

## Unit 7A(iii) Understanding materials

### Focus: textiles

#### About the unit

The main aim of this unit is to develop pupils' understanding of the properties of materials and how to apply this understanding when designing with textiles.

In this unit, pupils tackle a design and make assignment (DMA) on the theme 'Be seen!', in which they design and make a safety garment or accessory to wear when walking, jogging or cycling. They must use materials appropriately to meet a specific technical purpose.

Pupils gain the knowledge, skills and understanding they need to carry out the DMA successfully through product evaluation activities and focused practical tasks. They:

- classify materials by fibre sources, *eg natural, synthetic*, and by fabric construction, *eg woven, non-woven, knitted*
- investigate different cultural contexts in which textiles have been developed and used
- investigate and develop skills in modifying the appearance of textiles, *eg colouring and decorative techniques*
- consider the aesthetic and functional properties of materials, *eg water resistance, drape, comfort, absorbency, flexibility*

#### Where the unit fits in

This is one of three textiles units that focus on understanding materials: this one in year 7 on using and understanding materials; one in year 8 on exploring materials in greater depth; and one in year 9 on critically selecting materials. These units ensure progression in understanding about materials.

This is part of a series of three units in year 7 on understanding materials; there are equivalent units, with similar learning outcomes, on food and resistant materials. Together these units are expected to take 15–24 hours. It is important that the department plans as a team so that pupils are able to draw on knowledge, skills and understanding from across the units to reinforce their learning and avoid unnecessary repetition.

If you choose not to teach this unit, then plan to include the essential activities identified by the symbol ■ as part of another unit.

If pupils are encouraged to use resistant materials or electronics in their design, they could work across materials.

#### Expectations

##### At the end of this unit

**most pupils will:** select materials and components from a given range for particular purposes, considering their working properties, the available tools and equipment, and processes for working with the material; apply their understanding of how materials are classified according to their use, origin and properties; recognise that the properties of materials meet different needs; use their understanding of the limitations of materials to guide their ideas and help them make final decisions about which materials to use; combine materials and components to suit particular purposes; process materials to change their working properties and performance, applying an increasing range of cutting, shaping and forming techniques, as appropriate; choose from the range of finishing processes available to enhance the appearance of materials and improve their performance, *eg waterproof coating*, and recognise where self-finishing techniques are available

**some pupils will not have made so much progress and will:** choose the most appropriate materials from those available and draw on some previous experience of working with materials; explain their choice of materials; cut, shape and form materials, as appropriate; select and use finishing techniques that are suitable for the product's end use

**some pupils will have progressed further and will:** draw on their knowledge of materials and processes; recognise the advantages and disadvantages of particular tools and equipment, and processes; make decisions which resolve conflicting demands, *eg cost with the suitability of a material for the chosen design*; check that materials are capable of taking the desired form, have aesthetic appeal, are an appropriate weight and have other properties needed

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## Prior learning

It is helpful if pupils have:

- learnt how structures can fail when loaded, and investigated techniques for reinforcing and strengthening them
- carried out simple tests on a small range of textiles for water resistance and strength, and to find out about performance textiles
- joined and combined materials and components accurately in temporary and permanent ways, using textiles
- learnt that many different materials can be used on a product, *eg a slipper*, some to stiffen, some to provide a hard-wearing surface and some for appearance
- identified the different materials used and why they have been chosen
- investigated different materials for warmth, wear and strength

Pupils should have gained the above knowledge, skills and understanding in year 6, through unit 6A ‘Shelters’ and unit 6B ‘Slippers’ in the key stage 2 scheme of work, or similar projects.

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## Language for learning

Through the activities in this unit, pupils will be able to understand, use and spell correctly words relating to:

- materials and their classifications, *eg synthetic fibres (polyester, acrylic, nylon), natural fibres (cotton, wool, linen, silk)*
- the characteristics and properties of materials, *eg strong, stretchy, thin, thick, elasticity, hairy, coarse, warm, stain-resistant, absorbent*

Speaking and listening – through the activities pupils could:

- ask questions to gain clarification and further information, *eg Why...? How...? What...? What then...?*
- share information and discuss ideas in groups, and solve problems

Reading – through the activities pupils could:

- use skimming, scanning, highlighting and note-taking as appropriate to different texts

Vocabulary and spelling – through the activities pupils could:

- read and use accurately terms which relate to key concepts in D&T
- recognise links between words related by word families and roots
- understand and use correctly terms of qualification and comparison
- learn and spell D&T-specific key words correctly
- use strategies to attempt, find and check spellings

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## Resources

Resources include:

- a collection or pictures/photographs of similar products, *eg safety accessories for cyclists*, made from different materials and in other times, cultures and countries
- tools and equipment for processing materials, *eg a sewing machine*
- tools and equipment for carrying out material testing, *eg strength testing*
- computers for researching databases and analysing materials
- useful websites, *eg*
  - [www.design-council.org.uk](http://www.design-council.org.uk)
  - [www.textile-toolkit.org.uk](http://www.textile-toolkit.org.uk)

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## Future learning

Pupils could go on to further units on materials: unit 8A ‘Exploring materials’ and unit 9A ‘Selecting materials’. Applying an understanding of materials when designing and making is an important part of every design and make assignment. In year 8, pupils learn how to apply their understanding of the properties of materials when designing in a range of materials, so that they are able to identify those that are suitable for a task.

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## Out-of-school activities and homework

Pupils could:

- investigate the types of materials used in sports equipment, relating them to their purpose and how they are used
- investigate the textiles used in a range of products, *eg tents and kites, children’s clothes, protective clothing, vehicles*, relating their use to working and performance characteristics, structure, and how they are manufactured
- develop a flow chart or storyboard explaining a particular processing technique, *eg overlocking*

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## Links with other subjects

- English: displaying and communicating information.
- Art and design: investigating, combining and manipulating materials, taking account of purposes and audiences.
- Sustainable development: considering the effects of the extraction, use and eventual disposal of some materials on the natural environment and human health.

**Learning objectives**

Pupils should learn:

**Possible teaching activities****Learning outcomes**

Pupils:

**Points to note****DESIGN AND MAKE ASSIGNMENT (DMA)**

- to design a product to meet a specific technical purpose, choosing appropriate materials, by applying the knowledge, skills and understanding they developed during the product evaluation activities and focused practical tasks

Set the pupils an assignment to design and make a product to meet a specific technical purpose, choosing appropriate materials.

**Example**

This example DMA has been written so it can be copied and given directly to pupils. Further details and contexts can be added, as appropriate.

**Be seen!**

Whatever sport people like to do, it is important that they have the right kit to practise their sport safely. 'To be seen' is one of the recommendations of the Department of the Environment, Transport and the Regions. Design and make a safety garment or accessory for people aged 16 and under to wear when walking, jogging or cycling on the road. Safety should be a priority, and you should incorporate fluorescent and reflective materials.

- find and select information that informs and clarifies the task
- draw on their understanding of familiar products, including how, where and why they are used
- design to meet a set of criteria in a specification
- select materials according to their working characteristics and availability
- show an understanding of the situation in which their design will be used
- express ideas in discussion, and as 2-D and 3-D models
- suggest an ordered sequence for managing the task
- use tools, equipment and techniques with precision
- discuss with users the design criteria and the extent to which their design meets them, using questions to clarify users' needs and views and to gain insights into how to improve their design

*Some pupils can also be expected to:*

- consider the environmental impact of their design, and to justify their use of materials*
- propose alternative materials and ways of working*

**Use of ICT**

- Pupils could use CAD/CAM (computer-aided design and manufacture) software linked to a cutter/plotter to produce vinyl 'stick-on' symbols to be incorporated in the design or nets for the product. This would cover aspects of unit 7C 'Using ICT to support researching and designing'.

**Language for learning when talking to users**

- When preparing to discuss their design with users, *eg a cyclist, police safety officer, parents with small children*, pupils will need to plan questions in advance. To check out the design criteria and the effectiveness of their design, they might ask users
  - How would you modify our criteria?*
  - Why do you think our design would or would not work?*
  - What changes or improvements would you suggest?*

■ essential activities

○ optional activities

Pupils should learn:

Pupils:

## PRODUCT EVALUATION

Organise a range of activities that give pupils an opportunity to:

- examine, describe and evaluate similar products. This will help pupils to understand why materials and processes have been chosen, and will inform their own designing and making
- consider how products work and look
- name materials and investigate and explain processes

- how to classify materials by properties, uses and sources, eg *natural and synthetic fibres, woven, non-woven and knitted fabrics*

- Ask the pupils to identify products that are made from a variety of materials originating from many sources worldwide. Ask them to investigate the original sources of the materials used to make a product, eg *sports equipment (trainers, rackets, roller blades, skateboards)*.

Discuss ways of classifying materials by their properties and the ways in which the properties are used.

- state the names and types of common materials used in familiar products
- explain where the materials come from and why they are used
- spell and use the names of materials accurately



**Health and safety** – product evaluation activities which involve products with potentially dangerous features, eg *sharp edges*, should be carefully supervised by a teacher. The possibility of materials tearing during testing, or components causing harm, should also be assessed

### Language for learning during product evaluation

- Give pairs of pupils a selection of products made from different materials. Ask them to describe:
  - the original sources of materials
  - how the materials can be classified
  - what the names of materials mean
  - where the materials come from
 Each pair presents the information for each product in the form of maps and presents one sample on an overhead transparency (OHT) to the class.
- With teacher support, ask pupils to develop a word bank or dictionary. The teacher will need to highlight the meaning of key prefixes, word families and roots, eg *poly-*, *synthetic*. Less able pupils will need more support and guidance when organising a word bank. Teachers may prefer to create a class resource, possibly with an ICT version as well.

■ essential activities

○ optional activities

**Learning objectives**

Pupils should learn:

- to consider the properties of materials, *eg water resistance, comfort*
- to consider how the properties of a material suit a particular product

**Possible teaching activities**

- Ask the pupils to examine a range of existing products. Discuss what materials they are made from and why these materials were chosen by the manufacturer. Consider the characteristics and working properties of materials, *eg absorbency, aesthetic appeal, comfort, colour, ease of access and availability, cost, quality of material chosen for the target market, maintenance, product lifespan.*

*For example, pupils could investigate in small groups a selection of sports kits for different functions which have a range of features, including zips, buckles, sections or pouches. Discuss the stages in which these were constructed, examine how many pieces there are, how they have been shaped and joined, and what materials have been used.*

Extension: some pupils may also be able to consider the impact of a product beyond the purpose for which it was designed.

- Ask the pupils to discuss protective clothing or safety accessories for cyclists, *eg tabards, leg/arm/headbands, shoulder straps, reflective panels.* Evaluate the product's fitness for purpose, including its aesthetic appeal.

- to investigate different cultural contexts in which materials, *eg textiles and some plastics, such as PVC,* have been produced

- Ask the pupils to look at how the materials used for a particular product have changed over time, or are different in other parts of the world. Discuss where the materials have come from, how they are processed, what local resources are used, and why the materials used may have changed or be different.

*For example, pupils could:*

- *research other forms of protective clothing for specific activities and investigate safety finishes applied to fabrics*
- *put together a scrapbook of high-visibility clothing and annotate important design features*
- *discuss the skills and experience of designers in a number of countries around the world to develop their awareness of the wide range of solutions developed by different cultures over time in response to their particular needs*

- to consider how the extraction, use and eventual disposal of some materials affects the natural environment and human health

- Discuss with the pupils the values issues relating to sources of materials, *eg finite resources and reuse of materials.* Pupils could consider the following questions
  - *What happens to this product after it has been used?*
  - *What effect will it have on the built and natural environment?*
  - *How easily can it be recycled?*
  - *Who will pay the cost of recycling?*
  - *Where do resources come from?*
  - *Are they likely to run out?*
  - *Is there a problem with side effects such as pollution or waste disposal?*
  - *What is the social, cultural or economic effect of this product?*

**Learning outcomes**

Pupils:

- state why particular materials are chosen for functional and aesthetic properties
- judge how far a product is fit for its purpose, and whether resources have been used appropriately
- identify the working characteristics of common materials

- understand how the use of materials has changed over time and is influenced by local resources, technological developments and social and cultural factors, *eg the use of synthetic fibres rather than locally produced wool*

- recognise that choosing the best materials for the job may not simply mean choosing the materials most appropriate for the design's functional needs
- know it is important to consider recycling, reusing and reducing the amount of materials when designing a new product

**Points to note**

■ essential activities

○ optional activities

Pupils should learn:

Pupils:

### FOCUSED PRACTICAL TASKS (FPTs)

These practical tasks should focus on the knowledge, skills and understanding outlined in 'About the unit'. They should give pupils an opportunity to practise any new skills they will need during the DMA, *eg consider the physical properties of materials and how to join and shape them.*

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|--|---|---|
| <ul style="list-style-type: none"> <li>■ to explore materials with different properties by joining, cutting and shaping them, to find out about their working characteristics</li> <li>■ to measure and consider the effects of varying materials, <i>eg on flexibility</i></li> </ul> | <ul style="list-style-type: none"> <li>■ Ask the pupils to explore the behaviour of materials during particular processes, <i>eg joining</i>. Discuss the impact on the end product and how the physical properties can be used to achieve particular results when designing and making.<br/><i>For example, pupils could work in groups to explore suitable methods for joining materials to make a strong seam or join.</i></li> </ul>  | <ul style="list-style-type: none"> <li>■ demonstrate how to process materials to make best use of their working properties</li> <li>■ demonstrate an increasing range of techniques for joining, cutting and shaping</li> <li>■ know the health and safety rules for working with the range of materials and processes</li> </ul> |
| <ul style="list-style-type: none"> <li>■ to investigate and develop skills in modifying the appearance of textiles, <i>eg colouring or decorative techniques</i></li> </ul>  | <ul style="list-style-type: none"> <li>■ Ask the pupils to make a display about all the different things that can be achieved by processing or modifying one material, <i>eg polyester, cotton, wool</i>, in different ways.<br/>The production of a display can be divided into group work.</li> </ul>   | <ul style="list-style-type: none"> <li>■ apply their understanding of the properties of materials, <i>eg durability, strength</i>, and how these can be exploited</li> </ul>  |
| <ul style="list-style-type: none"> <li>■ to carry out fair tests for evaluation purposes</li> </ul>  | <ul style="list-style-type: none"> <li>■ Show the pupils simple ways that materials can be tested against performance characteristics. Examine how fair tests can be carried out.<br/><i>For example, pupils could:</i> <ul style="list-style-type: none"> <li>– <i>design and carry out tests to determine particular properties, eg water absorption, abrasion resistance</i></li> <li>– <i>design and carry out tests to determine strength and abrasion resistance</i></li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>■ select and carry out controlled tests to find out information about materials, <i>eg rubbing fabric over a rough surface for a specific number of rubs</i></li> </ul>  |



**Health and safety** – correct procedures should be written down, demonstrated and then followed when testing materials. Some tests, *eg flammability tests*, carry significant risks and teachers should judge when it is appropriate to use them. Pupils should be taught to manage their environment to ensure their own and others' health and safety

■ essential activities

○ optional activities

**Learning objectives**

Pupils should learn:

- to develop skills in seeking information about materials from different sources
- to use highlighting, skimming and scanning to identify key points and to develop critical reading approaches

**Possible teaching activities**

- Show the pupils how to research sources of information about materials, *eg databases, advertisements for products*, to help them select appropriate materials.

**Learning outcomes**

Pupils:

- use research techniques effectively to find relevant information about materials, *eg how cotton is produced*
- identify key points from information on a product

**Points to note****Language for learning when researching information**

- Ask pupils to work in small groups and analyse advertisements for products. Pupils could highlight or underline any facts in one colour and anything they think is opinion in another colour. They could then discuss how the advertisements use factual information.
- Ask the pupils to formulate three questions a reader could ask about the product, *eg Is it good value? Will it last?*
- Extension: more able pupils could highlight suspect claims.

**Use of ICT**

- There is an opportunity to use databases when identifying information about materials.