Curriculum: Design and Technology

Deepcar St. John's C.E. Junior School

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Vision

At Deepcar St John's C of E Junior School, we believe that a high-quality Design and Technology education should engage, inspire and challenge all pupils, equipping them with the knowledge and skills to design, make and evaluate their own products.

Intent

We follow Kapow Primary's Design and Technology scheme of work which aims to inspire pupils to be innovative and creative thinkers who have an appreciation for the product design cycle through ideation, creation, and evaluation. We want pupils to develop the confidence to take risks, through drafting design concepts, modelling, and testing and to be reflective learners who evaluate their work and the work of others. Through our scheme of work, we aim to build an awareness of the impact of design and technology on our lives and encourage pupils to become resourceful, enterprising citizens who will have the skills to contribute to future design advancements. Our Design and technology scheme of work enables pupils to meet the end of key stage attainment targets in the National curriculum and the aims also align with those in the National Curriculum.

Key Concepts		
	1	To design
	2	To make
	3	To evaluate
	4	To use technical knowledge

Implementation

The Design and Technology National curriculum outlines the three main stages of the design process: design, make and evaluate. Each stage of the design process is underpinned by technical knowledge which encompasses the contextual, historical, and technical understanding required for each strand. Cooking and nutrition has a separate section, with a focus on specific principles, skills and techniques in food, including where food comes from, diet and seasonality.
Like the National curriculum, Kapow organises the Design and technology attainment targets under four subheadings:

- Design
- Make
- Evaluate
- Technical knowledge

Cooking and nutrition is given a particular focus in the National curriculum. It is one of the six key areas that pupils revisit throughout their time in primary school:

- Cooking and nutrition
- Mechanisms/Mechanical systems
- Structures
- Textiles
- Electrical systems
- Digital world

Kapow Primary's Design and technology scheme has a clear progression of skills and knowledge within these strands and key areas across each year group. The National Curriculum overview shows which of the units cover each of the National curriculum attainment targets as well as each of the four strands. Our Progression of skills shows the skills and knowledge that are taught within

each year group and how these skills develop to ensure that attainment targets are securely met by the end of each key stage.

Through Kapow Primary's Design and Technology scheme, pupils respond to design briefs and scenarios that require consideration of the needs of others, developing their skills in the six key areas. Each of our key areas follows the design process (design, make and evaluate) and has a particular theme and focus from the technical knowledge or cooking and nutrition section of the curriculum. The Kapow Primary scheme is a spiral curriculum, with key areas revisited again and again with increasing complexity, allowing pupils to revisit and build on their previous learning. Lessons incorporate a range of teaching strategies from independent tasks, paired and group work including practical hands-on, computer-based and inventive tasks. This variety means that lessons are engaging and appeal to those with a variety of learning styles. Differentiated guidance is available for every lesson to ensure that lessons can be accessed by all pupils and opportunities to stretch pupils' learning are available when required. Knowledge organisers for each unit support pupils in building a foundation of factual knowledge by encouraging recall of key facts and vocabulary. Strong subject knowledge is vital for staff to be able to deliver a highly effective and robust Design and Technology curriculum. Each unit of lessons includes multiple teacher videos to develop subject knowledge and support ongoing CPD. Kapow Primary has been created with the understanding that many teachers do not feel confident delivering the full Design and Technology curriculum and every effort has been made to ensure that they feel supported to deliver lessons of a high standard that ensure pupil progression.

Impact

The impact of Kapow Primary's scheme can be constantly monitored through both formative and summative assessment opportunities. Each lesson includes guidance to support teachers in assessing pupils against the learning objectives. Furthermore, each unit has a unit quiz and knowledge catcher which can be used at the start and/or end of the unit. After the implementation of Kapow Primary Design and technology, pupils should leave school equipped with a range of skills to enable them to succeed in their secondary education and be innovative and resourceful members of society. The expected impact of following the Kapow Primary Design and technology scheme of work is that children will:

➔ Understand the functional and aesthetic properties of a range of materials and resources.
➔ Understand how to use and combine tools to carry out different processes for shaping, decorating, and manufacturing products.
➔ Build and apply a repertoire of skills, knowledge and understanding to produce high quality, innovative outcomes, including models, prototypes, CAD, and products to fulfil the needs of users, clients, and scenarios.
➔ Understand and apply the principles of healthy eating, diets, and recipes, including key processes, food groups and cooking equipment.
➔ Have an appreciation for key individuals, inventions, and events in history and of today that impact our world.
➔ Recognise where our decisions can impact the wider world in terms of community, social and environmental issues.
➔ Self-evaluate and reflect on learning at different stages and identify areas to improve.
➔ Meet the end of key stage expectations outlined in the National curriculum for Design and technology.
➔ Meet the end of key stage expectations outlined in the National curriculum for Computing.

National Curriculum

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment]. When designing and making, pupils should be taught to:

Design

- use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups
- generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

Make

- select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately
- select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

Evaluate

- investigate and analyse a range of existing products
- evaluate their ideas and products against their own design criteria and consider the views of others to improve their work
- understand how key events and individuals in design and technology have helped shape the world

Technical Knowledge

- apply their understanding of how to strengthen, stiffen and reinforce more complex structures
- understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]
- understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors]
- apply their understanding of computing to program, monitor and control their products.

Cooking and Nutrition

As part of their work with food, pupils should be taught how to cook and apply the principles of nutrition and healthy eating. Instilling a love of cooking in pupils will also open a door to one of the great expressions of human creativity. Learning how to cook is a crucial life skill that enables pupils to feed themselves and others affordably and well, now and in later life. Pupils should be taught to:

- understand and apply the principles of a healthy and varied diet
- prepare and cook a variety of predominantly savoury dishes using a range of cooking techniques
- understand seasonality, and know where and how a variety of ingredients are grown, reared, caught and processed.

Overview of Learning

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 3	Cooking and Nutrition: Eating Seasonally		Mechanical Systems: Pneumatic Toys		Structures: Constructing a Castle	
Year 4	Textiles: Fastenings		Digital World: Mindful moments timer		Electrical Systems: Torches	
Year 5	Structures: Catapults*		Textiles: Stuffed Toys		Cooking and Nutrition: What could be healthier?	
Year 6	Electrical Systems: Steady Hand Game		Digital World: Navigating the World		Mechanical Systems: Automata Toys	

Structures

	Year 3	Year 4	Year 5	Year 6
	Constructing a Castle	Pavillions	Catapults	Playground
		Skills		
Design	• Designing a castle with key features to appeal to a specific person/purpose. • Drawing and labelling a castle design using 2D shapes, labelling: the 3D shapes that will create the features, materials needed and colours. • Designing and/or decorating a castle tower on CAD software.		• Designing a stable structure that is able to support weight. • Creating a frame structure with a focus on triangulation.	
Make	• Constructing a range of 3D geometric shapes using nets. • Creating special features for individual designs. • Making facades from a range of recycled materials.		• Building a wooden structure. • Independently measuring and marking wood accurately. • Selecting appropriate tools and equipment for particular tasks. • Using the correct techniques to saws safely. • Identifying where a structure needs reinforcement and using card corners for support. • Explaining why selecting appropriating materials is an important part of the design process. • Understanding basic wood functional properties.	

Evaluate	• Evaluating own work and the work of others based on the aesthetic of the finished product and in comparison to the original design. • Suggesting points for modification of the individual designs.		• Adapting and improving own structure by identifying points of weakness and reinforcing them as necessary. • Suggesting points for improvements for own catapults and those designed by others.	
		Knowledge		
Technical	• To understand that wide and flat based objects are more stable. • To understand the importance of strength and stiffness in structures.		• To understand some different ways to reinforce structures. • To understand how triangles can be used to reinforce catapults. • To know that properties are words that describe the form and function of materials. • To understand why material selection is important based on properties. • To understand the material (functional and aesthetic) properties of wood.	
Additional	• To know the following features of a castle: flags, towers, battlements, turrets, curtain walls, moat, drawbridge and gatehouse - and their purpose. • To know that a façade is the front of a structure. • To understand that a castle needed to be strong and stable to withstand enemy attack. • To know that a paper net is a flat 2D shape that can become a 3D shape once assembled. • To know that a design specification is a list of success criteria for a product.		• To understand how to carry and use a saw safely.	

Mechanisms and Mechanical Systems

	Y3	Y4	Y5	Y6
	Pneumatic Toys	**Making a Slingshot Car**	**Pop Up Book**	**Automata Toys**
		Skills		
Design	• Designing a toy which uses a pneumatic system. • Developing design criteria from a design brief. • Generating ideas using thumbnail sketches and exploded diagrams. • Learning that different types of drawings are used in design to explain ideas clearly.			•Experimenting with a range of cams, creating a design for an automata toy based on a choice of cam to create a desired movement. • Understanding how linkages change the direction of a force. • Making things move at the same time. • Understanding and drawing cross-sectional diagrams to show the inner-workings of my design.
Make	• Creating a pneumatic system to create a desired motion. • Building secure housing for a pneumatic system. • Using syringes and balloons to create different types of pneumatic systems to make a functional and appealing pneumatic toy. • Selecting materials due to their functional and aesthetic characteristics. • Manipulating materials to create different effects by cutting, creasing, folding and weaving.			• Measuring, marking and checking the accuracy of the jelutong and dowel pieces required. • Measuring, marking and cutting components accurately using a ruler and scissors. • Assembling components accurately to make a stable frame. • Understanding that for the frame to function effectively the components must be cut accurately and the joints of the frame secured at right angles. • Selecting appropriate materials based on the materials being joined and the speed at which the glue needs to dry/set.
Evaluate	• Using the views of others to improve designs. • Testing and modifying the outcome, suggesting improvements. • Understanding the purpose of exploded-diagrams through the eyes of a designer and their client.			• Evaluating the work of others and receiving feedback on own work. • Applying points of improvement to their toys. • Describing changes they would make/do if they were to do the project again.

Knowledge				
Technical	• To understand how pneumatic systems work. • To understand that pneumatic systems can be used as part of a mechanism. • To know that pneumatic systems operate by drawing in, releasing and compressing air.			• To understand that the mechanism in an automata uses a system of cams, axles and followers. • To understand that different shaped cams produce different outputs.
Additional	• To understand how sketches, drawings and diagrams can be used to communicate design ideas. • To know that exploded-diagrams are used to show how different parts of a product fit together. • To know that thumbnail sketches are small drawings to get ideas down on paper quickly.			• To know that an automata is a hand powered mechanical toy. • To know that a cross-sectional diagram shows the inner workings of a product. • To understand how to use a bench hook and saw safely. • To know that a set square can be used to help mark 90° angles.

Electrical Systems

	Y3	Y4	Y5	Y6
	Electric Poster	Torches	Doodlers	Steady Hand Game
		Skills		
Design		• Designing a torch, giving consideration to the target audience and creating both design and success criteria focusing on features of individual design ideas.		• Designing a steady hand game - identifying and naming the components required. • Drawing a design from three different perspectives. • Generating ideas through sketching and discussion. • Modelling ideas through prototypes. • Understanding the purpose of products (toys), including what is meant by 'fit for purpose' and 'form over function'.
Make		• Making a torch with a working electrical circuit and switch. • Using appropriate equipment to cut and attach materials. • Assembling a torch according to the design and success criteria.		• Constructing a stable base for a game. • Accurately cutting, folding and assembling a net. • Decorating the base of the game to a high quality finish. • Making and testing a circuit. • Incorporating a circuit into a base.
Evaluate		• Evaluating electrical products. • Testing and evaluating the success of a final product.		• Testing own and others finished games, identifying what went well and making suggestions for improvement. • Gathering images and information about existing children's toys. • Analysing a selection of existing children's toys.

Knowledge				
Technical		• To understand that electrical conductors are materials which electricity can pass through. • To understand that electrical insulators are materials which electricity cannot pass through. • To know that a battery contains stored electricity that can be used to power products. • To know that an electrical circuit must be complete for electricity to flow. • To know that a switch can be used to complete and break an electrical circuit.		• To know that batteries contain acid, which can be dangerous if they leak. • To know the names of the components in a basic series circuit, including a buzzer.
Additional		• To know the features of a torch: case, contacts, batteries, switch, reflector, lamp, lens. • To know facts from the history and invention of the electric light bulb(s) - by Sir Joseph Swan and Thomas Edison.		•To know that 'form' means the shape and appearance of an object. •To know the difference between 'form' and 'function'. •To understand that 'fit for purpose' means that a product works how it should and is easy to use. • To know that form over purpose means that a product looks good but does not work very well. • To know the importance of 'form follows function' when designing: the product must be designed primarily with the function in mind. • To understand the diagram perspectives 'top view', 'side view' and 'back'.

Cooking and Nutrition

	Y3	Y4	Y5	Y6
	Eating Seasonally	Adapting a Recipe	What could be healthier?	Come Dine with Me
			Skills	
Design	• Creating a healthy and nutritious recipe for a savoury tart using seasonal ingredients, considering the taste, texture, smell and appearance of the dish.		• Adapting a traditional recipe, understanding that the nutritional value of a recipe alters if you remove, substitute or add additional ingredients. • Writing an amended method for a recipe to incorporate the relevant changes to ingredients. • Designing appealing packaging to reflect a recipe.	
Make	• Knowing how to prepare themselves and a work space to cook safely in, learning the basic rules to avoid food contamination. • Following the instructions within a recipe.		• Cutting and preparing vegetables safely. • Using equipment safely, including knives, hot pans and hobs. • Knowing how to avoid cross-contamination. • Following a step by step method carefully to make a recipe.	
Evaluate	• Establishing and using design criteria to help test and review dishes. • Describing the benefits of seasonal fruits and vegetables and the impact on the environment. • Suggesting points for improvement when making a seasonal tart.		• Identifying the nutritional differences between different products and recipes. • Identifying and describing healthy benefits of food groups.	

Knowledge				
Technical	• To know that not all fruits and vegetables can be grown in the UK. • To know that climate affects food growth. • To know that vegetables and fruit grow in certain seasons. • To know that cooking instructions are known as a 'recipe'. • To know that imported food is food which has been brought into the country. • To know that exported food is food which has been sent to another country. • To understand that imported foods travel from far away and this can negatively impact the environment. • To know that each fruit and vegetable gives us nutritional benefits because they contain vitamins, minerals and fibre. • To understand that vitamins, minerals and fibre are important for energy, growth and maintaining health. • To know safety rules for using, storing and cleaning a knife safely. • To know that similar coloured fruits and vegetables often have similar nutritional benefits.		• To understand where meat comes from - learning that beef is from cattle and how beef is reared and processed, including key welfare issues. • To know that I can adapt a recipe to make it healthier by substituting ingredients. • To know that I can use a nutritional calculator to see how healthy a food option is. • To understand that 'cross-contamination' means bacteria and germs have been passed onto ready-to-eat foods and it happens when these foods mix with raw meat or unclean objects.	

Textiles

	Y3	Y4	Y5	Y6
	Egyptian Collars	Fastenings	Stuffed Toys	Waistcoats
		Skills		
Design		• Writing design criteria for a product, articulating decisions made. • Designing a personalised book sleeve.	• Designing a stuffed toy, considering the main component shapes required and creating an appropriate template. • Considering the proportions of individual components.	

Make		• Making and testing a paper template with accuracy and in keeping with the design criteria. • Measuring, marking and cutting fabric using a paper template. • Selecting a stitch style to join fabric. • Working neatly by sewing small, straight stitches. • Incorporating a fastening to a design.	• Creating a 3D stuffed toy from a 2D design. • Measuring, marking and cutting fabric accurately and independently. • Creating strong and secure blanket stitches when joining fabric. • Threading needles independently. • Using appliqué to attach pieces of fabric decoration. • Sewing blanket stitch to join fabric. • Applying blanket stitch so the spaces between the stitches are even and regular.	
Evaluate		• Testing and evaluating an end product against the original design criteria. • Deciding how many of the criteria should be met for the product to be considered successful. • Suggesting modifications for improvement. • Articulating the advantages and disadvantages of different fastening types.	• Testing and evaluating an end product and giving point for further improvements.	
		Knowledge		
Technical		• To know that a fastening is something which holds two pieces of material together for example a zipper, toggle, button, press stud and velcro. • To know that different fastening types are useful for different purposes. • To know that creating a mock up (prototype) of their design is useful for checking ideas and proportions.	• To know that blanket stitch is useful to reinforce the edges of a fabric material or join two pieces of fabric. • To understand that it is easier to finish simpler designs to a high standard. • To know that soft toys are often made by creating appendages separately and then attaching them to the main body. • To know that small, neat stitches which are pulled taut are important to ensure that the soft toy is strong and holds the stuffing securely.	

Digital World

	Y3	Y4	Y5	Y6
	Electronic Charm	Mindful Moments Timer	Monitoring Devices	Navigating the World
		Skills		
Design		• Writing design criteria for a programmed timer (Micro:bit). • Exploring different mindfulness strategies. • Applying the results of my research to further inform my design criteria. • Developing a prototype case for my mindful moment timer. • Using and manipulating shapes and clipart by using computer-aided design (CAD), to produce a logo. • Following a list of design requirements.		• Writing a design brief from information submitted by a client. • Developing design criteria to fulfil the client's request. • Considering and suggesting additional functions for my navigation tool. • Developing a product idea through annotated sketches. • Placing and manoeuvring 3D objects, using CAD. • Changing the properties of, or combining one or more 3D objects, using CAD.
Make		• Developing a prototype case for my mindful moment timer. • Creating a 3D structure using a net. • Programming a Micro:bit in the Microsoft Micro:bit editor, to time a set number of seconds/minutes upon button press.		• Considering materials and their functional properties, especially those that are sustainable and recyclable (for example, cork and bamboo). • Explaining material choices and why they were chosen as part of a product concept. • Programming an N, E, S, W cardinal compass.
Evaluate		• Investigating and analysing a range of timers by identifying and comparing their advantages and disadvantages. • Evaluating my Micro:bit program against points on my design criteria and amending them to include any changes I made. • Documenting and evaluating my project. • Understanding what a logo is and why they are important in the world of design and business. • Testing my program for bugs (errors in the code). • Finding and fixing the bugs (debug) in my code.		• Explaining how my program fits the design criteria and how it would be useful as part of a navigation tool. • Developing an awareness of sustainable design. • Identifying key industries that utilise 3D CAD modelling and explaining why. • Describing how the product concept fits the client's request and how it will benefit the customers. • Explaining the key functions in my program, including any additions. • Explaining how my program fits the design criteria and how it would be useful as part of a navigation tool. • Explaining the key functions and features of my navigation tool to the client as part of a product concept pitch. • Demonstrating a functional program as part of a product concept pitch.

Knowledge				
Technical		• To understand what variables are in programming. • To know some of the features of a Micro:bit. • To know that an algorithm is a set of instructions to be followed by the computer. • To know that it is important to check my code for errors (bugs). • To know that a simulator can be used as a way of checking your code works before installing it onto an electronic device.		• To know that accelerometers can detect movement. • To understand that sensors can be useful in products as they mean the product can function without human input.
Additional		•To understand the terms 'ergonomic' and 'aesthetic'. •To know that a prototype is a 3D model made out of cheap materials, that allows us to test design ideas and make better decisions about size, shape and materials.		• To know that designers write design briefs and develop design criteria to enable them to fulfil a client's request. • To know that 'multifunctional' means an object or product has more than one function. • To know that magnetometers are devices that measure the Earth's magnetic field to determine which direction you are facing.

Vocabulary

	Y3	Y4	Y5	Y6
Structures	<u>Constructing a Castle</u> ● 2D shapes ● 3D shapes ● Castle ● Design criteria ● Evaluate ● Facade ● Feature ● Flag ● Net ● Recyclable ● Scoring ● Stable ● Strong ● Structure ● Tab ● Weak		<u>Catapults</u> ● Abutment ● Accurate ● Coping saw ● Evaluation ● File ● Mark out ● Material properties ● Measure ● Predict ● Reinforce ● Research ● Sandpaper ● Set square ● Tenon saw ● Test ● Wood	

Mechanisms and Mechanical Systems	<u>Pneumatic Toys</u> ● Exploded-diagram ● Function ● Input ● Lever ● Linkage ● Mechanism ● Motion ● Net ● Output ● Pivot ● Pneumatic system ● Thumbnail sketch			<u>Automata Toys</u> ● Accurate ● Assembly-diagram ● Automata ● Axle ● Bench hook ● Cam ● Clamp ● Component ● Cutting list ● Diagram ● Dowel ● Drill bits ● Exploded-diagram ● Finish ● Follower ● Frame ● Function ● Hand drill ● Jelutong ● Linkage ● Mark out ● Measure ● Mechanism ● Model ● Research ● Right-angle ● Set square ● Tenon saw
Electrical Systems		<u>Torches</u> ● Battery ● Bulb ● Buzzer ● Cell ● Component ● Conductor ● Copper ● Design criteria ● Electrical item ● Electricity ● Electronic item ● Function ● Insulator ● Series circuit ● Switch ● Test ● Torch ● Wire		<u>Steady Hand Game</u> Assemble ● Battery ● Battery pack ● Benefit ● Bulb ● Bulb holder ● Buzzer ● Circuit ● Circuit symbol ● Component ● Conductor ● Copper ● Design ● Design criteria ● Evaluation ● Fine motor skills ● Fit for purpose ● Form ● Function ● Gross motor skills Insulator ● LED ● User

Cooking and Nutrition	<u>Eating Seasonally</u> ● Climate ● Dry climate ● Exported ● Imported ● Mediterranean climate ● Nationality ● Nutrients ● Polar climate ● Recipe ● Seasonal food ● Seasons ● Temperate climate ● Tropical climate		<u>What could be healthier?</u> ● Beef ● Cross-contamination ● Diet ● Ethical issues ● Farm ● Healthy ● Ingredients ● Method ● Nutrients ● Packaging ● Reared ● Recipe ● Research ● Substitute ● Supermarket ● Vegan ● Vegetarian ● Welfare	
Textiles		<u>Fastenings</u> ● Aesthetic ● Assemble ● Book sleeve ● Design criteria ● Evaluation ● Fabric ● Fastening ● Mock-up ● Net ● Running-stitch ● Stencil ● Target audience ● Target customer ● Template	<u>Stuffed Toys</u> ● Accurate ● Annotate ● Appendage ● Blanket-stitch ● Design criteria ● Detail ● Evaluation ● Fabric ● Sew ● Shape ● Stuffed toy ● Stuffing ● Template	

Digital World		<u>Mindful Moments Timer</u> ● Advantage ● Annotate ● Assemble ● Aesthetic ● Block ● Brand ● Brand identity ● Bug ● Computer-aided design (CAD) ● Clipart ● Coding ● Criteria ● Debug ● Design ● Develop ● Disadvantage ● Display ● Ergonomic ● Evaluate ● Exhibition ● Feedback ● Form ● Function ● Foin ● Logo ● Loop ● Mindfulness ● Model ● Net ● Program ● Prototype ● Research ● Script ● Sketchpad ● Test ● Timer ● User ● Variable		<u>Navigating the World</u> 3D CAD ● Application (apps) ● Biodegradable ● Boolean ● Cardinal compass ● Client ● Compass ● Concept ● Convince ● Corrode ● Duplicate ● Environmentally friendly ● Equipment ● Feature ● Finite ● Function ● Functional ● GPS tracker ● If statement ● Infinite ● Investment ● Lightweight ● Loop ● Manufacture ● Materials (wood, metal, plastic etc.) ● Mouldable ● Navigation ● Non-recyclable ● Product lifecycle ● Product lifespan ● Program ● Recyclable ● Smart ● Sustainable ● Sustainable design ● Unsustainable design ● Variable ● Workplane