



Understanding Different Types of Design and Technology



Substantive Knowledge

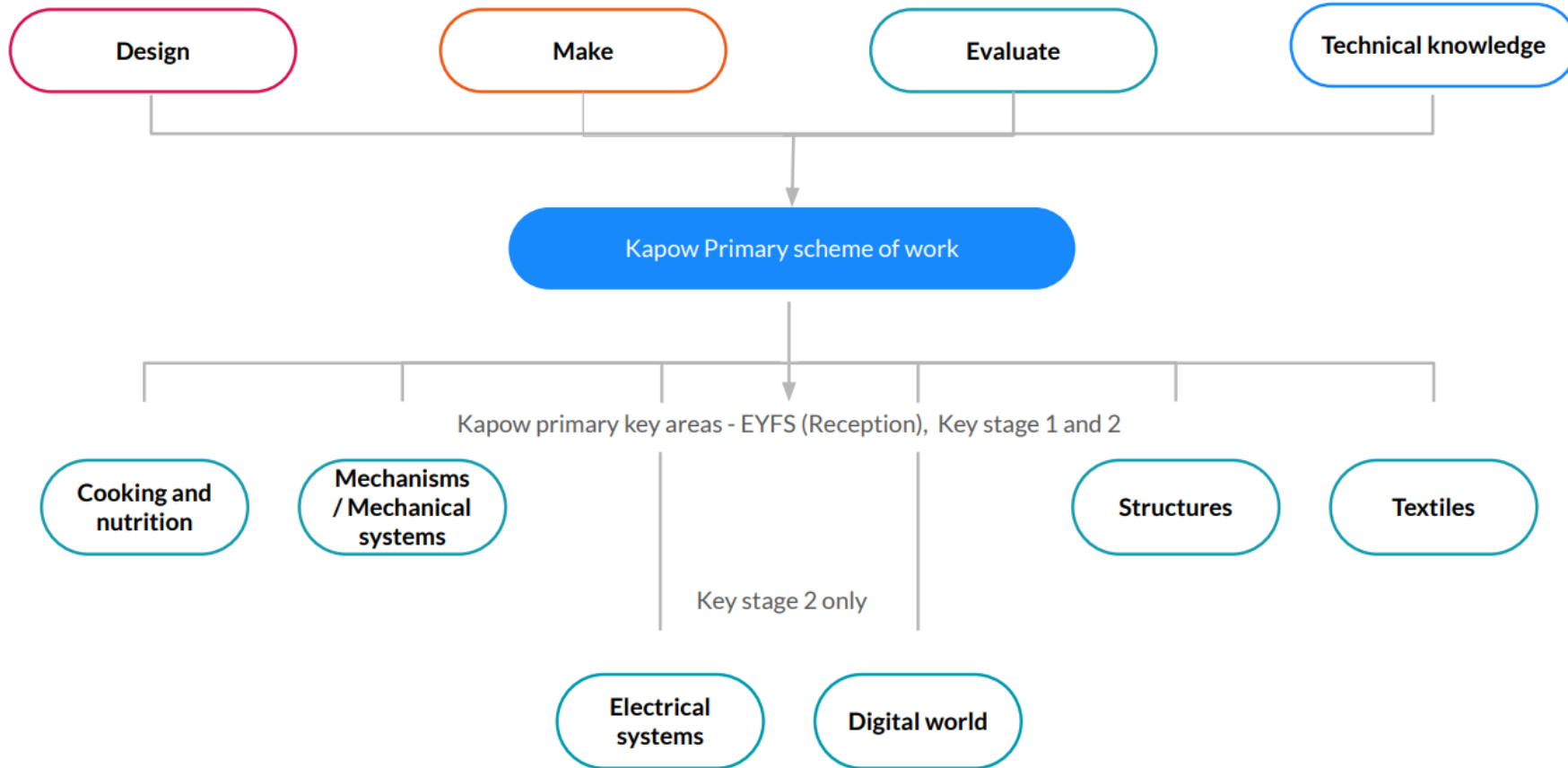
Substantive knowledge is the subject-specific content of design and technology which is taught through research and practice. This is the core subject knowledge, skills and vocabulary used about the designing and making processes and the contribution of designers from a range of genres, times and cultural traditions. We explore these through the lenses of substantive concepts which are taught through explicit vocabulary instruction as well as through the direct content and context of the study. The substantive concepts that we develop through our Design and Technology curriculum are:

- Food and Nutrition
- Mechanisms
- Structures
- Electrical Systems
- Textile

Disciplinary Knowledge

In addition to the core knowledge required to be successful within each of these elements, our curriculum outlines key aspects of how we intend to develop working as a designer. We organise our curriculum so that it focuses on developing different aspects of these competencies at different points. The features of working as a designer in our Design and Technology Curriculum are:

- Design - The art or process of deciding how something will look or work.
- Make - Create something by combining materials or putting parts together.
- Evaluate - Form an opinion of the value or quality of something after careful thought.
- Technical Knowledge - Building and using mechanisms and structures. Understanding and applying how electrical, mechanical and computing systems can work in their products.



National Curriculum Programme of Study and EYFS Framework

EYFS	Key Stage 1	Key Stage 2
<p><u>Development Matters 4-5 Years:</u> <i>Explore, use & refine a variety of artistic effects to express their ideas and feelings. Return to & build on their previous learning, refining ideas & developing their ability to represent them. Create pictures/collages using a range of techniques. Create collaboratively, sharing ideas, resources and skills</i> <u>ELG 16a:</u> Safely use & explore materials & techniques, experimenting with colour, design, texture, form and function <u>ELG 16b:</u> Share creations, explaining the process they have used <u>ELG 16c:</u> Make use of props and materials when role playing characters in narratives and stories. ELG Use a range of small tools, including scissors, paintbrushes and cutlery.</p>	<p><i>Design</i></p> <ul style="list-style-type: none"> design purposeful, functional, appealing products for themselves and other users based on design criteria generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology <p><i>Make</i></p> <ul style="list-style-type: none"> select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing] select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics <p><i>Evaluate</i></p> <ul style="list-style-type: none"> explore and evaluate a range of existing products evaluate their ideas and products against design criteria <p><i>Technical knowledge</i></p> <ul style="list-style-type: none"> build structures, exploring how they can be made stronger, stiffer and more stable explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products <p><i>Cooking and Nutrition</i></p> <ul style="list-style-type: none"> use the basic principles of a healthy and varied diet to prepare dishes understand where food comes from. 	<p><i>Design</i></p> <ul style="list-style-type: none"> 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 <p><i>Make</i></p> <ul style="list-style-type: none"> 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 <p><i>Evaluate</i></p> <ul style="list-style-type: none"> 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 <p><i>Technical knowledge</i></p> <ul style="list-style-type: none"> 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. <p><i>Cooking and Nutrition</i></p> <ul style="list-style-type: none"> 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

		<ul style="list-style-type: none"> • <i>understand seasonality, and know where and how a variety of ingredients are grown, reared, caught and processed.</i>
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Substantive Knowledge – theoretical knowledge of movements and artists		
EYFS	Year 1	Year 2
<ul style="list-style-type: none"> • Use different media and materials to express their own ideas • Use what they have learnt about media and materials in original ways, thinking about form, function and purpose <ul style="list-style-type: none"> • Make plans and construct with a purpose in mind using a variety of resources • Develop skills to use simple tools and techniques appropriately, effectively and safely 	<p>To understand that the shape of materials can be changed to improve the strength and stiffness of structures. •</p> <p>To understand that cylinders are a strong type of structure (and, therefore, they are the main shape used for windmills and lighthouses)</p> <ul style="list-style-type: none"> • To understand that axles are used in structures and mechanisms to make parts turn in a circle. • To know that a mechanism is the parts of an object that move together • To know that a slider mechanism moves an object from side to side. • To know that a slider mechanism has a slider, slots, guides and an object • To know that bridges and guides are bits of card that purposefully restrict the movement of the slider • To understand the difference between fruits and 	<p>To know that mechanisms are a collection of moving parts that work together as a machine to produce movement.</p> <ul style="list-style-type: none"> • To know that there is always an input and an output in a mechanism. • To know that an input is the energy that is used to start something working. • To know that an output is the movement that happens as a result of the input. • To know that a lever is something that turns on a pivot. • To know that a linkage mechanism is made up of a series of levers. • To know that sewing is a method of joining fabric. • <p>To know that different stitches can be used when sewing.</p> <ul style="list-style-type: none"> • To understand the importance of tying a knot after

	<p>vegetables</p> <ul style="list-style-type: none"> • To understand that some foods typically known as vegetables are actually fruits (e.g. cucumber). • To know that a blender is a machine which mixes ingredients together into a smooth liquid. • To know that a fruit has seeds and a vegetable does not. • To know that fruits grow on trees or vines 	<p>sewing the final stitch.</p> <ul style="list-style-type: none"> • To know that a thimble can be used to protect my fingers when sewing. • To know that ‘diet’ means the food and drink that a person or animal usually eats. • To understand what makes a balanced diet. • To know where to find the nutritional information on packaging • To know that the five main food groups are: Carbohydrates, fruits and vegetables, protein, dairy and foods high in fat and sugar. • To understand that I should eat a range of different foods from each food group, and roughly how much of each food group. • To know that nutrients are substances in food that all living things need to make energy, grow and develop. • To know that ‘ingredients’ means the items in a mixture or recipe. • To know that I should only have a maximum of five teaspoons of sugar a day to stay healthy. • To know that many food and drinks we do not expect to contain sugar do; we call these ‘hidden sugars’.
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Key Stage 2

Substantive Knowledge –			
Year 3	Year 4	Year 5	Year 6
To know that not all fruits and vegetables	To understand that electrical conductors are materials which	To understand that it is important to	To know that structures can be strengthened by manipulating

<p>can be grown in the UK.</p> <ul style="list-style-type: none"> • 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 that has been brought into the country. • To understand that wide and flat based objects are more stable. • To understand the importance of strength and stiffness in structures. • 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 facade is the front of a structure. • To understand that a castle needed to be strong and stable to withstand enemy attack. • To know that appliqué is a way of mending 	<p>electricity can pass through.</p> <ul style="list-style-type: none"> • To understand what variables are in programming. • To know some of the features of a Micro:bit. • To understand that all moving things have kinetic energy. • 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 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 	<p>design clothing with the client/target</p> <ul style="list-style-type: none"> • To understand what a 'footprint plan' is. • To understand that in the real world design can impact users in positive and negative ways. • To know that a prototype is a cheap model to test a design idea. • To know that a 'device' means equipment created for a certain purpose or job and that monitoring devices observe and record. • To know that a sensor is a tool or device that is designed to monitor, • 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 	<p>materials and shapes. customer in mind.</p> <ul style="list-style-type: none"> • To know that using a template (or clothing pattern) helps to accurately mark out a design on fabric • To understand the importance of consistently sized stitches. 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
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<p>or decorating a textile by applying smaller pieces of fabric.</p> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • To understand that some products are turned inside out after sewing so the stitching is hidden. 	<p>be used as a way of checking that your code works before installing it onto an electronic device.</p> <ul style="list-style-type: none"> • 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 	<p>recipe to make it healthier by</p> <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. • 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 aesthetically pleasing. 	<p>‘back’.</p> <ul style="list-style-type: none"> • To know that ‘flavour’ is how a food or drink tastes. • To know that many countries have ‘national dishes’ which are recipes associated with that country. • To know that ‘processed food’ means food that has been put through multiple changes in a factory. • To understand that it is important to wash fruit and vegetables before eating to remove any dirt and insecticides. • To understand what happens to a certain food before it appears on the supermarket shelf (Farm to Fork).
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EYFS and Key Stage 1

EYFS	Year 1	Year 2
<ul style="list-style-type: none"> • Select appropriate resources for a product and adapt their work where necessary • Cook and prepare food adhering to good health and hygiene routines 	<ul style="list-style-type: none"> • Safe use of simple tools to punch to cut and make holes materials • Joining 2D and 3D materials- gluing , sticking, • Tying, fixing with split pins • Creating basic hinges • Creating levers and sliders • Understanding of structures and how these can be made stronger and more stable • Understanding simple mechanisms that allow movement – sliding mechanisms • Basic food handling, hygienic practices and personal hygiene, including how to control risks • Safe use of a variety of tools and equipment to peel, cut , grate, mix and mould food • The nutritional value of food stuffs in a balanced diet • Know about and apply basic finishing techniques e.g. collag 	<ul style="list-style-type: none"> • Using templates and patterns on fabric, pinning, <ul style="list-style-type: none"> • tracing around outline of component parts . • Experimenting with using a template to draw and cut out 2 identical shapes • Applying basic measuring skills • Cutting fabric with precision • Use of simple models e.g. base kits/use of nets to plan out use of space or a structure might be marked out in order to be made • Developing basic sewing techniques – starting, ending, running stitch to join fabric • Developing a range of techniques for joining fabriclacing, stitching, stapling, gluing, taping • Joining wheels and axels • Understanding simple mechanisms that allow movement - winding mechanisms • Know about and apply different finishing techniques <ul style="list-style-type: none"> – collage, paint, cut out shapes, computer generated images to match a design brief.

Key Stage 2

Disciplinary Knowledge – *working as a designer*

Year 3	Year 4	Year 5	Year 6
<p>Work safely with a range of hand tools incl junior hacksaw</p> <ul style="list-style-type: none"> • Extend understanding of ways of fixing and joining components and selecting most appropriate for a given task • Understanding how to make stable structures - rolling, folding, and layering, reinforcing corners, cutting a mitre joint • Understanding how pneumatic systems work • Revising how simple levers work • Know about and apply different finishing techniques –collage, paint, cut out shapes, decoupage, varnishing for durability. • Understanding of food preparation techniques(tearing, cutting, slicing, grating) and ways of combining foods to make a product for a particular purpose • Combining foods on the basis of taste, appearance and texture 	<ul style="list-style-type: none"> • Measuring accurately, marking out, cutting, folding, scoring, • Using patterns and templates with more than 2 pieces • Relate a mechanism to its purpose and select for a desired type of movement • Joining and reinforcing fabrics • Demonstrating fabric can be joined in a number of different ways – sewing using a range of stitches • Understanding linkage mechanisms and the type of movement they produce • Applying knowledge about electrical circuits in designing and making products • Understanding what makes a quality finish- collage, printing, drawing, use of font, size, colour, layout . • Using a widening range of decorative techniques such as dyeing and embroidery, embellishing, applique, fabric paints, fastenings (buttons, buckles, press st 	<p>Measuring accurately, marking out, cutting, folding, scoring, drilling and mounting structures</p> <ul style="list-style-type: none"> • Using a range of sharp tools safely – paper drill, hole punch • Understanding how different materials can be reinforced for different purposes • Assembling materials in temporary ways as a trial prior to finalizing design choices • Cutting and joining component parts to a main structure • Understanding how to control movement with a cam mechanism • Selecting appropriate methods and resources for finishing a design that reflect the intended use, cultural, geographical or historical influences • Accurate measuring and weighing skills, understanding that the properties and quantities of ingredients will affect the final product • Increased awareness of food safety and hygiene, including the use of ovens • Exploring the functions and properties of 	<ul style="list-style-type: none"> • Making accurate patterns and templates • Using a range of tool and techniques for marking out, measuring and cutting a range of sheet materials, wood, plastic, fabric • Knowing that structures can fail when loaded • Knowing how to reinforce structures and to research info about this from a range of sources • Using a variety of temporary and permanent joining techniques, including framework, materials and textiles. • Assembling components to make working models • Using known skills e.g. applique,, cutting, embellishing, fabric gluing, stenciling and extend to include dyeing and machine sewing • Understanding how products can be driven by electricity • Understanding of how to control speed and direction

<ul style="list-style-type: none">• Understanding of different food groups within a healthy and balanced diet		ingredients	<ul style="list-style-type: none">• Understanding how different sorts of switches can be used to control electrical current• Developing a structure with finishing techniques including cladding• Distinguish between functional and decorative products
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Vocabulary

Developing vocabulary: our aim is to ensure that our children are familiar with frequently occurring words that appear in various contexts and topics (including terms and concepts).

DT Vocabulary progression document					
Vocabulary: Textiles					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Pattern, join, mark out, decorate, running stitch, needle, fabric.	Template, quality, suitable, features, dye, overstitch, design, fray, mock-up, seam.	Fastening, compartment, zip, finishing technique, function, prototype, back stitch, felted, woven, knitted, bonded.	Aesthetics, seam allowance, pinning, embroidery, back/blanket/cross stitch.	Specification, tacking, working drawing, clasp, pinking shears, design criteria, hem, reinforce, stem stitch, satin stitch, tie dye.	Applique, annotate, evaluate, innovation, functionality, renewable, authentic, chain stitch.
Vocabulary: Electrical systems					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		User, fault, toggle switch, insulator, conductor, battery holder, crocodile clip	Series circuit, connection, push-to-make switch, push to-break switch, innovative, appealing, control box, input device, output device, system	Parallel circuit, light emitting diode, monitor, flowchart, design specification, reed switch, tilt switch	Light dependent resistor, interface control, micro switch, latching switch
Vocabulary: Mechanisms					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<u>Wheels & Axles:</u> Wheel, axel, fixed, free, design, make, cutting, joining, hacksaw, vice, dowel, body, cab, shaping	<u>Slider & Leavers:</u> Mechanism, lever, slider, slot, pivot, guide/bridge, masking tape, fastener, pull/push, down, straight, work, design, evaluate, purpose	<u>Leavers & linkages:</u> Loose/fixed pivot, system, input, process	<u>Leavers & Linkages:</u> Loose pivot, fixed pivot, system, input, process, output, linear, rotary, reciprocating, innovative, appealing, linkage, oscillating	<u>Pulleys or Gears:</u> Pulley, gear, driver, follower, rotation, motor, belt, spindle, motor, circuit, switch, ratio, transmit, annotated drawings, exploded diagrams, functionality	<u>Pulleys or Gears:</u> Transmit, annotated drawings, exploded diagrams, functionality

Vocabulary: Structures





Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p><u>Freestanding Structures:</u> Cut, fold, join, fix, weak, strong</p>	<p><u>Freestanding Structures:</u> Structure, base, underneath, thicker, thinner, corner, point, straight, curved, rectangle, cube, cuboid, cylinder</p>	<p><u>Shell Structures:</u> Shell, structure, net, marking out, material, joining, three dimensional, stiff</p>	<p><u>Shell Structures:</u> Assemble, prism, vertex, breadth, capacity, scoring, adhesives, reduce, reuse, recycle, corrugating, ribbing, laminating</p>	<p><u>Frame Structures:</u> Reinforce, triangulation, stability, temporary, permanent, prototype, innovation, functional, design brief</p>	

Vocabulary: Nutrition

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p><u>Preparing Fruit & Vegetables:</u> Fruit, vegetables, soft, juicy, crunchy, sticky, smooth, sharp, crisp, sour hard, flesh, skin, seed pip, core, slicing, peeling, cutting, squeezing, healthy diet, choosing, ingredients, planning, tasting, arranging</p>		<p><u>Healthy & Varied Diet:</u> Texture, taste, appearance, preference, greasy, moist, fresh, savoury, hygienic, edible, grown, reared, caught, frozen, tinned, processed, seasonal, harvested</p>		<p><u>Celebrating Culture & Seasonality:</u> Ingredients, yeast, dough, wholemeal, unleavened, baking soda, spice, herbs, carbohydrate, sugar, fat, protein, vitamins, nutrients, gluten,</p>	

		<p>allergy, intolerance, savoury, seasonality, pour, mix, knead, whisk, beat, combine, fold, rubbing in</p>
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Key Symbols

	research
	design
	make
	evaluate

Book Links:

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
					