


Mendell Primary School

Aspire Challenge Achieve

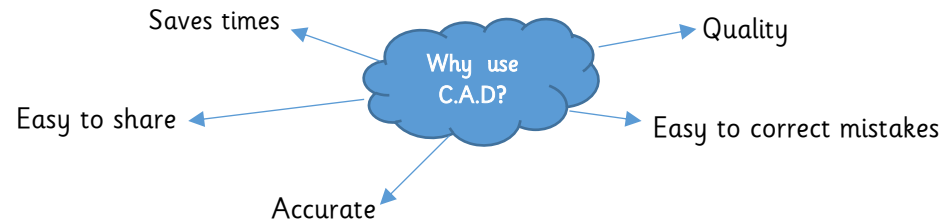
Medium Term Plan Design Technology



Year Group: 3	Term: Spring 2 2022	Teacher: Jessica Hindley	Subject lead: Catherine O'Neill Edwards	Overview: Structures: shell structures using Computer Aided Design Use CAD to design and make an Easter gift box	Key End Points: By the end of this unit children will be able to: <ul style="list-style-type: none"> - Know what a net is - Know what C.A.D is and why it is used - Choose a finish for my product 	
Links to other learning: Maths: Shape Computing:	Relevant Prior Learning: Computing Y1: word processing & media storage	Future Learning: Y6: C.A.D in textiles	High Quality Text: 'A Box Story' Kenneth Kit Lamug	Risk Assessment: <ul style="list-style-type: none"> - Food allergies/intolerance (when investigating packaging as well as eating eggs) - Use of laptops and electrical equipment 	Teacher CPD: Please read the DATA project on a page sheets attached at the end of this plan prior to teaching.	
<u>Learning Intention</u>	<u>Lesson Outline (Key Questions in colour)</u>			<u>Resources</u>	<u>Vocabulary</u>	<u>Lowest 20% Adaptations</u>
I can investigate a range of boxes I know what a net is	<p>This is a DT lesson. In DT we design and make to solve problems.</p> <p>Tell children that in this unit of work we are going to be making our own Easter Box. To learn more about boxes, we are going to investigate and evaluate a range of different boxes. Quick recap on 3d shapes: cube, cuboid, cylinder, triangular prism, pyramid.</p> <p>Investigative and Evaluative Activities (IEAs)</p> <ul style="list-style-type: none"> • Children investigate a collection of different shell structures and box types including packaging. Have these questions in groups and encourage children to discuss and answer them, adults prompt and facilitate discussion <p>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/strengthened i.e. folded, corrugated, ribbed, laminated? What information does it show and why? How attractive is the design?</p> <ul style="list-style-type: none"> • We are going to take some of the boxes apart to see how they are made. Demonstrate how to carefully prise a box apart and lay it out flat. This is called a net. A net is a 3d shape that is opened out and laid flat. What is a net? A 3d shape that is unfolded and laid flat. Repeat three times in different voices and throughout lesson. Introduce children to 'tabs' and discuss what their purpose. Children take a small package apart identifying and discussing parts of a net including the tabs. How are the tabs used to join the 'free' edges of the net? • Have a range of nets available (some with and some without tabs) for children to explore constructing. Discuss which are easy to make and which are most difficult and why. Which are easy to construct? Which are more difficult? What could make it easier? <p>Tell the children that in this unit of work they are going to be designing and making an easter box to hold chocolate eggs in that they can give someone as a gift (or keep for themselves!) Which shapes are most ideal for creating a box that can be opened (e.g. for storing chocolate eggs in) Discuss that cubes and cuboids are the most appropriate shapes (as triangular prisms and pyramids are harder to create a 'lid' to open and close, cylinders and other shapes are more difficult to construct). Therefore, we will be using cubes and cuboids for our boxes.</p>			<p>3d shapes</p> <p>Variety of shaped boxes to take apart and look at the net shapes</p> <p>Print different shaped boxes and make these before the lesson for the children to explore, some laminated paper before constructing, some on card, some on paper</p> <p>Geometric printable nets (on google drive) not constructed – with and without tabs</p>	<p>Net</p> <p>3d shape Solid Flat Tab (not flap) Investigate Evaluate</p>	 <p>The above has been purchased to aid understanding for any children who struggle with motor/visualisation skills. It is kept in the y3 storeroom</p>

I know what C.A.D is and why it is used

This is a DT lesson. In DT we design and make to solve problems.
Recap prior learning: **What is a net? A 3d shape that is unfolded and laid flat.**
Display/hold up some of the packaging from the previous lesson. **Look at the designs on all these boxes.**
Look at the graphics (pictures) and words. What do they all have in common? They were all designed on a computer. They weren't hand drawn. Why were they designed on a computer rather than drawing them?
Discuss answers such as: *higher quality (how well something is made), professional finish. Easier to reproduce. Easy to correct if a mistake is made. Is it easier to draw an accurate square on a computer or by hand? On a computer as there is a draw tool.* Summarise answers on board as:



This is called Computer Aided Design – also known as C.A.D. **What is C.A.D? Computer Aided Design.**
Repeat three times in different voices and revisit throughout lesson. **Why is C.A.D used?** Revisit answers above throughout lesson.
Focused Tasks (FTs): Show children PowerPoint called 'cube net blank'. **What shape are these nets for? Why are we only looking at cube and cuboid nets?** Recap on reasons discussed in yesterday's lessons.
Today we are going to start our own C.A.D design s for our Easter Box. Before we start designing, we need to be clear on our design brief:

- WHAT we are making – this is called the **product**
- WHO it is for - this is called the **user**
- WHY we are making it – this is called the **purpose**

Discuss who they are going to make the easter box for and how this will affect their design e.g. choosing pictures and colours the intended user will like. They can design and make their box for themselves. In books record and complete the following sentence **Design, make and evaluate a _____ for _____ that will be used for _____**

Then complete three bullet points:
* Product =
* User =
* Purpose =

Now teach children specific computer skills they will need for C.A.D.:
• Demonstrate how to insert a picture/clip art, how to move it and re-size it
• Demonstrate how to insert word art, how to move it and re-size it
• Demonstrate how to insert a square, resize it, move it and recolour it.
• Demonstrate how to delete a slide on PowerPoint – children will need to decide if they are designing a cube or cuboid and delete the net they do not need.
• Recap on how to save work.

Children now locate the PowerPoint that has previously been saved with their name on it and open it. Their first job is to decide if they are making a cube or cuboid then delete the slide with the net they do

Cube net blank
PowerPoint

Laptop each – switched on

**before the lesson, save blank net PowerPoint first two slides as each child's name in your class so they can find and open

Additional adults in this lesson may be helpful to assist children with computer skills

	<p>not need. Allow children to start designing by inserting easter themed clip art, text, shapes. Assist as needed. Encourage children to save their work sporadically throughout. By the end of lesson children need to have inserted all graphics and text (pictures and words) – this may need to be spread over two lessons.</p> <p><i>NB: This lesson all text and graphics will be inserted vertically – these will need rotating next lesson which will become apparent when their designs are printed up. If any children identify this before the next lesson, explain that we are going to insert all graphics and text today and will then 'manipulate' and change it next week.</i></p> <p>Exit pass: Why use C.A.D? on a post it note (remove answers from board prior so the children aren't copying). Add post it notes to books. (ensure dated)</p>			
<p>I can edit my design using C.A.D.</p>	<p><i>This is a DT lesson. In DT we design and make to solve problems.</i> Recap on prior learning: <i>What is a net? A 3d shape that is unfolded and laid flat.</i> <i>What is C.A.D? Computer Aided Design.</i> <i>Why use C.A.D? time, quality, sharing, accurate, easy to correct</i></p> <p>Explain to children that you have printed up their designs for them so we can build them and check if anything needs changing so far. Allow children time to make their boxes. It should become apparent that some of the graphics and text is the wrong way up when the box is made. <i>Do we need to start everything again?</i> No, we can use the rotate tool. <i>What does rotate mean?</i> Turn.</p> <ul style="list-style-type: none"> • Demonstrate how to rotate text and graphics <p>Display 'Net correct way up week 3 – PowerPoint' this shows which way up the text and graphics should be.</p> <p>Children open their saved design from last lesson and edit by rotating their pictures and words (graphics and text). Encourage children to save throughout the lesson.</p> <p>Children need to complete designs and save their work this lesson.</p> <p>Revisit first lesson activity where they looked at a variety of packaging. Children have four options for their box:</p> <ul style="list-style-type: none"> - Paper - Card - Laminated paper - Laminated card <p>Pass around pre-prepared and assembled boxes. Children assess which they feel is the most appropriate finish and discuss why. On post it notes children record: The finish I will use on my product is _____ because _____ Stick in books (ensure dated)</p>	<p>All children's nets printed up from previous lesson prior to start of lesson (these could be cut out prior to lesson also)</p> <p>Laptops</p> <p>Net correct way up week 3 – PowerPoint</p> <p>Example boxes (see examples week 3 on google drive) printed and assemble made from:</p> <ul style="list-style-type: none"> - Paper - Card - Laminated paper - Laminated card 		
<p>I can make, test and evaluate my product</p>	<p><i>This is a DT lesson. In DT we design and make to solve problems.</i> Recap on prior learning: <i>What is a net? A 3d shape that is unfolded and laid flat.</i> <i>What is C.A.D? Computer Aided Design.</i> <i>Why use C.A.D? time, quality, sharing, accurate, easy to correct</i></p> <p>This lesson you will make, test and evaluate your product. Give out printed designs (some of which will be on card/paper and some will need to be laminated)</p> <p>Children cut out themselves, fold and stick tabs.</p>	<p>All children's nets printed up from previous lesson prior to start of lesson - some will need to be on paper, some will need to be on card,</p>		<p>Retain nutritional value of chocolate eggs and share with parent of child who has diabetes and any children with allergies e.g.</p>

	<p>Once assembled children can add shredded tissue paper and chocolate eggs to their boxes. Photograph children with their finished products (close up as well as of the children).</p> <p>Discuss why we complete evaluations? To make improvements. DT is about solving problems – evaluations help us check if there is a better way. Children answer the following questions as part of their evaluation (these can be printed and stuck in books for children to answer). Ask children to ensure they answer in full sentences giving reasons.</p> <p>What do you like about your design? Is your product sturdy? Does your product work? What was the most difficult? What would you change? How do you feel about using C.A.D?</p> <p>Children take products home and eat eggs at home</p>	<p>some will need laminating</p> <p>Sellotape Pritt stick</p> <p>Shredded tissue paper</p>		<p>no gelatine/ vegan</p>
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1. Year Groups
Years
3/4

2. Aspect of D&T Structures

Focus
Shell structures using computer-aided design (CAD)

3. Key learning in design and technology

Prior learning

- Experience of using different joining, cutting and finishing techniques with paper and card.
- A basic understanding of 2-D and 3-D shapes in mathematics and the physical properties and everyday uses of materials in science.
- Familiarity with general purpose software that can be used to draw accurate shapes, such as Microsoft Word, or simple computer-aided design (CAD), such as 2D Primary by Techsoft.

Designing

- Generate realistic ideas and design criteria collaboratively through discussion, focusing on the needs of the user and the functional and aesthetic purposes of the product.
- Develop ideas through the analysis of existing shell structures and use computer-aided design to model and communicate ideas.

Making

- Plan the order of the main stages of making.
- Select and use appropriate tools and software 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 computer-generated finishing techniques suitable for the product they are creating.

Evaluating

- Investigate and evaluate a range of 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

- Develop and use knowledge of nets of cubes and cuboids and, where appropriate, more complex 3D shapes.
- Develop and use knowledge of how to construct strong, stiff shell structures.
- Know and use technical vocabulary relevant to the project.

4. What could children design, make and evaluate?
gift boxes desk tidy lunchboxes packaging cool boxes party boxes mystery boxes toy car body shell moneyboxes other – specify

7. Links to topics and themes
Shape and Space Shopping Going Green Festivals Celebrations Healthy Eating Our School Toys and Games other – specify

5. Intended users
themselves siblings parents relatives friends younger/older children party guests shop customers community group neighbours other – specify

8. Possible contexts
home school shopping culture enterprise local community wider environment other – specify

6. Purpose of products
packaging storage protection marketing presentation display celebration postage other – specify

9. Project title
Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose). To be completed by the teacher. Use the project title to set the scene for children's learning prior to activities in 10, 12 and 14.

10. Investigative and Evaluative Activities (IEAs)

- Children investigate a collection of different shell structures including packaging. Use questions to develop children's understanding e.g. *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? What information does it show and why? How attractive is the design?*
- 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 'tree' edges of the net?*
- 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. Discuss graphics including colours/impact of style/logo/size of font e.g. *What do you prefer and why? What style of graphics and lettering might we want to include in our product to meet users' preferences and its intended purpose? Which packaging might be the best for...?*

12. Focused Tasks (FTs)

- Demonstrate simple drawing software such as Techsoft 2D Primary or Microsoft Word. Ask children to explore the interface and drawing tools to practise drawing and manipulating shapes such as rectangles, squares, ellipses, trapezoids and triangles.
- Ask children to use the software to open existing drawings including nets and to draw nets of their own, using gridlines and pre-shaped tools.
- Let the children explore and be guided to try out different fill and font tools to become familiar with the graphic design aspects of the available software to achieve the desired appearance of their products.
- Practise making nets out of card, joining flat faces with masking tape to create 3-D shapes. Experiment with assembling pre-drawn nets in numerous ways using scoring, cutting and assembling techniques. Allow children to construct a simple box and show how a window can be cut out and acetate sheet added.

14. Design, Make and Evaluate Assignment (DMEA)

- Develop a design brief with the children within a context which is authentic and meaningful.
- Discuss the uses and purposes of their shell structure 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 develop a design using computer-aided design (CAD) software to create nets, addressing the needs of the user and the purpose.
- Using computer-aided design (CAD) software ask the children to print out their nets to develop prototypes in order to evaluate and refine their ideas 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?*
- 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 their computer-aided design (CAD) skills as appropriate.
- Evaluate throughout and the final products against the intended purpose and with the intended user, where safe and practical, drawing on the design criteria previously agreed.

11. Related learning in other subjects

- **Science** – discuss the properties and suitability of materials for particular purposes.
- **Mathematics** – compare and sort common 2-D and 3-D shapes in everyday objects. Recognise 3-D shapes in different orientations and describe them.
- **Spoken language** – ask relevant questions to extend knowledge and understanding. Build their technical vocabulary.

13. Related learning in other subjects

- **Mathematics** – use a ruler to measure to the nearest cm, half cm or mm. Draw 2-D shapes and make 3-D objects using modelling materials.
- **Computing** – design and create digital content on screen, creating nets for their products and combining text with graphics.

15. Related learning in other subjects

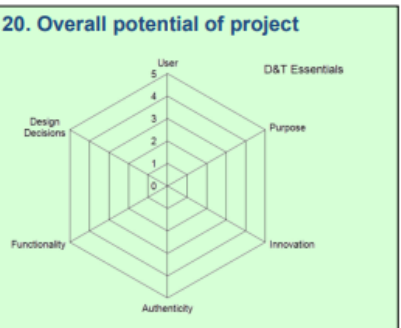
- **Spoken language** – ask relevant questions to extend knowledge and understanding. Build technical vocabulary.
- **Art and design** – use and develop drawing skills.
- **Writing** – write for real purposes and audiences.
- **Computing** – design and create digital content on screen using computer-aided design (CAD) software, creating nets for their products and combining graphics with text.

16. Possible resources
collection of shell structures for different purposes and users card, squared paper, coloured paper, adhesive tape, masking tape, PVA glue, glue spreaders, acetate sheet, pencils, felt-tip pens, rulers, right/left handed scissors computer with computer-aided design (CAD) software such as Techsoft 2D Primary or Microsoft Word, printer

17. Key vocabulary
shell structure, three-dimensional (3-D) shape, net, cube, cuboid, prism, vertex, edge, face, length, width, breadth, capacity marking out, scoring, graphics, decision, joining, assemble, accuracy, material, stiff, strong, reduce, reuse, recycle, corrugating, ribbing, laminating font, lettering, text, evaluating, design brief design criteria, innovative, prototype

18. Key competencies
problem-solving teamwork negotiation consumer awareness organisation motivation persuasion leadership perseverance other – specify

19. Health and safety
Pupils should be taught to work safely, using tools, equipment, materials, components and techniques appropriate to the task. Risk assessments should be carried out prior to undertaking this project.



Years 3/4

Structures

Shell structures using CAD

Instant CPD



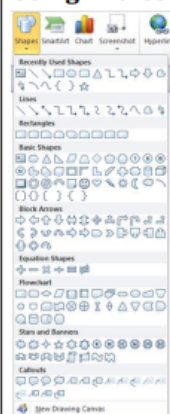
Tips for teachers

- ✓ Please also refer to the Instant CPD guidance in 'Year 3/4 Structures – shell structures' when carrying out this project
- ✓ Many software packages have demonstration versions with tutorials that you can try out without paying a charge.
- ✓ Visit a local shop or supermarket to investigate different types of card packaging.
- ✓ Make a collection of shell structures of various shapes and, where possible, flatten them to show the nets and for storage.
- ✓ Put together an image board of packaging so children can see the range of fonts and consistency with a brand.
- ✓ Discuss environmental issues relating to the wastage of materials when packaging items including the three R's - reducing, recycling and reusing.
- ✓ If children are designing and making packages for a food product, they will need to choose materials appropriate for direct contact with food.
- ✓ You may want to restrict children to using particular standard shapes when designing their nets and final products.
- ✓ Ensure that the children include sufficient tabs in their drawings for assembling their nets.
- ✓ Use the options in Microsoft Word and other software to display rulers and grids that can help with generating nets and other items.
- ✓ Using copy and paste will ensure that objects are of a consistent size.
- ✓ Ensure that the children have a good understanding of the associated vocabulary and of 2-D and 3-D shapes in maths before carrying out this project.

Useful resources at www.data.org.uk

- [Primary Subject Leaders' File Section 5.9](#)
- [Banish broken biscuits! Box them brilliantly](#)
- [Working with Materials](#)
- [Packaging – with links to Maths](#)
- [Nets for packaging](#)

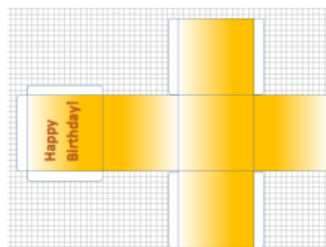
Using Microsoft Word



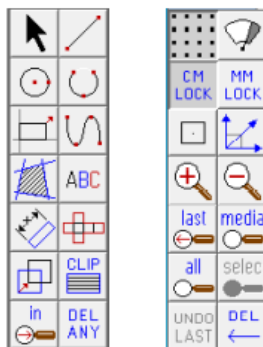
Turn on gridlines and use the pre-set shapes to draw simple nets. Shapes can be edited if you choose.

Text boxes and colouring using the format tab will allow children to come up with a range of designs.

Microsoft Word has many features that allow children to draw and manipulate accurate shapes, import or paste in graphics and print the final designs without having to use dedicated CAD software.

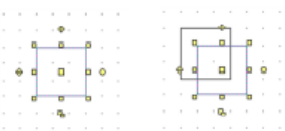
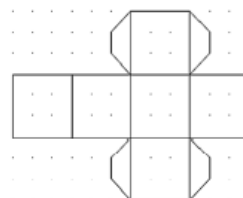


Using TechSoft 2D Primary



Explore and use the different drawing tools and zoom, grid and locking tools to help ensure accurate drawings.

Demonstrate how to draw a simple net and ask children to practise using the copy and move 'handles'.



When to use CAD

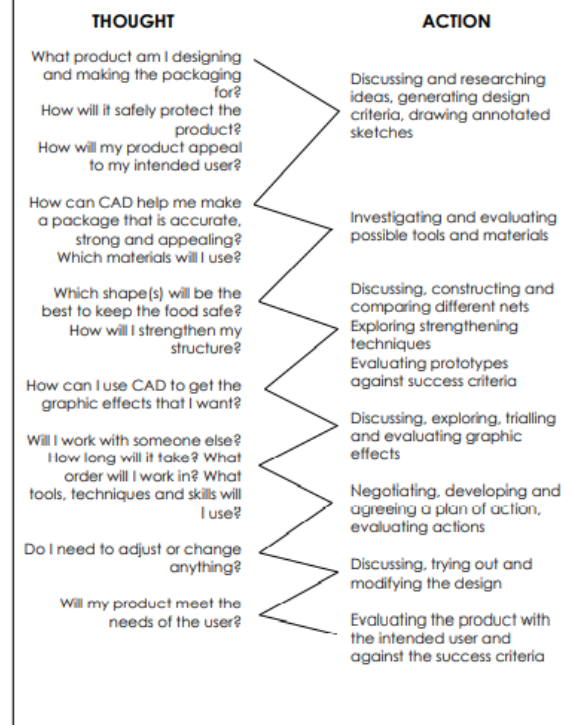
- When children understand the value of using it to improve the accuracy and appearance of their products
- Where it achieves learning objectives more efficiently
- Where children have been taught and practised the necessary computing skills
- Wherever possible, to design the functional and aesthetic features of a product

When not to use CAD

- When children do not have sufficient understanding of the product they are designing
- As a substitute for practical activities with actual materials and components
- When a project can be delivered as effectively without it

Designing, making and evaluating CAD-based packaging to protect and display a food product for sale

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:



Glossary

- **CAD** – computer-aided design.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Edge** – where two surfaces meet at an angle.
- **Face** – a surface of a geometric shape.
- **Vertex** – the corners of a geometric shape where edges meet.
- **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.
- **Cuboid** – a solid body with rectangular sides.
- **Prism** – a solid geometric shape with ends that are similar, equal and parallel.