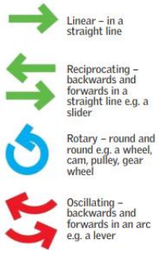
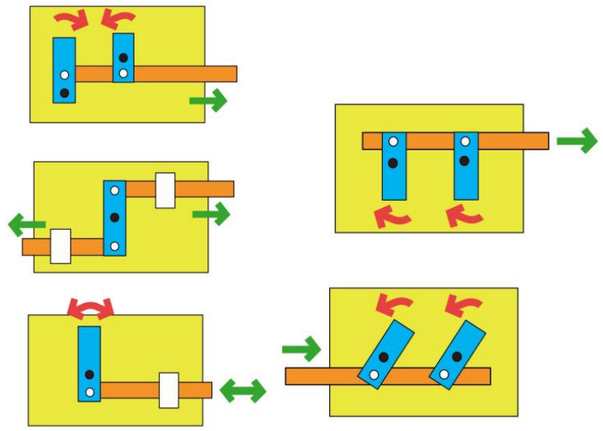
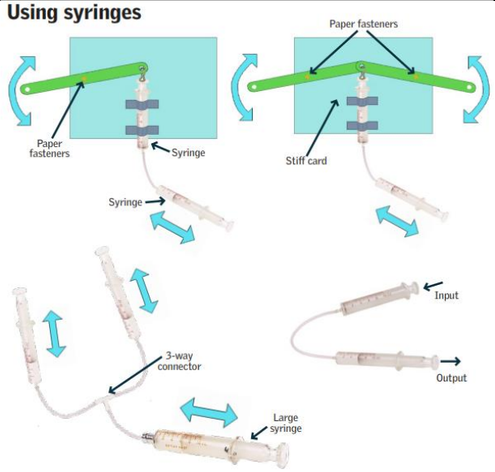
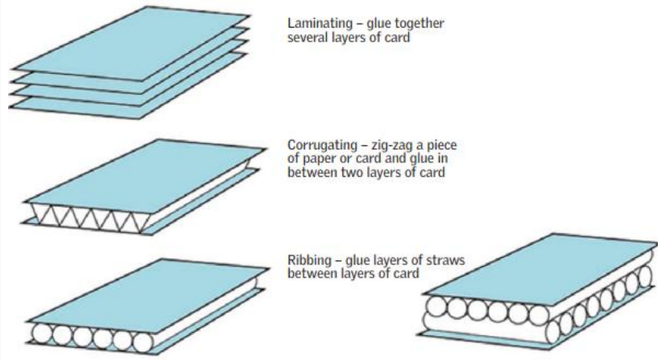
Charles Darwin Community Primary School Progression in Design Technology
Year 3

Term **Topic**	**Autumn** **Design, make and evaluate a card for a family member for Christmas**	**Spring** **Design, make and evaluate a moving creature in a box for younger children to entertain them**	**Summer** **Design, make and evaluate a pencil box for yourself for protecting your pencils**
Themes	Mechanisms - levers and Linkages	Mechanisms – Pneumatics	Shell structures
Prior knowledge	From Y1 Explore and use sliders and levers. • Understand that different mechanisms produce different types of movement.	Experience of target audience	Experience of joining materials Science work on material properties
Prior skills	Explored and used mechanisms such as flaps, sliders and levers. • Gained experience of basic cutting, joining and finishing techniques with paper and card.	Explored simple mechanisms, such as sliders and levers, and simple structures. • Learnt how materials can be joined to allow movement. • Joined and combined materials using simple tools and techniques.	Experience of using different joining, cutting and finishing techniques with paper and card. • A basic understanding of 2D and 3D shapes in mathematics and the physical properties and everyday uses of materials in science.
Key vocabulary	mechanism, lever, linkage, pivot, slot, bridge, guide • system, input, process, output • linear, rotary, oscillating, reciprocating • user, purpose, function • prototype, design criteria, innovative, appealing, design brief	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	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
NC Statutory Requirements	**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.		
Technical knowledge and understanding	**Lever and linkage mechanisms usually produce oscillating or reciprocating movement:**  **Glossary** • Mechanism – a device used to create movement in a product. • Lever – a rigid bar which moves around a pivot. • Slot – the hole through which a lever is placed to enable part of a picture to move. • Guide or bridge – a short card strip used to keep lever and linkage mechanisms in place and control movement. • Loose pivot – a paper fastener that joins card strips together. • Fixed pivot – a paper fastener that joins card strips to the backing card. • System – a set of related parts or components used to create an outcome. Systems have an input, process and an output. In a lever and linkage mechanism, the 'input movement' is where the user pushes or pulls a card strip. The 'output movement' is where one or more parts of the picture move	Children might use a squeezy bottle and a balloon in a container to raise or lower an object or a lever. • They might choose to use three syringes connected by a T-connector so that two objects move backwards and forwards. • Adding levers and linkages allows children to design and make more complex mechanical systems	**Glossary** • Cuboid – a solid body with rectangular sides. • Edge – where two surfaces meet at an angle. • Face – a surface of a geometric shape. • Font – a printer's term meaning the style of lettering being used. • Net – the flat or opened-out shape of an object such as a box. • Prism – a solid geometric shape with ends that are similar, equal and parallel. • Scoring – cutting a line or mark into sheet material to make it easier to fold. • Shell structure – a hollow structure with a thin outer covering. • Vertex – used to refer to the corners of a solid geometric shape, where edges meet.

Techniques		**Using syringes** 	Stiffening and strengthening sheet materials: 
KPIs	**Designing** Generate realistic ideas and their own design criteria through discussion, focusing on the needs of the user. • Use annotated sketches and prototypes to develop, model and communicate ideas.	**Designing** • Generate realistic and appropriate ideas and their own design criteria through discussion, focusing on the needs of the user. • Use annotated sketches and prototypes to develop, model and communicate ideas.	**Designing** • Generate realistic ideas and design criteria collaboratively through discussion, focusing on the needs of the user and purpose of the product. • Develop ideas through the analysis of existing products and use annotated sketches and prototypes to model and communicate ideas.
	Making Order the main stages of making. • Select from and use appropriate tools with some accuracy to cut, shape and join paper and card. • Select from and use finishing techniques suitable for the product they are creating.	**Making** • Order the main stages of making. • Select from and use appropriate tools with some accuracy to cut and join materials and components such as tubing, syringes and balloons. • Select from and use finishing techniques suitable for the product they are creating.	**Making** • Order the main stages of making. • Select and use appropriate tools to measure, mark out, cut, score, shape and assemble with some accuracy. • Explain their choice of materials according to functional properties and aesthetic qualities. • Use finishing techniques suitable for the product they are creating.
	Evaluating Investigate and analyse books and, where available, other products with lever and linkage mechanisms. • Evaluate their own products and ideas against criteria and user needs, as they design and make	**Evaluating** • Investigate and analyse books, videos and products with pneumatic mechanisms. • Evaluate their own products and ideas against criteria and user needs, as they design and make.	**Evaluating** • Investigate and evaluate a range of existing shell structures including the materials, components and techniques that have been used. • Test and evaluate their own products against design criteria and the intended user and purpose.
	Technical knowledge and understanding Understand and use lever and linkage mechanisms. • Distinguish between fixed and loose pivots. • Know and use technical vocabulary relevant to the project.	**Technical knowledge and understanding** • Understand and use pneumatic mechanisms. • Know and use technical vocabulary relevant to the project.	**Technical knowledge and understanding** • Develop and use knowledge of how to construct strong, stiff shell structures. • Develop and use knowledge of nets of cubes and cuboids and, where appropriate, more complex 3D shapes. • Know and use technical vocabulary relevant to the project.
Links to other subjects	**Spoken language** – participate in discussion and evaluation of books and, where available, other products with moving pictures. Ask relevant questions to extend knowledge and understanding. Build technical vocabulary **Mathematics** – use the vocabulary of position, direction and movement. Use a ruler to measure to the nearest cm, half cm or mm.	**Spoken language** – participate in discussion and evaluation of examples of products that use pneumatics. Ask relevant questions to extend knowledge and understanding. Build technical vocabulary. **Science** – identify and compare the suitability of a variety of everyday materials for particular uses	**Science** – discuss the properties and suitability of materials for particular purposes.

	Art and design – use colour, pattern, line, shape. – use and develop drawing **Computing** – digital graphics and text could be incorporated into final products as the background or moving parts.	**Mathematics** – measure, compare, add and subtract: lengths, volume and capacity.	**Mathematics** Recognise 3-D shapes in different orientations and describe them. use a ruler to measure to the nearest cm, half cm or mm. Draw 2-D shapes and make 3-D shapes using modelling materials. **Computing** – design and create digital content on screen, creating nets for their products and combining text with graphics. **Spoken language** – ask relevant questions to extend knowledge and understanding. Build their technical vocabulary
Lessons	**Investigative and Evaluative Activities (IEAs)** Children investigate, analyse and evaluate books and, where available, other products which have a range of lever and linkage mechanisms. • Use questions to develop children's understanding	**Investigative and Evaluative Activities (IEAs)** • Children investigate, analyse and evaluate familiar objects that use air to make them work e.g. bicycle pump, balloon, inflatable swimming aids, foot pump for inflating an air bed. • Construct a simple pneumatic system by joining a balloon to 5mm tubing and then to a washing-up liquid bottle. • Demonstrate lifting an object and ask the children to think about ways in which this might be used in a product. • Demonstrate a range of pneumatic mechanisms using prepared teaching aids including two syringes joined by plastic tubing; three syringes connected using a T-connector and using different sized syringes. Note: take care as the syringe may come out with force. Discuss why, when pressing a large syringe, it can take time and feel 'squishy' before the smaller syringe is moved	**Investigative and Evaluative Activities (IEAs)** • Children investigate a collection of different shell structures including packaging. Use questions to develop children's understanding • Children take a small package apart identifying and discussing parts of a net including the tabs • Evaluate existing products to determine which designs children think are the most effective. Provide opportunities for the children to judge the suitability of the shell structures for their intended users and purposes
	. **Focused Tasks (FTs)** • Demonstrate a range of lever and linkage mechanisms to the children using prepared teaching aids. • Use questions to develop children's understanding • Demonstrate the correct and accurate use of measuring, marking out, cutting, joining and finishing skills and techniques. • Children should develop their knowledge and skills by replicating one or more of the teaching aids.	**Focused Tasks (FTs)** • Demonstrate how to assemble the systems using syringes, tubing, balloons and plastic bottles. Introduce ways in which pneumatic systems can be used to operate levers. • Demonstrate the correct and accurate use of measuring, marking out, cutting, joining and finishing skills and techniques. • Provide the materials and ask the children to try out and draw the three systems they have been shown: a) Balloon connected to a washing-up liquid bottle. b) Two syringes of the same size connected together. c) Two syringes of different sizes connected together. Note: take care as the syringe may come out with force	**Focused Tasks (FTs)** • Children use kit parts with flat faces to construct nets. Practise making nets out of card, joining flat faces with masking tape to create 3-D shapes. Experiment with assembling in nets in numerous ways. • Demonstrate skills and techniques of scoring, cutting out and assembling using pre-drawn nets. Then allow children to practise by constructing a simple box. Show how a window could be cut out and acetate sheet added. • Demonstrate how to use different ways of stiffening and strengthening their shell structures e.g. folding and shaping, corrugating, ribbing, laminating. Provide opportunities for the children to practise these and to carry out tests to find out where their structures might need to be strengthened or stiffened. • Children discuss and explore the graphics techniques and media that could be used to achieve the desired appearance of their products. • Practise using computer-aided design (CAD) software to design the net, text and graphics for their products according to purposes
	Design, Make and Evaluate Assignment (DMEA) Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with children the purpose of the products they will be designing and making and who the products will be for. Ask the children to generate a range of ideas, encouraging creative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products. • Using annotated sketches and prototypes, ask the children to develop, model and communicate their ideas. • Ask the children to consider the main stages in making before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs. • Evaluate the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed	**Design, Make and Evaluate Assignment (DMEA)** • Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with children the purpose of the products they will be designing and making and who the products will be for. Ask the children to generate a range of ideas, encouraging creative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products. • Using annotated sketches and prototypes, ask the children todevelop, model and communicate their ideas. • Ask the children to consider the main stages in making before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs.	**Design, Make and Evaluate Assignment (DMEA)** • Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with the children the uses and purposes of their shell structures • Ask the children to use annotated sketches and prototypes to develop, model and communicate their ideas for the product • Ask children to identify the main stages of making and the appropriate tools and skills they learnt through focused tasks. Encourage the children to work with accuracy, using computer-aided design (CAD) where appropriate. • Evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed

		• Evaluate the final products against the intended purpose and with the intended user, where safe and practical, drawing on the design criteria previously agreed	
Assessment	Did your card look like the original design? How did you choose who to make it for? Did you use a tool that was difficult to use? Why did you choose the design? Is it like anything you have seen before? What type of mechanism did you use? How did the person like their card? Is there anything you could have done to make it better? What was the best thing about it?	Did you have any idea how the pop up would work before you made it? Describe how the pneumatic mechanism worked. What did you do first? What was the hardest part? Did you have to try something more than once? How did you improve on your design? How did you make it look exciting to use?	How did you make sure the pecils would fit into your product? How did you choose what to put on your design? What did you do to make the product strong? Did it work first time? Do you like your end product? What is the best bit? Does it look like the original design? If you made it again, what would you change?