

Design and Technology Expectations

Substantive Concepts

	EYFS		KS1		Lower KS2		Upper KS2	
	Nursery	Reception	Class 2	Class 3	Class 4		Class 5	
Mechanical Systems	<p>Toys</p> <ul style="list-style-type: none"> Know the cause & effect toys of simple mechanisms: remotes, winders, friction cars, remote control cars etc 	<p>Toys</p> <ul style="list-style-type: none"> Know that a programmable toy (or robot*) can be made to move by inputting information. It is then stored as a program. 	<p>Sliders and Levers</p> <ul style="list-style-type: none"> Know that a mechanism is a device used to create movement in a product. Know that a lever is a rigid bar which moves around a pivot. Levers are used in many everyday products. Know that a slider is a rigid bar which moves backwards and forwards along a straight line. To know that unlike a lever, a slider does not have a pivot point. <p>Wheels and Axels</p> <ul style="list-style-type: none"> Know that an axle is a rod that enables a wheel to rotate. And the wheel can rotate freely on the axle or be fixed to, and turn with, the axle. Know that the chassis is the frame or base on which a vehicle is built. <p>Sliders and Levers</p> <ul style="list-style-type: none"> To know that sliders move from side to side and up and down. To know that levers can be used with or without a slot. To know the movement of simple mechanisms such as levers, sliders, wheels and axles. 	<p>Pneumatics</p> <ul style="list-style-type: none"> Know how mechanical systems such as levers and linkages or pneumatic systems create movement Know that compressed means that something that is squashed, such as air in a tube. Know that input is what goes into a system and output is what comes out of a system. Know that a pivot is a point about which a lever turns. Know that a lever is a beam which turns about a point. Know that pneumatic is a system that works using gases (air) and hydraulic is a system that works using liquids (water). Know that inflate means to fill something with air or a gas to make it swell up and deflate is when you remove the pressurised air to allow an object like a balloon to shrink. Know that a syringe is a tube with a nozzle and plunger for sucking and blowing air or liquid Know the difference between fixed and loose pivots. Know that the term 'linkage' is also used to describe the lever and linkage mechanism as a whole. 			<p>Cams</p> <ul style="list-style-type: none"> To know that a rotary motion is a movement that goes round. To know that an oscillating motion is moving to and fro around a pivot point, as in a lever. To that that reciprocating motion is a backwards and forwards movement in a straight line, as in a slider. To know that a cam is a mechanism that changes one sort of movement to another. Cams can be an off-centre wheel or a specially shaped wheel. To know that a follower is the device that follows the movement of the cam: a lever or a slider. To know that a spacer is a piece of material used to create extra space to allow moving parts to move freely Understand how mechanical systems such as cams or pulleys or gears create movement 	
Vocabulary	push, pull, wind, press, up, down	recipe, sequence, remote forwards, backwards, cutting	slider, lever, pivot, slot, bridge/guide card, masking tape, paper fastener, join straight, curve, design, make, evaluate, user, purpose, ideas, design criteria, product, function vehicle, wheel, axle, axle holder, chassis, body, cab assembling, joining, shaping, finishing, fixed, free, moving, mechanism names of tools, equipment and materials used design, make, evaluate, purpose, user, criteria, functional	components, fixing, attaching, tubing, syringe, plunger, split pin, paper fastener pneumatic system, input movement, process, output movement, control, compression, pressure, inflate, deflate, pump, seal, air-tight linear, rotary, oscillating, reciprocating user, purpose, function, prototype, design criteria, innovative, appealing, design brief, research, evaluate, ideas, constraints, investigate mechanism, lever, linkage, pivot, slot, bridge, guide system, input, process, output linear, rotary, oscillating, reciprocating user, purpose, function			cam, snail cam, off-centre, cam, peg cam, pear, shaped cam, follower, axle, shaft, crank, handle, housing, framework, rotation, rotary motion, oscillating motion, reciprocating motion, annotated sketches, exploded diagrams, mechanical system, input movement, process, output movement, design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief	

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				prototype, design criteria, innovative, appealing, design brief		
Structures	<p>Modelling</p> <ul style="list-style-type: none"> Know how to use one-handed tools and equipment, for example, making snips in paper with scissors. Know how to make imaginative and complex 'small worlds' with blocks and construction kits, such as a city with different buildings and a park. 	<p>Modelling</p> <ul style="list-style-type: none"> Know how to create and explore structures using different materials, different ways to fasten, both inside and outside of the classroom Know how to use tools, such as scissors, with increasing confidence. 	<p>Freestanding structures</p> <ul style="list-style-type: none"> Know that a freestanding structure is a structure that stands on its own foundation or base without attachment to anything else. Know that their structure needs to be stable which means it is unlikely to fall over if a force is applied. Knows that brick bonding can improve the performance of the structure or improve its appearance 		<p>Shell Structures (Using CAD)</p> <ul style="list-style-type: none"> To know a net is the flat or opened-out shape of an object such as a box. To know the names and properties of 3D shapes including edges and vertices To know that scoring is when you cut a line or mark into sheet material to make it easier to fold. To know font is a printer's term meaning the style of lettering being used. To know that CAD means Computer Aided Design Understand how to make strong, stiff shell structures. 	<p>Frame Structures</p> <ul style="list-style-type: none"> To know that modelling is the process of making a 3-D representation of a structure or product. To know that a strut is a part of a structure under compression. To know that tension is when a force is pulling on a material or structure. To know that triangulation (the use of triangular shapes) is effective in strengthening a structure. Know how to reinforce and strengthen a 3D framework.
Vocabulary	cut, corner, scissors, build	fold, join thinner, thicker, point, straight, curved circle, triangle, square, rectangle	fix structure, wall, tower, framework, weak, strong, base, top, underneath, side, edge, surface, metal, wood, plastic, cuboid, cube, cylinder design, make, evaluate, user, purpose, ideas, design criteria, product, function		shell structure, three-dimensional (3-D), shape, net, cube, cuboid, prism, vertex, edge, face, length, width, breadth, capacity, marking out, scoring, shaping, tabs, adhesives, joining, assemble, accuracy, material, stiff, strong, reduce, reuse, recycle, corrugating, ribbing, laminating font, lettering, text, graphics, decision, evaluating, design brief design criteria ,innovative, prototype	frame structure, stiffen, strengthen, reinforce, triangulation, stability, shape, join, temporary, permanent design brief, design specification, prototype, annotated sketch, purpose, user, innovation, research, functional
Textiles	<p>Exploring materials</p> <ul style="list-style-type: none"> Explore different materials freely, in order to develop their ideas about how to use them and what to make. Develop their own ideas and then decide which materials to use to express them. 	<p>Exploring materials</p> <p>Explore a range of materials, including natural materials</p> <ul style="list-style-type: none"> Make objects from different materials, including natural materials 	<p>Templates and Joining Techniques</p> <ul style="list-style-type: none"> To know that textiles can be decorated in different ways including embroidery To know that edge may fray - to unravel or become worn at the edge. To know that a seam is a row of stitches joining two pieces of fabric. To know that sewing is joining pieces of fabric with stitches. 	<p>2D shape to 3D product</p> <ul style="list-style-type: none"> To know a pattern or template is a shape drawn to exact shape and size and used to assist cutting out. To know a seam is a line of stitching that joins pieces of fabrics together. Understand that a single fabric shape can be used to make a 3D textiles product. 	<p>2D shape to 3D product</p> <ul style="list-style-type: none"> To know that appliqué means 'applied' and describes the method of stitching/gluing To know a prototype that a model that is made to test whether a design will work. The know that aesthetics - the way in which the product looks with the nature and expression of beauty To know a seam Allowance is the extra fabric allowed for joining together and this is usually 1.5cm. 	<p>Combining different fabric shapes</p> <ul style="list-style-type: none"> Know that a mock up - quick 3-D modelling using easy to work and cheaper materials and temporary joints – can be useful for checking proportions and scale. Know that a pattern or template is a shape drawn to exact shape and size, used to assist in cutting out. Know that tacking is large running stitches to hold pieces of fabric together temporarily. Understand that a 3D textiles product can be made from a combination of fabric shapes.
Vocabulary	glue, , join, stick, Sellotape / sticky tape	Decorate, materials, attach, fabric	names of existing products, joining and finishing techniques, tools, fabrics and components template, pattern pieces, mark out,, finish features, suitable, quality mock-	fabric, names of fabrics, fastening, , templates, stitch, seam, design, model, evaluate, prototype, annotated sketch, functional, innovative, investigate, label, drawing	compartment, zip, button, structure, finishing technique, strength, weakness, stiffening, seam allowance, user, purpose, , aesthetics, function, pattern pieces	seam, seam allowance, wadding, reinforce, right side, wrong side, hem, template, pattern pieces name of textiles and fastenings used, pins, needles, thread, pinking shears, fastenings, iron transfer

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			up, design brief, design criteria, make, evaluate, user, purpose, function			paper design criteria, annotate, design decisions, functionality, innovation, authentic, user, purpose, evaluate, mock-up, prototype
Healthy Eating	<p>Healthy eating</p> <ul style="list-style-type: none"> Know that some foods are healthy and nutritious. Explore eating a range of fruit and vegetables at snack time. 	<p>Healthy eating & Food preparation</p> <ul style="list-style-type: none"> Change materials by heating and cooling, including cooking Explore a range of different types from the UK and around the world. Know that some food comes from plants. 	<p>Preparing fruit and vegetables</p> <ul style="list-style-type: none"> Know that all food comes from plants or animals. Know that food has to be farmed, grown elsewhere (e.g. home) or caught. Name and sort foods into the five groups in The Eatwell Plate. Know that everyone should eat at least five portions of fruit and vegetables every day. Know how to use techniques such as cutting, peeling and grating. 	<p>Healthy and Varied Diet</p> <ul style="list-style-type: none"> Know that food is grown (such as tomatoes, wheat and potatoes), reared (such as pigs, chickens and cattle) and caught (such as fish) in the UK, Europe and the wider world. Know how to prepare and cook a variety of predominantly savoury dishes safely and hygienically including, where appropriate, the use of a heat source. Know how to use a range of techniques such as peeling, chopping, slicing, grating, mixing, spreading, kneading and baking. Know that a healthy diet is made up from a variety and balance of different food and drink, as depicted in The Eatwell Plate Knowing the importance of being active and that healthy food and drink are needed to provide energy for the body. 	<p>Healthy and Varied Diet</p> <ul style="list-style-type: none"> To know that the appearance of food is how it looks to the eye. To know that the texture of food is how the product feels in the mouth. To know how to use sensory evaluation is evaluating food products in terms of the taste, smell, texture and appearance. To know that processed food mean that the ingredients that have been changed in some way to enable them to be eaten or used in food preparation and cooking. Know that food ingredients can be fresh, pre-cooked and processed. 	<p>Celebrating culture and Seasonality</p> <ul style="list-style-type: none"> Know that seasons may affect the food available. Know how food is processed into ingredients that can be eaten or used in cooking. Know that recipes can be adapted to change the appearance, taste, texture and aroma. Know that different food and drink contain different substances – nutrients, water and fibre – that are needed for health. Know the importance of finishing in terms of their presentation/ the appearance of the product – shape, decoration and colour.
	fruit and vegetable names,	Sensory vocabulary such as: soft, juicy, crunchy, sweet, sticky, smooth,	names of equipment and utensils sensory vocabulary e.g.s harp, crisp, sour, hard flesh, skin, seed, pip, core, slicing, peeling, cutting, squeezing, healthy diet, choosing, ingredients, planning, investigating tasting, arranging, popular, design, evaluate, criteria	taste, sweet, sour, hot, spicy, greasy, moist, cook, fresh, savoury, hygienic, edible, grown, reared, caught, frozen, tinned, processed,	name of products, names of equipment, utensils, techniques and ingredients, texture, appearance, smell, preference, seasonal, harvested, healthy/varied diet, planning, design criteria, purpose, user, annotated, sketch, sensory, evaluation	ingredients, yeast, dough, bran, flour, wholemeal, unleavened, baking soda, spice, herbs fat, sugar, carbohydrate, protein, vitamins, nutrients, nutrition, healthy, varied, gluten, dairy, allergy, intolerance, savoury, source, seasonality, utensils, combine, fold, knead, stir, pour, mix, rubbing in, whisk, beat, roll out, shape, sprinkle, crumble design specification, innovative, research, evaluate, design brief
Electrical systems					<p>Simple Circuits & Switches</p> <ul style="list-style-type: none"> To know that a circuit is a path through which electricity passes. To know that a conductor is a material which allows an electric current to pass through it. To know that an insulator is a material which does not easily allow electric current to pass through it. To know that a prototype is a model made to test whether a design will work. To know that a reed switch is operated by a magnet. To know that a toggle switch is operated when a lever is pressed. 	<p>Monitoring and Control</p> <ul style="list-style-type: none"> To know that some components (e.g. buzzers and LEDs) need to be connected the right way around in a circuit, ensuring positive and negative match the outputs of the interface box or microcontroller. children need to develop an To know that output devices are components that produce an outcome e.g. bulbs and buzzers. To know that input devices are components that are used to control an electrical circuit e.g. switches. Understand how more complex electrical circuits and components

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					<p>Simple Programming and Control</p> <ul style="list-style-type: none"> To know that a program is a sequence of instructions that can be used to control electrical components. To know that a microcontroller is a device that can be programmed to control how an electrical product operates. <p>To know that a light emitting diode (LED) is an output device that glows when electricity is passed through it.</p> <ul style="list-style-type: none"> Understand how simple electrical circuits and components can be used to create functional products. Understand how to program a computer to control their products. 	<p>can be used to create functional products.</p>
<p>Vocabulary</p>					<p>series circuit, fault, connection, toggle switch, push-to-make switch, push-to-break switch, battery, battery holder, bulb, bulb holder, wire, insulator, conductor, crocodile clip, control, program, system, input device, output device user, purpose, function, prototype, design criteria, innovative, appealing, design brief, light emitting diode (LED), bulb, bulb holder, USB cable, wire, insulator, conductor, crocodile clip</p>	<p>reed switch, toggle switch, push-to-make switch, push-to-break switch, light dependent resistor (LDR), tilt switch, light emitting diode (LED), bulb, bulb holder, battery, battery holder, USB cable, wire, insulator, conductor, crocodile clip, control, program, system, input device, output device, series circuit, parallel circuit, function, innovative, design specification, design brief, user, purpose</p>

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Disciplinary Knowledge

Aspect	EYFS	KS1		Lower KS2		Upper KS2	
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Designing	<ul style="list-style-type: none"> Develop their small motor skills so that they can use a range of tools competently, safely and confidently. Create collaboratively, sharing ideas, resources and skills. 	<p>Understanding contexts, users and purposes:</p> <ul style="list-style-type: none"> Work confidently within a range of contexts, such as imaginary, story-based, home, school, gardens, playgrounds, local community, industry and the wider environment. State what products they are designing and making. Say whether their products are for themselves or other users. Describe what their products are for. Say how their products will work. Say how they will make their products suitable for their intended users. Use simple design criteria to help develop their ideas. <p>Generating, developing, modelling and communicating idea:</p> <ul style="list-style-type: none"> Generate ideas by drawing on their own experiences. Use knowledge of existing products to help come up with ideas. Develop and communicate ideas by talking and drawing. Model ideas by exploring materials, components and construction kits and by making templates and mock-ups. Use information and communication technology, where appropriate, to develop and communicate their ideas. 		<p>Understanding contexts, users and purposes:</p> <ul style="list-style-type: none"> Work within a wider range of contexts, such as the home, school, leisure, culture, enterprise, industry and the wider environment. Describe the purpose of their products. Indicate the design features of their products that will appeal to intended users. Explain how particular parts of their products work. Gather information about the needs and wants of particular individuals and groups. Develop their own design criteria and use these to inform their ideas. <p>Generating, developing, modelling and communicating idea:</p> <ul style="list-style-type: none"> Share and clarify ideas through discussion. If appropriate, model their ideas using prototypes and pattern pieces. Use annotated sketches, cross-sectional drawings and exploded diagrams to develop and communicate their ideas. Use computer-aided design to develop and communicate their ideas. Generate realistic ideas, focusing on the needs of the user'. Make design decisions that take account of the availability of resources. 		<p>Understanding contexts, users and purposes:</p> <ul style="list-style-type: none"> Work confidently within a range of contexts, such as the home, school, leisure, culture, enterprise, industry and the wider environment. Describe the purpose of their products and how they link to the design brief. Indicate the design features of their products that will appeal to intended users. Explain how particular parts of their products work. Carry out research, using surveys, interviews, questionnaires and web-based resources. Identify the needs, wants, preferences and values of particular individuals and groups. Develop a simple design specification to guide their thinking. <p>Generating, developing, modelling and communicating idea:</p> <ul style="list-style-type: none"> Confidently share and clarify ideas through discussion. Model their ideas using prototypes and pattern pieces. Use annotated sketches, cross-sectional drawings and exploded diagrams to develop and communicate their ideas. Use computer-aided design to develop and communicate their ideas. Generate innovative ideas, drawing on research. Make design decisions, taking account of constraints such as time, resources and cost. 	
Making	<ul style="list-style-type: none"> Select and use activities and resources, with help when needed. This helps them to achieve a goal they have chosen or one which is suggested to them. Choose the right resources to carry out their own plan. 	<p>Planning:</p> <ul style="list-style-type: none"> Plan by suggesting what to do next. Select from a range of tools and equipment, explaining their choices. Select from a range of materials and components according to their characteristics. <p>Practical skills and techniques:</p> <ul style="list-style-type: none"> Follow procedures for safety and hygiene. Use a range of materials and components, including construction materials and kits, textiles, food ingredients and mechanical components. Measure, mark out, cut and shape materials and components. Assemble, join and combine materials and components. Use finishing techniques, including those from art and design. 		<p>Planning:</p> <ul style="list-style-type: none"> Begins to select tools and equipment suitable for the task. Explain their choice of tools and equipment in relation to the skills and techniques they will be using. Begins to select materials and components suitable for the task. Explain their choice of materials and components according to functional properties and aesthetic qualities. Order the main stages of making. <p>Practical skills and techniques:</p> <ul style="list-style-type: none"> Follow procedures for safety and hygiene. Use a wider range of materials and components than KS1, including construction materials and kits, textiles, food ingredients, mechanical components and electrical components. Measure, mark out, cut and shape materials and components with some accuracy. Assemble, join and combine materials and components with some accuracy. 		<p>Planning:</p> <ul style="list-style-type: none"> Select tools and equipment suitable for the task. Explain their choice of tools and equipment in relation to the skills and techniques they will be using. Select materials and components suitable for the task. Explain their choice of materials and components according to functional properties and aesthetic qualities. Produce appropriate lists of tools, equipment and materials that they need. Formulate step-by-step plans as a guide to making. <p>Practical skills and techniques:</p> <ul style="list-style-type: none"> Follow procedures for safety and hygiene. Use a wider range of materials and components, including construction materials and kits, textiles, food ingredients, mechanical components and electrical components. Accurately measure, mark out, cut and shape materials and components. Accurately assemble, join and combine materials and components. Accurately apply a range of finishing techniques, including those from art and design. 	

KS1 and KS2 through to early KS3. For full KS3 and KS4, see Personalised Learning Standards at LCS.

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			<ul style="list-style-type: none"> • Apply a range of finishing techniques, including those from art and design, with some accuracy. 	<ul style="list-style-type: none"> • Use techniques that involve a number of steps. • Demonstrate resourcefulness when tackling practical problems.
Evaluating	<ul style="list-style-type: none"> • Return to and build on their previous learning, refining ideas and developing their ability to represent them. 	<p>Own ideas and products:</p> <ul style="list-style-type: none"> • Talk about their design ideas and what they are making. • Make simple judgements about their products and ideas against design criteria. • Suggest how their products could be improved. <p>Explore existing products and consider:</p> <ul style="list-style-type: none"> • What products are • Who products are for • What products are for • How products work • How products are used • Where products might be used • What materials products are made from • What they like and dislike about products <p>Key events and individuals: Projects may be linked to other topics and holidays celebrations, but it not a requirement.</p>	<p>Own ideas and products:</p> <ul style="list-style-type: none"> • Begin to identify the strengths and areas for development in their ideas and products. • Begin to consider the views of others, including intended users, to improve their work. • Refer to their design criteria as they design and make their product. • Use their design criteria to evaluate their completed products. <p>Explore existing products and consider:</p> <ul style="list-style-type: none"> • How well products have been designed • How well products have been made • Why materials have been chosen • What methods of construction have been used • How well products work • How well products achieve their purposes • How well products meet user needs and wants <p>In early KS2 pupils should also investigate and analyse:</p> <ul style="list-style-type: none"> • who designed and made the products • where products were designed and made • when products were designed and made • whether products can be recycled or reused <p>Key events and individuals: Learn about inventors, designers, engineers, chefs and manufacturers who have developed ground-breaking products. These may be linked to topics on curriculum maps.</p>	<p>Own ideas and products:</p> <ul style="list-style-type: none"> • Identify the strengths and areas for development in their ideas and products. • Consider the views of others, including intended users, to improve their work. • Critically evaluate the quality of the design, manufacture and fitness for purpose of their products as they design and make evaluate their ideas and products against their original design specification. <p>Explore existing products and consider:</p> <ul style="list-style-type: none"> • How well products have been designed • How well products have been made • Why materials have been chosen • What methods of construction have been used • How well products work • How well products achieve their purposes • How well products meet user needs and wants • Investigate and analyse how much products cost to make • Consider how innovative products are • Investigate and analyse how sustainable the materials in products are • Consider what impact products have beyond their intended purpose <p>Key events and individuals: Learn about inventors, designers, engineers, chefs and manufacturers who have developed ground-breaking products. These may be linked to topics on curriculum maps.</p>