

# 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 framework-type shelter for an identified purpose. This can be a model or full-size structure.

This unit can be adapted by using alternative contexts for the design and make assignment *eg bridges, chairs, adventure playground equipment*.

### PRIOR LEARNING

It is helpful if the children have:

- learnt how to mark out, cut and join materials to make frameworks
- practised ways of showing their design ideas on paper

This unit builds on Units 1B 'Playgrounds', 1D 'Homes', 3A 'Packaging', 3D 'Photograph frames' and 5C 'Moving toys'.

It also builds on Science Units 1E 'Pushes and pulls', 2D 'Grouping and changing materials', 2E 'Forces and movement' and 3C 'Characteristics of materials'.

### 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 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**

**POSSIBLE TEACHING ACTIVITIES**

**LEARNING OUTCOMES**

**POINTS TO NOTE**

CHILDREN SHOULD LEARN

CHILDREN

**INVESTIGATIVE, DISASSEMBLY AND EVALUATIVE ACTIVITIES (IDEAs)**

- 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

- Ask the children to investigate a range of shelters including *eg bus shelters, playground shelters, tents, garden shelters, gazebos, canopies, umbrellas, historic shelters*. The range should include examples constructed in different ways *eg with a framework inside, a framework outside, shell structures*. Discuss aspects of the shelters including:
  - *What materials have been used to build the shelter?*
  - *How has the shelter been made?*
  - *Why has the shelter been made this way?*
  - *What are the different parts called? eg frame, canopy*
  - *What do the different parts do?*
  - *Who will use the shelter?*
  - *Who needs shelter?*
  - *Which constructions are the strongest?*
- Find out about performance textiles that are used in tents and outdoor equipment. Ask the children to record their findings in labelled drawings.
- Ask the children to use other sources of information *eg books, CD-ROM, Internet* to find out about framework structures.

- understand that there are many different types of shelters built for a variety of purposes
- can identify which parts support and strengthen simple structures

**Links to this unit**

**Science:** Unit 6E 'Balanced and unbalanced forces'

**Information technology:** Unit 5B 'Analysing data and asking questions: using complex searches'

**Mathematics:** Number (proportion, percentage, increase, decrease), handling data (probability scale)

**History:** Unit 11 'How did life change in our locality in Victorian times?'

**Content**

- Full-size structures could be made so that they can be evaluated properly. Choose the best models, make and evaluate them as a class or group project.
- Make a display of pictures and books showing a variety of shelters. You could give children first-hand experience by erecting a tent and looking at materials, methods of joining and strengthening, and design features.
- A prepared format may be useful for children to record notes and drawings made during their investigations. This could include space for making lists of resources required, a proposed sequence of work and evaluation comments.
- Pre-made concept boards are useful so that the children can see different methods of joining materials.
- 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.

**Class management**

- 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 *eg developing skills in fair testing and observation when testing textiles for strength*.
- If the children work in small groups, they will need to allocate tasks before they start.

**Health and safety**

When carrying out a risk assessment for this activity, teachers will need to consider the materials, tools and equipment being used.

In addition, the following points should be noted:

- 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

**Out-of-school activities and homework**

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.

**FOCUSED PRACTICAL TASKS (FPTs)**

- 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

- 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.
- Show the children how to reinforce a simple square framework by adding diagonals and/or triangles. This can then be tested.
- Show the children appropriate tests for a small range of textiles such as for water resistance and strength.
  - 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.
  - The children could experiment with different methods of joining material *eg plastic and paper straws, square and rectangular sections of wood, solid paper straws, doweling*.
  - The children could test how the use of a textiles cover can strengthen a structure.

- 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

**DESIGN AND MAKE ASSIGNMENT (DMA)**

**Design and make a model of a shelter for a specific purpose**

- 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

- ★ Discuss the task of designing and making a model of a shelter for a specific purpose. This could either be for an entirely fictitious purpose or for a school need *eg to use at playtime, for parents to use when waiting for children, a shelter for school events that could be folded and packed away when not required*. Alternatively the shelter could be made as part of a project on the local area or environment.
- ★ 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.
- ★ 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. *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?*
- ★ 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. *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?*
- ★ 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.

- essential activities
- ★ assignment stages (all are essential)
- optional activities

- 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



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