Design and Technology Curriculum – Year 5 and 6 – Cycle A

Link to DT Association guidance – Link to Projects on a Page Documents

National Curriculum Key Stage 2

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

When designing and making, pupils should be taught to:

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

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

Evaluate ♣ investigate and analyse a range of existing products ♣ evaluate their ideas and products against their own design criteria and consider the views of others to improve their work ♣ understand how key events and individuals in design and technology have helped shape the world Technical knowledge ♣ apply their understanding of how to strengthen, stiffen and reinforce more complex structures ♣ understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages] ♣ understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors] ♣ apply their understanding of computing to program, monitor and control their products.

Cooking and nutrition

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

Pupils should be taught to:

Key stage 2 ♣ understand and apply the principles of a healthy and varied diet ♣ prepare and cook a variety of predominantly savoury dishes using a range of cooking techniques ♣ understand seasonality, and know where and how a variety of ingredients are grown, reared, caught and processed.

	Developing Planning and Communicating Ideas	Evaluating Processes and Products	Knowledge and Understanding of Materials and Components
Non-Negotiables Year 5	• 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	•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	Apply their understanding of how to strengthen, stiffen and reinforce more complex structures
Non-Negotiables Year 6	• 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	• 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	• 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.
	Autumn: Food – Brazilian Cuisine	**Spring: Programming/modelling – Warning Systems**	**Summer: Moving Toys – Cam mechanisms**
Hierarchies	**To master practical skills:** DT1: Understand the importance of correct storage and handling of ingredients (using knowledge of micro-organisms). DT2: Measure accurately and calculate ratios of ingredients to scale up or down from a recipe. DT3: Demonstrate a range of baking and cooking techniques. DT4: Create and refine recipes, including ingredients, methods, cooking times and temperatures. **To design, make, evaluate and improve:** DT14: Design with the user in mind, motivated by the service a product will offer (rather than simply for profit) DT16: Ensure products have a high-quality finish, using art skills where appropriate. **To take inspirations form designers from history:** DT18: Combine elements of design from a range of inspirational designers throughout history, giving reasons for choices. DT19: Create innovative designs that improve upon existing products. D20: Evaluate the design of products so as to suggest improvements to the user experience.	**To master practical skills:** DT9: Create circuits using electronics kits that employ a number of components (such as LEDs, resistors, transistors and chips). DT10: Write code to control and monitor models or products. DT13: Use innovative combinations of electronics (or computing) and mechanics in product designs. **To design, make, evaluate and improve:** DT14: Design with the user in mind, motivated by the service a product will offer (rather than simply for profit) DT15: Make products through stages of prototypes, making continual refinements. DT16: Ensure products have a high-quality finish, using art skills where appropriate. DT17: Use prototypes, cross-sectional diagrams and computer aided designs to represent designs. **To take inspirations form designers from history:** DT18: Combine elements of design from a range of inspirational designers throughout history, giving reasons for choices. DT19: Create innovative designs that improve upon existing products. D20: Evaluate the design of products so as to suggest improvements to the user experience.	**To master practical skills:** DT5: 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). DT6: 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). DT11: Develop a range of practical skills to create products (such as cutting, drilling and screwing, nailing, gluing, filing and sanding). DT12: Convert rotary motion to linear using cams. **To design, make, evaluate and improve:** DT14: Design with the user in mind, motivated by the service a product will offer (rather than simply for profit) DT15: Make products through stages of prototypes, making continual refinements. DT16: Ensure products have a high-quality finish, using art skills where appropriate. DT17: Use prototypes, cross-sectional diagrams and computer aided designs to represent designs. **To take inspirations form designers from history:** DT18: Combine elements of design from a range of inspirational designers throughout history, giving reasons for choices. DT19: Create innovative designs that improve upon existing products. D20: Evaluate the design of products so as to suggest improvements to the user experience.

Resources	Recipe cards, ingredients, knifes, baking trays, ovens, chopping boards, bowls, plates, rolling pin.	***Due to the specialised nature of the mechanisms in the unit of work, learning intentions and outcomes are very similar.*** Crumble	***Due to the specialised nature of the mechanisms in the unit of work, learning intentions and outcomes are very similar.*** a collection of toys containing cams, construction kits, stiff sheet materials, *eg card, foamboard, corrugated plastic, prepared cams (shaped and off-centre wheels),* wooden wheels, doweling, cardboard boxes or wooden frames, PVA glue, masking tape, tools and equipment - bench hooks, saws, hand drill, G-cramp, round file, single-hole punch, paper drill, metal safety ruler, craft knife, cutting mats and glue gun (for teacher use)
Vocabulary	Recipe, design criterion, seasonality, grown, produced, chopping, grating, slicing, mixing, folding, kneading, baking, evaluate, refine, ingredient, appealing product, consumer	Knowledge and understanding - Computer system, programming, embedded, debugging, software, hardware, micro-controllers, LED, algorithms,	designing *eg sequence, annotated diagram, sketch, decision, choice, prototype, model, communicate* making *eg shape, assemble, accurate, saw, mark out* knowledge and understanding *eg cam, mechanism, movement, linear motion, rotary motion, pivot, off-centre, axle, force, framework, follower, guide, offset, shaft*
Flashback	• **how everyday free-standing objects have been made stable.** • **ways of making strong and stable structures.** • **and use strengthening and joining techniques.**	• **the importance of correct storage and handling of ingredients (using knowledge of micro-organisms).** • **How to measure accurately and calculate ratios of ingredients to scale up or down from a recipe.** • **How to create and refine recipes, including ingredients, methods, cooking times and temperatures.**	• **How to create circuits using electronics kits that employ a number of components (such as LEDs, resistors, transistors and chips).** • **How to code to control and monitor models or products.** • **How to use innovative combinations of electronics (or computing) and mechanics in product designs.**
Lesson 1	**WALT:** develop a design criterion by researching ingredients and techniques that are used together to create appealing products. **Activities:** Children will look at Brazilian cuisine, (Provide children with a list of recipes of carnival foods - Pao de Queijo, Brigadeiro, Salsa) not researching online. They will analyse whether there are any unique ingredients or techniques used different from our own. By the end of the lesson the class will have a design criterion written and a list of common Brazilian dishes that meet this criterion. **Children will know:** • what is needed to develop a design criterion for a particular group • what techniques will be used to create desired products. • and develop their ideas based on successful chefs who cook Brazilian cuisine.	**WALT:** computers and computer programs are used in a variety of products. **Activities:** Children will learn that many more complex electrical products are controlled using embedded computer systems, often with microcontrollers with specially written programs on them. They will begin to explain, in human language, the algorithms that monitor and control these systems. **Children will know:** • and develop their ideas by discussing, annotating diagrams and writing instructions • how embedded systems monitor and control products • how computer scientists have helped shape the world	**WALT:** investigate a variety of toys with moving cam mechanisms. **Activities:** Children will think of and investigate different moving toys. They will learn about cam mechanisms and explore different toys that use them. **Children will know:** • the movement of a mechanism within a toy or model • a cam mechanism will change rotary motion into linear motion • examples of cam toys and comment on how they work
Lesson 2	**WALT:** consider how the ingredients used are source and grown, linking to why they have been chosen for Brazilian cuisine. **Activities:** Children will choose some of the ingredients within the recipes they have researched and locate where they are grown/made. They will then make links to why these particular ingredients have been chosen for Brazilian cooking. They could the look at ingredients grown in Britain and see if any of these could substitute the traditional ingredients to reduce the impact on the environment. **Children will know:** • where food is grown or processed. • why these have been chosen for Brazilian cuisine. • British alternatives to reduce food miles.	**WALT:** develop ideas for a product with an embedded computer system that controls it. **Activities:** Children will learn about the work of computer hardware and software engineers, and about some famous computer engineering partnerships. They will go on to design and program a computer-controlled pelican crossing using Crumble software **Children will know:** • How to develop prototypes of a computer-controlled electrical system • How to incorporate one or more different electrical components in their system • Hpw to improve their prototype designs by 'debugging' their software and/or hardware	**WALT:** investigate different types of cam mechanisms. **Activities:** Children will explore and investigate different types of cam mechanisms and think about the shapes they will produce. They will be testing different shaped cams to see how they affect the linear movement of the follower. **Children will know:** • how cams work • how different shaped cams affect the movement of the follower • convert rotary motion to linear using cams. • how different cams could be used for different kinds of toys
Lesson 3	**WALT:** To design an appealing recipe based upon a design criterion. **Activities:** Children will use their design criterion created in the last lesson to develop a recipe that is an innovation on an existing Brazilian dish. They will need to outline the ingredients, techniques and method needed in order to make their product. Dishes for inspiration - Pao de Queijo, Brigadeiro, Salsa. **Children will know:** • How to design a recipe with the user in mind, not just focussing on the profit • And choose ingredients and techniques inspired by existing products. • their ideas and communicate them effectively and clearly in their plan.	**WALT:** develop, model and communicate ideas for an embedded system which monitors and controls a traffic light system. **Activities:** Children will consider how a range of electronic components in products might work. They will discover how pioneering computer scientists made computers easier to use over time. After that they will start to design a product such as an automatic traffic light upon the approach of a car. **Children will know:** • how to develop a design brief for a product • how to develop their ideas for their product through discussion and annotated sketches	**WALT:** investigate ways of strengthening structures for a moving toy. **Activities:** Children to explore materials and investigate different ways of strengthening moving toy structures. **Children will know:** • how they could make a sturdy structure for a moving toy • how to experiment with a variety of materials, tools and techniques • ways of strengthening a structure

		• know how to incorporate electrical systems in their product design	
Lesson 4	**WALT:** calculate the ratios of ingredients needed to scale up or down a recipe, calculating the cost of this. **Activities:** Now the children have designed their recipes they will need to calculate the specific amount of each ingredient that they need based on the purpose of their cooking project (To feed the class) How much is one portion? How much of each ingredient will they need? They need to write accurate measurements on their recipe. **Children will know:** • the audience for their product to decide about portion size • how to scale the proportions from a given recipe to meet the need of their own recipe • evaluate and make any necessary changes to an existing recipe • How to to calculate the cost.	**WALT:** develop ideas for a product and start to write programs to monitor and control them. **Activities:** Children will learn more about why and how microcontrollers are used to control electronic products, then attempt to 'debug' a simple program written by some children to control a switch and an LED. They may then either program electronic components for their own room system designs from the previous lesson, or consider how a novelty electronic toy might be programmed. **Children will know:** • ways in which a given product idea might be developed and improved • how to debug a defective algorithm for a given product idea • how to debug their own computer-controlled product ideas • to use innovative combinations of electronics (or computing) and mechanics in product designs.	**WALT:** design a moving toy with a cam mechanism. **Activities:** Children will use their previously learnt knowledge to design a moving toy with a cam mechanism. They will need to think about who the toy is for, what shape the cam will be, the structure, decoration and materials needed to construct it. **Children will know:** **Year 5 -** Children state the audience of their design • Children design a moving toy with a cam mechanism • Children describe how they will create their toy and what materials and tools they will need **Year 6 -**Children state the purpose and audience of their design • Children design a moving toy with a cam mechanism • Children describe how they will create their toy and what materials and tools they will need
Lesson 5	**WALT:** create an appealing food product using a wide range of cooking and baking techniques. **Activities**: Children will need to accurately measure out their ingredients base on their recipe – using good food hygiene practices throughout. Depending on the recipe they have developed they will choose appropriate skills based on what they have learnt lower down in the school. This could be chopping, grating, slicing, mixing, folding, kneading, baking. **Children will know:** • follow their own recipe and measure ingredients accurately • and use appropriate techniques as indicated in their recipe to create their product. • how to evaluate and refine their recipe if they notice anything needs changing.	**WALT:** model and communicate ideas, using either prototype models or computer-aided design. **Activities:** Children will consider why we make prototype models, and how using models to explain ideas can be interesting and inspiring. They may then either make shoebox model rooms to show how their previously designed electronic systems might work, or use 3-D CAD software to create 3-D models. **Children will know:** • suggest ways in which models can better communicate ideas than written/verbal descriptions alone • how to make prototype models to communicate their ideas • how to control their prototypes using electronic components and computers	**WALT:** follow a design to create a moving toy with a cam mechanism. **Activities:** Children will refer to their designs from the previous lesson to create their moving toys. **Children will know:** • how to follow a design to create a moving toy • how to work safely with a variety of materials and tools • of their toy that could be improved upon
Lesson 6	**WALT:** evaluate their product and refine the recipe. **Activities:** Children will taste their recipe and comment on the look, taste, texture and smell of their product. They will then make suggestions about how they could have refined the process to improve this. As a challenge they will also make comments on how they could make their product more environmentally friendly by choosing local products. **Children will know:** • what is good and what could be improved about their products. • how to refine their recipe to help make these improvements • how they can make their recipe seasonal or more environmentally friendly when producing it in the UK.	**WALT:** evaluate your design for a computer-controlled system and consider the views of others to improve your work. **Activities:** Children will reflect on their learning during previous lessons in this scheme of work, then evaluate their own product designs and design process. They will also consider ways in which the ideas of others helped them, and how they were able to help others, too. **Children will know:** • explain ways in which they debugged and improved their programs for controlling products • how they learned from others and improved their own designs • ways in which their DT and programming skills have developed, and ways in which they could further develop their learning	**WALT:** to evaluate a finished moving toy. **Activities:** Children will demonstrate their finished moving toys, then evaluate both their process and their finished product, either individually or with a partner. **Children will know:** • a finished product fairly • ways they could improve their product if they were to make it again • ways in which they have been successful
	Children will know: • the importance of correct storage and handling of ingredients (using knowledge of micro-organisms). • How to measure accurately and calculate ratios of ingredients to scale up or down from a recipe. • How to create and refine recipes, including ingredients, methods, cooking times and temperatures.	**Children will know:** • How to create circuits using electronics kits that employ a number of components (such as LEDs, resistors, transistors and chips). • How to code to control and monitor models or products. • How to use innovative combinations of electronics (or computing) and mechanics in product designs.	**Children will know:** • how different cams could be used for different kinds of toys • how cams work • how different shaped cams affect the movement of the follower • convert rotary motion to linear using cams.
