Year Groups
Years 3

Aspect of D&T
Structures

Focus
Shell structures using computer-aided design (CAD)

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

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

Project title
Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose).

Purpose of products
packaging storage protection
marketing presentation display
celebration postage 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.

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, 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

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.

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 '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…?*

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.

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.

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.

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.

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.

Cultural Capital

Visits and visitors Packaging designer	Experiences and events. Class trip linked to project
Key Texts	Links https://www.data.org.uk/resource-shop/primary/7-to-9-years/nets-for-packaging-helpsheet/ https://www.data.org.uk/resource-shop/primary/7-to-9-years/packaging-banish-broken-biscuits-box-them-brilliantly/ https://www.data.org.uk/resource-shop/primary/7-to-9-years/packaging-with-links-to-maths/
Community events and links Easter Event	Global issues Recycling – reusable materials.
Famous People Packaging designer companies – Bloom, Elmwood, Bulletproof.	Life Skills Problem solving Making links Strategic awareness.