Subject: DT	Assessment Y 5/6	Design Technology

YEAR 5 UNIT –: Bridges

KS2 Programmes of Study

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 range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing]

♣ 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.

Additional guidance

Purpose of study

Design and technology is an inspiring, rigorous and practical subject. Using creativity and imagination, pupils design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values. They acquire a broad range of subject knowledge and draw on disciplines such as mathematics, science, engineering, computing and art. Pupils learn how to take risks, becoming resourceful, innovative, enterprising and capable citizens. Through the evaluation of past and present design and technology, they develop a critical understanding of its impact on daily life and the wider world. High-quality design and technology education makes an essential contribution to the creativity, culture, wealth and well-being of the nation.

Aims

The national curriculum for art and design aims to ensure that all pupils:

♣ produce creative work, exploring their ideas and recording their experiences

♣ become proficient in drawing, painting, sculpture and other art, craft and design techniques

♣ evaluate and analyse creative works using the language of art, craft and design

♣ know about great artists, craft makers and designers, and understand the historical and cultural development of their art forms.

Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.

Cooking and nutrition

As part of their work with food, pupils should be taught how to cook and apply the principles of nutrition and healthy eating. Instilling a love of cooking in pupils will also open a door to one of the great expressions of human creativity. Learning how to cook is a crucial life skill that enables pupils to feed themselves and others affordably and well, now and in later life.

♣ understand and apply the principles of a healthy and varied diet

♣ prepare and cook a variety of predominantly savoury dishes using a range of cooking techniques

♣ understand seasonality, and know where and how a variety of ingredients are grown, reared, caught and processed.

Knowledge, skills and concepts	Key Questions
In this unit, the children will: • Designing a stable structure that is able to support weight. • Creating a frame structure with a focus on triangulation. • Making a range of different shaped beam bridges. • Using triangles to create truss bridges that span a given distance and support a load. • Building a wooden bridge structure. • Independently measuring and marking wood accurately. • Selecting appropriate tools and equipment for particular tasks. • Using the correct techniques to saws safely. • Identifying where a structure needs reinforcement and using card corners for support. • Explaining why selecting appropriating materials is an important part of the design process. • Understanding basic wood functional properties • Adapting and improving own bridge structure by identifying points of weakness and reinforcing them as necessary. • Suggesting points for improvements for own bridges and those designed by others. • To understand some different ways to reinforce structures. • To understand how triangles can be used to reinforce bridges. • To know that properties are words that describe the form and function of materials. • To understand why material selection is important based on properties. • To understand the material (functional and aesthetic) properties of wood. • To understand the difference between arch, beam, truss and suspension bridges. • To understand how to carry and use a saw safely	• What do the vertical supports/main horizontal beams look like? • Do they look different? Do they have similarities? • Can you spot any patterns? Shapes? • Can you suggest other ways to make the bridge stronger and/or stiffer? • Can you describe a beam and/or an arch bridge? • Did your suggestions improve the strength of the bridge (structure)? • Are there any similarities or differences in your designs and discoveries? • What did you learn from the first to the last design? • What other features of the bridge could we change to increase its strength and stability? For example, the number and shape of the supports • Are there any other factors that could have affected the investigation? For example, the size of the item (if not using a standard unit of measurement) would give more or less accurate results depending on how big or small the items are (building bricks vs golf balls). • What is the difference between a beam, arch and truss bridge? • What techniques did you use to improve the strength of the beam last lesson? • What other factors could change to increase the strength, stability and stiffness of the bridge?
Key Vocabulary Abutment ● Accurate ● Arched bridge ● Beam bridge ● Coping saw ● Evaluation ● File ● Mark out ● Material properties ● Measure ● Predict ● Reinforce ● Research ● Sandpaper ● Set square ● Suspension bridge ● Tenon saw ● Test ● Truss bridge ● Wood	

Cultural Capital	Opportunities
	Task and Quiz

Key Assessment Opportunity

- Make a bridge

<table>
<tr>
<td rowspan="3">Assessment Task plus end of unit Quiz

Pupils working towards
Can make fewer structures and test them, drawing simple conclusions. Use your demonstration piece as a visual model whilst they build a bridge design and provide verbal cues to guide their thinking if they are struggling to see other ways to improve the structure. Use slide 10 from the Presentation: Arch and beam bridges to share example answers on the Activity: Bridge design development sheet.

Should make simple truss bridges and will need extra support to check that they are being assembled correctly. Work in pairs. They may need to work from a photo of a spaghetti bridge. Provide with premade spaghetti triangles, to allow the children to focus on the building of the bridge structure.

Pupils working at greater depth indicated by:
Should make a wider range of different structures and test them, drawing meaningful conclusions, identifying specific areas of weakness or strength. Provide with extra bridge design development sheets if they have already made a beam, arch, laminated and corrugated bridge beam to include their own ideas and designs.

Should make a sophisticated bridge from more accurate equilateral triangles, which are securely constructed and assembled with sufficient amounts of tape and glue. If they complete the truss bridge in plenty of time challenge them to suggest methods of further strengthening the bridge and if possible see if they can replicate or develop the bridge design in different materials such as lollipop sticks. Add labels to the photograph or sketch to identify where the bridge had weak points in testing.</td>
<td>Working towards expectations Y5
Progression Framework statement:
1. Identifying arch and beam bridges and understanding ‘compression and tension’. Making a range of different shaped beam bridges, identifying stronger and weaker structures and finding different ways to reinforce structures
2. Building a spaghetti truss bridge -Identifying and building suspension and truss bridges, using triangles to create truss bridges and testing them, understanding how triangles can be used to reinforce bridges
3. Building a wooden bridge structure, measuring and marking the wood accurately, selecting appropriate tools and equipment, using saws safely and using card corners to reinforce the structure
4. Improving and reinforcing a bridge structure, identifying points of weakness and reinforce them as necessary and adding road markings</td>
<td rowspan="3">NOTES on children</td>
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<td>Working at Expectations Y5
Progression Framework statement:
1. Improving and reinforcing a bridge structure, identifying points of weakness and reinforce them as necessary and adding road markings
2. Identifying suspension and truss bridges and using triangles to create a simple truss bridge that spans a given distance and supports a load.
3. Independently measuring and marking out wood and using correct techniques to cut it safely
4. Evaluating the success of the bridge, making improvements and reinforcements as necessary</td>
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<tr>
<td>Working at greater depth Y5
Progression Framework statement:
1. Articulating the definition of ‘tension and compression’ and identifying where it is utilised in different structures. Suggesting a variety of ways to reinforce structures at the points at which they failed
2. Articulating the difference between beam, arch, truss and suspension bridges and making an</td>
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	accurate and well-constructed truss bridge, explaining where some bridges are stronger or weaker than others. 3. Independently creating accurate, neat and secure joints by using correct techniques to cut the wood safely and using card corners where they determine they need to reinforce their structure 4. Independently building the bridge design, adapting and improving the structure as necessary by identifying points of weakness as well as adding road markings to the bridge surface for a high quality finish	
	Working towards expectations Y6 **Progression Framework statement**: • Improving and reinforcing a bridge structure, identifying points of weakness and reinforce them as necessary and adding road markings • Identifying suspension and truss bridges and using triangles to create a simple truss bridge that spans a given distance and supports a load. • Independently measuring and marking out wood and using correct techniques to cut it safely • Evaluating the success of the bridge, making improvements and reinforcements as necessary	
	Working at Expectations Y6 **Progression Framework statement:** • Articulating the definition of 'tension and compression' and identifying where it is utilised in different structures. Suggesting a variety of ways to reinforce structures at the points at which they failed • Articulating the difference between beam, arch, truss and suspension bridges and making an accurate and well-constructed truss bridge, explaining where some bridges are stronger or weaker than others. • Independently creating accurate, neat and secure joints by using correct techniques to cut the wood safely and using card corners where they determine they need to reinforce their structure • Independently building the bridge design, adapting and improving the structure as necessary by identifying	

	points of weakness as well as adding road markings to the bridge surface for a high quality finish	
	Working at greater depth Y6 **Progression Framework statement:** • Clearly communicating a wide range of imaginative ideas and more sophisticated use of structures in the designs, using own experiences and peer evaluation to improve them • In depth understanding of types of bridges, structures, how to add strength, tension and compression etc • Completing their structures to a high standard; building more complex structures with sophisticated techniques. • Independently building a complex bridge design, adapting and improving the structure as necessary by identifying points of weakness as well as adding road markings to the bridge surface for a high quality finish	
Assessment notes / evaluation – include SEN / PP next step learning and areas that need more focus		

	Working below expectations	Working within Expected Standard	Working above expected
Target	**14 – 20%** **(no more than 2 children)**	**80 %- 86%**	**20%**
Term 1			
Term 2			

Term 3			