

Lyppard Grange DT Knowledge organiser

Year 3

Structures- shell structures (including computer aided design)

Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose) – (to be completed by year group)

Examples of possible design and make tasks- gift boxes/ containers, packaging, party boxes, recyclable lunchboxes.



Key Knowledge

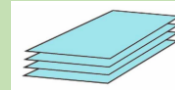
- To know how to construct strong, stiff shell structures
- Develop and use knowledge of nets of cubes, cuboids and other 3D structures (where appropriate)
- Know how to use and manipulate materials to create a structure

Skills

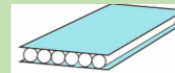
- Use research to inform the design criteria for structures suitable to the context of the era
- To investigate the construction of existing structures
- Develop ideas using annotated sketches and prototypes
- Use computer aided design to create nets for their products
- Investigate ways of stiffening and strengthening structures e.g. corrugating, ribbing, folding, laminating
- Use tools to measure, mark out, cut, score, shape and assemble nets made out of card
- Evaluate their products against the design criteria and purpose

Vocabulary

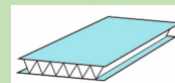
Shell structure, three-dimensional, net, cube, cuboid, prism, vertex, edge, face, length, width, marking out, scoring, tabs, joining, assemble, stiff, strong, corrugating, laminating.



Laminating- glue together several layers of card



Ribbing- glue layers of straws between two layers of card



Corrugating- zig zag a piece of paper or card and glue between 2 layers of card

- 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 'free' 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...?

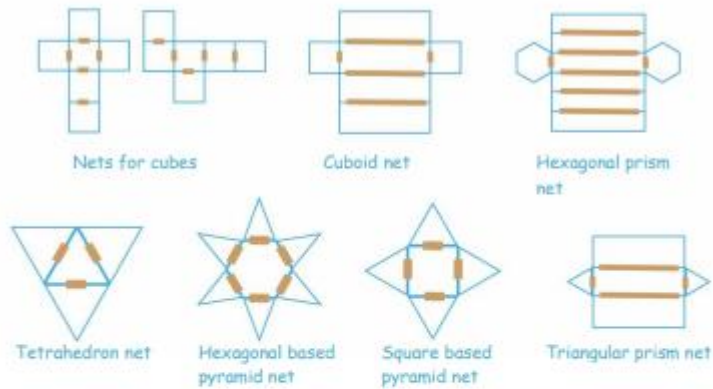
Focused Tasks (FTs)

- 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.

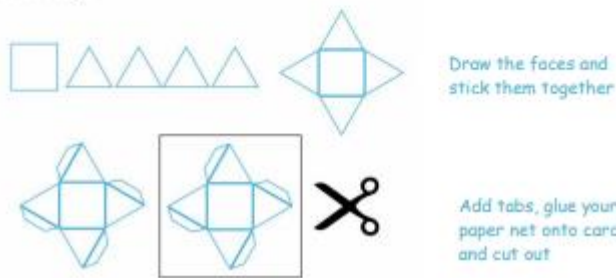
Design, Make and Evaluate Assignment (DMEA)

- Develop a design brief with the children within a context which is authentic and meaningful.
- Discuss with the children the uses and purposes of their 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?
- 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.

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:



Top Tips-

- Make a collection of boxes of various shapes and flatten them for storage.
- Discuss environmental issues relating to the wastage of materials when packaging items including the three R's - reducing, recycling and reusing.
- The use of an empty ball point pen together with a safety rule is ideal for scoring.
- The use of standard shapes as templates will help children design their own nets.
- Ensure that the children have sufficient tabs for assembling their nets.
- Display technical vocabulary to encourage the children to use it when discussing, designing and making their product.
- The use of computer-aided design to draw nets and graphics for the children's products could be practised in computing lessons.
- Ensure that the children have a good understanding of 2-D and 3-D shapes in maths before carrying out this project.

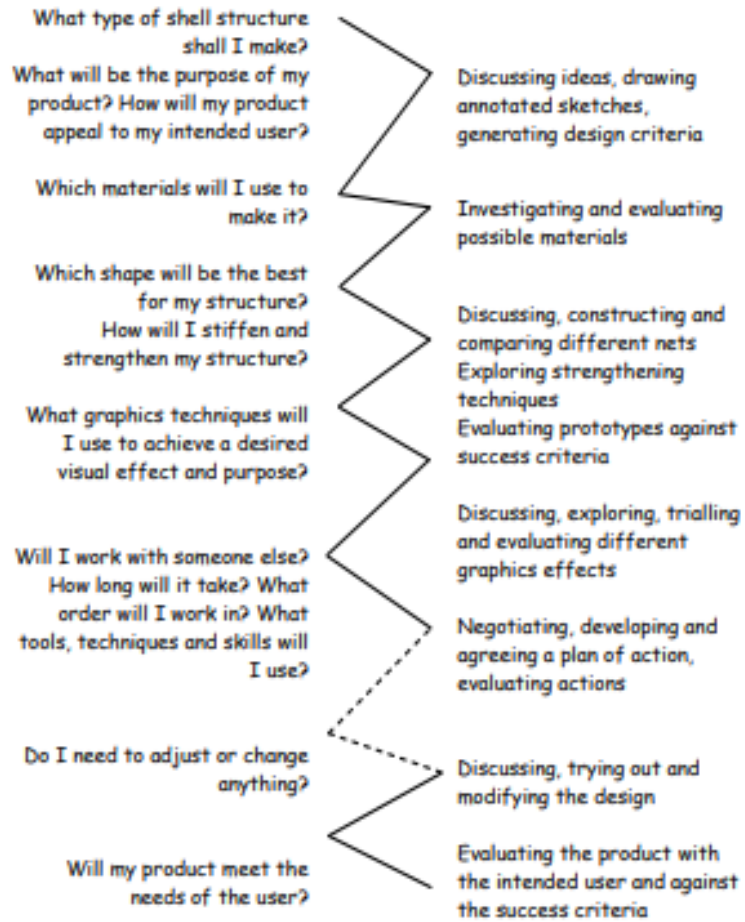
Health and safety-

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.

Risk assessments saved in staff shared.

THOUGHT

ACTION



This leads on from-

Year 2- structures- freestanding structures

Key knowledge

- To know how to join materials together effectively
- To know that a range of tools can be used for different purposes e.g. cutting, sticking, bending, joining
- To understand how structures can be made stiffer, stronger and more stable

Key skills-

- Explore initial ideas using drawings and mock-ups
- To measure and mark out materials using safe ways of cutting
- To investigate ways to strengthen materials by folding, joining or rolling
- Evaluate their ideas and review their product against design criteria

This leads onto-

Year 5- structures- frame structures

Key knowledge-

- To know how to strengthen, stiffen and reinforce 3D frameworks

Key skills-

- Carry out research into users' needs and existing products (surveys, interviews, questionnaires, web-based resources)
- Develop a design specification taking account of time constraints, resources and cost
- Generate ideas through discussion, prototypes and annotated sketches
- Create a step-by-step plan including list of resources
- Select and use tools competently to measure, mark out, cut, shape and join materials to make frameworks.
- Use finishing/ decorative techniques suitable for the product
- Investigate frame structures
- Evaluate products against design criteria/ user and purpose and carrying out appropriate tests.

