just the individual. Inspiring the students to further broaden their knowledge through sixth form or apprenticeships is an import part of the DT mindset.

Changes in fashion and trends in relation to new and emergent technologies requires students to be mindful of British values. They must show mutual respect when listening and consider the ideas and opinions of others, even if they differ from your own. Respecting people of different faiths and beliefs.

Due to the nature of the KS3 rotations there is a focus on revisiting key workshop rules and techniques to ensure students' knowledge is refreshed.

Implementation – Rosenshine principles of instruction

Daily Review	New Material in Small Steps	Ask Questions	Provide Models	Guide Student Practice	Check Student Understanding	Obtain High Success Rate	Scaffolds for Difficult Tasks	Independent Practice	Weekly and Monthly Review
<p>Daily review is an important component of instruction. It helps strengthen the connections of the material learned. Automatic recall frees working memory for problem solving and creativity.</p>	<p>Our working memory is small, only handling a few bits of information at once. Avoid its overload—present new material in small steps and proceed only when first steps are mastered.</p>	<p>The most successful teachers spend more than half the class time lecturing, demonstrating and asking questions. Questions allow the teacher to determine how well the material is learned.</p>	<p>Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud, help to clarify the specific steps involved.</p>	<p>Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term memory. More successful teachers build in more time for this.</p>	<p>Less successful teachers merely ask "Are there any questions?" no questions are taken to mean no problems. False. By contrast, more successful teachers check on all students.</p>	<p>A success rate of around 80% has been found to be optimal, showing students are learning and also being challenged. Better teachers taught in small steps followed by practice.</p>	<p>Scaffolds are temporary supports to assist learning. They can include modelling, teacher thinking aloud, cue cards and checklists. Scaffolds are part of cognitive apprenticeship.</p>	<p>Independent practice produces "overlearning" - a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.</p>	<p>The effort involved in recalling recently-learned material embeds it in long-term memory. And the more this happens, the easier it is to connect new material to such prior knowledge.</p>
<ul style="list-style-type: none"> • United Quizzing to help with exam questioning • Lesson plenaries mid-way and end of lesson recap • Questioning in class to review learning • Recapping previous knowledge through questioning 	<ul style="list-style-type: none"> • Each new skill is taught through small steps • Teacher demonstration with questioning • Practical aspect of lesson is done in small steps so skills can be evaluated before moving on 	<ul style="list-style-type: none"> • Targeted questioning to gain a feel of how the class • Clear and concise explanations of new techniques, skills and processes • Thorough questioning to check understanding at every stage of the lesson/ series of lessons • Getting students to recap steps through questioning and repetition 	<ul style="list-style-type: none"> • Exemplar work is shown from previous students High, middle and low examples shown to give students a range of work to see and set the high expectation. • Teacher demonstrations during practical work of the skills required to create a product. • Student led demonstrations in lessons to show progress and model how to master certain skills. 	<ul style="list-style-type: none"> • Through structured questioning to build on student knowledge. • Chunking activities and ensuring that appropriate time is spent on theory and practical work. • Revisiting theory work using starters and quizzing. 	<ul style="list-style-type: none"> • Use of appropriate questioning to check student understanding throughout theory and practical tasks. • Mid lesson plenaries to be used to check student understanding. 	<ul style="list-style-type: none"> • Students must master certain practical tasks before they can move onto the next. This giving them a higher quality finished product. • Always aiming for the higher mark and in GCSE and A level work. 	<ul style="list-style-type: none"> • Exemplar work to be used to help students aim high in achieving those difficult tasks. • Differentiated worksheets and prep work to help students achieve those difficult tasks. 	<ul style="list-style-type: none"> • Expectation is set that students are to work independently where possible in theory tasks. And self-assess this work where appropriate. • Practical work should be completed by one individual and quality checked by that individual therefore promoting independent practice in practical work. 	<ul style="list-style-type: none"> • QLA used to check progress on individual groups. • Quizzing in lessons. • End of term exams.

Term	1	2	3	4	5	6	6	
Year 7	PROJECT: Moving wooden toy – R1 Students will learn about a variety of different tools and equipment that can be found in the DT workshop. Students will be taught about health and safety and they will learn how to work safely around others. Students will learn about the different material that can be used and how they can be integrated together. <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Design specifications • Research into different materials • Introduction into different equipment • Introduction to different machines that can be used • How to evaluate your work and think about modifications 		PROJECT: Moving wooden toy – R2 Students will learn about a variety of different tools and equipment that can be found in the DT workshop. Students will be taught about health and safety and they will learn how to work safely around others. Students will learn about the different material that can be used and how they can be integrated together. <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Design specifications • Research into different materials • Introduction into different equipment • Introduction to different machines that can be used • How to evaluate your work and think about modifications 		PROJECT: Moving wooden toy – R3 Students will learn about a variety of different tools and equipment that can be found in the DT workshop. Students will be taught about health and safety and they will learn how to work safely around others. Students will learn about the different material that can be used and how they can be integrated together. <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Design specifications • Research into different materials • Introduction into different equipment • Introduction to different machines that can be used • How to evaluate your work and think about modifications 		Assessment 2	Review and reteach
Vocabulary instruction	Identify, evaluate, compare, improve, annotate, research, analyse.		Identify, evaluate, compare, improve, annotate, research, analyse.		Identify, evaluate, compare, improve, annotate, research, analyse.			

Term	1	2	3	4	5	6	6	
Year 8	PROJECT: Art Deco clock R1 Students will learn about the work of others and how a design movement can inspire their design. Drawing techniques will also be investigated and used to show their ideas. Students will be taught about modelling and how ideas can be brought to life. Students will also learn about the different <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Drawing techniques • Recap on workshop techniques • Introduction to different machines that can be used to create their clock • 6R's and sustainability • CAD 		PROJECT: Art Deco clock R2 Students will learn about the work of others and how a design movement can inspire their design. Drawing techniques will also be investigated and used to show their ideas. Students will be taught about modelling and how ideas can be brought to life. Students will also learn about the different <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Drawing techniques • Recap on workshop techniques • Introduction to different machines that can be used to create their clock • 6R's and sustainability • CAD 		PROJECT: Art Deco clock R3 Students will learn about the work of others and how a design movement can inspire their design. Drawing techniques will also be investigated and used to show their ideas. Students will be taught about modelling and how ideas can be brought to life. Students will also learn about the different <ul style="list-style-type: none"> • Health and safety in the workshop • Design brief and mood boards • Task analysis • Drawing techniques • Recap on workshop techniques • Introduction to different machines that can be used to create their clock • 6R's and sustainability • CAD 		Assessment 2	Review and reteach
Vocabulary instruction	Work of others, research, modelling, sustainability, CAD, evaluation.		Work of others, research, modelling, sustainability, CAD, evaluation.		Work of others, research, modelling, sustainability, CAD, evaluation.			

Term	1	2	3	4	5	6			
Year 9	Set 6 R1 Students will recap workshop safety and the importance of risk assessment before being introduced to frame project. They will look at design briefs and task analysis before creating then a frame made from various wood joints. Wood joints theory would be looking at different joint and advantages and disadvantages for the use of each one. Once the frame is created students will then be able to draw their product on Solidworks. Projects that will be completed and assessed by outcome are: <ul style="list-style-type: none"> Wooden Joint Frame project – skills covered include – workshop tools, machinery and specialised hand tools 		Set 6 R2 Students will recap workshop safety and the importance of risk assessment before being introduced to frame project. They will look at design briefs and task analysis before creating then a frame made from various wood joints. Wood joints theory would be looking at different joint and advantages and disadvantages for the use of each one. Once the frame is created students will then be able to draw their product on Solidworks. Projects that will be completed and assessed by outcome are: <ul style="list-style-type: none"> Wooden Joint Frame project – skills covered include – workshop tools, machinery and specialised hand tools 		Set 6 Students will recap workshop safety and the importance of risk assessment before being introduced to frame project. They will look at design briefs and task analysis before creating then a frame made from various wood joints. Wood joints theory would be looking at different joint and advantages and disadvantages for the use of each one. Once the frame is created students will then be able to draw their product on Solidworks. Projects that will be completed and assessed by outcome are: <ul style="list-style-type: none"> Wooden Joint Frame project – skills covered include – workshop tools, machinery and specialised hand tools 		Assessment 1	Assessment 2	Review and reteach
	Mainstream – R1 Students will look at orthographic drawing and using different techniques to show their ideas. Theory lessons will consist of manufactured boards and how they differ from traditional natural timber. Students will look at different manufacturing techniques to manufacture their product. Students will be reintroduced to Solidworks and they will be drawing their product in CAD Projects that will be completed and assessed by outcome include: <ul style="list-style-type: none"> Design movement box based on work of others – skills covered include – workshop tools, machinery and finishes. Accuracy in manufacture becomes more relevant with the inclusion of smaller tolerances for error. 		Mainstream – R2 Students will look at orthographic drawing and using different techniques to show their ideas. Theory lessons will consist of manufactured boards and how they differ from traditional natural timber. Students will look at different manufacturing techniques to manufacture their product. Students will be reintroduced to Solidworks and they will be drawing their product in CAD Projects that will be completed and assessed by outcome include: <ul style="list-style-type: none"> Design movement box based on work of others – skills covered include – workshop tools, machinery and finishes. Accuracy in manufacture becomes more relevant with the inclusion of smaller tolerances for error. 		Mainstream – R3 Students will look at orthographic drawing and using different techniques to show their ideas. Theory lessons will consist of manufactured boards and how they differ from traditional natural timber. Students will look at different manufacturing techniques to manufacture their product. Students will be reintroduced to Solidworks and they will be drawing their product in CAD Projects that will be completed and assessed by outcome include: <ul style="list-style-type: none"> Design movement box based on work of others – skills covered include – workshop tools, machinery and finishes. Accuracy in manufacture becomes more relevant with the inclusion of smaller tolerances for error. 				
Vocabulary instruction	Wood joints, design movement, CAD, finish, tolerance, accuracy, 3D modelling.		Wood joints, design movement, CAD, finish, tolerance, accuracy, 3D modelling.		Wood joints, design movement, CAD, finish, tolerance, accuracy, 3D modelling.				

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Year 10	<ul style="list-style-type: none"> Advanced workshop safety CAD/CAM lamp project Introduction to electronics Soldering skills Advanced CAD skills Manufacturing skills with use of hand tools and CAM machines. 	<ul style="list-style-type: none"> Metal work project Introduction to ferrous and non-ferrous metals Phone holder project. Identifying a client Combining two or more materials Use of polymers 	<ul style="list-style-type: none"> NEA practice – iterative design NEA project based on previous NEA tasks to give an introduction into their final project and prepare them for the final year. NEA design process to be covered. Primary and secondary research Design skills – isometric, one and two-point perspective, exploded. Modelling skills 	<ul style="list-style-type: none"> NEA practice NEA project based on previous NEA tasks to give an introduction into their final project and prepare them for the final year. NEA design process to be covered. CAD skills Prototyping Evaluation skills 	<ul style="list-style-type: none"> Small scaled manufacture. Evaluation techniques Introduction to NEA once design tasks have been released on 1/7/21 Students will undertake a single 'design and make' activity, which will arise from investigating one of three Contextual Challenges set by AQA.	<ul style="list-style-type: none"> Primary research – Product Analysis, questionnaire Secondary research - Design based on work of others Design specification Initial design ideas Development work Modelling and testing Model development Evaluation to improve outcomes Materials investigation and selection with justification 	Assessment 1	Assessment 2	Review and reteach
	Vocabulary instruction	CAM, soldering, metal, manufactured board, tolerance, client.		CAM, soldering, metal, manufactured board, tolerance, client.		CAM, soldering, metal, manufactured board, tolerance, client.			

Term	1	2	3	4	5
Year 11	<ul style="list-style-type: none"> CAD Modelling/ orthographic drawings Manufacture including CAM Evaluation of modelling from peer feedback Full size card model manufacture and evaluation Prep covers materials and their properties. The main categories are papers and boards, timbers, polymers, metals and textiles 	<ul style="list-style-type: none"> CAD Modelling/ orthographic drawings Further research e.g. standard components Manufacture including CAM – laser cutter, CNC Router or 3D printer Theory lesson and prep covers energy, smart, modern and composite materials, systems and mechanisms. 	<ul style="list-style-type: none"> Flow diagram to show investigative thinking Testing of the product e.g. durability, stability and suitability Manufacturing diary with detailed annotation of different steps 	<ul style="list-style-type: none"> Evaluation plus 3rd party feedback Manufacture developments based on feedback Evaluation against spec and summary Modifications 	Revision and past paper practice to embed knowledge and apply skills
Vocabulary instruction	Iterative design, specification, modelling, design techniques, modifications, third party evaluation.	Iterative design, specification, modelling, design techniques, modifications, third party evaluation.	Iterative design, specification, modelling, design techniques, modifications, third party evaluation.		

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Year 12	<ul style="list-style-type: none"> An introductory project of a composite material project Looking at technical principles such as material properties Plastic processes e.g. vacuum forming, line bending and other molding techniques 	<ul style="list-style-type: none"> Year 12 will sit a mock exam based on GCSE/A-level content to get a baseline of where the student's knowledge is at Students complete a mock NEA based on last year's contextual challenges 2/3 lessons a week. Health and safety at work act 1974 Safe working practices 	<ul style="list-style-type: none"> Theory lesson and prep covers core designing and making principals e.g. Design methods, processes, critical analysis and evaluation Iterative design process in detail Research investigation methods Ergonomics and anthropometric data theory Responsible design Theory lesson and prep covers core technical principals e.g. Materials and their properties and design communication 	<ul style="list-style-type: none"> Accuracy in design manufacture – how to use a range of measuring and marking out equipment Introduction to A level NEA substantial design and make task. Produce a final prototype based on a context student have developed. Identifying and investigating design possibilities Produce a design brief and specification Identify client/end user 	<ul style="list-style-type: none"> Development of design proposals Development of design prototypes Build prototype using a range of materials, tools and equipment e.g. CAM equipment such as 3D printers, laser cutters, router, milling machine, lathes and vinyl cutters 	<ul style="list-style-type: none"> Continue with building prototype using a range of materials, tools and equipment e.g. CAM equipment such as 3D printers, laser cutters, router, milling machine, lathes and vinyl cutters Analysing and evaluating – involve client and target user Testing prototype Suggest improvements 	Review and reteach
Vocabulary instruction	Composite, plastic processes, contextual design, H&S act, ergonomics, anthropometric data.		Critical analysis, research, investigation, material properties, responsible design, iterative design, design and making principals.		Design possibilities, design development, prototypes, 3D printing, CAM, testing.		

Term	1	2	3	4	5
Year 13	<ul style="list-style-type: none"> NEA prototype evaluation continued Client feedback – obtain expert opinion by getting feedback on final piece – specific product forum for their design 	<ul style="list-style-type: none"> Further modifications – In response to feedback from third party user and consumer views Review final project before submitting 	<ul style="list-style-type: none"> Further introduction into the A level paper – technical principles Multiple choice questions Focus on mathematics-based questions Focus on science-based questions Identify command words – Look at the key word before answering the question 	<ul style="list-style-type: none"> Further introduction into the A level paper 2 – designing and making principles Section A – Product Analysis Section B – Commercial manufacture 	Revision and past paper practice to embed knowledge and apply skills
Vocabulary instruction	Prototype evaluation, client feedback, third part evaluation, modifications, consumer views, review.		Technical principles revision, cross curricular, multiple choice, designing and making principles, product analysis, commercial manufacture.		

Impact

The curriculum of Product Design enables students to access parts of the academy that they would not access anywhere else. It builds on vital life skills that they may not learn anywhere else. It gives them an insight into industry and skills that they will carry on into apprenticeships and higher education. We complete repetition in each key stage which imbeds this knowledge for students and builds in difficulty as each year comes.

Product design is a popular choice at both GCSE and A level.

At key stage 3 all groups of students tend to make even progress by the end of the year.