

Year 6 Design and Technology

Unit 6A – Shelters

Focus – structures

ABOUT THE UNIT

In this unit, children learn about structures. They learn that structures can fail when loaded, and the use of techniques for reinforcing and strengthening structures. They are shown the strength of tubes as a construction material and textiles as a suitable cover for a framework.

The main outcome of this unit will be the design and construction of a model framework-type shelter.

CONTEXT

An important context for this unit is our history work this term which concerns life in Britain during World War II.

Construction will relate to the need at that time to create shelters which are very strong and therefore offer a good level of protection for those inside.

VOCABULARY

In this unit, children will use words and phrases relating to:

- designing *eg modelling, scale model, fair test*
- making *eg rolling, strengthening, reinforcing*
- knowledge and understanding *eg triangulation, diagonal, stable, strength, framework, material, tube, rigid, section, water resistance, tie, strut, beam, bracket, stay, member, horizontal, vertical, gusset*
– forces *eg tension, compression, bending, twisting*

RESOURCES

- a collection of books/pictures showing different types of shelters including those from other times (especially World War II) and cultures
- video/collection of photographs of different types of shelters and framework structures
- concept boards to show different ways of joining materials
- paper straws, square section wood, wooden doweling
- paper straws, pipe-cleaners, masking tape, paper fasteners, PVA wood glue
- plastic tube to join doweling
- plant spray bottle
- card, fabric, cotton, plastic sheet *eg carrier bags*
- thread, string, needles
- model figure or doll to use for scale

EXPECTATIONS

at the end of this unit

most children will:

have investigated several shelters; have made, used and recognised the use of tubes as a material from which to make a framework; have reinforced and strengthened frameworks using triangulation and carried out a fair test; have included in their designs drawings showing several alternative shelter ideas; have chosen to make an appropriate scale or full-size shelter for a specific purpose; have incorporated a framework and a textiles cover

some children will not have made so much progress and will:

have investigated at least one example of a shelter; have made a simple model shelter incorporating framework and a textiles cover

some children will have progressed further and will:

have investigated several framework structures including shelters and others showing a thorough understanding of materials used and methods of construction; have set out a step-by-step approach to how their shelter will be made and listed tools and materials to be used; have made their shelter using a wider range of materials and techniques; have been able to identify what is and what is not working well with their chosen shelter designs and modified their shelter as they went along

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
INVESTIGATIVE, DISASSEMBLY AND EVALUATIVE ACTIVITIES (IDEAs)			
<ul style="list-style-type: none"> to relate the way things work to their intended purpose how to seek information from a wide range of sources on different structures and how they support things how materials and components have been used to record their evaluations using drawings with labels 	<p>Ask the children to investigate a range of shelters including <i>eg bus shelters, playground shelters, tents, garden shelters, gazebos, canopies, umbrellas, historic shelters</i>. The range should include examples constructed in different ways <i>eg with a framework inside, a framework outside, shell structures</i>. Using slideshow, discuss aspects of the shelters including:</p> <ul style="list-style-type: none"> <i>What materials have been used to build the shelter?</i> <i>How has the shelter been made?</i> <i>Why has the shelter been made this way?</i> <i>What are the different parts called? eg frame, canopy</i> <i>What do the different parts do?</i> <i>Who will use the shelter?</i> <i>Who needs shelter?</i> <i>Which constructions are the strongest?</i> <p>Ask the children to use other sources of information <i>eg books, CD-ROM, Internet</i> to find out about framework structures.</p> <p>Ø The children could test how the use of a textiles cover can strengthen a structure. Take children on a framework trail to identify framework structures in the local community. Ask the children to identify framework structures in their home and immediate neighbourhood. They could record their findings through charts and labelled drawings.</p> <p>Ø The children could test how the use of a textiles cover can strengthen a structure. Roll play activity – our bus stop</p>	<ul style="list-style-type: none"> understand that there are many different types of shelters built for a variety of purposes can identify which parts support and strengthen simple structures 	<p>Links to this unit History: Life in Britain during World War II</p> <p>Worksheets: Go on a Shelter Trail, Be a Shelter Expert Role play sheets: Our bus stop</p> <p>Slideshow: Who needs a shelter? Slideshow: What different sorts of shelter are there?</p>

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
FOCUSED PRACTICAL TASKS (FPTs)			
<ul style="list-style-type: none"> • how structures can fail when loaded, and techniques for reinforcing and strengthening them • to join and combine materials and components accurately in temporary and permanent ways 	<p>Make a tube by rolling a piece of paper diagonally and around a piece of doweling. Ask the children to devise a fair test to discover if a tube provides a stronger structure. Test cube and triangular section "beams".</p> <p>Show the children how to reinforce a simple square framework by adding diagonals and/or triangles. This can then be tested.</p> <p>Children test a range of textiles to compare their properties in terms of water resistance and strength.</p> <p>The children could test how the use of a textiles cover can strengthen a structure.</p> <p>The children could try different techniques for attaching textiles to a frame. Discuss the impact of the technique chosen on water resistance, strength and appearance.</p> <p>The children could experiment with different methods of joining material <i>eg plastic and paper straws, square and rectangular sections of wood, solid paper straws, doweling</i>. The children could test how the use of a textiles cover can strengthen a structure.</p>	<ul style="list-style-type: none"> • recognise that under certain circumstances structures can fail when loaded (they will be familiar with common techniques for reinforcing and strengthening structures and will incorporate some of these in their shelter models) • use appropriately a variety of temporary and permanent joining techniques using framework materials and textiles 	<ul style="list-style-type: none"> • Children to record notes and drawings made during their investigations. This could include making lists of resources required, a proposed sequence of work and evaluation comments. A prepared format could be used. • Children could mount their examples of different joints/materials onto a piece of card for reference. • A plant spray bottle could be used when testing materials to see if they are water-resistant. <p>Cross curricular link: Science unit 5/6H e.g. investigating textiles and developing tests for water resistance and strength.</p>

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
DESIGN AND MAKE ASSIGNMENT (DMA) Option 1: Design and make a model air-raid shelter			
<ul style="list-style-type: none"> to explore, develop and communicate aspects of their design proposals by modelling their ideas in a variety of ways to develop a clear idea of what has to be done, planning how to use materials, equipment and processes, and suggesting alternative methods of making if first attempts fail to evaluate their products, identifying strengths and areas for development, and carrying out appropriate tests 	<ul style="list-style-type: none"> - Discuss the task of designing and making a model of an air-raid shelter which could also be used as a table (i.e. similar to a Morrison Shelter). This should be very strong and have a very strong, flat top. - Brainstorm children's initial ideas on designing and making a shelter for the specific purpose. - Recap on their earlier investigations. - The children should develop their ideas in models and drawings, taking account of the available resources, the sequence of construction and the techniques to be used. - Ask the children to model their design ideas using paper straws, paper and inexpensive material. Test for size using model figures. <i>How will you make it stable? How will it stand up? How could you make it stronger? Where are the weak points? How could you reinforce them?</i> - The children may record their design ideas on paper. - During the making, encourage the children to evaluate their work as it progresses and think of alternatives if their first attempt fails. <i>How well is it working? Is it strong enough? What could you do to make it better? How could you improve the way it looks? Will it do what you intend? How will it meet the needs of the user?</i> - Remind the children to use simple tests to evaluate the function and strength of the shelter. - Encourage the children to evaluate each other's work in a positive manner. - Discuss with individual children what they have learnt from the project and some targets for their next project. 	<ul style="list-style-type: none"> apply what they have learnt through IDEAs/FPTs in their designing and making make models of their shelter ideas work as part of a team produce several clear design ideas, including step-by-step lists of what needs to be done and lists of resources to be used make suggestions for alternative methods of construction if necessary evaluate their own and other children's shelters identifying what is and what is not working, including appearance 	<p>Class management</p> <ul style="list-style-type: none"> Children will work in groups throughout this unit (three or four children). They will need to make decisions and choices about allocation of tasks, materials and the purpose of their shelter. Some of the IDEAs and FPTs link closely with science and therefore the activities will be dual purpose <i>eg developing skills in fair testing and observation when testing textiles for strength.</i> <p>Health and safety</p> <p>when using loads for testing strength loads used will be such that they cannot cause injury or damage when the structures fail</p>

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
DESIGN AND MAKE ASSIGNMENT (DMA) Option 2: Design and make a model shelter suitable to protect two people overnight in a mountain environment			
<ul style="list-style-type: none"> to explore, develop and communicate aspects of their design proposals by modelling their ideas in a variety of ways to develop a clear idea of what has to be done, planning how to use materials, equipment and processes, and suggesting alternative methods of making if first attempts fail to evaluate their products, identifying strengths and areas for development, and carrying out appropriate tests 	<ul style="list-style-type: none"> - Discuss the task of designing and making a model of an shelter which would protect two people sleeping out in a mountain environment. - Brainstorm children's initial ideas on designing and making a shelter for the specific purpose. - Recap on their earlier investigations. - The children should develop their ideas in models and drawings, taking account of the available resources, the sequence of construction and the techniques to be used. - Ask the children to model their design ideas using paper straws, paper and inexpensive material. Test for size using model figures. <i>How will you make it stable? How will it stand up? How could you make it stronger? Where are the weak points? How could you reinforce them?</i> - The children may record their design ideas on paper. - During the making, encourage the children to evaluate their work as it progresses and think of alternatives if their first attempt fails. <i>How well is it working? Is it strong enough? What could you do to make it better? How could you improve the way it looks? Will it do what you intend? How will it meet the needs of the user?</i> - Remind the children to use simple tests to evaluate the function and strength of the shelter. - Encourage the children to evaluate each other's work in a positive manner. - Discuss with individual children what they have learnt from the project and some targets for their next project. 	<ul style="list-style-type: none"> apply what they have learnt through IDEAs/FPTs in their designing and making make models of their shelter ideas work as part of a team produce several clear design ideas, including step-by-step lists of what needs to be done and lists of resources to be used make suggestions for alternative methods of construction if necessary evaluate their own and other children's shelters identifying what is and what is not working, including appearance 	<p>Class management</p> <ul style="list-style-type: none"> Children will work in groups throughout this unit (three or four children). They will need to make decisions and choices about allocation of tasks, materials and the purpose of their shelter. Some of the IDEAs and FPTs link closely with science and therefore the activities will be dual purpose <i>eg developing skills in fair testing and observation when testing textiles for strength.</i> <p>Health and safety</p> <p>when using loads for testing strength loads used will be such that they cannot cause injury or damage when the structures fail</p>

LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE (cont.)
CHILDREN SHOULD LEARN		CHILDREN	
DESIGN AND MAKE ASSIGNMENT (DMA) Option 3: Design and make a model of a shelter suitable for a summer holiday play scheme (from DATA Unit)			
<ul style="list-style-type: none"> to explore, develop and communicate aspects of their design proposals by modelling their ideas in a variety of ways to develop a clear idea of what has to be done, planning how to use materials, equipment and processes, and suggesting alternative methods of making if first attempts fail to evaluate their products, identifying strengths and areas for development, and carrying out appropriate tests 	<ul style="list-style-type: none"> ⊕ Discuss the task of designing and making a model of a shelter for a summer holiday play scheme. Emphasise that an important part of this project is to make sure their shelter meets a wide variety of different needs ⊕ Brainstorm children's initial ideas on designing and making a shelter for the specific purpose. ⊕ Recap on their investigations into the strength of tubes, reinforcing frameworks and testing textiles. ⊕ Encourage the pupils to ask the users (<i>what do they have trouble with?</i>), to think carefully about the access and features (<i>steps, doorways and space</i>), to observe people using shelters and imagine what it will be like for different people. ⊕ Ask the children to model their design ideas using paper straws, paper and inexpensive material. Test for size using model figures. <i>How will you make it stable? How will it stand up? How could you make it stronger? Where are the weak points? How could you reinforce them?</i> ⊕ The children may record their design ideas on paper. ⊕ Ask them to present their ideas to the group at this stage and to answer questions. <i>Who are you designing for? What are their needs? How will this meet their needs? What materials will you use? How will it be made?</i> 	<ul style="list-style-type: none"> apply what they have learnt through IDEAs/FPTs in their designing and making make models of their shelter ideas work as part of a team produce several clear design ideas, including step-by-step lists of what needs to be done and lists of resources to be used make suggestions for alternative methods of construction if necessary evaluate their own and other children's shelters identifying what is and what is not working, including appearance 	<p>Resources for these activities</p> <p>Worksheet - Design an Inclusive Shelter</p> <p>Slide show – Who needs a shelter?</p> <p>Slide show – Who are we designing for?</p> <p>Slide show – What's the problem with this?</p> <p>Slide Show – A day in the life of...</p> <p>Class management</p> <ul style="list-style-type: none"> Children could work in groups throughout this unit (three or four children). They will need to make decisions and choices about allocation of tasks, materials and the purpose of their shelter. Some of the IDEAs and FPTs link closely with science and therefore the activities could be dual purpose <i>eg developing skills in fair testing and observation when testing textiles for strength.</i> If the children work in small groups, they will need to allocate tasks before they start. <p>Health and safety</p> <p>When carrying out a risk assessment for this activity, teachers will need to consider the materials, tools and equipment being used.</p> <p>In addition, the following points should be noted:</p> <ul style="list-style-type: none"> when using loads for testing strength ensure that the loads cannot cause injury or damage when the structures fail fire safety should be ensured for any large structures that young children may use

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE (cont.)
DESIGN AND MAKE ASSIGNMENT (DMA) Design and make a model of a shelter suitable for a summer holiday play scheme continued.			Resources for these activities Inclusive Designer Certificate "Designing Everyone In"
<ul style="list-style-type: none"> ⊕ During the making, encourage the children to evaluate their work as it progresses and think of alternatives if their first attempt fails. <i>How well is it working? Is it strong enough? What could you do to make it better? How could you improve the way it looks? Will it do what you intend? How will it meet the needs of the user?</i> ⊕ Encourage the children to judge their designs against success criteria for inclusive design <ul style="list-style-type: none"> - Can everyone use this shelter? - If not, why not? - How could it be improved? - Would everyone feel comfortable using this shelter? - In what ways does your shelter meet the design brief? ⊕ Remind the children to use simple tests to evaluate the function and strength of the shelter. ⊕ Encourage the children to evaluate each other's work in a positive manner. ⊕ Discuss with individual children what they have learnt from the project and some targets for their next project. 			