# Design and Technology – Year 4

## Content- Structures- Shell Structures using CAD.

## Big Question: How does CAD support design?

| NC objectives - **areas of study** | End point of area of study | Vocabulary | | |
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| | | Basic | Adventurous | Technical |
| 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. When designing and making pupils should be taught to:<br><br>-Use research and develop design criteria to inform the design of innovative, functional, appealing products that fit for purpose, aimed at a particular individual or groups.<br>-Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design.<br>-Select from and use a wider range of tools and equipment to perform practical tasks.<br>-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.<br>-Investigate and analyse a range of existing products. | **<u>Structures</u>**<br>Children can identify shell structures and investigated a range of existing shell structures.<br>They can identify the materials, components and techniques that have been used to make them in order to support their own making process.<br>Children will have developed and understood how to construct a strong, stuff shell structure, as well as understanding how to stiffen and strengthen their own structure. This will build upon their knowledge from year 1.<br>Children will have developed and used knowledge of nets of cubes and cuboids and where appropriate, more complex 3D shapes. This will also be secure during mathematic lessons.<br>Children know and use technical vocabulary that is relevant to the project. This will be used confidently throughout the whole process of their product. (See Tier 3 vocabulary)<br>Children will have used kit parts with flat faces to practice constructing their nets and help develop their design.<br>They know how to make nets out of card, joining flat faces with masking tape to create 3D shapes.<br>They will have explored how to assemble nets in numerous ways.<br>Children will know and have used techniques such as scoring, cutting out and assembling pre-drawn nets.<br>Children will use methods such as folding, shaping, corrugating, ribbing and laminating to help strengthen their structure.<br>Children will have used ICT to help design their net or create additional finishing ideas- graphics or text. | 3D Shape, cube, cuboid, prism, edge, face, length, width, marking out, joining, material, decision, illustrate | Construct, invent, breadth, assemble, reduce, | Shell structure, three dimensional (3D), net, vertex, scoring, corrugating, ribbing, laminating, graphics, evaluating, design brief, design criteria, innovative, prototype.<br><br>Acetate sheets, computer with computer aided design (CAD), Software, and printer. |

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| -Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.<br>-Understand how key events and individuals in design and technology have helped the shape world.<br>-Apply their understanding of how to strengthen, stiffen and reinforce structures that are more complex.<br>-Apply their understanding of computing to programme, monitor and control their products. | | | | |

## Knowledge

### Substantive Knowledge

Structures- Concept- Functionality

**Lesson 1:**

(Retrieval from year 1- What is a free-standing structure?)

**LO: To know existing shell structures and their functions.**

Children to investigate and identify a range of existing shell structures including packaging. Encourage children to analyse the types of materials used and identify the different part of the product.

Express the joy of exploring different range of shell structures.

**Key questions:**

*What is the purpose of the shell structure – protecting, containing, presenting?*

*What material is it made from?*

*How has it been constructed?*

*Are the materials recyclable or reusable? How has it been stiffened i.e. folded, corrugated, ribbed, laminated? What size/shape/colour is it?*

### Disciplinary Knowledge

**Each lesson: Tell chn-** Explain to the children that today they are going to be researchers for a biscuit company. Children to create a new style of packaging that will prevent broken biscuits. Children to research 3D shapes and materials that will support the function of their packaging. Collaboratively create a design criteria with purpose and function in mind.

Throughout the unit, children will be able to draw upon other subject disciplines such as Mathematics, Science and Art. This will include the following:

**Mathematics** – 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. Compare and sort common 2-D and 3-D shapes in everyday objects. Recognise 3-D shapes in different orientations and describe them.

**Computing** – design and create digital content on screen, creating nets for their products and combining text with graphics.

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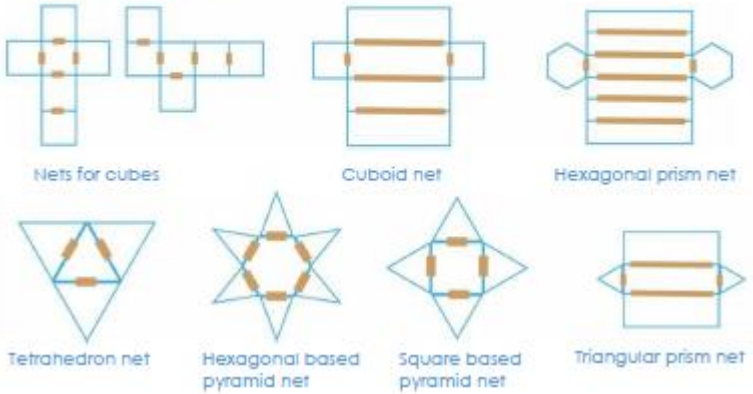
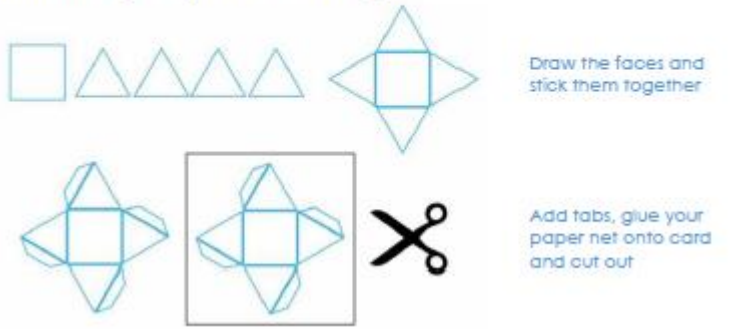
| *What information does it show and why? How attractive is the design*<br><br>**<u>Lesson 2:</u>**<br>**<u>LO: To know nets of cubes, cuboids and where appropriate more complex shapes.</u>**<br>Children take a small package apart identifying and discussing parts of a net including the tabs e.g. *How are different faces of the package arranged? How are the tabs used to join the 'free' edges of the net?*<br>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. If possible could children use CAD to explore making nets or use of paint/word? | **Science** – discuss the properties and suitability of materials for particular purposes.<br>**Spoken language** – ask relevant questions to extend knowledge and understanding. Build their technical vocabulary.<br>**Art-** Children to use line, pattern and colour to draw sketches during the design process.<br><br>Children to follow the four aspects of Design and Technology- research, design, make and evaluate whilst building upon technical knowledge to make their finished product. |

Assemble and evaluate 3-D shapes using standard sized card squares, rectangles, equilateral triangles, isosceles triangles and hexagons, joined with masking tape.




Creating the net for the product you are designing and making without using computer aided design:



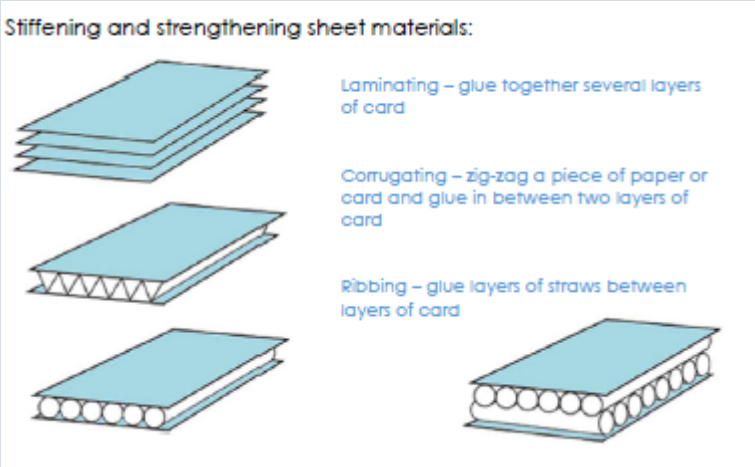

**Lesson 3:**

**LO: To understand how to construct strong, stiff shell structures.**

**LO: To know how to measure, mark out, cut, score and shape with accuracy.**

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.




**Lesson 4: To know how to generate realistic ideas and designs to create a functional shell structure.**

Provide hook for the children- Posting biscuits which have arrived at school broken. Children to design their own functional packaging that will protect products. E.g. creating packaging to store Christmas food craft.

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 e.g. *What does the product need to do? Who is it aimed at? How will the purpose and user affect your design decisions?* Agree on design criteria that can be used to guide the development and evaluation of children's products *e.g. How will we know that we have designed and made successful products?* Ask the children to use annotated sketches and prototypes to develop, model and communicate their ideas for the product e.g. *What will you need to include in your design? How can you improve it? What materials will you use? How will you make sure your product works well and has the right appearance?*

How can we use CAD to support packaging design- how will this meet the users needs?

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| **Lesson 5:**<br>**LO: To know how to make a strong, stiff and secure shell structure.**<br>**LO: To know how CAD can support finishing techniques suitable for their product.**<br>Children to make their product using knowledge throughout unit. If possible children to create their nets on computers to aid making process and assemble using scoring, cutting and shaping.<br>Children could use word to add packaging designs or writing to meet users needs.<br>Enjoying and celebrating their personal creativity.<br><br>**Lesson 6:**<br>**LO: To understand how to test and evaluate their product against design criteria and intended user.**<br>Children to be given opportunity to test out finished product. Children to refer back to design criteria and the intended user. If packaging successful they can use packaging for their Christmas craft or biscuits. Is their product functional? What other functional products have you made already in DT? | |

| Concepts | | | |
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| **Functionality**<br>Pupils should design and make products that work/function effectively in order to fulfil users' needs, wants and purposes.<br><br>• Know that their products should work in some way.<br>• Know how a range of existing products work.<br>• Develop specific technical knowledge and understanding in order to ensure that their products work well.<br>• Understand the meaning of 'functionality' and its importance to design and technology.<br>• Know how functionality is relevant to the product they are designing.<br>• Know how the materials and components they use assist the functionality of the product.<br>• Contrast the functional properties of materials and components with their aesthetic qualities.<br>• Understand that how products work affects how they are used. | **Authenticity** | **Innovation** | **Significance** |

## ASSESSMENT

**KNOW MORE, REMEMBER MORE, DO MORE...**

In this unit of learning, progress has been made when a learner knows more. This 'distance travelled' from the starting point is evidenced through them remembering more and doing more: in books, low stakes quizzes, retrieval, use of mind maps, answering the big question and being able to feel more confident about this unit.