

Design and Technology Department Intent Plan (Draft)

The Joseph Whitaker Design and Technology Department aims for its students:

- Inspire and develop pupil's imagination to design and make products/prototypes that draw on a repertoire of knowledge, understanding and skills in orders to solve real and relevant problems within a variety of different contexts and users.
- To develop a sound understanding of materials and processes.
- Enable pupils to understand the needs, wants and values of different users and taking this into consideration when designing and making products/prototypes.
- Apply a broad range of knowledge and skills learn in other subject areas such as mathematics, science, engineering, computing and art.
- Develop an understanding of the world around us through the evaluation of past and present design and technology, including the impact this has on our daily lives.
- Prepare students to take risks, become resourceful and innovative through the development of creative, technical and practical skills needed to perform everyday tasks and become capable citizens. (Problem solving/ Time management/ Team work/ Meeting deadlines)
- Pupils must be able to critique, evaluate and test their ideas and products and the work of others to inform design decisions.
- To enable students to develop their cultural capital through self-reflection, independence, creativity, learning to design for others and having an awareness of local connections.

	Designing: Understanding contexts, users and purposes. Generating, developing, modelling and communicating ideas.	Making: Planning. Practical skills and Techniques.	Evaluating: Own ideas and products, existing products, key events and individuals.	Technical Knowledge: Being able to make products and work.
National Curriculum Links	<ul style="list-style-type: none"> • Work confidently within a range of relevant domestic, local and industrial contexts: (Home, health, leisure, culture, engineering, manufacturing, constructions, food, energy, agriculture and fashion. • Use research and exploration, such as the study of different cultures, to identify and understand user needs • Identify and solve their own design problems and understand how to reformulate problems given to them • Develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations • Use a variety of approaches [for example, biomimicry and user-centred design] to generate creative ideas and avoid stereotypical responses • Develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations 	<ul style="list-style-type: none"> • Select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture • Select from and use a wider, more complex range of materials, components and ingredients, considering their properties. 	<ul style="list-style-type: none"> • Analyse the work of past and present professionals and others to develop and broaden their understanding • Investigate new and emerging technologies • Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups • Understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists 	<ul style="list-style-type: none"> • Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions • Understand how more advanced mechanical systems used in their products enable changes in movement and force • 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] • Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors] and control outputs [for example, actuators] using programmable components [for example, microcontrollers]

Links to GCSE	<p>AO1 - Identify, investigate and outline design possibilities.</p> <p>AO2 - Design prototypes that are fit for purpose.</p> <p>3.3.1 Investigation, primary and secondary data; being able to write a design brief and design/manufacturing specification. Carry out investigations in order to investigate problems and needs. Use primary and secondary data to understand client/user needs.</p> <p>3.3.2 Environmental, social and economic challenges that influence design and make decisions; global warming, deforestation and fair trade.</p> <p>3.3.3 The work of others.</p> <p>3.3.4 Design strategies: generate imaginative and creative design ideas using a range of different design strategies to explore and develop their own ideas.</p> <p>3.3.5 Communication of design ideas: develop, communicate, record and justify design ideas using a range of appropriate techniques.</p>	<p>AO2 - Make prototypes that are fit for purpose.</p> <p>3.3.6 Prototype Development: design and develop prototypes in response to client wants and needs.</p> <p>3.3.8 Tolerances: SI units showing accurate use of appropriate tolerances +/- 2mm, resistor tolerance and seam allowance</p> <p>3.3.9 Material management: to understand how to cut materials efficiently to reduce waste and to use appropriate marking out methods, coordinates and data points.</p> <p>3.3.10 How to use specialist tools and equipment, including hand tools, machinery, digital design and manufacture, appropriate for the material and/or task to complete quality outcomes. How to use them safely to protect themselves and others from harm.</p> <p>3.3.11 Specialist techniques and processes: understand how to select and use specialist techniques and processes appropriate for the material and/or task and use them to the required level of accuracy in order to complete quality outcomes. How to use them safely to shape, fabricate and construct a high-quality prototype, including techniques such as wastage, addition, deforming and reforming.</p> <p>3.3.11 Surface treatments and finishes.</p>	<p>AO3 – Analyse and Evaluate</p> <p>3.3.6 Know and understand how to evaluate prototypes to critically reflect and inform modifications and fitness for purpose.</p>	<p>3.2.1 Selection of materials and components considering their: Functionality, aesthetics, environmental factors, availability, cost, social factors, cultural factors, ethical factors.</p> <p>3.2.5 Using and working with materials: know and understand how different properties of materials and components are used in products, how properties influence use and how properties affect performance.</p> <p>3.3.7 Selection of materials and components; select and use materials and components appropriate to the task considering functional need, cost and availability.</p> <p>Links to Maths:</p> <ul style="list-style-type: none"> -Recognise and use expressions in decimal and standard form: Calculation of quantities of materials, costs and sizes. Use ratios, fractions and percentages: Scaling drawings, analysing responses to user questionnaires. Calculate surface area and volume: Determining quantities of materials. -Handling data: Presentation of data, diagrams, bar charts and histograms. -Graphs -Geometry and Trigonometry. <p>Links to Science:</p> <p>Use scientific vocabulary, terminology and definitions</p>
A Level Links	<p>AO1 – Identify, investigate and outline design possibilities to address needs and wants.</p> <p>AO2 – Design prototypes that are fit for purpose.</p>	<p>AO2 – Make prototypes that are fit for purpose.</p>	<p>AO3 – Analyse and evaluate: Design decisions and outcomes, including for prototypes made by themselves and others.</p> <p>Wider issues in design and technology.</p>	<p>AO4 – Demonstrate and apply knowledge and understanding of technical principles and design and making principles.</p>

<p>Rationale for Year 7</p> <p>Design:</p> <ul style="list-style-type: none"> - To develop detailed specifications to guide their thinking. - Use research including the study of different cultures, to identify and understand user needs. - Work within a range of different contexts. - Begin to identify and solve their own design problems. - Use 2D and 3D CAD to model their design ideas. - Produce models of their ideas (could be CAM) to test out their ideas. - Introduction to a variety of different approaches to avoid stereotypical design ideas and begin to take creative risk. - Begin to develop a range of communication techniques (drawing skills and rendering), including annotated sketches. - Begin to identify suitable materials and manufacturing methods for their designs. <p>Make:</p> <ul style="list-style-type: none"> - Begin to select and use appropriate specialist tools, techniques, processes, equipment, and machinery, including CAM and handcraft. - Use a range of materials and components with some understanding of their properties. - Make use of specialist equipment to mark out materials. - Understand a range of material joining techniques. - Develop skills in modifying the appearance of materials. - Produce 3D models to communicate design ideas. - Understand and follow relevant H&S - Use CAD/CAM to manufacture products with some understanding of levels of production and quality. <p>Evaluate:</p> <ul style="list-style-type: none"> - Evaluate their product against their original specification and identify ways of improving them. 	<p>Rationale for Year 8</p> <p>Design:</p> <ul style="list-style-type: none"> - Work within a range of different contexts. - Develop detailed specifications to guide their thinking and respond to a variety of situations. - Develop design specifications that include a wider range of requirements such as environmental, aesthetic, quality, and safety. - Use primary and secondary data to inform design brief/specification. - Begin to identify and solve their own design problems. - Use 2D and 3D CAD to model and develop their design ideas. - Develop skills using a variety of different approaches to avoid stereotypical design ideas and take creative risk. - Identify which design criteria clash and which should take priority. - Developing a broader range of communication techniques (drawing skills and rendering), including annotated sketches demonstrating a higher level of quality and skill. - Use mathematical modelling to test ideas, material performance and components prior to manufacture. - Give oral and digital presentations. <p>Make:</p> <ul style="list-style-type: none"> - Select and use appropriate specialist tools, techniques, processes, equipment, and machinery, including CAM. - Select and apply specialist equipment to mark out materials. - Understand and apply a broader range of material joining techniques. - Investigate and develop skills in modifying the appearance of materials. - Produce 3D models to communicate and develop design ideas. - Begin to select suitable materials with some consideration of their fitness for purpose 	<p>Rationale for Year 9</p> <p>Design:</p> <ul style="list-style-type: none"> - Work within a range of different contexts. - Develop design specifications that include a wider range of requirements such as environmental, aesthetic, cost, maintenance, quality, and safety. - Research into the health and wellbeing, cultural, religious, and socio-economic contexts of their intended users. - Understand how to reformulate design problems given to them and take creative risks. - Use 3D CAD to model, develop and present their ideas. - Use CAD and related software packages to validate their designs in advance of manufacture. - Developing and demonstrate a broad range of communication techniques (drawing skills and rendering), including annotated sketches showing a higher level of quality and skill. - Use mathematical modelling to test ideas, material performance and components prior to manufacture. - Consider ergonomics and anthropometric factors to inform design decisions. - Apply a variety of approaches when developing design ideas to avoid stereotypical responses. <p>Make:</p> <ul style="list-style-type: none"> - Match and select appropriate materials with consideration to their fitness for purpose. - Recognise when it is necessary to develop new skills or techniques. - Adapt their methods of manufacture to changing circumstances. - Select and apply specialist tools, techniques, processes, equipment, and machinery (including CAM) - Use a broader range, more complex materials and components taking into consideration their working properties. - Produce their own planning charts / production schedules (Gantt chart) to show manufacture. - Follow all H&S procedures and understand the process of a risk assessment.
--	--	---

<ul style="list-style-type: none"> - Actively involve others in the testing of their products. - Identify some ways in which products have a positive and negative impact on the world around us. - A basic awareness of existing products and the impact they have on the wider world. - Introduction to some design movements and key designers. <p>Technical Knowledge:</p> <ul style="list-style-type: none"> - Use learning from mathematics and science to develop working prototypes. - Understand how to classify materials by structure. - Begin to understand the physical properties of materials. - How to use simple electronic circuits understanding inputs and outputs, including basic electronic components. - Apply computing and electronics to program basic controllers. - Control outputs such as actuators and motors. - How to make use of microcontrollers in products. - Begin to use appropriate technical language. 	<ul style="list-style-type: none"> - Use CAD/CAM to produce products and apply surface finishing techniques <p>Evaluate:</p> <ul style="list-style-type: none"> - Evaluate their product against their original specification and identify ways of improving them. - Apply user/ feedback from others to help inform design decisions. - Analyse products through disassembly to determine how they are constructed and function. - Introduction to life cycle analysis 'cradle to grave'. - Develop a broader knowledge on design movements, designers, technologists, and manufacturers and use these to inform their own design and making decisions. <p>Technical Knowledge:</p> <ul style="list-style-type: none"> - Develop a deeper understanding of the physical properties of materials. - How to select and modify patterns and use in textile construction. - Use learning from mathematics and science to develop working prototypes. - Understand how to classify materials by structure. - Develop a deeper understanding of the physical properties of a broader range of materials. - Begin to understand the performance and structural elements of their design and materials to achieve functioning solutions. - Understand how mechanical systems used in their products enables changes in movement and force. - Demonstrate a deeper understanding of technical language. - Use software and hardware to develop programmes and transfer these to programmable components. 	<ul style="list-style-type: none"> - Use confidently a broad range of manufacturing techniques, including handcraft and CAD/ CAM. - Apply confidently a broad range of finishing techniques to a variety of different materials. <p>Evaluate:</p> <ul style="list-style-type: none"> - Select appropriate methods to evaluate their products in use and modify them to improve performance. - Produce short reports on making suggestions and how to improve their products. - Understand the life cycle analysis of products and how this influences the design and manufacture process. - Understand the circular and linear economy in relation to product development and consumption. - Evaluate and refine ideas against the specification, considering the views of intended users and other interested groups. <p>Technical Knowledge:</p> <ul style="list-style-type: none"> - Develop a succinct understanding of the physical properties of materials and how this can influence material selection. (Including smart and modern materials) - Understand how materials can be cast in moulds and the advantages/disadvantages of this. - Demonstrate a deeper and succinct understanding of technical language. - Use learning from mathematics and science to develop working prototypes. - Understand the performance of structural elements to achieve functioning solutions. - Understand how to set up different equipment and machinery. - Apply computing and electronics to embed intelligence into products to respond to inputs. - Understand a wider range of electronic components, inputs/outputs and feedback systems.
---	---	--

Year 7	Year 8	Year 9
Electronics and Computing: <ul style="list-style-type: none"> - Use simple electronic circuits understanding inputs, outputs and circuit symbols. - Introduction to basic electronic components and how electricity works. - Understanding of how electronic systems work and are applied to products using snap circuits. - Introduction of real life problems (domestic setting) that can be solved with Micro bit programming and specialist software. Research into existing products to broaden understanding. - Careers: Electrician / Electrical Engineer / Games Designer. 	Point of Purchase <ul style="list-style-type: none"> - Develop a detailed creative client brief based on an industrial context. (AO 3.3.3) - Broader understanding of the properties for paper and boards. Links to LEGO - Understanding of the industrial manufacturing methods (printing processes and die-cutting) Modifying surface finishes/ treatments. (AO3 3.3.11/ 3.2.8) - Application of some finishing processes for paper and board. - Use specialist tools and equipment using papers and boards to mark out, cut and shape. Including health and safety requirements. (AO 3.3.10) - Begin to identify and solve their own design problems. - Understanding of net construction and modification. - Produce creative design solutions using a variety of approaches and user centred design. (AO2 3.3.3 / 3.3.4) - Careers: Illustrator / Branding and Marketing 	Architecture <ul style="list-style-type: none"> - Recap of understanding of paper and boards focusing on their properties. Links to POP - Use 3D CAD to model and present design ideas using Google Sketch-up. - Deeper understanding of technical drawings – scale. Links to Lego (AO 3.2.8) - Art movements and work of others to inform creative design solutions. (AO2 3.3.3 / 3.3.4) - Interpreting working drawings and communication (AO2 3.3.5) - Work in a domestic/local context – based on home/ environmental focus. - Produce 3D mathematical modelling. - Implement ergonomics and anthropometrics. Links to POP - Introduction to alternative energies and sustainable materials. (AO2 3.3.2) - Apply mastery skills using specialist tools and equipment to mark out, cut and shape. Including health and safety requirements. (Paper & Board) Link to POP - Use specialist tools and equipment using papers and boards. Links to POP (AO 3.3.10) - Evaluate and refine ideas against the specification, considering the views of intended users and other interested groups. (AO 3.3.6) - Careers: Architect / Structural Engineer/ Interior Architect
Lego: <ul style="list-style-type: none"> - How to write a specification - Analyse and evaluate existing products to inform design ideas, including product disassembly. - Identifying and understanding user needs. 	Mechanical Toy <ul style="list-style-type: none"> - Deeper understanding of timbers. Links to Memphis - Develop a broader understanding of different joining techniques. - Develop a specification based on a leisure context. 	Lamp <ul style="list-style-type: none"> - Comprehensive understanding of timbers and manufactured boards. Links to M.Toy - Match and select appropriate materials based on their fitness for purpose. - Analysis of existing products – product disassembly. (AO1) Link to POP

<ul style="list-style-type: none"> - To work in an industrial context – manufacturing of new product range and industrial manufacturing processes. - Use specialist tools and equipment to mark out, cut and shape. Including health and safety requirements. (Styrofoam) - Apply joining techniques using adhesive for Styrofoam. - Understand properties and classification of Styrofoam and some papers / board. - Develop freehand communication techniques for design ideas. - Modify surface finish by applying acrylic paint. (AO3 3.3.11) - Understanding properties of Styrofoam. - Evaluate their product against the design specification. (AO 3.3.6) - Careers: Graphic Designer / Manufacturing Engineer / CAD/CAM Programmer 	<ul style="list-style-type: none"> - Mechanical systems of gears and their movement. (AO 3.1.5) - Test, evaluate and refine products against the design specification. (AO 3.3.6) - Produce creative design solutions based on user centred design. (AO2 3.3.3 / 3.3.4) - Begin to identify and solve their own design problems through modelling and prototyping - Develop skill using specialist tools and equipment to mark out, cut and shape. (Timber) Including health and safety requirements (AO 3.3.10) Link to Memphis - Careers: Joinery / Carpentry 	<ul style="list-style-type: none"> - Identify and solve their own design problems. - Comprehensively undertake practical using specialist tools and equipment to mark out, cut and shape. Including health and safety requirements. (Timber) - Generate design ideas using a variety of strategies: biomimicry and work of others. (AO2 3.3.3 / 3.3.4) - Adapt methods of manufacture to changing circumstances. - Production schedules and costing of materials and quantity. (AO 3.3.7) Link to Memphis / Speaker - Mathematical calculation of material. - Develop practical skills using electronics - Careers: Furniture Designer
<p>Memphis:</p> <ul style="list-style-type: none"> - Apply mathematical modelling and apply tolerances. - Classification of softwoods, hardwoods and manufactured boards. - Understand the physical properties of materials. - Understand how to set up machinery and equipment. - Use specialist tools and equipment to mark out, cut and shape. Including health and safety requirements. (Timber) - Apply joining techniques using joints and adhesive for timbers. - Modify surface finish / finishing techniques by understanding and applying acrylic paint/ stains/ varnish and bees wax. (AO3 3.3.11) 	<p>Textiles:</p> <ul style="list-style-type: none"> - Introduction to Textiles: natural and synthetic fibres. (AO. 3.2.4) - Modify surface finish / finishing techniques in Textiles. (AO 3.2.5) (AO 3.2.9) - Project focus on Primark and textile industry. Developing a design brief and specification. - Product analysis of existing textile products using set criteria. ACCESS FM - Apply joining and decoration techniques in textiles - Introduction to specialist tool and equipment used in textiles. (AO 3.2.8) - Environmental impacts of the Textile and Fashion industries. (AO 3.3.2) - Health and Safety within Textiles. - Careers: Fashion Designer/ Textile Designer 	<p>Textiles:</p> <ul style="list-style-type: none"> - Focus on 'GAP' clothing brand from fashion/ industrial textiles. - Develop understanding of a design brief and mind map exploration. - Developing a range of design proposals for a textile outcome. - Deeper understanding of specialist tool and equipment used in textiles. (AO 3.2.8) Link to Yr8 - Deeper understanding of how to modify surface finish / finishing techniques in Textiles. (AO 3.2.5) (AO 3.2.9) (Batik/ Embroidery/ Block Printing / Sublimation Printing) Link to Yr8 - Pattern cutting and tolerance. - Evaluation of final product against design specification. - Careers: Fashion Designer / Textile Designer

<ul style="list-style-type: none"> - Understand the basic principles of the Memphis movement to inform the design of their product. 		
<p>Metal:</p> <ul style="list-style-type: none"> - Introduction to material classification - Use specialist tools and equipment in using metal. (AO 3.3.10) - Understand the principles of casting. - Use 2D CAD to produce designs - Identify and solve their own design problems. - Implement appropriate H&S / risk assessment <p>Plastics:</p> <ul style="list-style-type: none"> - Identify and solve own design problems. - Use specialist tools and equipment in using plastic. (AO 3.3.10) - Understand the classification of polymers. - Cultural Capital: Understand the impact of global warming and plastic pollution. - Evaluate their own environmental impact. - Identifying how some products have a positive and negative impact on the world. - Implement appropriate H&S / risk assessment <p>Careers: CAD Technician/ Product Designer and Model Maker.</p>		<p>Technical Drawing and CAD Project:</p> <ul style="list-style-type: none"> - Isometric drawing techniques (AO 3.3.5) - Crating and isometric circles - Introduction to exam drawing techniques - Rendering techniques on a 3D shape. - Orthographic projection - Deeper understanding of 2D Design CAD skills. Links to Year 7 Metal and Year 9 Architecture - BSI Dimensioning on technical drawings. - Theory on CAD/CAM/ JIT - Deeper understanding of papers and boards and their uses. (AO 3.1.6.1) Link to POP Project - Introduction to Tinker CAD 3D modelling. - Careers: Machine Operator / CNC Operator/ Robotics Engineer