

ACET Junior Academies

Scheme of Work for Design Technology

Y3 Structures - Shell Structures



About this unit: In this unit pupils will be learning about shell structure products. They will explore a range of products, including packaging, and identify the purpose of the shell structure; for protecting, presenting, or containing. Children will disassemble shell structures to investigate how they are made and will learn about how materials are stiffened and strengthened. Children will practise using construction kits and card to make nets of shapes and will develop skills in scoring, cutting out and assembling nets to make 3D shapes. Children will design a shell structure for an intended user and purpose. They will apply their learning from the unit to make their product and will evaluate their completed products, judging the extent to which they have met the original design criteria.

Final piece ideas: disposable/recyclable lunch boxes, food packaging, party boxes, (Link Science - Nutrition - make food packaging, party boxes, disposable lunch boxes; possible link back to Egyptians - Pyramids)

Unit structure

1. Investigate and Evaluate: What are shell structures?
2. Focused Tasks: How do you make shell structures?
3. Designing: What could I make and how could I make it? (may require two lessons)
4. Making: Can I make the product I have designed?
5. Making - Finishing: Is my product finished?

Links to previous and future National Curriculum units

- KS1 - Freestanding structures
- UKS2 - Frame Structures

6. Evaluating: What went well? How could I improve my product?

1: Investigate and Evaluate: How does packaging differ? What is a Shell Structure?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
<p>Pupils will have experience of using different joining, cutting and finishing techniques with paper and card.</p> <p>They will have a basic understanding of 2D and 3D shapes in mathematics and the physical properties and everyday uses of materials in science.</p>	<p>Substantive knowledge: (<i>What students should know.</i>)</p> <p>That there are a range of shell structure products which have been designed, produced and evaluated.</p> <p>That many food packaging are shell structures.</p> <p>That shell structures can be made of different materials.</p> <p>That shell structures can present, protect or contain another product.</p> <p>To know that shell structures are hollow shapes made from nets.</p> <p>Second order concepts: (<i>What students should understand</i>)</p> <p>Evaluation</p> <p>Purpose</p> <p>Function</p>	<p>Skills</p> <ul style="list-style-type: none"> • Begin to evaluate existing products, considering how well they have been made, the materials chosen, whether they work, how they have been made and if they are fit for purpose. • Identify who designed a product and when it was made. • Identify the materials products are made from. <p>Key vocabulary/concepts: https://20353.stem.org.uk/Nuffield%20Glossary2/index.html</p> <p>Evaluate, user, purpose, product, function, Shell structure, three-dimensional</p>	<p>Can your children:</p> <p>Explore a range of shell identifying their purpose and intended user.</p> <p>Identify the materials used products are made from and explain why materials have been chosen.</p> <p>Explain how materials have been stiffened.</p> <p>Express opinions about products based on design and use.</p>	<p>Horizontal:</p> <p>Science - properties and suitability of materials for particular purposes; nutritional information (food packaging)</p> <p>Maths - 2D/3D shapes; nets</p> <p>Vertical:</p>

		(3D) shape, material, stiffen, recycle, reuse, net, font, lettering, text, graphics,		
--	--	--	--	--

Suggested activities:	Resources:	Useful links:
<p>Provide a collection of different shell structures including packaging for pupils to investigate ie cereal boxes, chocolate boxes, plastic packaging etc. Use questions to develop pupils' understanding and of shell structures and to introduce and develop the use of technical vocabulary e.g. <i>What is the purpose of this shell structure - protecting, containing, presenting? What materials is it made from? How has it been constructed? Are the materials recyclable or reusable? How has it been stiffened - folded, corrugated, ribbed, laminated? What size/shape/colour is it? What information does it show and why? (nutritional information?) How attractive is the design?</i></p> <p>Pupils take a package apart identifying and discussing parts of a net including the tabs - <i>How are the different faces of the package arranged? How are the tabs used to join the 'free' edges of the net?</i></p> <p>Pupils evaluate a range of products to determine which designs they think are most effective. Encourage them to judge the suitability of the shell structures for their intended users and purposes. Encourage discussion about the graphics including colours, impact of style, logo, size of font e.g. <i>Which do you prefer and why? What style of graphics and lettering might we want to include in our product to meet the users' preferences and its intended purpose? Which packaging might be best for...?</i></p> <p>Pupils could complete an evaluation of a chosen product.</p>	<p>Range of shell structures Evaluation sheet Cereal boxes, other packaging</p>	<p>https://www.educationquizzes.com/ks2/d-and-t/structures/</p> <p>http://mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</p>

2: Focused Tasks: How do you make a shell structure?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
-----------------------------------	--	---	-----------------------------	--------------------------

<p>Pupils will have evaluated and analysed a range of shell structures, identifying the intended purpose and user. They will have identified the materials used to make products and considered the ways that the materials have been stiffened. Pupils will understand that shell structures are made from nets and will have identified how faces are joined together to make 3D structures. Pupils will have considered their own preferences, identifying the structures that they prefer and explaining their reasons.</p>	<p>Substantive knowledge: (<i>What students should know.</i>) 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.</p> <p>Second order concepts: (<i>What students should understand</i>) Strengthening Stiffening Two dimensional Three dimensional</p>	<p>Skills</p> <ul style="list-style-type: none"> • Begin to understand how learning from Science and maths can be used to help design and make products that work • how to make strong, stiff shell structures • Work safely, hygienically and accurately with a range of simple tools. • Measure, mark out, cut and shape materials and components with some accuracy • Assemble, join and combine materials and components with some accuracy • the correct technical vocabulary for the projects they are undertaking <p>Key Vocabulary/concepts: Shell structure, three-dimensional (3D) shape, net, material, stiffen, marking out, scoring, shaping, tabs, join, assemble, accuracy</p>	<p>Can your children: Use construction kits and card to construct nets. Assemble nets to create 3D shapes. Use a range of techniques to stiffen and strengthen structures. Explore a range of graphics techniques to achieve their desired appearance. Order the main stages of making.</p>	<p>Horizontal: Maths- measure to the nearest c, half cm or mm; make 3D shapes from nets Computing – Graphics Spoken language – understand and use technical vocabulary Science – nutritional information (food packaging)</p> <p>Vertical:</p>
<p>Suggested activities:</p>		<p>Resources:</p>	<p>Useful links:</p>	

Pupils complete a range of activities to develop an understanding of nets. Pupils practise making 3D shapes construction kits.

Provide a range of 2D shapes in card. Children practise assembling the faces using masking tape to make 3D shapes. Children could be given the 3D shape

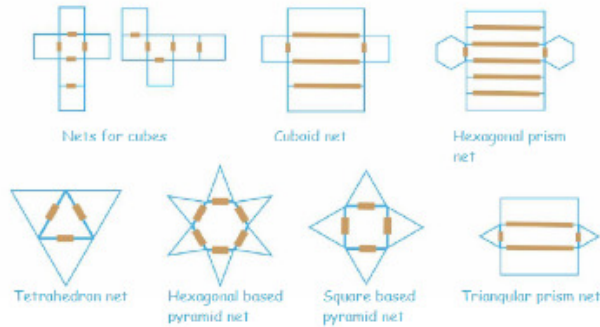
to make and challenged to find the faces required.

Using pre-drawn nets, demonstrate skills and techniques of scoring, cutting out and assembling to make 3D shapes.

Pupils could investigate a range of ways to stiffen and strengthen materials to make shell structures stronger e.g. folding and shaping, corrugating, ribbing, laminating.

Provide opportunity for pupils to discuss and explore the graphics techniques that could be used to finish their products.

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



Card, squared paper, coloured paper, masking tape, PVA glue, acetate sheet, pencils, pens, scissors, graphics programme/software

<http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf>

3: Designing: What container could I make and how could I make it?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
----------------------------	-------------------------------------	----------------------------------	----------------------	-------------------

<p>Children will have experienced using construction kits and card to make nets. They will have assembled nets to make 3D shapes and will have used different joining techniques to fix parts together. Pupils will have explored a range of graphics techniques and will have developed preferences for a desired effect.</p>	<p>Substantive knowledge: (<i>What students should know.</i>) That products need to be designed before they are made. That designers consider the needs and wants of a user. That products are according to design criteria. That a design brief outlines the aims of a design that is needed. That design criteria are the standards the finished product must meet. That a design proposal is a response to a design brief That the order of making needs to be planned</p> <p>Second order concepts: (<i>What students should understand</i>) Design brief Design criteria Design proposal</p>	<p>Skills</p> <ul style="list-style-type: none"> • Begin to describe the purpose of their product • Explain how particular parts of their product work • Consider the needs and wants the user • Develop their own design criteria and use to inform their ideas • Through discussion, generate realistic ideas for an item, considering its purpose and the needs of the user/s • Model ideas through the use of prototypes. • Communicate ideas through producing drawings with labels • Select from a range of tools and materials • Order the main stages of making <p>Key Vocabulary/concepts: Design brief, design criteria, design proposal, prototype, intended user, purpose, function,</p>	<p>Can your children: Describe what they are going to make, explaining the purpose and intended user. Gather information about the needs and wants of the intended user. Develop design criteria and use this to help develop their ideas. Communicate their ideas in annotated sketches and through making prototypes of their product.</p>	<p>Horizontal: Spoken language - understand and use technical vocabulary Science - Nutrition English - Instructions (ordering the stages of making) Science - properties and suitability of materials for particular purposes</p> <p>Vertical:</p>
<p>Suggested activities:</p>		<p>Resources:</p>	<p>Useful links:</p>	
<p>Set a context which is authentic and meaningful e.g. picnic lunch, party, presentation of a gift etc and share a design brief for the product they will make e.g. party box, disposable lunch box, chocolate box. Discuss with the children the use and purpose of their shell structure. Use questioning to develop design ideas: <i>What does the product need to do - protect, contain, present? Who is it aimed at? How will the intended user affect your design decisions?</i></p>		<p>Design brief</p>	<p>https://www.data.org.uk/shop-products/packaging-banish-broken-biscuits-box-them-brilliantly/ - this is a paid resource but could be useful for this lesson https://www.data.org.uk/shop-products/nets-for-packaging-helpsheet/</p>	

<p>Agree on design criteria that can be used to guide the development and evaluation of pupils' products e.g. <i>How will we know we have designed and made successful products?</i> - biscuits must not break, must be strong enough to carry sandwiches and fruit, must show nutritional information etc.</p> <p>Following discussion to develop ideas, pupils produce labelled drawings and prototypes to model and communicate their ideas. Pupils consider e.g. <i>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?</i></p> <p>Pupils complete a design proposal, detailing the tools, equipment and materials they will use and the order in which they will make the product through. This could be done through flow charts or storyboards or through writing a list of instructions.</p>		<p>https://www.data.org.uk/shop-products/dt-primary-38-pdf-copy/</p> <p>http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</p>
--	--	---

4: Making: Can I produce the container I have designed?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
<p>Children will have identified the structure they are going to make. They will have a clear understanding of the purpose of the product and of needs and wants of the intended user. Pupils will have developed design criteria to guide the development of their products.</p>	<p>Substantive knowledge: (<i>What students should know.</i>) That design proposals and criteria are used to guide the making process. The importance of evaluating ongoing work.</p> <p>Second order concepts: (<i>What students should understand</i>) Functionality Aesthetics Evaluate</p>	<p>Skills</p> <ul style="list-style-type: none"> • Use materials and components, building on those used in KS1. • Work safely, hygienically and accurately with a range of simple tools. • Measure, mark out, cut and shape materials and components with some accuracy • Assemble, join and combine materials and components with some accuracy 	<p>Can your children: Select and use a range of materials relevant to the product. Mark out the net for their 3D product. Use skills in scoring, marking out, cutting and joining to create 3D structures. Work with increasing accuracy. Evaluate evolving product and use problem</p>	<p>Horizontal: Maths- measure to the nearest c, half cm or mm; make 3D shapes from nets Computing - Graphics Spoken language - understand and use technical vocabulary Science - nutrition; properties and suitability of materials</p> <p>Vertical:</p>

		<ul style="list-style-type: none"> Use finishing techniques to strengthen and improve the appearance of their product with some accuracy. <p>Key Vocabulary/concepts: Shell structure, three-dimensional (3D) shape, net, material, stiffen, marking out, scoring, shaping, tabs, join, assemble, accuracy</p>	<p>solving skills when things go wrong.</p>	
Suggested activities:		Resources:	Useful links:	
<p>Remind pupils of the design brief and give them opportunity to revisit their design proposals and plans. Pupils recall the appropriate tools required and skills learned in previous lessons.</p> <p>Pupils collect the materials and tools required for their product. Encourage them to work with accuracy and to evaluate their developing products against the intended purpose and the needs and wants of the intended user e.g. <i>Is your product stiff/strong enough? Do your pieces fit perfectly together?</i></p> <p>Encourage children to problem solve when things go wrong e.g. <i>How could you improve that? How can you make sure your product doesn't have any gaps along the edges? Does it look fit for purpose?</i> Pupils could record changes made to overcome problems or any improvements made on their plans.</p>		<p>Paper, card, masking tape, PVA glue, scissors, acetate, rulers, pencils</p>	<p>https://www.data.org.uk/shop-products/packaging-banish-broken-biscuits-box-them-brilliantly/ - this is a paid resource but could be useful for this lesson</p> <p>https://www.data.org.uk/shop-products/nets-for-packaging-helpsheet/</p> <p>http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</p>	
5: Finishing: How will I make my product appealing?				
Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:

<p>Pupils will have experienced making products choosing from and using a range of materials, tools and techniques. They will have evaluated their evolving work , considering the purpose of the product and the needs and wants of the intended user, and will have use skills to overcome problems.</p>	<p>Substantive knowledge: (<i>What students should know.</i>) That products need to be finished to a high quality to make them appealing to the intended user. Know a range of techniques suitable for the product they are creating. The importance of evaluating evolving work. Second order concepts: (<i>What students should understand</i>) Finish Appeal</p>	<p>Skills</p> <ul style="list-style-type: none"> • Use finishing techniques to strengthen and improve the appearance of their product with some accuracy. <p>Key Vocabulary/concepts: Finish/finishing, appearance, appealing, font, lettering, text, graphics</p>	<p>Can your children: Apply a range of finishing techniques suitable for the product they are making? Evaluate their developing products and use problem solving skills when things go wrong?</p>	<p>Horizontal: Art and design - use a range of skills to finish product. Computing - graphics Vertical:</p>
<p>Suggested activities:</p>		<p>Resources:</p>	<p>Useful links:</p>	
<p>Refer to design brief and proposals. Pupils use finishing techniques to complete their products, referring to the design brief and their design proposals. Pupils continue to evaluate their work e.g. Which finishing technique are you using? Why are you choosing this technique? How does your chosen finish meet the needs of the intended user?</p>		<p>Finishing resources, e.g. pens, pencils, paint, computing software, collage materials</p>	<p>https://www.data.org.uk/shop-products/packaging-banish-broken-biscuits-box-them-brilliantly/ - this is a paid resource but could be useful for this lesson https://www.data.org.uk/shop-products/nets-for-packaging-helpsheet/ http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</p>	
<p>6: Evaluating: Next time I will...?</p>				
<p>Links to previous learning</p>	<p>Knowledge and second order concepts</p>	<p>Skills, Concepts and Vocabulary:</p>	<p>Assessment criteria:</p>	<p>Curricular links:</p>

<p>Children will have generated and developed ideas for their product. They will have explored different shell structures and designed a product with an intended purpose for an intended user. They will have chosen techniques to make and finish their product. They will have evaluated their evolving work and overcome problems using problem solving skills.</p>	<p>Substantive knowledge: (What students should know.) That evaluations identify the strengths and areas for development in a product. That products change and evolve through evaluations.</p> <p>Second order concepts: (What students should understand) Evaluate Develop</p>	<p>Skills</p> <ul style="list-style-type: none"> • Begin to use their design criteria as they design and make • Begin to use their design criteria to evaluate their product identifying both strengths and areas for development • Consider how their product can be improved. <p>Key vocabulary/concepts: Evaluate, design criteria, design brief, innovative, user, purpose, function, product, ideas, appeal, finish, improve</p>	<p>Use their design criteria to evaluate their product by judging the extent to which it suits the purpose and meets the needs of the intended user. Identify both the strengths of the product and the areas for development?</p>	<p>Horizontal: Spoken language - ask relevant questions to extend knowledge and understanding. Respond to questions giving clear explanations.</p> <p>Vertical:</p>
<p>Suggested activities:</p>		<p>Resources:</p>	<p>Useful links:</p>	
<p>Pupils evaluate their final products against the design criteria. They consider the extent to which the product meets the needs of the intended user and suits the intended purpose. Where possible allow feedback from the intended user. <i>Does the product suit the purpose? Does it suit the intended user? Does the mechanism work smoothly? Is it the right kind of movement? How well has the product been finished? Are the materials suitable for the product? How could the product be made more appealing?</i> Pupils complete an evaluation for their own product.</p>		<p>Evaluation sheets</p>	<p>http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</p>	