

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.

	Designing	Making	Evaluating	Technical knowledge	Food technology
KS1	<p>Design - purposeful, functional, appealing products for themselves and other users based on design criteria.</p> <p>Design - generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology.</p>	<p>Select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing].</p> <p>Select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics.</p>	<p>Explore and evaluate a range of existing products evaluate their ideas and products against design criteria.</p>	<p>Build structures, exploring how they can be made stronger, stiffer and more stable.</p> <p>Explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products.</p>	<p>Use the basic principles of a healthy and varied diet to prepare dishes understand where food comes from.</p>
KS2	<p>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.</p> <p>Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.</p>	<p>Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing].</p> <p>Accurately select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.</p>	<p>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.</p> <p>Understand how key events and individuals in design and technology have helped shape the world.</p>	<p>Apply their understanding of how to strengthen, stiffen and reinforce more complex structures.</p> <p>Understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages].</p> <p>Understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors].</p> <p>Apply their understanding of computing to program, monitor and control their products.</p>	<p>Understand and apply the principles of a healthy and varied diet.</p> <p>Prepare and cook a variety of predominantly savoury dishes using a range of cooking techniques.</p> <p>Understand seasonality and know where and how a variety of ingredients are grown, reared, caught and processed.</p>

Structures

		Year 1	Year 2
		Constructing a windmill	Baby bear's chair
Skills	Design	<ul style="list-style-type: none"> Learning the importance of a clear design criteria. Including individual preferences and requirements in a design 	<ul style="list-style-type: none"> Generating and communicating ideas using sketching and modelling. Learning about different types of structures, found in the natural world and in everyday objects.
	Make	<ul style="list-style-type: none"> Making stable structures from card, tape and glue. Learning how to turn 2D nets into 3D structures. Following instructions to cut and assemble the supporting structure of a windmill. Making functioning turbines and axles which are assembled into a main supporting structure. 	<ul style="list-style-type: none"> Making a structure according to design criteria. Creating joints and structures from paper/card and tape. Building a strong and stiff structure by folding paper.
	Evaluate	<ul style="list-style-type: none"> Evaluating a windmill according to the design criteria, testing whether the structure is strong and stable and altering it if it isn't Suggest points for improvements 	<ul style="list-style-type: none"> Exploring the features of structures. Comparing the stability of different shapes. Testing the strength of own structures. Identifying the weakest part of a structure. Evaluating the strength, stiffness and stability of own structure.
Knowledge	Technical	<ul style="list-style-type: none"> To understand that the shape of materials can be changed to improve the strength and stiffness of structures. To understand that cylinders are a strong type of structure (e.g. the main shape used for windmills and lighthouses). To understand that axles are used in structures and mechanisms to make parts turn in a circle. To begin to understand that different structures are used for different purposes. To know that a structure is something that has been made and put together. 	<ul style="list-style-type: none"> To know that shapes and structures with wide, flat bases or legs are the most stable. To understand that the shape of a structure affects its strength. To know that materials can be manipulated to improve strength and stiffness. To know that a structure is something which has been formed or made from parts. To know that a 'stable' structure is one which is firmly fixed and unlikely to change or move. To know that a 'strong' structure is one which does not break easily. To know that a 'stiff' structure or material is one which does not bend easily.
	Additional	<ul style="list-style-type: none"> To know that a client is the person I am designing for. To know that design criteria is a list of points to ensure the product meets the clients needs and wants. To know that a windmill harnesses the power of wind for a purpose like grinding grain, pumping water or generating electricity. To know that windmill turbines use wind to turn and make the machines inside work. To know that a windmill is a structure with sails that are moved by the wind. To know the three main parts of a windmill are the turbine, axle and structure. 	<ul style="list-style-type: none"> To know that natural structures are those found in nature. To know that man-made structures are those made by people.

		Year 3
		Construct a castle
Skills	Design	<ul style="list-style-type: none"> 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.
	Make	<ul style="list-style-type: none"> Constructing a range of 3D geometric shapes using nets. Creating special features for individual designs. Making facades from a range of recycled materials
	Evaluate	<ul style="list-style-type: none"> 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.
Knowledge	Technical	<ul style="list-style-type: none"> To understand that wide and flat based objects are more stable. To understand the importance of strength and stiffness in structures.
	Additional	<ul style="list-style-type: none"> 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.

Mechanisms/Mechanical systems

		Year 2 - Mechanisms	Year 4 Mechanical systems	Year 5 Mechanical systems	Year 6 Mechanical systems
		Fairground wheel	Making a sling shot	Making a pop-up book	Automata toys
Skills	Design	<ul style="list-style-type: none"> • Conducting simple surveys or discussions to gather opinions on what others need or like in a design. • Knowing that a survey is used to find out what people like. • Using a simple design brief that outlines the intended use, target user, and key features of the product, to create simple design criteria. • Knowing that a design brief helps to decide what to make. • Knowing that design criteria are the steps for making a product successful. • Creating ideas with design criteria in mind. • Referring to specific parts of existing products when generating ideas. • Knowing that the design criteria help when thinking of ideas. • Using labels to explain parts of a design, label materials, etc. • Using labels to explain parts of a design, label materials, etc. • Knowing that drawings can help explain how something works. • Knowing that a label explains part of a drawing. 	<ul style="list-style-type: none"> • Designing a shape that reduces air resistance. • Drawing a net to create a structure from. • Choosing shapes that increase or decrease speed as a result of air resistance. • Personalising a design. 	<ul style="list-style-type: none"> • Designing a pop-up book which uses a mixture of structures and mechanisms. • Naming each mechanism, input and output accurately. • Storyboarding ideas for a book. 	<ul style="list-style-type: none"> • Noticing wider-reaching problems or needs in the community. • Coming up with a broader range of ideas and deeper innovation, requiring pupils to think critically about their ideas' practicality and originality. • Beginning to use more complex annotated sketches, such as cross-sectional and exploded diagrams and pattern pieces in design.
	Make	<ul style="list-style-type: none"> • Choosing materials, ingredients or components from a wider range of materials, ingredients or components. • Explaining their choices based on the properties of materials and components. • Knowing some properties of materials like hard, soft, flexible, waterproof, strong etc. • Following and recalling simple safety instructions. 	<ul style="list-style-type: none"> • Measuring, marking, cutting and assembling with increasing accuracy. • Making a model based on a chosen design. 	<ul style="list-style-type: none"> • Following a design brief to make a pop-up book, neatly, and with focus on accuracy. • Making mechanisms and/or structures using sliders, pivots and folds to produce movement. • Using layers and spacers to hide the workings of mechanical parts for an aesthetically pleasing result. 	<ul style="list-style-type: none"> • Producing lists of equipment, materials and tools that they need for a task. • Selecting materials, components or ingredients based on research or user needs. • Explaining their choices, referring to their research. • Considering which equipment will work well together.

		<ul style="list-style-type: none"> Knowing that some tools are sharp like scissors and knives. Choosing known geometric shapes when making. Beginning to shape objects to improve how they work. Knowing the names of some geometric shapes: triangle, pyramid, square, cube, circle, sphere. Considering balance in their finishing, like evenly spaced decoration. 			<ul style="list-style-type: none"> Choosing from the known range of equipment available to them with little guidance. Assessing risks associated with different tools and equipment. Understanding and explaining the importance of each safety rule. Consistently apply safety instructions. Cutting jelutong or other harder wood with a coping saw or a tenon saw in small groups. Cutting in a back-and-forth sawing motion where appropriate. In supervised groups, using hot glue guns safely. Recognising that hot glue is useful for joining materials that need a strong bond that sets quickly.
	Evaluate	<ul style="list-style-type: none"> Discussing a range of existing products and saying what they like and dislike about them. Evaluating existing products against design criteria. Evaluating their ideas and creations against simple design criteria. Knowing that design criteria help to decide if their product is a success. Suggesting improvements to their peers' designs and products. Knowing that improve means to make something better. Knowing that their suggestions can improve someone else's work 	<ul style="list-style-type: none"> Evaluating the speed of a final product based on: the effect of shape on speed and the accuracy of workmanship on performance. 	<ul style="list-style-type: none"> Evaluating the work of others and receiving feedback on own work. Suggesting points for improvement. 	<ul style="list-style-type: none"> Assessing their designs against a more complex set of design criteria that includes functionality, aesthetics, user experience, sustainability and cost. Providing feedback that is helpful, specific and encouraging. Incorporating feedback from peers or users to improve their product further, explaining the changes they made and the impact they had.
Knowledge	Technical	<ul style="list-style-type: none"> To know everyday objects have mechanisms. To know many things that move have parts inside to help them work. To know mechanisms usually limit unwanted movement. To know everyday objects utilise wheels and axles. To know wheels must be able to turn to work effectively. To know axles allow wheels to turn without falling off. 	<ul style="list-style-type: none"> To understand that all moving things have kinetic energy. To understand that kinetic energy is the energy that something (object/person) has by being in motion. To know that air resistance is the level of drag on an object as it is forced through the air. To understand that the shape of a moving object will affect how it moves due to air resistance. 	<ul style="list-style-type: none"> To know that mechanisms control movement. To understand that mechanisms can be used to change one kind of motion into another. To understand how to use sliders, pivots and folds to create paper-based mechanisms. 	<ul style="list-style-type: none"> To know that the mechanism in an automata uses a system of cams, axles and followers. To know that different shaped cams produce different outputs. To know which mechanisms are working together to make a mechanical system. To know that there are different directions of movement. <ul style="list-style-type: none"> To know that mechanisms can change one type of movement to another.
	Additional	<ul style="list-style-type: none"> To know the features of a fairground wheel include the wheel, frame, pods, a base an axle and an axle holder. 	<ul style="list-style-type: none"> To understand that products change and evolve over time. To know that aesthetics means how an object or product looks in design and technology. 	<ul style="list-style-type: none"> To know that a design brief is a description of what I am going to design and make. To know that designers often want to hide mechanisms to make a product more 	<ul style="list-style-type: none"> 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.

			<ul style="list-style-type: none"> To know that a template is a stencil you can use to help you draw the same shape accurately. To know that a birds-eye view means a view from a high angle (as if a bird in flight). To know that graphics are images which are designed to explain or advertise something. To know that it is important to assess and evaluate design ideas and models against a list of design criteria 	aesthetically pleasing.	
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Cooking and nutrition

		Year 1	Year 2
		Smoothies	Cooking and nutrition – balanced diet
Skills	Design	<ul style="list-style-type: none"> Designing smoothie carton packaging by-hand. 	<ul style="list-style-type: none"> Designing three wrap ideas.
	Make	<ul style="list-style-type: none"> Chopping fruit and vegetables safely to make a smoothie. Juicing fruits safely to make a smoothie. 	<ul style="list-style-type: none"> Chopping foods safely to make a wrap. Constructing a wrap that meets a design brief. Grating foods to make a wrap. Snipping smaller foods instead of cutting. Spreading soft foods to make a wrap. Identifying the five food groups. Learning about balanced diet.
	Evaluate	<ul style="list-style-type: none"> Tasting and evaluating different food combinations. Describing appearance, smell and taste. Suggesting information to be included on packaging. Comparing their own smoothie with someone else's. 	<ul style="list-style-type: none"> Describing appearance, smell and taste. Taste and evaluating different food combinations. Describing the information that should be included on a label.
Knowledge		<ul style="list-style-type: none"> To know that a blender is a machine which mixes ingredients together into a smooth liquid. To know that a fruit has seeds. To know that fruits grow on trees or vines. To know that vegetables can grow either above or below ground. To know that vegetables is any edible part of a plant (e.g. roots: potatoes, leaves: lettuce, fruit: cucumber). 	<ul style="list-style-type: none"> To know that 'diet' means the food and drink that a person or animal usually eats. To know what makes a balanced diet. To know that the five main food groups are: Carbohydrates, fruits and vegetables, protein, dairy and foods high in fat and sugar. To know that I should eat a range of different foods from each food group, and roughly how much of each food group. To know that 'ingredients' means the items in a mixture or recipe. To know how to cut, grate, snip and spread to prepare foods. To know how to review and give a score to evaluate.
		Year 3	Year 5
		Eating seasonally	Developing a recipe

Skills	Design	<ul style="list-style-type: none"> Designing a recipe for a savoury tart. 	<ul style="list-style-type: none"> 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. Researching existing recipes to inform ingredient choices.
	Make	<ul style="list-style-type: none"> Following the instructions within a recipe. Tasting seasonal ingredients. Selecting seasonal ingredients. Peeling ingredients safely. Cutting safely with a vegetable knife. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Identifying the nutritional differences between different products and recipes. Identifying and describing healthy benefits of food groups.
Knowledge		<ul style="list-style-type: none"> 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 know that eating seasonal foods can have a positive impact on the environment. To know that similar coloured fruits and vegetables often have similar nutritional benefits. To know that the appearance of food is as important as taste. 	<ul style="list-style-type: none"> To understand where meat comes from - learning that beef is from cattle and how beef is reared and processed. To know that recipes can be adapted to suit nutritional needs and dietary requirements. 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. To know that coloured chopping boards can prevent cross-contamination. To know that nutritional information is found on food packaging. To know that food packaging serves many purposes.

Textiles

		Year 1	Year 3	Year 5
		Puppets	Cross stitch and applique	Stuffed toys
Skills	Design	<ul style="list-style-type: none"> Using a template to create a design for a puppet. 	<ul style="list-style-type: none"> Designing and making a template from an existing cushion and applying individual design criteria. 	<ul style="list-style-type: none"> Designing a stuffed toy, considering the main component shapes required and creating an appropriate template. Considering the proportions of individual components.
	Make	<ul style="list-style-type: none"> Cutting fabric neatly with scissors. Using joining methods to decorate a puppet. Sequencing the steps taken during construction. 	<ul style="list-style-type: none"> Following design criteria to create a cushion or Egyptian collar. Selecting and cutting fabrics with ease using fabric scissors. Threading needles with greater independence. Tying knots with greater independence. Sewing cross stitch to join fabric. Decorating fabric using appliqué. Completing design ideas with stuffing and sewing the edges (Cushions) or embellishing the collars based on design ideas (Egyptian collars). 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Reflecting on a finished product, explaining likes and dislikes. 	<ul style="list-style-type: none"> Evaluating an end product and thinking of other ways in which to create similar items. 	<ul style="list-style-type: none"> Testing and evaluating an end product and giving point for further improvements.

Knowledge	<ul style="list-style-type: none"> To know that 'joining technique' means connecting two pieces of material together. To know that there are various temporary methods of joining fabric by using staples, glue or pins. To understand that different techniques for joining materials can be used for different purposes. To understand that a template (or fabric pattern) is used to cut out the same shape multiple times. To know that drawing a design idea is useful to see how an idea will look. 	<ul style="list-style-type: none"> To know that applique is a way of mending or decorating a textile by applying smaller pieces of fabric to larger pieces. To know that when two edges of fabric have been joined together it is called a seam. To know that it is important to leave space on the fabric for the seam. To understand that some products are turned inside out after sewing so the stitching is hidden. 	<ul style="list-style-type: none"> 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.
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Electrical systems (KS2 only)

		Year 4	Year 6
		Torches	Steady hand game
Skills	Design	<ul style="list-style-type: none"> Designing a torch, giving consideration to the target audience and creating both design and success criteria focusing on features of individual design ideas. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Evaluating electrical products. Testing and evaluating the success of a final product. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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'

Digital world (KS2 only)

		Year 4	Year 6
		Mindful moment timer	Navigating the world
Skills	Design	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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 combine one or more 3D objects, using CAD
	Make	<ul style="list-style-type: none"> • Developing a prototype case for my mindful moment timer. • Creating 3D structures using modelling materials. • Programming a micro:bit in the Microsoft micro:bit editor, to time a set number of seconds/minutes upon button press. 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. • Using an exhibition to gather feedback. • Gathering feedback from the user to make suggested improvements to a product 	<ul style="list-style-type: none"> • 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 explain 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
Knowledge	Technical	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 an exhibition is a way for companies to showcase products, meet potential new customers and gather feedback from users. 	<ul style="list-style-type: none"> • 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