

## Design Technology Long Term Plan

### EYFS

DT			
Three and Four-Year-Olds	Personal, Social and Emotional Development	<ul style="list-style-type: none"> <li>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.</li> </ul>	
	Physical Development	<ul style="list-style-type: none"> <li>Use large-muscle movements to wave flags and streamers, paint and make marks.</li> <li>Choose the right resources to carry out their own plan.</li> <li>Use one-handed tools and equipment, for example, making snips in paper with scissors.</li> </ul>	
	Understanding the World	<ul style="list-style-type: none"> <li>Explore how things work.</li> </ul>	
	Expressive Arts and Design	<ul style="list-style-type: none"> <li>Make imaginative and complex 'small worlds' with blocks and construction kits, such as a city with different buildings and a park.</li> <li>Explore different materials freely, in order to develop their ideas about how to use them and what to make.</li> <li>Develop their own ideas and then decide which materials to use to express them.</li> <li>Create closed shapes with continuous lines, and begin to use these shapes to represent objects.</li> </ul>	
Reception			
Physical Development		<ul style="list-style-type: none"> <li>Progress towards a more fluent style of moving, with developing control and grace.</li> <li>Develop their small motor skills so that they can use a range of tools competently, safely and confidently.</li> <li>Use their core muscle strength to achieve a good posture when sitting at a table or sitting on the floor.</li> </ul>	
Expressive Arts and Design		<ul style="list-style-type: none"> <li>Explore, use and refine a variety of artistic effects to express their ideas and feelings.</li> <li>Return to and build on their previous learning, refining ideas and developing their ability to represent them.</li> <li>Create collaboratively, sharing ideas, resources and skills.</li> </ul>	
ELG			
Physical Development		Fine Motor Skills	<ul style="list-style-type: none"> <li>Use a range of small tools, including scissors, paintbrushes and cutlery.</li> </ul>
Expressive Arts and Design		Creating with Materials	<ul style="list-style-type: none"> <li>Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.</li> <li>Share their creations, explaining the process they have used.</li> </ul>

# Threshold concept: design and technology

## Importance

Design and technology is about making something for somebody for a purpose. In Early Years, much of the time spent on design and technology is spent exploring and combining different materials. In doing this, children learn about the properties of materials and how to use them to solve problems. As their projects progress, children experience success and failure, which helps them to build resilience. As they have ideas, children need to find creative ways to fulfil them.

## Big ideas

- Mastering practical skills: children need to experiment with a range of techniques to improve their practical skills.
- Designing and making: children come up with some design ideas (think), test them out (make), evaluate (break) and improve (repeat).
- Taking inspiration from products: children are encouraged to be curious about how products are made, taking them apart and rebuilding.

## Vocabulary

- architecture
- break
- design
- join
- make
- materials
- measure
- properties
- repeat
- speed
- stability
- test
- think

## Progression milestones

N

- Explores the feel of a range of everyday objects.
- Develops knowledge about design through play with objects.
- Can talk about what they are going to make.
- Manipulates basic tools.
- Uses trial and error to develop understanding.
- Reflects on a product, saying what they like.

R1

- Explores a range of everyday objects and can talk about similarities and differences between them.
- Draws what they are going to make.
- Chooses appropriate tools.
- Explains what they are happy with in a product and how they will tweak the design to improve it.

R2

- Makes judgements about properties of different materials and their suitability for construction.
- Tests out the properties of materials.
- Draws what they are going to make and explains designs.
- Experiments with designs and materials.
- Uses tools safely.
- Describes how a product is made up of many different parts.

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R2

- Makes judgements about properties of different materials and their suitability for construction.
- Tests out the properties of materials.
- Draws what they are going to make and explains designs.
- Experiments with designs and materials.
- Uses tools safely.
- Describes how a product is made up of many different parts.

**Class 2 Even Year**

	<u>Autumn Term</u>	<u>Spring Term</u>	<u>Summer Term</u>
<b>Topic/content of learning</b>	<u>Baby bear's chair (Y2)</u> <u>Structures</u>	<u>Making a moving monster (Y2)</u> <u>Mechanisms</u>	<u>Fruit and vegetables (Smoothie) (Y1)</u> <u>Food</u>
<b>Disciplinary knowledge</b>	<p><b>LH: To master practical skills (materials/ Construction)</b></p> <ul style="list-style-type: none"> <li>• Cut materials safely using tools provided.</li> <li>• Measure and mark out to the nearest centimetre.</li> <li>• Demonstrate a range of cutting and shaping techniques (such as tearing, cutting, folding and curling).</li> <li>• Demonstrate a range of joining techniques (such as gluing, hinges or combining materials to strengthen).</li> <li>• Use materials to practise drilling, screwing, gluing and nailing materials to make and strengthen products.</li> </ul>	<p><b>LH: To master practical skills (materials/ construction)</b></p> <ul style="list-style-type: none"> <li>• Cut materials safely using tools provided.</li> <li>• Measure and mark out to the nearest centimetre.</li> <li>• Demonstrate a range of cutting and shaping techniques (such as tearing, cutting, folding and curling).</li> <li>• Demonstrate a range of joining techniques (such as gluing, hinges or combining materials to strengthen).</li> <li>• Use materials to practise drilling, screwing, gluing and nailing materials to make and strengthen products.</li> </ul>	<p><b>LH: To master practical skills (food)</b></p> <ul style="list-style-type: none"> <li>• Cut, peel or grate ingredients safely and hygienically.</li> <li>• Measure or weigh using measuring cups or electronic scales.</li> <li>• Assemble or cook ingredients.</li> </ul> <p><b>* Before teaching this lesson, ensure you are aware of any food allergies within the class and adjust the foods you use accordingly.</b></p>
<b>Substantive knowledge</b>	<ul style="list-style-type: none"> <li>• Generating and communicating ideas using sketching and modelling.</li> <li>• Learning about different types of structures, found in the natural world and in everyday objects.</li> <li>• Making a structure according to design criteria.</li> <li>• Creating joints and structures from paper/card and tape.</li> <li>• Building a strong and stiff structure by folding paper.</li> <li>• Exploring the features of structures.</li> </ul>	<ul style="list-style-type: none"> <li>• Creating a design-criteria for a moving monster as a class.</li> <li>• Designing a moving monster for a specific audience in accordance with a design criteria.</li> <li>• Making linkages using card for levers and split pins for pivots.</li> <li>• Experimenting with linkages adjusting the widths, lengths and thicknesses of card used.</li> <li>• Cutting and assembling components neatly.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing smoothie carton packaging by-hand or on ICT software.</li> <li>• Chopping fruit and vegetables safely to make a smoothie.</li> <li>• Identifying if a food is a fruit or a vegetable.</li> <li>• Learning where and how fruits and vegetables grow.</li> <li>• Tasting and evaluating different food combinations.</li> <li>• Describing appearance, smell and taste.</li> </ul>

	<ul style="list-style-type: none"> <li>• Comparing the stability of different shapes.</li> <li>• Testing the strength of their own structures.</li> <li>• Identifying the weakest part of a structure.</li> <li>• Evaluating the strength, stiffness and stability of their own structure.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluating own designs against design criteria.</li> <li>• Using peer feedback to modify a final design.</li> </ul> <p><b>*Could also include a slider mechanism (see Making a moving picture unit)</b></p>	<ul style="list-style-type: none"> <li>• Suggesting information to be included on packaging.</li> </ul>
<b>Substantive Concepts:</b>	<ul style="list-style-type: none"> <li>• To know that shapes and structures with wide, flat bases or legs are the most stable.</li> <li>• To understand that the shape of a structure affects its strength.</li> <li>• To know that materials can be manipulated to improve strength and stiffness.</li> <li>• To know that a structure is something which has been formed or made from parts.</li> <li>• To know that a 'stable' structure is one which is firmly fixed and unlikely to change or move.</li> <li>• To know that a 'strong' structure is one which does not break easily.</li> <li>• To know that a 'stiff' structure or material is one which does not bend easily.</li> </ul>	<ul style="list-style-type: none"> <li>• Creating a design criteria for a moving monster as a class.</li> <li>• Designing a moving monster for a specific audience in accordance with a design criteria.</li> <li>• Making linkages using card for levers and split pins for pivots.</li> <li>• Experimenting with linkages adjusting the widths, lengths and thicknesses of card used.</li> <li>• Cutting and assembling components neatly.</li> <li>• Evaluating own designs against design criteria.</li> <li>• Using peer feedback to modify a final design.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand the difference between fruits and vegetables.</li> <li>• To understand that some foods typically known as vegetables are actually fruits (e.g. cucumber).</li> <li>• To know that a blender is a machine which mixes ingredients together into a smooth liquid.</li> <li>• To know that a fruit has seeds and a vegetable does not.</li> <li>• To know that fruits grow on trees or vines.</li> <li>• To know that vegetables can grow either above or below ground.</li> <li>• To know that vegetables can come from different parts of the plant.</li> </ul>
<b>Vocabulary</b>	<b>design criteria</b> , man-made, natural, properties, <b>structure</b> , <b>stable</b> , shape, <b>model</b> , test	<b>Axle</b> , <b>design criteria</b> , input, linkage, <b>mechanical</b> , output, pivot, <b>wheel</b>	balanced diet, balance, carbohydrate, dairy, fruit, ingredients, oils, sugar, protein, vegetable, <b>design criteria</b>

<b>Resources</b>	Playdough, card, masking tape, straws, pipe cleaners, decorative objects (stickers, gems, sequins, etc)	Card, split pins, plasticine, materials for colouring and decorating (e.g. googly eyes)	A plate for each table with a selection of fruit and vegetables, cut up but keeping seeds visible, for the children to handle: <ul style="list-style-type: none"> <li>• Fruits: Pepper*, Avocado*, Cucumber*, Butternut squash*, Tomato*, Grapes (with seeds), Orange (with seeds), Apple, Kiwi, Strawberry, Banana, Pineapple, Mango, Blueberries (Fruit (include items marked with * as these are often mistakenly referred to as vegetables))</li> <li>• Vegetables: potato, Carrot, Green beans, Lettuce, Onion, Spinach, Celery, Parsnip, broccoli</li> <li>• Plastic cups, paper plates, blenders, knives, chopping boards</li> <li>• Smoothie 1: Carrot, pineapple and mango smoothie</li> <li>• Smoothie 2: Spinach, banana, grape and apple smoothie</li> <li>• Smoothie 2: Spinach, banana, grape and apple smoothie</li> </ul>
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**Class 2 Odd Year**

	<u>Autumn Term</u>	<u>Spring Term</u>	<u>Summer Term</u>
<b>Topic/content of learning</b>	<u>Wheels and Axles (Y1)</u> <u>Mechanisms</u>	<u>Pouches (Y2)</u> <u>Textiles</u>	<u>Constructing a windmill (Y1)</u> <u>Structures</u>
<b>Disciplinary knowledge</b>  <u>Master techniques</u>	<b>LH: To master practical skills (Mechanics/ computing)</b> <ul style="list-style-type: none"> <li>• Model designs using software.</li> <li>• Create products using levers, wheels and winding mechanisms.</li> </ul>	<b>LH: To master practical skills (textiles)</b> <ul style="list-style-type: none"> <li>• Shape textiles using templates.</li> <li>• Join textiles using running stitch.</li> <li>• Colour and decorate textiles using a number of techniques (such as dyeing, adding sequins or printing).</li> </ul>	<b>LH: To master practical skills (materials)</b> <ul style="list-style-type: none"> <li>• Cut materials safely using tools provided.</li> <li>• Measure and mark out to the nearest centimetre.</li> <li>• Demonstrate a range of cutting and shaping techniques (such as tearing, cutting, folding and curling).</li> </ul>

			<ul style="list-style-type: none"> <li>• Demonstrate a range of joining techniques (such as gluing, hinges or combining materials to strengthen).</li> </ul>
<b>Substantive knowledge</b>	<ul style="list-style-type: none"> <li>• Designing a vehicle that includes wheels, axles and axle holders, which will allow the wheels to move.</li> <li>• Creating clearly labelled drawings that illustrate movement.</li> <li>• Adapting mechanisms.</li> <li>• Testing mechanisms, identifying what stops wheels from turning, knowing that a wheel needs an axle in order to move.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a pouch.</li> <li>• Selecting and cutting fabrics for sewing.</li> <li>• Decorating a pouch using fabric glue or running stitch.</li> <li>• Threading a needle.</li> <li>• Sewing running stitch, with evenly spaced, neat, even stitches to join fabric.</li> <li>• Neatly pinning and cutting fabric using a template.</li> <li>• Troubleshooting scenarios posed by teacher.</li> <li>• Evaluating the quality of the stitching on others' work.</li> <li>• Discussing as a class, the success of their stitching against the success criteria.</li> <li>• Identifying aspects of their peers' work that they particularly like and why.</li> </ul>	<ul style="list-style-type: none"> <li>• Learning the importance of a clear design criteria.</li> <li>• Including individual preferences and requirements in a design.</li> <li>• Making stable structures from card, tape and glue.</li> <li>• Learning how to turn 2D nets into 3D structures.</li> <li>• Following instructions to cut and assemble the supporting structure of a windmill.</li> <li>• Making functioning turbines and axles which are assembled into a main supporting structure.</li> </ul>
<b>Substantive Concepts:</b>	<ul style="list-style-type: none"> <li>• To know that wheels need to be round to rotate and move.</li> <li>• To understand that for a wheel to move it must be attached to a rotating axle.</li> <li>• To know that an axle moves within an axle holder which is fixed to the vehicle or toy.</li> <li>• To know that the frame of a vehicle (chassis) needs to be balanced.</li> <li>• To know some real-life items that use wheels.</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• To know that sewing is a method of joining fabric.</li> <li>• To know that different stitches can be used when sewing.</li> <li>• To understand the importance of tying a knot after sewing the final stitch.</li> <li>• To know that a thimble can be used to protect my fingers when sewing.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand that the shape of materials can be changed to improve the strength and stiffness of structures.</li> <li>• To understand that cylinders are a strong type of structure (and, therefore, they are the main shape used for windmills and lighthouses).</li> <li>• To understand that axles are used in structures and mechanisms to make parts turn in a circle.</li> </ul>

<p><b>Vocabulary</b></p>	<p><b>Axle</b>, axle holder, chassis, diagram, dowel, equipment, <b>mechanism</b>, <b>wheel</b></p>	<p>Decorate, fabric, knot, needle, needle threader, running stitch, sew, <b>template</b>, thread</p>	<ul style="list-style-type: none"> <li>• To begin to understand that different structures are used for different purposes.</li> <li>• To know that a structure is something that has been made and put together.</li> </ul> <p><b>Axle</b>, bridge, <b>design criteria</b>, <b>model</b>, net, packaging, <b>structure</b>, <b>template</b>, unstable, <b>stable</b>, strong, weak</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li>• Items that have wheels, such as bicycles, tricycles, trundle wheels, toy cars, skateboards, trolleys.</li> <li>• Straws, masking tape</li> </ul> <p>Materials for making vehicles:</p> <ul style="list-style-type: none"> <li>• Body: cardboard tubes, cardboard boxes</li> <li>• Axle: straws, dowel (cut to size - 20cm lengths), pipe cleaners</li> <li>• Wheels: wooden wheels, card discs, plastic cotton reels</li> <li>• Materials for decorating vehicles, such as tissue paper, glitter, googly eyes (optional)</li> </ul>	<ul style="list-style-type: none"> <li>• Fabric (felt), children's needles, needle threader, thread (thick but not woolly), thimble, Sequins or other decorative items</li> </ul>	<ul style="list-style-type: none"> <li>• Stiff card, split pins, pipe cleaners, tape, straws, materials to decorate.</li> </ul>

- *Through end of term science session, cover **Electricals and electronics**: Diagnose faults in battery operated devices (such as low battery, water damage or battery terminal damage).*
- *Through links with Madeley school, arrange workshop days for woodwork for **Construction**: Use materials to practise drilling, screwing, gluing and nailing materials to make and strengthen products.*



**Class 3 Even Year**

	<u>Autumn Term</u>	<u>Spring Term</u>	<u>Summer Term</u>
Topic/content of learning	<u>Adapting a recipe (Y4)</u> <u>Cooking and nutrition</u>	<u>Electronic charms (Y3)</u> <u>Digital world</u>	<u>Pneumatic toys (Y3)</u> <u>Mechanical systems</u>
Prior learning	Fruit and vegetables (Smoothie) (Y1)	Coding in computing lessons - Scratch and ScratchJr	Making a moving monster (Y2)
Disciplinary knowledge  <u>Master techniques</u>	<p><b>LH: To master practical skills (food)</b></p> <ul style="list-style-type: none"> <li>• Prepare ingredients hygienically using appropriate utensils.</li> <li>• Measure ingredients to the nearest gram accurately.</li> <li>• Follow a recipe.</li> <li>• Assemble or cook ingredients (controlling the temperature of the oven or hob, if cooking).</li> </ul>	<p><b>LH: To master practical skills (computing)</b></p> <ul style="list-style-type: none"> <li>• Control and monitor models using software designed for this purpose.</li> </ul>	<p><b>LH: To master practical skills (mechanics)</b></p> <ul style="list-style-type: none"> <li>• Use scientific knowledge of the transference of forces to choose appropriate mechanisms for a product (such as levers, winding mechanisms, pulleys and gears).</li> </ul> <p><b>LH: To master practical skills (materials)</b></p> <ul style="list-style-type: none"> <li>• Cut materials accurately and safely by selecting appropriate tools.</li> <li>• Measure and mark out to the nearest millimetre.</li> <li>• Apply appropriate cutting and shaping techniques that include cuts within the perimeter of the material (such as slots or cut outs).</li> <li>• Select appropriate joining techniques.</li> </ul>
Substantive knowledge	<ul style="list-style-type: none"> <li>• Designing a biscuit within a given budget, drawing upon previous taste testing.</li> <li>• Following a baking recipe.</li> <li>• Cooking safely, following basic hygiene rules.</li> <li>• Adapting a recipe.</li> </ul>	<ul style="list-style-type: none"> <li>• Problem solving by suggesting potential features on a Micro:bit and justifying my ideas.</li> <li>• Developing design ideas for a technology pouch.</li> <li>• Drawing and manipulating 2D shapes, using computer-aided design, to produce a point of sale badge.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a toy that uses a pneumatic system.</li> <li>• Developing design criteria from a design brief.</li> <li>• Generating ideas using thumbnail sketches and exploded diagrams.</li> </ul>

	<ul style="list-style-type: none"> <li>• Evaluating a recipe, considering: taste, smell, texture and appearance.</li> <li>• Describing the impact of the budget on the selection of ingredients.</li> <li>• Evaluating and comparing a range of products.</li> <li>• Suggesting modifications.</li> </ul>	<ul style="list-style-type: none"> <li>• Using a template when cutting and assembling the pouch.</li> <li>• Following a list of design requirements.</li> <li>• Selecting and using the appropriate tools and equipment for cutting, joining, shaping and decorating a foam pouch.</li> <li>• Applying functional features such as using foam to create soft buttons.</li> <li>• Analysing and evaluating an existing product.</li> <li>• Identifying the key features of a pouch.</li> </ul>	<ul style="list-style-type: none"> <li>• Learning that different types of drawings are used in design to explain ideas clearly.</li> <li>• Creating a pneumatic system to create a desired motion.</li> <li>• Building secure housing for a pneumatic system.</li> <li>• Using syringes and balloons to create different types of pneumatic systems to make a functional and appealing pneumatic toy.</li> <li>• Selecting materials due to their functional and aesthetic characteristics.</li> <li>• Manipulating materials to create different effects by cutting, creasing, folding and weaving.</li> <li>• Using the views of others to improve designs.</li> <li>• Testing and modifying the outcome, suggesting improvements.</li> <li>• Understanding the purpose of exploded-diagrams through the eyes of a designer and their client.</li> </ul>
<p><b>Substantive Concepts:</b></p>	<ul style="list-style-type: none"> <li>• To know that the amount of an ingredient in a recipe is known as the 'quantity'.</li> <li>• To know that it is important to use oven gloves when removing hot food from an oven.</li> <li>• To know the following cooking techniques: sieving, creaming, rubbing method, cooling.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand that in programming a 'loop' is code that repeats something again and again until stopped.</li> <li>• To know that a Micro:bit is a pocket-sized, codeable computer.</li> <li>• Writing a program to control (button press) and/or monitor (sense light) that will initiate a flashing LED algorithm.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand how pneumatic systems work.</li> <li>• To understand that pneumatic systems can be used as part of a mechanism.</li> <li>• To know that pneumatic systems operate by drawing in, releasing and compressing air.</li> <li>•</li> </ul>

<p><b>Vocabulary</b></p>	<ul style="list-style-type: none"> <li>To understand the importance of budgeting while planning ingredients for biscuits.</li> </ul> <p><b>design criteria</b>, research, texture, innovative, aesthetic, measure, cross-contamination, diet, processed, packaging</p>	<ul style="list-style-type: none"> <li>smart wearables, product design, digital revolution, technology, analogue, digital, feature, function, digital world, Micro:bit, electronic products, program, loops, initiate, simulator, control, monitor, sense, template, develop, fasten, test, user, CAD (computer-aided design), point of sale, display, badge, stand</li> </ul>	<p>Mechanism, lever, pivot, linkage, system, pneumatic system, input, output, component, thumbnail, ketch, research, adapt, properties, reinforce, motion</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li>Different types of biscuits to sample</li> <li>Ingredients for biscuits: Butter, eggs, caster sugar, plain flour, vanilla essence</li> <li>Additional ingredients, such as: chocolate chips, sprinkles, spices, food colouring, food flavouring, chocolate chunks, dried fruits, cocoa powder, honey and oats.</li> <li>Equipment: Aprons, tea towels, chopping boards, knives, large mixing bowls, bowls, wooden spoons, spatulas, sieves, spoons, teaspoons, baking paper, baking trays, wire racks, biscuit cutters</li> </ul>	<ul style="list-style-type: none"> <li>BBC Micro:bits with battery packs or MI:power coin cell boards (not required if using the online simulator).</li> <li>Micro USB cables (not required if using the online simulator).</li> <li>A5 foam sheets</li> <li>Paper clips or small bulldog clips</li> <li>Foam stickers, and other decorative craft items</li> <li>Pipe-cleaners (or alternative suitable handle material)</li> </ul>	<ul style="list-style-type: none"> <li>Balloon, Tape, Small lightweight toy, Syringes: two the same size and one of a different size, Tubing to connect the syringes (40-50cm lengths of plastic tubing, connectors, approximately 5mm diameter.)</li> <li>Masking tape, sandwich bags, boxes with a hinged lid, bottles (e.g. tissue, egg, shoe), elastic bands, paper fasteners or split pins</li> <li>Materials to make the pneumatic toys: card, straws, pipe cleaners, cotton wool, buttons, bottles, socks, tights, plastic bags, stuffing, etc.</li> <li>materials for details: tissue paper, textures paper/sandpaper, feathers, pom poms, googly eyes, sequins.</li> </ul>
<p><b>Class 3 Odd Year</b></p>			
	<p><u>Autumn Term</u></p>	<p><u>Spring Term</u></p>	<p><u>Summer Term</u></p>
<p><b>Topic/content of learning</b></p>	<p><u>Pavilions (Y4)</u> <u>Structures</u></p>	<p><u>Torches (Y4)</u> <u>Electronic systems</u></p>	<p><u>Cushions (Y3)</u> <u>Textiles</u></p>

Prior learning	Constructing a windmill (Y1)	Science lessons: <i>Electricals and electronics: Diagnose faults in battery operated devices</i>	Pouches (Y2)
<p><b>Disciplinary knowledge</b></p> <p><u>Master techniques</u></p>	<p><b>LH: To master practical skills (construction)</b></p> <ul style="list-style-type: none"> <li>• Choose suitable techniques to construct products or to repair items.</li> <li>• Strengthen materials using suitable techniques.</li> </ul> <p><b>LH: To master practical skills (materials)</b></p> <ul style="list-style-type: none"> <li>• Cut materials accurately and safely by selecting appropriate tools.</li> <li>• Measure and mark out to the nearest millimetre.</li> <li>• Apply appropriate cutting and shaping techniques that include cuts within the perimeter of the material (such as slots or cut outs).</li> <li>• Select appropriate joining techniques.</li> </ul>	<p><b>LH: To master practical skills (electricals and electronics)</b></p> <ul style="list-style-type: none"> <li>• Create series and parallel circuits.</li> </ul> <p><i>*This unit fits with science unit taught this term (understanding electrical circuits)</i></p>	<p><b>LH: To master practical skills (textiles)</b></p> <ul style="list-style-type: none"> <li>• Understand the need for a seam allowance.</li> <li>• Join textiles with appropriate stitching.</li> <li>• Select the most appropriate techniques to decorate textiles.</li> </ul>
<p><b>Substantive knowledge</b></p>	<ul style="list-style-type: none"> <li>• Designing a stable pavilion structure that is aesthetically pleasing and selecting materials to create a desired effect.</li> <li>• Building frame structures designed to support weight.</li> <li>• Creating a range of different shaped frame structures.</li> <li>• Making a variety of free-standing frame structures of different shapes and sizes.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a torch, giving consideration to the target audience and creating both design and success criteria focusing on features of individual design ideas.</li> <li>• Making a torch with a working electrical circuit and switch.</li> <li>• Using appropriate equipment to cut and attach materials.</li> <li>• Assembling a torch according to the design and success criteria.</li> <li>• Evaluating electrical products.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing and making a template from an existing cushion and applying individual design criteria.</li> <li>• Following design criteria to create a cushion.</li> <li>• Selecting and cutting fabrics with ease using fabric scissors.</li> <li>• Threading needles with greater independence.</li> <li>• Tying knots with greater independence.</li> <li>• Sewing cross stitch to join fabric.</li> </ul>

	<ul style="list-style-type: none"> <li>• Selecting appropriate materials to build a strong structure and for the cladding.</li> <li>• Reinforcing corners to strengthen a structure.</li> <li>• Creating a design in accordance with a plan.</li> <li>• Learning to create different textural effects with materials.</li> </ul>	<ul style="list-style-type: none"> <li>• Testing and evaluating the success of a final product.</li> </ul>	<ul style="list-style-type: none"> <li>• Decorating fabric using appliqué.</li> <li>• Completing design ideas with stuffing and sewing the edges.</li> <li>• Evaluating an end product and thinking of other ways in which to create similar items.</li> </ul>
<p><b>Substantive Concepts:</b></p>	<ul style="list-style-type: none"> <li>• To understand what a frame structure is.</li> <li>• To know that a 'free-standing' structure is one that can stand on its own.</li> <li>• To know that a pavilion is a decorative building or structure for leisure activities.</li> <li>• To know that cladding can be applied to structures for different effects.</li> <li>• To know that aesthetics are how a product looks.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand that electrical conductors are materials which electricity can pass through.</li> <li>• To understand that electrical insulators are materials which electricity cannot pass through.</li> <li>• To know that a battery contains stored electricity that can be used to power products.</li> <li>• To know that an electrical circuit must be complete for electricity to flow.</li> <li>• To know that a switch can be used to complete and break an electrical circuit.</li> </ul>	<ul style="list-style-type: none"> <li>• To know that appliqué is a way of mending or decorating a textile by applying smaller pieces of fabric.</li> <li>• To know that when two edges of fabric have been joined together it is called a seam.</li> <li>• To know that it is important to leave space on the fabric for the seam.</li> </ul>
<p><b>Vocabulary</b></p>	<p><b>3D shapes, design criteria, natural, cladding, innovative, reinforce, structure</b></p>	<p>Battery, bulb, buzzer, conductor, circuit, circuit diagram, electricity, insulator, series circuit, switch, component, design, design criteria, diagram, evaluation, LED, model, shape, target audience, input, recyclable, theme, aesthetics, assemble, equipment, ingredients, packaging</p>	<p>To understand that some products are turned inside out after sewing so the stitching is hidden.</p> <p>Appliqué, cross-stitch, design, equipment, <b>fabric</b>, patch, running, stitch, thread, seam, <b>texture</b>, knot</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li>• Plasticine, toothpicks</li> <li>• Assorted materials for making the frame: matchsticks, lolly sticks, toothpicks, straws, card, pipe cleaners, thick card for triangles.</li> </ul>	<ul style="list-style-type: none"> <li>• Selection of torches to investigate</li> <li>• Batteries and battery holders (AA or AAA), crocodile wires, bulb holders and bulbs</li> </ul>	<ul style="list-style-type: none"> <li>• A collection of fabrics (including felt, cotton), children's needles, thread, needle threaders, safety pins or sewing clips, pins, stuffing,</li> </ul>

	<ul style="list-style-type: none"><li>• Glue guns, tape</li></ul>	<ul style="list-style-type: none"><li>• Split pins, uncoated paper clips, foil, white card, sticky tape, empty plastic drinks bottles, stuffing, PVA glue</li></ul>	decorative details such as buttons, beads or sequins
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*\*Use kitchen at Madeley School to allow children opportunity to understand controlling the temperature of the oven or hob: Eating seasonally (Y3) cooking and nutrition.*

**Class 4 Even Year**

	<u>Autumn Term</u>	<u>Spring Term</u>	<u>Summer Term</u>
Topic/content of learning	<u>Automata toys (Y6)</u> <u>Mechanical Systems</u>	<u>Come dine with me (Y6)</u> <u>Cooking and nutrition</u>	<u>Steady Hand Game (Y6)</u> <u>Electronical systems</u>
Prior learning	Pneumatic Toys (Y3)	Adapting a recipe (Y4)	Torches (Y4)
Disciplinary knowledge  <u>Master techniques</u>	<p><b>LH: To master practical skills (construction)</b></p> <ul style="list-style-type: none"> <li>• Develop a range of practical skills to create products (such as cutting, drilling and screwing, nailing, gluing, filing and sanding).</li> </ul> <p><b>LH: To master practical skills (mechanics)</b></p> <ul style="list-style-type: none"> <li>• Convert rotary motion to linear using cams.</li> <li>• Use innovative combinations of electronics (or computing) and mechanics in product designs</li> </ul>	<p><b>LH: To master practical skills (food)</b></p> <ul style="list-style-type: none"> <li>• Create objects (such as a cushion) that employ a seam allowance.</li> <li>• Join textiles with a combination of stitching techniques (such as back stitch for seams and running stitch to attach decoration).</li> <li>• Use the qualities of materials to create suitable visual and tactile effects in the decoration of textiles (such as a soft decoration for comfort on a cushion).</li> </ul>	<p><b>LH: To master practical skills (electricals and electronics)</b></p> <ul style="list-style-type: none"> <li>• Create circuits using electronics kits that employ a number of components (such as LEDs, resistors, transistors and chips)</li> </ul> <p><i>*This units fits with science unit 'Understanding electrical circuits' taught at the same time.</i></p>
Substantive knowledge	<ul style="list-style-type: none"> <li>• Experimenting with a range of cams, creating a design for an automata toy based on a choice of cam to create a desired movement.</li> <li>• Understanding how linkages change the direction of a force.</li> <li>• Making things move at the same time.</li> <li>• Understanding and drawing cross-sectional diagrams to show the inner-workings of my design.</li> <li>• Measuring, marking and checking the accuracy of the jelutong and dowel pieces required.</li> </ul>	<ul style="list-style-type: none"> <li>• Writing a recipe, explaining the key steps, method and ingredients.</li> <li>• Including facts and drawings from research undertaken.</li> <li>• Following a recipe, including using the correct quantities of each ingredient.</li> <li>• Adapting a recipe based on research.</li> <li>• Working to a given timescale.</li> <li>• Working safely and hygienically with independence.</li> <li>• Evaluating a recipe, considering: taste, smell, texture and origin of the food group.</li> <li>• Taste testing and scoring final products.</li> <li>• Suggesting and writing up points of improvements in productions.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a steady hand game, identifying and naming the components required.</li> <li>• Drawing a design from three different perspectives.</li> <li>• Generating ideas through sketching and discussion.</li> <li>• Modelling ideas through prototypes.</li> <li>• Understanding the purpose of products (toys), including what is meant by 'fit for purpose' and 'form over function'.</li> <li>• Constructing a stable base for a game.</li> </ul>

	<ul style="list-style-type: none"> <li>• Measuring, marking and cutting components accurately using a ruler and scissors.</li> <li>• Assembling components accurately to make a stable frame.</li> <li>• Understanding that for the frame to function effectively the components must be cut accurately and the joints of the frame secured at right angles.</li> <li>• Selecting appropriate materials based on the materials being joined and the speed at which the glue needs to dry/set.</li> <li>• Evaluating the work of others and receiving feedback on own work.</li> <li>• Applying points of improvement to their toys.</li> <li>• Describing changes they would make/do if they were to do the project again.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluating health and safety in production to minimise cross contamination.</li> </ul>	<ul style="list-style-type: none"> <li>• Accurately cutting, folding and assembling a net.</li> <li>• Decorating the base of the game to a high-quality finish.</li> <li>• Making and testing a circuit.</li> <li>• Incorporating a circuit into a base.</li> <li>• Testing their own and others' finished games, identifying what went well and making suggestions for improvement.</li> <li>• Gathering images and information about existing children's toys.</li> <li>• Analysing a selection of existing children's toys.</li> </ul>
<p><b>Substantive Concepts:</b></p>	<ul style="list-style-type: none"> <li>• To understand that the mechanism in an automata uses a system of cams, axles and followers.</li> <li>• To understand that different shaped cams produce different outputs.</li> <li>• To know that an automata is a hand-powered mechanical toy.</li> <li>• To know that a cross-sectional diagram shows the inner workings of a product.</li> </ul>	<ul style="list-style-type: none"> <li>• To know that 'flavour' is how a food or drink tastes.</li> <li>• To know that many countries have 'national dishes' which are recipes associated with that country.</li> <li>• To know that 'processed food' means food that has been put through multiple changes in a factory.</li> <li>• To understand that it is important to wash fruit and vegetables before eating to remove any dirt and insecticides.</li> </ul>	<ul style="list-style-type: none"> <li>• To know that 'form' means the shape and appearance of an object.</li> <li>• To know the difference between 'form' and 'function'.</li> <li>• To understand that 'fit for purpose' means that a product works how it should and is easy to use.</li> <li>• To know that 'form over purpose' means that a product looks good but does not work very well.</li> <li>• To know the importance of 'form follows function' when designing:</li> </ul>



<p><b>Vocabulary</b></p>	<p>Accurate, assembly-diagram, automata, <b>axle</b>, bench hook, cam, clamp, <b>component</b>, cutting list, <b>diagram</b>, dowel, drill bits, exploded-diagram, finish, follower, frame, function, hand drill, jelutong, <b>linkage</b>, mark out, <b>measure</b>, <b>mechanism</b>, <b>model</b>, research, right-angle, set square, tenon, saw</p>	<ul style="list-style-type: none"> <li>To understand what happens to a certain food before it appears on the supermarket shelf (Farm to Fork).</li> </ul> <p><b>Equipment</b>, flavours, <b>ingredients</b>, method, <b>research</b>, recipe, bridge, cookbook, cross-contamination, farm to fork, preparation, storyboard</p>	<p>the product must be designed primarily with the function in mind.</p> <ul style="list-style-type: none"> <li>To understand the diagram perspectives 'top view', 'side view' and 'back'.</li> </ul> <p><b>Assemble</b>, 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</p>
<p><b>Resources</b></p>	<ul style="list-style-type: none"> <li>Hand drills and drill bits of 3mm and 4mm, tenon saws and bench hooks, set or engineers squares, masking tape and plastic wallets, Sandpaper or glasspaper</li> <li>Materials: 10mm x 10mm wood square rod, also referred to as square section timber (188cm), 3mm dowel rod (54cm), 1x thin card (A4), 1x thick card (A4)</li> <li>Corrugated card, thick and thin card, <b>Blue tack</b>, Colouring and decorating equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Childrens own ingredient list including: Peppers (for the starter), salmon (for the main course), pineapple (for the dessert) (or alternatives),</li> <li>Cooking equipment (e.g. Aprons, tea towels, chopping boards, knives, bowls/ plates, spoons)</li> <li>A variety of cookbooks</li> </ul>	<ul style="list-style-type: none"> <li>A range of children's toys to support product analysis</li> <li>Colouring pens and pencils, black fine liner or marker, <b>Set squares</b></li> <li>Electrical wires - preferably with crocodile clips (four per pupil), buzzer or bulb and bulb holder (per pupil), Battery pack (per pupil), AA batteries (two per pupil), Tinned copper wire (50cm per pupil) or other uncoated conductive flexible wire (refer to <a href="#">YPO Tinned copper wire</a> or <a href="#">Kitronik - Tinned copper wire.</a>), approx 15m for 30 pupils at 50cm per pupil, wire cutters, pliers, switch - one for each pupil (e.g. 2-pin SPST rocker switches), plasticine or blu-tack - two balls for each pupil.</li> </ul>

**Class 4 Odd Year**

	<u>Autumn Term</u>	<u>Spring Term</u>	<u>Summer Term</u>
<p>Topic/content of learning</p>	<p><a href="#"><u>Bridges (Y5)</u></a> <a href="#"><u>Structures</u></a></p>	<p><a href="#"><u>Stuffed Toys (Y5)</u></a> <a href="#"><u>Textiles</u></a></p>	<p><a href="#"><u>Monitoring devices (Y5)</u></a> <a href="#"><u>Digital World</u></a></p>

Prior learning	Pavilions (Y4)	Cushions (Y3)	Electronic charms (Y3)
<p><b>Disciplinary knowledge</b></p> <p><u>Master techniques</u></p>	<p><b>LH: To master practical skills (materials)</b></p> <ul style="list-style-type: none"> <li>• Cut materials with precision and refine the finish with appropriate tools (such as sanding wood after cutting or a more precise scissor cut after roughly cutting out a shape).</li> <li>• Show an understanding of the qualities of materials to choose appropriate tools to cut and shape (such as the nature of fabric may require sharper scissors than would be used to cut paper).</li> </ul>	<p><b>LH: To master practical skills (textiles)</b></p> <ul style="list-style-type: none"> <li>• Create objects (such as a cushion) that employ a seam allowance.</li> <li>• Join textiles with a combination of stitching techniques (such as back stitch for seams and running stitch to attach decoration).</li> <li>• Use the qualities of materials to create suitable visual and tactile effects in the decoration of textiles (such as a soft decoration for comfort on a cushion).</li> </ul>	<p><b>LH: To master practical skills (computing)</b></p> <ul style="list-style-type: none"> <li>• Write code to control and monitor models or products.</li> </ul>
<p><b>Substantive knowledge</b></p>	<ul style="list-style-type: none"> <li>• Designing a stable structure that is able to support weight.</li> <li>• Creating a frame structure with focus on triangulation.</li> <li>• Making a range of different shaped beam bridges.</li> <li>• Using triangles to create truss bridges that span a given distance and support a load.</li> <li>• Building a wooden bridge structure.</li> <li>• Independently measuring and marking wood accurately.</li> <li>• Selecting appropriate tools and equipment for particular tasks.</li> <li>• Using the correct techniques to saw safely.</li> <li>• Identifying where a structure needs reinforcement and using card corners for support.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing a stuffed toy considering the main component shapes required and creating an appropriate template.</li> <li>• Considering the proportions of individual components.</li> <li>• Creating a 3D stuffed toy from a 2D design.</li> <li>• Measuring, marking and cutting fabric accurately and independently.</li> <li>• Creating strong and secure blanket stitches when joining fabric.</li> <li>• Threading needles independently.</li> <li>• Using appliqué to attach pieces of fabric decoration.</li> <li>• Sewing blanket stitch to join fabric.</li> <li>• Applying blanket stitch so the spaces between the stitches are even and regular.</li> <li>• Testing and evaluating an end product and giving points for further improvements.</li> </ul>	<ul style="list-style-type: none"> <li>• Researching (books, internet) for a particular animal's needs.</li> <li>• Developing design criteria based on research.</li> <li>• Generating multiple housing ideas using building bricks.</li> <li>• Understanding what a virtual model is and the pros and cons of traditional and CAD modelling.</li> <li>• Placing and manoeuvring 3D objects, using CAD.</li> <li>• Changing the properties of, or combining one or more, 3D objects using CAD.</li> <li>• Understanding the functional and aesthetic properties of plastics.</li> <li>• Programming to monitor the ambient temperature and coding an (audible or visual) alert when the temperature moves out of a specified range.</li> </ul>

	<ul style="list-style-type: none"> <li>• Explaining why selecting appropriate materials is an important part of the design process.</li> <li>• Understanding basic wood functional properties.</li> <li>• Adapting and improving own bridge structure by identifying points of weakness and reinforcing them as necessary.</li> <li>• Suggesting points for improvements for own bridges and those designed by others.</li> </ul>		<ul style="list-style-type: none"> <li>• Stating an event or fact from the last 100 years of plastic history.</li> <li>• Explaining how plastic is affecting planet Earth and suggesting ways to make more sustainable choices.</li> <li>• Explaining key functions in my program (audible alert, visuals).</li> <li>• Explaining how my product's programmed features would be useful for an animal carer.</li> </ul>
<p><b>Substantive Concepts:</b></p> <p><b>Vocabulary</b></p>	<ul style="list-style-type: none"> <li>• To understand some different ways to reinforce structures.</li> <li>• To understand how triangles can be used to reinforce bridges.</li> <li>• To know that properties are words that describe the form and function of materials.</li> <li>• To understand why material selection is important based on their properties.</li> <li>• To understand the material (functional and aesthetic) properties of wood.</li> </ul> <p>beam bridge, arch bridge, truss , ridge, strength, technique, corrugation, lamination, stiffness, rigid, factors, stability, visual appeal, aesthetics, joints, mark out, hardwood, softwood, wood, file/rasp, sandpaper/glasspaper, bench hook/vice, tenon, saw/coping saw, assemble, material properties,</p>	<ul style="list-style-type: none"> <li>• To know that blanket stitch is useful to reinforce the edges of a fabric material or join two pieces of fabric.</li> <li>• To understand that it is easier to finish simpler designs to a high standard.</li> <li>• To know that soft toys are often made by creating appendages separately and then attaching them to the main body.</li> <li>• 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.</li> </ul> <p>Accurate, annotate, appendage, blanket-stitch, design criteria, detail, evaluation, fabric, sew, shape, stuffed toy, stuffing, template</p>	<ul style="list-style-type: none"> <li>• To know that a 'device' means equipment created for a certain purpose or job and that monitoring devices observe and record.</li> <li>• To know that a sensor is a tool or device that is designed to monitor, detect and respond to changes for a purpose.</li> <li>• To understand that conditional statements (and, or, if booleans) in programming are a set of rules which are followed if certain conditions are met.</li> </ul> <p>monitoring device, electronic, sensor, thermoscope, thermometer, research, design brief, design criteria, development, inventor, vivarium, programming loop, programming comment alert, ambient, Boolean, duplicate, copy, value, variable, model, sustainability, plastic, microplastics, decompose, plastic pollution, man-made</p>

<b>Resources</b>	reinforce, wood sourcing, evaluate, quality of finish, accuracy  <ul style="list-style-type: none"> <li>• Paper straws, paper tubes, A4 card, spaghetti, glue gun</li> <li>• Square rod wood pieces (10 x 10mm), Lolly sticks, set squares, saws (preferably tenon saws and bench hooks), sandpaper, PVA glue</li> </ul>	<ul style="list-style-type: none"> <li>• Fabric in different colours (e.g. felt), pins, thread, needles, needle threaders, stuffing, decorative details such as buttons, beads, sequins</li> </ul>	<ul style="list-style-type: none"> <li>• A range of building bricks, including flat, square, rectangular and other more creative pieces.</li> <li>• BBC Micro: bits with battery packs or MI power coin cell boards and Micro: bit cables (optional)*</li> </ul>
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*\*Use Madeley school kitchen to provide children with opportunity to prepare ingredients by peeling, grating and cutting carefully and also to cook ingredients: Y5 - Food 'What Could be Healthier?' (cooking and nutrition)*

*\*Use Madeley school DT workshops for construction to allow children opportunity to develop a wider range of practical skills (such as cutting, drilling and screwing, nailing, gluing, filing and sanding)*