

Unit 3C Characteristics of materials

ABOUT THE UNIT

Through this unit children should extend their knowledge of the range of materials we use and of the properties that characterise them. This knowledge should help them recognise what needs to be considered when a material is chosen for a particular use.

Experimental and investigative work focuses on:

- planning investigations
- deciding what to change, what to keep the same and what to measure
- deciding whether a fair comparison was made
- using results to draw conclusions.

Work in this unit also offers opportunities for children to relate science to materials they use every day, to obtain evidence to test ideas, and to identify hazards and risks as they work.

This unit takes approximately 10 hours.

WHERE THE UNIT FITS IN

Builds on Unit 1C 'Sorting and using materials' and Unit 2D 'Grouping and changing materials'

Children need:

- to know that every material has characteristics or properties which can be identified
- appropriate vocabulary to describe some of these properties.

Links with Units 3E, 4D, 4F and design and technology.

VOCABULARY

In this unit children will have opportunities to use:

- words describing the characteristics of materials *eg strong, hard, flexible, absorbent, transparent*
- words related to the investigation of these properties *eg investigate, test, describe, explain, comparison, fair, conclude, evidence*
- words which have different meanings in other contexts *eg test, fair, conclude*
- nouns and related verbs *eg comparison/compare, description/describe.*

RESOURCES

- collections of objects made from different materials *eg wood, glass, metal*
- video/pictures of everyday objects made of specific materials
- collection of floor coverings, weights
- measuring jugs and other apparatus for measuring volume
- variety of paper towels
- variety of tights
- apparatus for measuring length

EXPECTATIONS

at the end of this unit

most children will:

identify uses of some common materials, suggesting several reasons why the material is suitable; make measurements of length using standard units; explain it is important to test materials to find out whether descriptions of characteristics are reliable and to recognise when a test or comparison is unfair

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

identify uses of some common materials, suggesting a reason why the material is suitable; make measurements of length using standard units

some children will have progressed further and will also:

explain how to make a test fair and represent measurements in a bar chart

LEARNING OBJECTIVES

POSSIBLE TEACHING ACTIVITIES

LEARNING OUTCOMES

POINTS TO NOTE

Review children’s knowledge of materials and their properties by presenting them with a collection of everyday materials and asking them what they know about the materials. Talk about responses with the class, drawing out similarities and differences between materials.

Children’s responses to this activity will indicate their knowledge and understanding of materials and their uses. Teachers will need to take this into consideration in their short-term planning.
Children sometimes confuse the word ‘material’ with the word ‘fabric’.

CHILDREN SHOULD LEARN

- to identify a range of common materials and that the same material is used to make different objects

- ◆ Ask children to do a survey around the school of materials that have been used for particular purposes *eg wood for floors, plastic for guttering, metal for door handles, plastic for electric sockets, gold for rings*. Ask children to say how they know or what helped them to decide that a particular object is made of a particular material. Ask children to explain their classification of ‘difficult’ objects *eg plastic with a wood grain*.

CHILDREN

- identify other objects made of a particular material *eg glass, plastic, wood* and name the material

The term ‘plastic’ includes a variety of materials *eg polythene, nylon, PVC*.

Children often have difficulty in distinguishing the material from the object made from the material. It is helpful to have some pieces of material which are not made into particular objects.

Some children may identify different metals *eg gold, steel, aluminium*. They should be encouraged to do so.

 **SAFETY** – glass objects are best not handled by young children. However, they can touch glass windows, etc.

- to recognise properties such as hardness, strength and flexibility and compare materials in terms of these properties

- ◆ Ask children to describe a material so that others can identify it, using terms *eg transparent, strong, hard, flexible*. With the children, draw up a table or simple database of properties of materials *eg wood, glass, metal, rubber, plastic, wool, cotton, ceramics*.

- state one or two characteristics of a range of common materials and make comparisons between materials *eg wood is usually hard and strong but glass is usually hard and breaks easily*

Different objects, made from the same material, may be different, *eg a wooden spoon may be rough but a wooden table smooth*. At this stage, children should be introduced to generalities *eg metals are usually smooth and shiny*.

- that materials are suitable for making a particular object because of their properties and that some properties are more important than others when deciding what to use

- ◆ Present children with a series of objects or pictures *eg a wooden chair, plastic bottle, paper towel, woollen jersey* or show a video illustrating different materials being used. Ask children why each material was used to make the object and ask them to suggest and evaluate an alternative material.

- identify sensible reasons for using particular materials *eg it’s useful to see how full the bottle is, the towel needs to soak up water*
- identify alternative materials and explain which property is important *eg the plastic bottle is lighter than the glass bottle*

- to obtain evidence to test scientific ideas
- to plan and carry out a test safely
- to decide whether the test was fair

- ◆ Ask children how they knew about materials *eg why they said wood was hard, or why they said paper towels were good for mopping up spills or how they knew wood is hard*. Ask children how they would find out whether a material was hard or how they could compare the hardness of materials *eg in order to find out what materials would be suitable for a floor covering for a model house or for a board game* and what apparatus they would use. Ask children to explore different ideas *eg carrying out a ‘rub’ test to find out whether materials wear well, dropping a soft ball of plasticine onto surfaces of different hardness to see which distorted the plasticine most, or dropping a hard object to explore which tiles are hardest*. Ask questions to find out which tests worked well *eg whether they could easily compare the marks made or the shape of the plasticine, whether the tests were fair eg Did they always rub equally hard? Did they drop the hard object or plasticine from the same height?* and how the test could have been improved.

- carry out their test safely
- decide whether the test was good enough to answer the question *eg to rank the floor coverings in order of hardness or how well they wear*
- explain whether the test they carried out was fair and if not, say what they would have needed to do to make it fair

Children sometimes think that ‘solid’ means ‘hard’.

 **SAFETY** – Care is needed if heavy objects are dropped. Keep feet out of the way *eg by dropping the object into a large box or bin with the material to be tested at the bottom*. Don’t use materials that might shatter *eg earthenware tiles*.

- to plan a test to compare the absorbency of different papers, deciding what evidence to collect, considering what to change, what to keep the same and what to measure
- to make comparisons and draw conclusions

- ◆ Ask children how they could find out which paper is best for mopping up spills. Question them to find out what they mean by ‘best’ and how they are going to make this test fair *eg by using the same sized piece of paper or towel or by using the same amount of water and seeing how much paper or towel is needed*. Help children to carry out an investigation, to record their results and draw a conclusion.

- plan a fair test and explain why it was fair, pointing out any difficulties
- explain why the evidence collected in this investigation is stronger or weaker than that in the previous test *eg this time we knew how much water the same sized pieces of towel mopped up so it was better than just looking at the scratches on the floor coverings*
- state which paper was best *eg this towel mopped up the most water* or rank papers in order of absorbency

This activity offers children the opportunity of carrying out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.

Include examples of papers which are not kitchen towels. Kitchen towels are all of similar absorbency. Children need some examples which are not very effective.

At this stage it is acceptable for children to refer to ‘amount’ of water rather than ‘volume’.

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- to plan how to find out which pair of tights is most stretchy, making a fair comparison
- to decide what to change, what to keep the same and what to measure
- to make careful measurements of length, to present measurements as a bar chart and to draw conclusions

POSSIBLE TEACHING ACTIVITIES

- ◆ Ask children how they could find out which tights are most stretchy/elastic. Talk with them about how they might measure 'stretchiness' *eg by adding the same weights to different pairs of tights and measuring the new length* and what factors *eg thickness of tights* they should consider. Help children to make careful measurements of the length of the tights and to present results using a bar chart. Ask children what their results show about the different tights.

LEARNING OUTCOMES

CHILDREN

- add the same weights to each pair of tights
- make careful measurements of the length of the tights
- with help, present results in a bar chart and use the results to explain which tights were most stretchy

POINTS TO NOTE

This activity offers children the opportunity of carrying out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.

 **SAFETY** – Limit the total weight used. Keep feet out of the way *eg by putting a large box or bin underneath so that feet are automatically clear.*

Consolidate the work in this unit by asking children to think about a new material that has been recommended for a particular purpose *eg to make a swimming costume or a chopping board or a drying-up cloth*. Ask children to suggest what tests they would carry out on a new material to compare it with a familiar material, already used for the purpose, and how they would ensure the comparison was fair.



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