

Design and Technology (Structures and Mechanisms)

National Curriculum expectations (KS1):

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home and school, gardens and playgrounds, the local community, industry and the wider environment]. When designing and making, pupils should be taught to:

Design

- design purposeful, functional, appealing products for themselves and other users based on design criteria
- generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology

Make

- select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing]
- select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics

Evaluate

- explore and evaluate a range of existing products
- evaluate their ideas and products against design criteria

Technical knowledge

- build structures, exploring how they can be made stronger, stiffer and more stable
- explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products.

	Year 1 Term 1 and 2 Structures	Year 1 Term 3 and 4 Mechanisms
Unit Summary	Forest School Theme: Keeping Warm and Cooking As part of their Forest School skill development, children will design, make and evaluate a range of structures and shelters, including mini dens for small animals and full scale shelters	Forest School Theme: Tools and Woodland Management As part of their Forest School skill development, children will design, make and evaluate their own interactive picture using levers. Through this they will explore a range of simple tools, choosing the appropriate one for each task.
Design, make evaluate	Children will have the opportunities to explore a range of structures and shelters, design their own, thinking about how to make it strong, stiff and stable. They will make their designs, choosing from appropriate tools and materials and have the opportunity to evaluate their own and each other's.	Children will have the opportunities to explore a range of simple tools and mechanisms, including levers, sliders, wheels and axles.
Substantive knowledge	Understand that structures need to be self-supporting. Know that the materials used to build a structure need to be strong and stiff enough to hold its own weight.	Understand that each tool has a different job, choosing the right tool makes the job easier. Match tools to jobs.

	Know that to make structures stable they need a steady base, which is either anchored, heavy or wide	Identify and name trowel, fork, spade, rake, wheelbarrow, scissors, glue, pins Identify and name sliders, levers, wheels and axles. Know that levers make lifting easier. Know that wheels and axles make moving heavy loads easier.
Disciplinary knowledge	Join materials together effectively to make them stiffer by overlapping materials at joins Reinforce materials to make them stronger (e.g. wrapping, rolling, covering flimsy materials) Make a structure that stands by itself	Use a trowel and hand fork appropriately. Use scissors with increasing accuracy. Use a range of techniques to stick and join materials
Vocabulary	Structure, strong, stiff, stable, weak, flimsy, unstable, wobbly, join, overlap, reinforce, den, shelter,	Trowel, spade, fork, rake, gloves, wheelbarrow, plant, soil, dig, break up, slider, slide, lever, wheel, axel, heavy, effort
Texts These may be used across the curriculum not only in DT but support DT curriculum	A Year at a Construction Site by Nicholas Harris Amazing Buildings by Kate Hayden Aphabet Under Construction by Denise Fleming Building a House by Bryon Barton	What Do You Do With an Idea? By Kobi Yamanda Imaginative Invetions by Charise Mericle Harper Mr Ferris and His Wheel by Kathryn Gibbs Davis
Enhancements Exceeding the National Curriculum	Forest School sessions to provide real life opportunities for problem solving – creating bug hotels, bird houses, dens for small mammals.	Forest School sessions to provide real life opportunities for using tools and to inspire ideas for interactive pictures.

Long Term Subject Overview

Design and Technology (Structures and Mechanisms)

National Curriculum expectations (KS2):

Key stage 2

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment].

When designing and making, pupils should be taught to:

Design

- use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups
- generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

Make

- select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately
- select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

Evaluate

- investigate and analyse a range of existing products
- evaluate their ideas and products against their own design criteria and consider the views of others to improve their work
- understand how key events and individuals in design and technology have helped shape the world

Technical knowledge

- apply their understanding of how to strengthen, stiffen and reinforce more complex structures
- understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]
- understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors]
- apply their understanding of computing to program, monitor and control their products

	Year 5 Term 1 and 2 Structures	Year 5 Term 3 and 4 Mechanisms
Unit Summary	Forest School Theme: Keeping Warm and Cooking As part of their Forest School skill development, children will design, make and evaluate a range of structures and shelters, including dens and shelters	Forest School Theme: Tools and Woodland Management As part of their Forest School skill development, children will design, make and evaluate their own gardening tool with a range of mechanisms.
Design, make evaluate	Children will have the opportunities to explore a range of structures and shelters, design their own, thinking about how to make it strong, stiff and stable. They will make their designs, choosing from appropriate tools and materials and have the opportunity to evaluate their own and each other's.	Children will have the opportunities to explore a range of tools and mechanisms, including levers, sliders, wheels and axles, gears, pulleys, cams, levers and linkages.

Substantive knowledge	<p>Understand that structures need to be self-supporting.</p> <p>Know that the materials used to build a structure need to be strong and stiff enough to hold its own weight and the weight of anything it is designed to hold</p> <p>Know that structures can be anchored in a variety of ways to make them more stable</p> <p>Know that a wide or heavy base is an effective way to ensure a structure is stable</p> <p>Know that poles, guy ropes and pegs can be used to stabilise tarpaulin shelters</p> <p>Know that not all structures are stationary, some have moving parts (e.g. bridges that open to let boats through)</p> <p>Know that long and tall structures have to be strengthened and stabilised in different ways</p>	<p>Understand that each tool has a different job, choosing the right tool makes the job easier.</p> <p>Know that tools use a range of mechanisms to make jobs easier.</p> <p>levers, sliders, wheels and axles, gears, pulleys, cams, levers and linkages.</p> <p>Match tools to jobs.</p> <p>Identify and name trowel, fork, spade, rake, wheelbarrow, scissors, glue, pins, hack saw, hand drill, screw driver,</p> <p>Identify and name levers, sliders, wheels and axles, gears, pulleys, cams, levers and linkages.</p> <p>Know that levers make lifting easier.</p> <p>Know that wheels and axles make moving heavy loads easier.</p> <p>Know that gears adjust effort input and output</p> <p>Know that pulleys make lifting easier by adjusting the direction of force and reducing the effort needed</p>
Disciplinary knowledge	<p>Use a range of joining methods to secure materials together, thinking carefully about preventing weak spots</p> <p>Choose materials carefully and combine materials to benefit from their properties</p> <p>Make a structure that stands by itself and holds the weight of a chosen object</p>	<p>Use basic gardening tools appropriately.</p> <p>Begin to use a hack saw and hand drill with support</p> <p>Use a range of techniques to stick and join materials</p>
Vocabulary	<p>Structure, strong, stiff, stable, weak, flimsy, unstable, wobbly, join, overlap, reinforce, den, shelter, anchor, sky scraper, viaduct, aqueduct, bridge, drawbridge, swing bridge, bascule bridge, materials, properties, combine, benefit, weakness, secure, joint, triangular, flexibility, truss,</p>	<p>Trowel, spade, fork, rake, gloves, wheelbarrow, plant, soil, dig, break up, levers, sliders, wheels, axles, gears, pulleys, cams, levers and linkages. heavy, effort, direction, force, adjust, input, output,</p>
Texts <small>These may be used across the curriculum</small>	<p>Building Big by David Macauley</p> <p>Amazing Buildings by Philip Wilkinson</p> <p>Building by Philip Wilkinson</p> <p>Curious Constructions by Michael Hearst</p>	<p>What Do You Do With an Idea? By Kobi Yamanda</p> <p>Imaginative Inventions by Charise Mericle Harper</p> <p>Mr Ferris and His Wheel by Kathryn Gibbs Davis</p>

<p>not only in DT but support DT curriculum</p>	<p>The Future Architect's Handbook by Barbara Beck</p>	
<p>Enhancements Exceeding the National Curriculum</p>	<p>Forest School sessions to provide real life opportunities for problem solving – creating bug hotels, bird houses, dens for small mammals.</p> <p>Visit the harbour to watch the bridges open and close. Talk from the Harbour Master about how the bridges work and different types of structures and opening bridges in the Harbour and other water ways</p>	<p>Forest School sessions to provide real life opportunities for problem solving – creating a gardening tool to make a gardening job easier</p> <p>Visit the church to meet the gardening team to learn about the gardening jobs through the year and the tools that are used.</p>