Ian Ramsey CE Academy: Design and Technology Curriculum Progression Model

CURRICULUM OVERVIEW

Curriculum What we study. Why study it. Why study it now.

What we need pupils to have learnt at each point/end of each year and the logical connection and the sequential learning between what is studied in the different terms and between years. This is what is to be covered and when, effectively creating the idea that the intent is the curriculum. The intent is everything up to the point of teaching. The purpose of our curriculum and the knowledge we want our pupils to go away with in their working memory.

In Design and Technology, we aim to engage pupils in an iterative way to understand how to DESIGN, MAKE and EVALUATE products to creatively solve real life problems within a variety of contexts, considering user needs, wants and values. Pupils will analyse existing products and designers to develop their design skills and make a range of innovative high-quality working products, creatively and independently. Pupils will develop the technical knowledge through a hands-on, practical approach that encourages them to experience how ingredients, materials and components are combined or manipulated to understand their working properties. Pupils will develop their understanding of modern manufacturing and technology with a clear link to industrial practice as essential learning tools which sit alongside hand skills. Pupils will critique, evaluate, and test their ideas and products and apply these skills to the work of others.

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How we make learning memorable and how we support our pupils to remember it. How we use rote, retrieval, interleaving, metacognition etc. in our teaching; why we teach in the way we are and justify decisions around how and why it's being taught this way.

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	Setting	Designing	Planning
YEAR 7	**SUSTAINABILITY**		
	What: Bug Hotel	**What:** Food Preparation and Nutrition	**What:** Mini Light/Money box
	What: Introduction to design briefs and specifications. Designing to meet a specification leading to working drawings. Introduction to Health and Safety in a workshop, hand tools and machines with a focus on accuracy and quality of finish. **Key Questions:** What makes products sustainable? What is the purpose of working drawings? How can quality assurance tests be carried out during manufacture? How can a material be modified to extend its lifespan?	**What:** Introduction to food preparation, cooking and nutrition considering how food is stored, prepared, and cooked in a safe way. **Key Questions:** How can ingredients be combined to change their working properties, i.e., the function of raising agents? What nutrition our body needs to be healthy and sustainable? How can the body's senses be used to critically evaluate a product? What is the social, emotional, and physical impact of replacing fresh food with convenience foods?	**What:** Introduction to electronics and basic circuits considering different material and their use. **Key Questions:** How does a simple light circuit work? How do the components work? How do we use a scroll saw? What is a one-off production? How do we use a die cutter and why do we use one? How do we use a vinyl cutter? What is quality control? **Money Box** (alternative project dependant on rooming) What is a target market? What is a net? How to apply surface finishes.
	Why now: Many pupils will have no prior experience of a workshop, and this introduces many good working practices to be applied in subsequent years.	**Why now:** Pupils engage with food subconsciously every day. They must now connect the food they consume to health, physical wellbeing, social, moral, environmental, and financial impact it has on their lives.	**Why now:** Pupils embed learning with the link between DT and maths form the start of study and applies maths to real situations.
YEAR 8	**USER NEEDS**		
	What: Amplifier	**What:** Food Preparation and Nutrition 2	**What:** STEM Mini-Projects
	What: Pupils will use CAD/CAM to personalise a standard component before manufacturing with a laser cutter. Introduction to electronics and soldering a PCB. This will develop testing and problem-solving skills. **Key Questions:** How does user need and wants effect design decisions? What is CAD/CAM? How does 2D design work? How can a CAD file be converted to a CAM file? What are the benefits of CAD/CAM in DT? What are the functions of basic electronic components? How is quality assurance testing used to increase productivity and success?	**What:** Development of practical food preparation and cooking skills, advanced knife skills, food styling weighing and measuring. **Key Questions:** What is a macronutrient and what is its function? How do culture, religion and moral values effect our food choices? How can function of ingredients such as different fats change the working properties of other ingredients it is combined or processed with? what is the legal and moral obligation of the food industry to inform consumers about food products?	**Why:** Develop an understanding of a range of STEM principles through the completion of mini challenges looking at structure, kinetic energy and properties, aerodynamics, and robotics. **Key Questions:** What makes a strong structure? How can we make informed choices based on knowledge of materials and properties? What are the basic principles of aerodynamics? How do we solve problems through design and manufacturing?
	Why now: Pupils will develop greater understanding of CAD/CAM in Year 9.	**Why now:** Pupils understand the wider context of food as a global industry and to begin to consider the needs and wants of others when interacting with food.	**Why now:** Pupils build on practical skills introduced in the bug hotel project whilst applying them to a different range of materials.
YEAR 9	**NEW TECHNOLOGY**		
	What: Clock	**What:** Food Preparation and Nutrition 3	**What:** Hold it!
	What: Pupils will design and make a clock based on a design movement. **Key Questions:** Why is CAD/CAM used in industry? What materials are used in the making of the clock. What are thermosetting plastics? What is sustainability? How do plastics effect the environment? Why is it important to use quality control when making practical?	**What:** Development of practical food preparation and cooking skills, scale of production and industrial processes. **Key Questions:** How is food produced on a mass scale fit to feed global need? What is food provenance and how can consumers be conscious of their food choice based on this? How are raw food ingredients processed in industry to produce high quality and safe products? What are the social, moral, and ethical obligations of the food industry?	**What:** Pupils will design and make a product to hold items of their choice based on a culture or place, incorporating 3D printing, vinyl cutting or laser cutting as well as hand cutting, shaping, and finishing methods. Industrial manufacturing principles will be introduced such as working drawings, CAD / CAM. **Key Questions:** How has new technology influenced product development? Has product design and development responded to technology push and market pull?
	Why now: To introduce key concepts of core DT and engineering at KS4.	**Why now:** To introduce key concepts of FPN at KS4.	**Why now:** To introduce key concepts of core DT and engineering at KS4.

Delivering

In Year 7-9 all pupils study design and technology through 3 projects each year. Each project utilises the specialist equipment in each teaching room spending 18 GLHs. Tools and equipment are used to meet their response to a design brief. The curriculum is based on a carousel approach. A 2-hour lesson is timetabled in each cycle to enable greater challenge when making in the food and nutrition projects.

Pupils will follow one of four learning journeys based on prior attainment data. Learning is targeted to each journey (Beck, Conran, Newey, and Ramsey) to develop appropriate skills and provide the correct level of challenge to each pupil. Classes have been arranged to teach a max of 2 learning journey's where possible. Over 3 years of study pupils will increase their skills and build on prior learning in each of the 3 areas of Design, Make and Evaluate, except for FPN projects which focus on make and evaluate skills.

Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there.

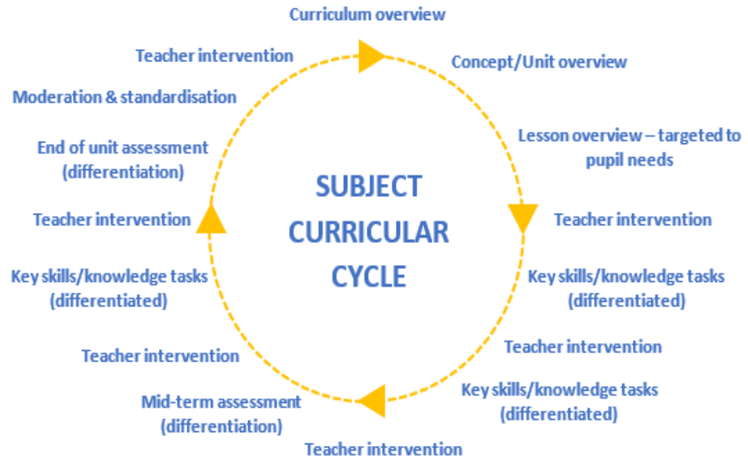
Formative Assessment

This is used to provide information about what pupils know, understand, and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include:

- Questioning
- Effective teacher feedback (written and verbal)
- Peer feedback.
- Pupil self-assessment

Summative Assessment

This is also used at key points in each year to evaluate pupils' achievement. These allow a holistic view of pupils' performance and support the identification of areas requiring additional focus to improve learning overall.



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Year 10 and 11 – Design and Technology (Core)

Setting	Designing		Planning		Delivering
What: Materials and their working properties	**What:** Materials and their working properties	**What:** Developments in new materials	**What:** New and emerging technologies / energy generation	**What:** Mechanical devices	**What:** Systems/ electronics
What: Pupils must be able to categorise materials and their properties into the following: • papers and boards • natural manufactured timbers • metals • alloys	**What:** Pupils must be able to categorise materials and their properties into the following: • Polymers • textiles	**What:** Pupils should be aware of developments in new materials. They must be able to classify, select appropriate materials and extract information from technical specifications of the following types of new materials: • modern materials • smart materials • composite materials • technical textiles	**What:** Pupils must understand the impact on contemporary and future scenarios of the following: • industry • enterprise, • sustainability • people • culture • society • environment • production techniques. Pupils must understand how energy is generated and stored from the following sources: fossil fuels, nuclear power, renewable energy, and batteries.	**What:** Pupils must understand the functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movement. Pupils must be able to identify how mechanisms can change the magnitude and direction of force: • levers • linkages • rotary systems	**What:** Pupils must consider electronic systems in terms of a range of inputs, processes, and outputs.
Why now: To build on the breadth of materials used at KS3 and support the specialist materials area.	**Why now:** To build on the breadth of materials used at KS3 and support the specialist materials area. End of unit test.	**Why now:** To extend material knowledge and be able to link these to specialist materials area.	**Why now:** Pupils need to understand the global impact of design and technology to incorporate these considerations in the NEA.	**Why now:** NEA projects may include moving parts. Preparation for the end of year exams.	**Why now:** Preparation for the mock exams.
What: Designing and making principles	**What:** Designing and making principles	**What:** NEA		**What:** Revision	
What: Pupils should understand that all DT activities happen within a wide range of contexts including: the work of others, environmental, social, and economic challenges, prototype development.	**What:** Pupils should understand that all DT activities happen within a wide range of contexts including: selection of materials and components, tolerances, material management, manufacturing specifications.	**What:** Pupils will focus on completing the NEA; however, each lesson will include a recall activity.		**What:** Pupils will revise the core unit of the syllabus to be able to answer exam style questions and develop exam technique.	
Why now: To support the investigation, design brief /specification and designing sections of the NEA.	**Why now:** To support the development section of the NEA.	**Why now:** To ensure all elements of the NEA are completed in time for assessment.		**Why now:** To prepare for the exam.	

The core unit of the GCSE is taught across both product design and graphics. It is delivered during 1 lesson per cycle and underpins learning in the specialist materials options. Learning builds on the KS3 curriculum.

Teaching learning around materials will take a practical route where materials are available. Pupils will physically test and work with materials to experience capabilities of materials and how they can apply them to their own ideas. Pupils will record learning in a core book which will form the basis of exam preparation in Year 11. Pupils will develop exam practice to deepen extended answers. Learning from core lessons will inform project work in their specialist material specialism lessons.

Links to Maths, physics and geography learning will be recalled to give broader contextualised understanding of learning. Where possible, visits to relevant sites such as EDF energy Hartlepool or NETA Lustrum site will be used to reinforce classroom learning. Learning will be retrieved over time through starter recall activities.

Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there.

Formative Assessment

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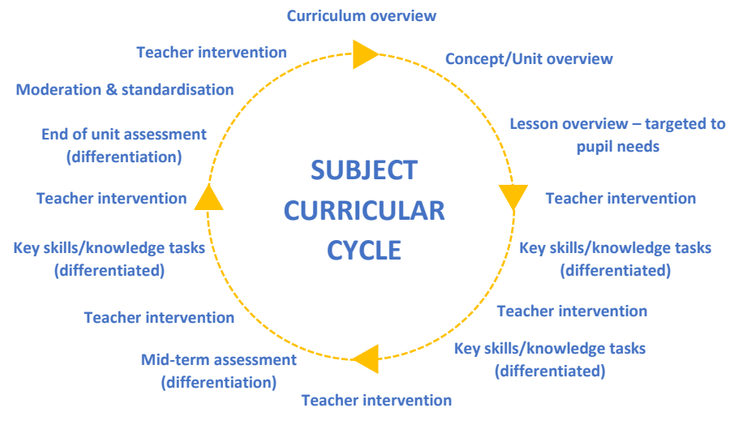

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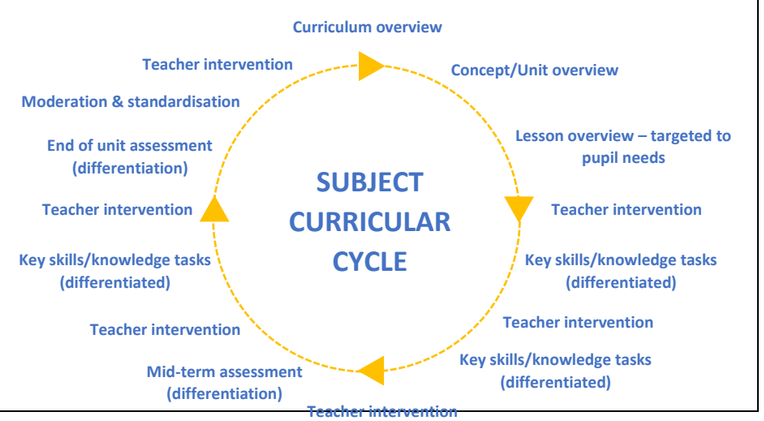
Year 10 and 11 – Design and Technology (Product Design)

Setting	Designing		Planning		Delivering
What: Pewter casting and box construction	**What:** Pewter casting and box construction cont. candle holder	**What:** CAD/CAM	**What:** Clock project	**What:** Designing for target markets	**What:** NEA	Pupils will learn through project-based teaching to ensure learning is contextualised and iterative. Focussed practical tasks will lead to individual responses to design briefs to prepare pupils for the NEA project. At this point, creativity is essential, and projects enable pupils to build knowledge and skills to develop their ideas unrestricted by a particular material or process. The kinaesthetic and individual nature of pupil outcome means that pupil engagement, memory recall are strong due to the requirement to explain and justify all decisions made on an individual basis. Where pupils are challenged by this level of independent decision making, structures are retained from focussed practical tasks to build confidence and ability. Design and manufacture of a high-quality working prototype motivates pupils to improve work and seek extra challenge. The NEA project is high task setting medium task taking. This encompasses a 5-year curriculum of learning and demands a comprehensive and individual response to a design brief and is highly challenging. Exam skills are practiced throughout all project work.	Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there. **Formative Assessment** This is used to provide information about what pupils know, understand, and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include: • Questioning • Effective teacher feedback (written and verbal) • Peer feedback. • Pupil self-assessment **Summative Assessment** This is also used at key points in each year to evaluate pupils' achievement. These allow a holistic view of pupils' performance and support the identification of areas requiring additional focus to improve learning overall.
What: Designing - pupils must have in-depth knowledge of timber-based products, be able to work with timber-based materials and understand their origin, stock forms, joining methods and finishing methods. They must know about the casting process; this also introduces them to mould making and laser cutting. In addition, the use of adhesives to join a variety of materials.	**What:** Pupils will complete the pewter casting and box construction project. Pupils will develop skills in wasting both metal and plywood using cutting and drilling techniques. Metal forming process using the rolling bars. Quality control measures for accuracy.	**What:** Pupils will learn how to independently use the laser cutter. Pupils must be able to use solid works as a designing tool. Pupils must be able to export solid works drawings into STL files for use in the 3D printer.	**What:** Pupils must understand how to create formers and reshape materials, this project uses solid works for designing and the vacuum bag press as a specialist process. Vinyl cutting is used as a CAM process. Pupils must learn how to apply finishes to materials.	**What:** Pupils must understand different users have different needs. How anthropometrics and ergonomics can affect development of a solution. How rapid 3D prototyping enhances development of a solution How smart materials work.	**What:** Pupils must independently respond to a design brief issued by the exam board. They will investigate the context and develop a clear understanding of their chosen client need. From this they will formulate a design brief and specification.		
Why now: Learning supports the core delivery. Practical skills focus on quality and accuracy. Mould making develops skills learnt at KS3.	**Why now:** Pupils will complete the first project. They will develop further skills with the same materials using different processes to build their knowledge.	**Why now:** Pupils need to be independent when using CAD/CAM as their NEA project will develop more unique outcomes requiring autonomous application of skills.	**Why now:** Builds on CAD/CAM skills. Develops knowledge of timber-based materials in terms of working properties	**Why now:** Transition of focus on target market and user need in preparation of pupils' NEA project. Development of skills and knowledge required for independent completion of NEA.	**Why now:** Exam board release the design brief on June 1st and represents 50% of the GCSE.		
What: NEA				**What:** Revision			
What: Development of a solution – pupils must plan the manufacture of the working prototype. A comprehensive manufacture specification must be produced, and materials and components must be resourced. Manufacture of protype to access assessment criteria.	**What:** Manufacture of protype to access assessment criteria.	**What:** Testing and evaluating finished working prototype. Submission of NEA.	**What:** Practice recall techniques and exam performance. Extend longer response answers.				
Why now: In line with exam board timeframe.			**Why now:** In line with exam board timeframe.				



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Year 10 and 11 – Design and Technology (Graphics)

Setting	Designing		Planning		Delivering
What: Perfume bottle/aftershave	**What:** Board Game	**What:** Advertising a Product	**What:** CD Packaging	**What:** New emerging technologies and Materials (Toothbrush)	**What:** NEA	Pupils will learn through project-based teaching to ensure learning is contextualised and iterative. Focussed practical tasks will lead to individual responses to design briefs in order to prepare pupils for the NEA project. At this point, creativity is essential and projects enable pupils to build knowledge and skills to develop their ideas unrestricted by a particular material or process. The kinaesthetic and individual nature of pupil outcome means that pupil engagement, memory recall is strong due to the requirement to explain and justify all decisions made on an individual basis. Where pupils are challenged by this level of independent decision making, structures are retained from focussed practical tasks to build confidence and ability. Design and manufacture of a high-quality working prototype motivates pupils to improve work and seek extra challenge. The NEA project is high task setting medium task taking. This encompasses a 5-year curriculum of learning and demands a comprehensive and individual response to a design brief and is highly challenging. Exam skills are practiced throughout all project work.	Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there. **Formative Assessment** This is used to provide information about what pupils know, understand and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include: • Questioning • Effective teacher feedback (written and verbal) • Peer feedback. • Pupil self-assessment **Summative Assessment** This is also used at key points in each year to evaluate pupils' achievement. These allow a holistic view of pupils' performance and support the identification of areas requiring additional focus to improve learning overall.
What: Pupils must be imaginative and create innovative ideas which have been developed, demonstrating creativity, flair and originality using various materials such as styro foam and other modelling materials. They will use machines and tools which are used in industry. Pupils will have a final product which show many design and making skills.	**What:** Pupils will produce a working board game which show a high level of making/modelling/finishing skills. They will be accurate during this project such as using appropriate tools, materials and technologies including CAD/CAM either through the laser cutter or the vinyl cutter. Pupils will plan and design their own game. The boardgame must be targeted to the correct market. Pupils will also understand the importance of using the correct materials and techniques.	**What:** Pupils must understand how to use various CAD drawing packages to advertise a product which is directed to a particular market. Pupils need to be able to edit and produce a real-life advertising campaign.	**What**: Pupils will problem solve within this task, they will have to produce a piece of packaging for a cd and fold it in a particular way to keep it shut without having glue, tape, or fasteners. Pupils will have to develop a sound understanding of the materials used in order to be successful at the task. This will help later with prototyping and model making in their NEA.	**What:** Pupils must know in detail how new emerging technologies impact on industry, society, environment, and production. Pupils should also know properties of materials such as paper and board timber and metals. This will overlap in all areas of the course. Pupils must design and make an original model toothbrush for a child using various materials such as stryro foam. Pupils will follow a strict specification	**What:** Pupils must independently respond to a design brief issued by the exam board. They will investigate the context and develop a clear understanding of their chosen client need. From this they will formulate a design brief and specification.	
Why now: This project allows the pupils to develop and investigate their making skills ready to utilise in their NEA.	**Why now:** Helps the students to develop their independent learning through investigation and problem solving. This also enables students to build up a large bank of knowledge for their NEA.	**Why now:** Pupils must develop their CAD skills in order to use in their NEA.	**Why now:** Pupils will have covered many design problems throughout the course and now pupils will show their understanding of how their prototypes become actual products.	**Why now:** To focus pupils on the theory side of the NEA and reinforce the relevance of the projects done so far. Good preparation for their upcoming exam.	**Why now:** Exam board release the design brief on June 1st and represents 50% of the GCSE.	
What: NEA				**What:** Revision		
What Designing - pupils must generate creative design ideas through and iterative approach. These will be presented as part of their portfolio. Development of a solution – pupils will develop an idea through prototyping and testing until a viable working solution is generated. This must be evaluated against the brief and specification	**What:** Development of a solution – pupils must plan the manufacture of the working prototype. A comprehensive manufacture specification must be produced, and materials and components must be resourced. Manufacture of protype to access assessment criteria.	**What:** Manufacture of protype to access assessment criteria.	**What:** Working out problems and testing and evaluating finished prototype checking if product works. Submission of NEA.	**Why:** Lots of recall from theory. Practice questioning, repetition, enabling pupils to test their level of understanding leading up to their exam		
Why now: In line with exam board timeframe.				**Why now:** In line with exam board timeframe.