DT - Sequencing Document

DT National Curriculum Aims	
The national curriculum for design and technology aims to ensure that all pupils: • develop the creative, technical and practical expertise needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world • build and apply a repertoire of knowledge, understanding and skills in order to design and make high-quality prototypes and products for a wide range of users • critique, evaluate and test their ideas and products and the work of others • understand and apply the principles of nutrition and learn how to cook.	
Intent	**To inspire children to think creatively, design and make products that solve real and relevant problems.** Design and technology is sequenced and linked across the school with a focus on designing, making and evaluating. From nursery to year six, through innovative design, children will create products that have a positive impact on the school, the community and the wider world.

Characteristics of Designers
• Take creative risks to produce innovative, original ideas and prototypes that they evaluate throughout the whole process of designing and making. • The ability to work collaboratively with others. • The ability to carry out thorough research, show initiative and ask questions to develop detailed knowledge of users' needs. • A thorough knowledge of which tools, equipment and materials to use to make their products. • The ability to manage risks exceptionally well to make products safely and hygienically. • A passion for the subject and knowledge of, up-to-date technological innovations in materials, products and systems.

Kingfisher Hall ACADEMY

	DT Knowledge Progression					
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year A EYFS		Winter		People who help us		Under the Sea
		Mechanisms – Christmas cards		Structures – designing a vehicle		Textiles – flags and kites
Year B EYFS		Traditional Tales		Here we go!		My world
		Food – porridge and pancakes		Structures – houses and animal environments		Textiles – T-Shirts
Y1		Blast From the Past			The Secret Garden	Animal Kingdom
		Mechanisms (Sliders and Leavers)			Structures (Freestanding structures)	Textiles (Templates and joining Techniques)
Y2			Fire! Fire!	Spring has Sprung	Coming to England	
			Food (Food hygiene/ bread)	Mechanisms (Wheels and Axles)	Food (Preparing fruit and Vegetables)	
Y3				Animal Magic!	Let it grow	May the force be with you
				Mechanical Systems (Leavers and Linkages)	Food (Healthy and varied Diet)	Mechanisms (Pneumatics)
Y4		Our Changing World	Brilliant Bodies		Buzzers, Bulbs and Batteries	
		Textiles (2D shapes to 3D shapes)	Structures (Shell Structures)		Electrical Systems (Simple circuits and switches)	
Y5		Vicious Vikings?	Force of Nature		Reach for the Stars	
		Food (Celebrating Cultures and Seasonality)	Mechanical Systems (Pulleys or Gears)		Electrical Systems (Monitoring and control)	
Y6	All Creatures Great and Small	Wars Through Time		Healthy Me		
	Structures (Fame Structures)	Textiles (using CAD)		Food (Designing a healthy snack)		

EYFS

Structures
Freestanding structures

Instant CPD

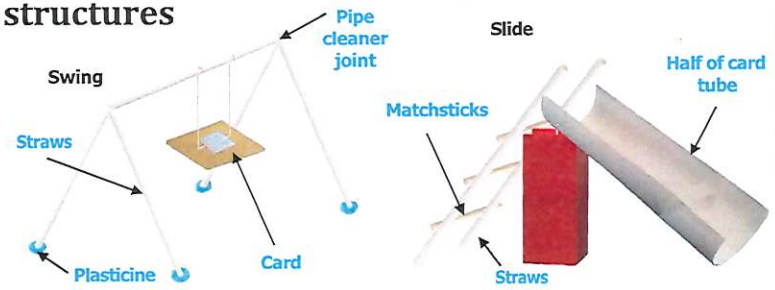
Tips for teachers

- ✓ Nursery: Will design a vehicle for someone who helps us with adaptations e.g. a police car, an ambulance
- ✓ Reception: Will create a new vehicle inspired by a character e.g. the witch from Room on the broom.
- ✓ Create a PowerPoint or range of pictures showing a variety of vehicles and structures relevant to the product the children are designing and making.
- ✓ Exploring vehicles in the local area provides a good opportunity to develop children's observational drawing.
- ✓ Create and display a word bank of relevant technical vocabulary in the classroom.
- ✓ Ensure that work with construction kits and materials builds on children's prior experience in the Early Years Foundation Stage (EYFS).
- ✓ Ensure that different types of construction kits are available for children to explore through focused tasks.
- ✓ Demonstrate measuring, marking out, cutting, joining and strengthening techniques and provide help sheets showing instructions for the children to practise independently.
- ✓ Prior to producing their designs, have a range of materials available for children to access and create models.

Useful resources at www.data.org.uk

- 021_nw_allabout_junkmodeling.pdf (nurseryworld.co.uk)
- Development Matters - Non-statutory curriculum guidance for the early years foundation stage (publishing.service.gov.uk)
- Early years foundation stage (EYFS) statutory framework - GOV.UK (www.gov.uk)
- Primary Charts_Layout 1 (designtechnology.org.uk)

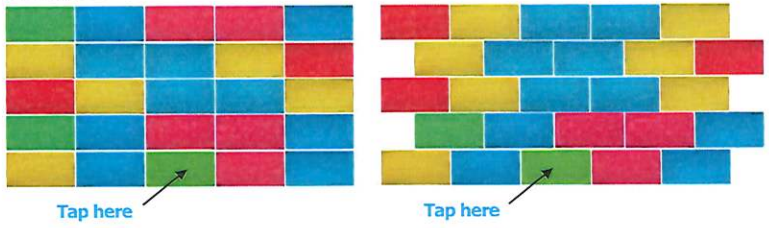
Techniques for assembling freestanding structures

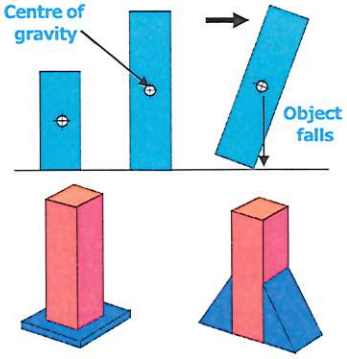


Show children how to join sheet materials and reclaimed boxes together using different tapes and glues.

Technical knowledge and understanding

Build walls with these different patterns. Tap away the centre brick in the bottom row of each wall in turn. What happens? Which wall is the strongest?





As a freestanding structure becomes taller its centre of gravity rises. Stability in a structure can generally be increased by making the base wider, making the base heavier or adding buttresses.

Ask the children to build and explore a variety of freestanding structures through focused tasks. Use a range of construction kits.

Designing, making and evaluating a vehicle with adaptations

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:

THOUGHT	ACTION
What sort of vehicle shall I make? Who is it for and what is it for?	Choose an appropriate soft toy Generating ideas through talking and drawing based on own experiences.
How can I make sure it is strong, stiff and stable?	Developing ideas using construction kits to create mock-ups.
Which joining techniques will work best for the vehicle?	
What media, materials and kits will I use?	Exploring and evaluating joining techniques.
What shall I do first? What tools and techniques will I use? What materials shall I use?	Exploring and evaluating construction kits, new and reclaimed materials.
More thoughts... judging, planning, generating new ideas.	Selecting from a range of tools, techniques and materials Explaining choices.
	More actions... making, testing, modifying.
Will the vehicle meet the needs of the user and achieve its purpose?	Evaluating the chair with a soft toy and against design criteria.

Glossary

- **Freestanding structure** – a structure that stands on its own foundation or base without attachment to anything else.
- **Frame structure** – a structure made from thin components e.g. tent frame.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Stability** – in relation to a freestanding structure, the extent to which it is likely to fall over if a force is applied.
- **Buttress** – a structure added to a wall, tower or framework to make it more stable and/or reinforce it.
- **Brick bonding** – arranging bricks in a wall to improve the performance of the structure or improve its appearance.
- **Mock-up** – 3-D representation of a product.

Adapted from the Design and Technology Association

1. Year Groups

EYFS

Kingfisher Hall Primary Academy

2. Aspect of D&T

Textiles

Focus

Nursery – Creating a flag

Reception – Creating a kite

4. What could children design, make and evaluate?

Country flags an array of kites

sports flags

fabric placemat other – specify

5. Intended users

themselves friends younger children

parents grandparents toys story character

class doll soft toy other – specify

6. Purpose of products

playing with kites flags for a sandcastle

flags for an event of occasion other – specify

7. Links to topics and themes

Toys Festivals Stories Nursery

RhymesCelebrations Homes

other – specify

8. Possible contexts

entertainment leisure home school

recycling/reusing 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.

16. Possible resources

existing products linked to chosen project

variety of textiles e.g. dipryl, felt, reclaimed fabric

thread, pins, needles, magnet, staplers, staples, fabric glue

left/right handed scissors

items for finishing e.g. buttons, wool, fabric paints, sequins

drawing and colouring media

17. Key vocabulary

names of existing products, joining and finishing techniques, tools, fabrics and components

template, pattern pieces, mark out, join, decorate, finish

features, suitable, quality mock-up, design brief, design criteria, make, evaluate, user, purpose, function

3. Key learning in design and technology

Prior learning

- Explored and used different fabrics.
- Cut and joined fabrics with simple techniques.
- Thought about the user and purpose of products.

Designing

- Design a functional and appealing product for a chosen user and purpose based on simple design criteria.
- Generate, develop, model and communicate their ideas as appropriate through talking, drawing, templates, mock-ups and information and communication technology.

Making

- Select from and use a range of tools and equipment to perform practical tasks such as marking out, cutting, joining and finishing.
- Select from and use textiles according to their characteristics.

Evaluating

- Explore and evaluate a range of existing textile products relevant to the project being undertaken.
- Evaluate their ideas throughout and their final products against original design criteria.

Technical knowledge and understanding

- Understand how simple 3-D textile products are made, using a template to create two identical shapes.
- Explore different finishing techniques e.g. using painting, fabric crayons, stitching, sequins, buttons and ribbons.
- Know and use technical vocabulary relevant to the project.

10. Investigative and Evaluative Activities (IEAs)

- Children investigate and evaluate existing products linked to the chosen project. Explore and compare e.g. fabrics, joining techniques, finishing techniques and fastenings used.
- Use questions to develop children's understanding e.g. *How many parts is it made from? What is it joined with? How is it finished? Why do you think these joining techniques have been chosen? How is it fastened? Who might use it and why?*
- Make drawings of existing products, stating the user and purpose. Identify and label, if appropriate, the fabrics, fastenings and techniques used.

11. Related learning in other subjects

- **Spoken language** – ask relevant questions to build understanding and their vocabulary.
- **Art and design** – quick drawings or detailed observational drawings of one product to develop and share ideas.

12. Focused Tasks (FTs)

- Investigate fabrics to determine which is best for the purpose of the product they are creating.
- Using prepared teaching aids, demonstrate the use of a template or simple paper pattern. Children could make their own templates or paper patterns. If necessary, they can use ones provided by the teacher.
- Using prepared teaching aids, demonstrate the correct use of appropriate tools to mark out, tape or pin the fabric to the templates or paper patterns and cut out the relevant fabric pieces for the product.
- Using prepared teaching aids, demonstrate appropriate examples of joining techniques for children to practise in guided groups
- Using prepared teaching aids, demonstrate examples of finishing techniques for children to practise in guided groups e.g. sewing buttons, 3-D fabric paint, gluing sequins, printing.

13. Related learning in other subjects

- **Science** – everyday materials. Investigate physical properties of fabric types against suitability for the product to be made.
- **Spoken language** – ask questions throughout the process to check understanding, develop vocabulary and build knowledge. Listen and respond to adults.
- **Art and design** – use colour, pattern, texture, and shape as appropriate.

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.

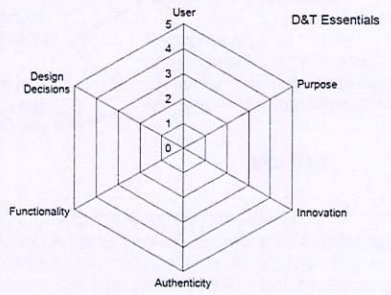
14. Design, Make and Evaluate Assignment (DMEA)

- Provide the children with a context that is authentic. Discuss with children the purpose and user of the products they will be designing, making and evaluating. Design criteria developed with the teacher should be used to guide the development and evaluation of the children's products.
- Ask the children to generate a range of ideas e.g. *What parts will the product need to have and what will it be made from? What size will it be? How will it be joined and finished?*
- Through talk, drawings and mock-ups, ask the children to develop and communicate their ideas. Information and communication technology could be used for symmetry and pattern ideas. Choose one idea to follow through.
- Talk with the children about the stages in making before assembling quality products, applying the knowledge, understanding and skills learnt through the IEAs and FTs.
- Evaluate ongoing work and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

15. Related learning in other subjects

- **Science** – use knowledge of properties of everyday materials to select appropriate ones for their products.
- **Spoken language** – ask questions throughout the process to check understanding, develop vocabulary and build knowledge. Explain and articulate their ideas orally.
- **Art and design** – use and develop drawing skills.
- **Mathematics** – measurement using non-standard and standard units.
- **Computing** – use technology purposefully to create and manipulate digital content.

20. Overall potential of project



1. Year Groups

Year 2

Kingfisher Hall Primary Academy

2. Aspect of D&T

Food

Focus

Preparing food – To design, make and bake a bread roll

3. Key learning in design and technology

Prior learning

- Experience of common breads, undertaking sensory activities i.e. appearance taste and smell.
- Experience of mixing, kneading and forming dough using appropriate utensils
- EYFS – making pancakes and porridge

Designing

- Design appealing products for a particular user based on simple design criteria.
- Generate initial ideas and design criteria through investigating a variety of breads.
- Communicate these ideas through talk and drawings.

Making

- Use simple utensils and equipment to e.g. weigh, measure, mix, form, bake and rest safely.
- Select from a range of breads according to their characteristics e.g. colour, texture and taste to create a chosen product.

Evaluating

- Taste and evaluate a range of breads to determine the intended user's preferences.
- Evaluate ideas and finished products against design criteria, including intended user and purpose.

Technical knowledge and understanding

- Understand where a range of breads come from e.g. shops or made at home.
- Understand and use basic principles of a healthy and varied diet to prepare dishes, including how breads and grains are part of *The eatwell plate.*
- Know and use technical and sensory vocabulary relevant to the project.

4. What could children design, make and evaluate?

breads pastries rolls loaves
butter cheese fruits vegetables
other -specify

5. Intended users

themselves parents siblings
grandparents friends peers at school
younger/older children visitors
other – specify

6. Purpose of products

picnic celebration party school event
sports day pleasure café corner
other – specify

7. Links to topics and themes

Healthy Eating Festivals and Celebrations
Teddy Bear Picnic Food and Farming
Ourselves Senses Growing
other – specify

8. Possible contexts

home school gardens playgrounds
local community culture industry
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 examine a range of bread. Use questions to develop children's understanding e.g. *What is this called? Who has eaten this bread before? Where is it made? When can it be eaten? What are its taste, smell, texture and appearance? What will it look like if cut itin half? What are the different parts called?*
- Provide opportunities for children to handle, smell and taste breads in order to describethem through talking and drawing. e.g. *What words can we use to describe the shape, colour, feel, taste?*
- Evaluate existing products to determine what the children like best; provide opportunities for the children to investigate preferences of their intended users/suitability for intended purposes e.g. *What do you prefer and why? What might we want to include in our product to meet our user's preferences? Which types of bread might be the best for our product to match the occasion/purpose?*

11. Related learning in other subjects

- **Science** – understand the importance of growing plants and how seasons affect growth. (ie wheat, harvest)
- **Spoken language** – children develop and use a sensory vocabulary.
- **Writing** – develop descriptive writing based on first-hand experience of tasting different types of bread products.
- **Mathematics** – carry out a simple survey to find out which are the favourite breads / bread products; construct and interpret the information in e.g. pictograms and bar graphs.

12. Focused Tasks (FTs)

- Discuss basic food hygiene practices when handling food including the importance of following instructions to control risk e.g. *What should we do before we work with food? Why is following instructions important?*
- Demonstrate how to use simple utensils and provide opportunities for the children to practise food-processing skills such as measuring, mixing, kneading, baking e.g. *Do you eat the whole loaf of bread? Why or why not? Which parts do we eat? What might we have to do before eating this? Why do we measure, mix, knead and bake in this way?* Discuss different effects achieved by different processes.
- Discuss healthy eating advice, including eating bread as part of a balanced diet; using *The eatwell plate* model talk about the importance of bread and grains in our balanced diet e.g. *Why is it good to eat bread and grains? How many pieces of bread do you eat per day?*

13. Related learning in other subjects

- **Spoken language** – ask questions to check understanding; use the correct terminology for equipment and food processes.
- **Writing** – instructions on how to use one of the utensils; how to prepare e.g. bread products for eating
- **Science** – talk about a balanced diet, different types of food and hygiene.

14. Design, Make and Evaluate Assignment (DMEA)

- Set a context for designing and making which is authentic and meaningful.
- Discuss with the children the possible products that they might want to design, make and evaluate and who the products will be for. Agree on design criteria that can be used to guide the development and evaluation of children's products e.g. *Who/what is the product for? What will make our product unique/different? How will we know that we designed and made a successful product?*
- Use talk and drawings when planning for a product; ask the children to develop, model and communicate their ideas e.g. *What will you need? What ingredients will you need? How much will you need? How will you present the product?*
- Talk to the children about the main stages in making, considering appropriate utensils and food processes they learnt about through IEAs and FTs.
- Evaluate as the children work through the project and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

15. Related learning in other subjects

- **Spoken language** – ask questions to develop and check understanding, develop technical and sensory vocabulary and build knowledge.
- **Art and design** – use and develop drawing skills.
- **Writing** – children write a simple account about how they made their food product.
- **Computing** – use digital photographs to help order the main stages of making and support children's writing.

16. Possible resources

range of different types of bread

chopping boards, knives, mixing bowls, trays, oven, spoons, jugs, plates, measuring scales, bowls, aprons, plastic table covers, hand washing and washing-up facilities

17. Key vocabulary

Names of different bread types, names of equipment and utensils

sensory vocabulary e.g. soft, hard, smooth, rough, crusty, warm, tasty, seeded, plain, flour, white, whole meal

measuring, mixing, kneading, forming, rolling, baking, resting, healthy diet, choosing, ingredients, planning, investigating tasting, arranging, popular, design, evaluate, criteria

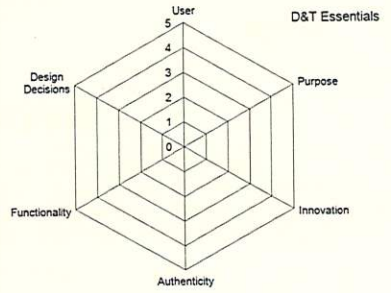
18. Key competencies

problem-solving teamwork negotiation
consumer awareness organisation motivation
persuasion leadership perseverance
other – specify

19. Health and safety

Pupils should be taught to work safely and hygienically, using tools, equipment, techniques and ingredients appropriate to the task. Prior to undertaking this project risk assessments should be carried out, including identifying whether there are children who are not permitted to taste or handle any food ingredients or products.

20. Overall potential of project



Adapted from the Design and Technology Association

Year 2

Food

Preparing and baking bread

Instant CPD

- ✓ Display bread, including photographs and associated technical vocabulary, to encourage the children to use it when discussing, designing and making a food product.
- ✓ Ask the children to sort a selection of bread products – which is which? Photo cards could be used for this.
- ✓ Include bread that is less likely to be known to the children.
- ✓ Stories and poems about food could be used for inspiration and as an introduction to the project.
- ✓ Visit a local shop or food market to give your project a real-life context.
- ✓ Serrated knives with rounded ends are the best.
- ✓ Foods for chopping/slicing could be cut in half lengthways to provide a flat base and held still with, for example, a fork so that children cut safely.
- ✓ Before you organise any food tasting in your class, you need to check your school and local authority health and safety policy. Seek parental consent.

Useful resources:

- Step-by-step simple guide on how to make bread - BBC Bitesize
- Farm to plate - BBC Bitesize
- Free education resources for teaching young people aged 3-16 years about where food comes from, cooking and healthy eating, and teacher training. - Food A Fact Of Life
- The Eatwell Guide - NHS (www.nhs.uk)
- The Eatwell Guide - GOV.UK (www.gov.uk)
- Baking with children recipes - BBC Food

Teaching aids to demonstrate food processing skills

Kneading

Mixing

Measuring

Baking

Food processing equipment

Utensil	Food	Effect	Texture
Scales	Flour	Measure	Soft
Tray	Bread	Holds bread place	Warm / crusty
Mixing bowl and spoon	Flour and water	Mixes bread	Sticky

Hygiene – some key pointers

- Jewellery is removed
- Hair is tied back
- Sleeves are rolled up
- Aprons are on
- Hands are washed
- Cuts are covered with blue waterproof dressing

Designing, making and evaluating a bread roll to sell to families

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:

Tips for teachers

THOUGHT	ACTION
What sort of bread product shall I make? Who will it be for? Which ingredients will I put into roll? Will my product appeal to my intended user?	Talking, drawing, writing lists, generating design criteria.
How will I process my ingredients?	Using different tools and practicing using different food-processing skills, e.g. mixing, kneading.
How will different food processes create different effects?	Discussing and comparing different effects. Trying them out and evaluating.
What tools and food processing skills will I use? What order will I work in? How will I present my bread roll?	Negotiating, developing and agreeing a plan of action, evaluating actions.
Do I need to adjust or change anything? Refining and reflecting.	Discussing, trying out and modifying the design.
Will my bread roll meet the needs of the user and achieve its purpose?	Evaluating the product with the intended user and against the design criteria.

Glossary

- **Bread** – baked product that is made from flour and water
- **Dough** – the wet, sticky product that is made before baking
- **Nutrients** – all the things in food that the body needs toremain healthy.
- **Crust** – the outside of the bread, usually crusty in texture
- **Mixture** – mixture of the ingredients before the dough is formed

Adapted from the Design and Technology Association

1. Year Groups

Year 4

Kingfisher Hall PRIMARY ACADEMY

2. Aspect of D&T

Structures

Focus

Shell structures – To make a keepsake tooth box

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.
- Year 1 – make a structure that supports a plant

Designing

- Generate realistic ideas and design criteria collaboratively through discussion, focusing on the needs of the user and purpose of the product.
- Develop ideas through the analysis of existing products and use annotated sketches and prototypes to model and communicate ideas.

Making

- Order the main stages of making.
- Select and use appropriate tools 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 finishing techniques suitable for the product they are creating.

Evaluating

- Investigate and evaluate a range of existing 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 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.

4. What could children design, make and evaluate?

gift boxes/containers desk tidy
disposable/recyclable lunchboxes packaging
cool boxes party boxes keep safe boxes
mystery boxes other – specify

5. Intended users

themselves siblings parents
relatives friends younger/older children
party guests neighbours other – specify

6. Purpose of products

celebration storage packaging
protection marketing presentation display
postage other – specify

7. Links to topics and themes

Shape and Space Going Green
Festivals Celebrations Healthy Eating
Our School Toys and Games
other – specify

8. Possible contexts

home school culture enterprise
local community wider environment
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 '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)

- 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.
- 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.

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 shapes 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 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?*
- 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.

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, 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

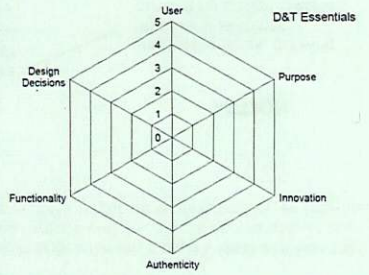
18. Key competencies

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.

20. Overall potential of project

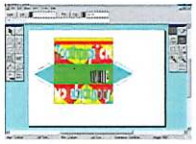


Adapted from the Design and Technology Association

Year 4

Structures
Shell structures

Instant CPD



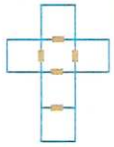
Tips for teachers

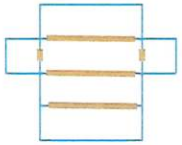
- ✓ Make a collection of boxes of various shapes and flatten them for storage.
- ✓ Discuss environmental issues relating to the wastage of materials when packaging items including the three R's – reducing, recycling and reusing.
- ✓ Visit a local shop or supermarket to investigate different types of card packaging.
- ✓ 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.
- ✓ Consider the use of enlarge and reduce facilities on the photocopier when copying 2-D nets for the children as examples.
- ✓ Display technical vocabulary to encourage the children to use it when discussing, designing and making their product.
- ✓ Divide your class into teams and assign children to specific jobs within their teams e.g. Resources Manager, Sustainability Officer, Design Director, Tools Manager, Process Controller, Graphics Director.
- ✓ 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.

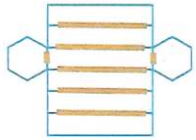
Useful resources at www.data.org.uk

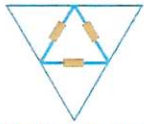
- Primary Subject Leaders' File Section 5.9
- Banish broken biscuits! Box them brilliantly
- Desk Tidy
- Working with Materials
- Packaging – with links to Maths
- Nets for packaging helpsheet
- Door hinges helpsheet

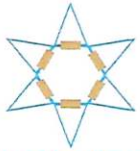
Assemble and evaluate 3-D shapes using standard sized card squares, rectangles, equilateral triangles, isosceles triangles and hexagons, joined with masking tape.

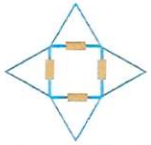

Nets for cubes

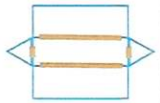

Cuboid net


Hexagonal prism net

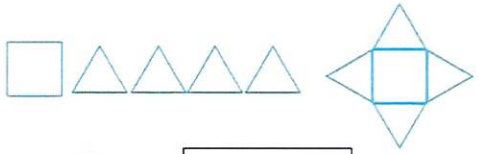

Tetrahedron net

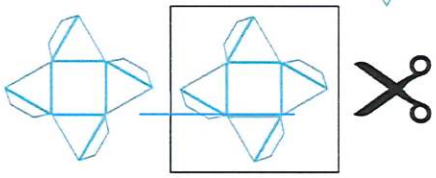

Hexagonal based pyramid net


Square based pyramid net

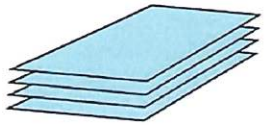

Triangular prism net

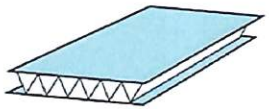
Creating the net for the product you are designing and making without using computer aided design:

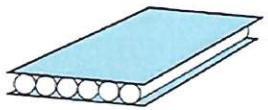

Draw the faces and stick them together

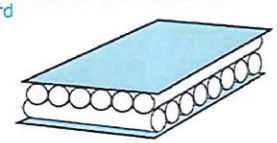

Add tabs, glue your paper net onto card and cut out

Stiffening and strengthening sheet materials:


Laminating – glue together several layers of card


Corrugating – zig-zag a piece of paper or card and glue in between two layers of card


Ribbing – glue layers of straws between layers of card



Designing, making and evaluating packaging for a gift for a family member

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:

THOUGHT	ACTION
What type of shell structure shall I make? What will be the purpose of my product? How will my product appeal to my intended user?	Discussing ideas, drawing annotated sketches, generating design criteria.
Which materials will I use to make it?	Investigating and evaluating possible materials.
Which shape will be the best for my structure? How will I stiffen and strengthen my structure? What graphics techniques will I use to achieve a desired visual effect and purpose?	Discussing, constructing and comparing different nets. Exploring strengthening techniques. Evaluating prototypes against success criteria.
	Discussing, exploring, trialling and evaluating different graphics effects.
Will I work with someone else? How long will it take? What order will I work in? What tools, techniques and skills will I use?	Negotiating, developing and agreeing a plan of action, evaluating actions.
Do I need to adjust or change anything?	Discussing, trying out and modifying the design.
Will my product meet the needs of the user?	Evaluating the product with the intended user and against the success criteria.

Glossary

- **Cuboid** – a solid body with rectangular sides.
- **Edge** – where two surfaces meet at an angle.
- **Face** – a surface of a geometric shape.
- **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.
- **Prism** – a solid geometric shape with ends that are similar, equal and parallel.
- **Scoring** – cutting a line or mark into sheet material to make it easier to fold.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Vertex** – used to refer to the corners of a solid geometric shape, where edges meet.

Adapted from the Design and Technology Association