

Unit 2D Grouping and changing materials

ABOUT THE UNIT

Through this unit children learn to distinguish between an object and the material from which it is made. They learn about some of the ways materials can be changed and that heating can cause changes which produce materials which are often useful.

Experimental and investigative work in this unit focuses on:

- thinking about what is expected to happen
- making and recording observations and comparisons
- deciding whether a test is fair.

Work also offers opportunities for children to relate science to domestic contexts *eg cooking* and to recognise hazards and risks to themselves and to control these.

This unit takes approximately 9 hours.

WHERE THE UNIT FITS IN

Builds on Unit 1C 'Sorting and using materials'

Children need:

- to know the names and properties of some common materials and the vocabulary for describing these
- to know vocabulary associated with changing shape.

Links with Unit 2E, art, design and technology.

VOCABULARY

In this unit children will have opportunities to use:

- names of a variety of materials *eg wood, metal, leather, plastic, clay* and of groups of material *eg natural, manufactured*
- words giving ways of changing materials *eg squash, bend, twist, stretch, heat, cool, freeze, melt, boil*
- words which have a different meaning in other contexts *eg fair, material*
- expressions of comparison *eg warm/warmer/warmest*
- expressions of reason using 'because'
- expressions making predictions.

RESOURCES

- secondary sources *eg simple reference books, CD-ROMs*
- collection of naturally occurring and man-made materials
- objects made from naturally occurring materials *eg wood, stone, wool*
- shapes/moulds for making ice shapes
- access to a freezer
- access to a kiln for firing clay
- access to an oven for cooking
- materials which harden on cooling *eg butter, chocolate*

EXPECTATIONS

at the end of this unit

most children will:

identify some naturally occurring materials; predict and describe how heating can change some materials into new and useful materials and state the dangers of hot water or naked flame; describe what happens to water when it is heated and cooled; record observations in tables and recognise when simple comparisons are unfair

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

describe how heating can change some materials and make observations which, with help, they record in tables

some children will have progressed further and will also:

state that ice, water and steam are the same material and describe how water can be changed into ice and steam and how these changes can be reversed; recognise and explain when a comparison is unfair

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- that there is a range of materials with different characteristics

- that some materials occur naturally and some do not
- the names of some naturally occurring materials
- that some naturally occurring materials are treated (shaped, polished) before they are used

- that some materials occur naturally and some do not

- that objects made from some materials can be altered by squashing, bending, twisting and stretching
- to describe ways of making materials or objects change, using appropriate vocabulary
- to explore materials using appropriate senses and making observations and simple comparisons

- that materials often change when they are heated
- to make observations and simple comparisons
- to construct a table to record observations

- to explore melting ice using appropriate senses

POSSIBLE TEACHING ACTIVITIES

- ◆ Present children with a collection of materials *eg wood, metal, leather, plastic, cotton* and ask children to sort them, using their own criteria, and to explain what the criteria are. Show children a chart of the materials, characteristics and uses prepared by them or another class in Year 1 and ask them what they remember about different materials and what they are like.

- ◆ Present children with a careful selection of materials, some of which are found naturally and some of which are not *eg twigs, unpolished/unfinished wood, sand, rocks, water, bone, clay, sheep's wool, glass, plastic, paper, cardboard* and ask them to sort the materials into those which are found naturally and those which are not. Show children objects *eg a wooden ruler or chair, a woollen jersey, a stone lampstand* and talk to them about how the natural material was altered in making the object and why people might want to do this. Ask children to use simple secondary sources *eg books, CD-ROMs* to find out how some materials *eg glass, paper, earthenware* are made from naturally occurring materials.

- ◆ Challenge children to classify materials by making a collage using only naturally occurring or only not naturally occurring materials.

- ◆ Give children a variety of materials to explore *eg plasticine, play dough, clay, Blu-tac* and ask them to make a variety of shapes *eg by twisting, stretching, bending, or squashing the materials*. Ask children to try to do the same with other objects *eg elastic bands, foam sponges, soft rubber ball* and to describe what happens.

- ◆ Ask children to make objects out of clay to describe what they are like and to predict what will happen when the clay is fired. Fire the clay and talk with children about the changes. Give children the ingredients of a cake to mix and cook. Ask children to describe the differences they observe before and after heating. Ask children what they need to record and show them how to construct a table. Discuss with children whether the fired clay or cooked cake could be turned back into its original form. Discuss other things that change when they are heated *eg bread to toast, frying or boiling eggs* and ask why we want to change things in this way.

- ◆ Make a number of ice shapes (different shapes and different sizes) and leave them in the room during the day. Ask children to touch the ice and describe what it feels like and observe what happens over the course of the session, answering questions *eg what happens to its shape, why is it changing shape?*

LEARNING OUTCOMES

CHILDREN

- identify criteria for sorting, suggest uses for the materials from which objects are made

- recognise that some materials are naturally occurring and some are not
- name some naturally occurring materials
- distinguish between the material and the object made from it *eg between wood and a wooden spoon*

- choose natural or manufactured materials for their picture

- use terms *eg squash, bend, twist, stretch*
- identify some materials which can be changed by squashing, bending, twisting and stretching, some that easily change back and some that cannot easily be changed *eg stone*

- describe changes that take place when some materials *eg clay, bread, potatoes* are heated
- explain that the new materials made are different and often useful


- describe ice as 'cold' and use terms *eg 'melting', 'turning to water'* when describing what happens to ice shapes left in the room

POINTS TO NOTE

This activity is intended to help teachers find out what children remember from Unit 1C. Teachers will need to take this into account in their short-term planning of later activities.

Children will need help to distinguish the object from the material used to make the object. It is helpful to have available a number of objects made of the same material.


Children often have difficulty recognising a material that has been shaped as natural. It is helpful to have both the material and an object made from the material *eg sheep's wool and a woollen jersey, a twig and a wooden ruler*.

 **SAFETY** – Sheep's wool must be washed before being handled by children. Bones must be sterilised if they are used. Young children should not handle glass objects but can touch windows etc.

This activity is very similar to an activity in Unit 2E and could be carried out quickly if children seem familiar with the ideas.


These activities illustrate science in everyday life and could be taught through a theme *eg science in the kitchen*.

Children do not need to be introduced to the terms 'reversible' and 'irreversible' at this stage.

 **SAFETY** – Cooking activities must observe conditions of scrupulous hygiene including hand-washing, use of clean utensils and disinfecting surfaces. Use of cookers must be clearly supervised. See 'Be Safe', Section 4.

This activity will need to be started early in the session.

Children enjoy exploring 'ice balloons'.

 **SAFETY** – Children should not touch ice immediately after it has been taken out of a freezer.

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- to use their knowledge about what makes ice melt to plan what to do
- to recognise what would make a test unfair
- to use results to draw a conclusion about which place is warmest

- to use a table to make a record of observations

- that many materials change when they are cooled
- to suggest how some materials might change when they are cooled
- to decide whether their observations matched their prediction

- to make observations and simple comparisons
- to decide whether what happened was what they expected

- that water turns to steam when it is heated but on cooling the steam turns back to water

POSSIBLE TEACHING ACTIVITIES

- ◆ Ask children to suggest many ways in which ice could be made to melt more quickly. Establish that an ice cube will melt more quickly in a warmer place and ask children how they could use this to find the warmest place in the school/classroom. Discuss ideas and agree a method *eg putting ice in 5 places and observing them every ¼ hour*. Show children a large piece of ice and a small ice cube and ask them if it would be all right to use these in different places. If necessary, prompt children by reminding them of the previous activity. Agree that it would be fair to use ice cubes of the same size.

- ◆ Show children how to make a table for the observations, drawing attention to what they need to record *eg where the ice cubes were put, when they were observed*. Talk with children about what happened and help them draw conclusions.

- ◆ Ask children to suggest how to turn water into ice. Freeze some containers of water and ask children to describe what the ice looks like. Ask children to suggest other materials that might change when they are cooled and to think about and find out what happens when *eg soup, tomato sauce* is put in the freezer.

- ◆ Ask children to suggest how they would make materials *eg butter, chocolate* become softer. Test their ideas and then ask them to predict what will happen if they leave the material to cool.

- ◆ Ask children to describe what happens when water is heated *eg in a kettle*. Demonstrate that when a cool surface is held near a steaming kettle, drops of water are seen on it. Talk with children about the idea that steam can be changed back to water by cooling.

Review work on changing materials by helping children to draw a concept map using terms *eg naturally occurring, change, heat, cool, freeze, melt, ice, water, steam, new material, bread, toast, clay*. Discuss outcomes and emphasise how heating some materials makes new materials *eg clay to fired clay, bread to toast, cake ingredients to cake*.

LEARNING OUTCOMES

CHILDREN

- make a suggestion of how to use ice to find the warmest place in the classroom
- explain why the comparison might not be fair *eg using different sizes and shapes of ice cube because this might change how long it took to melt*

- record observations clearly in a table
- draw conclusions from the work *eg ice melted first by the radiator. That was the warmest place*


- explain that water can be changed into ice by cooling
- describe what happens to some materials when they are cooled and say whether it was what they expected

- state that common materials *eg chocolate, butter, fat* become harder when they are cooled but softer when they are warmer again and relate this to what they suggested would happen


- describe that when water is heated, it boils and turns into steam, but that steam can be turned back into water by cooling

POINTS TO NOTE

This activity will need to be started early in the session. It offers children the opportunity to carry out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.

 **SAFETY** – Small samples of chocolate etc may be melted using small night lights or stubby candles standing in a metal tray *eg baking tray* filled with dry sand. Children should be kept away from the naked flame.

'Steam' is an acceptable term to use with children at this stage, although visible steam is condensed water droplets. Children at Key Stage 1 do not need to be introduced to terms such as 'evaporate', 'condense' or 'water vapour'.

 **SAFETY** – Take great care with hot water and steam. Note that some plastics soften in contact with hot water or steam. Children should be kept well back.

A concept map shows the connections between different ideas in a particular topic and is a useful source of information about children's understanding. Children will need to be taught how to make a concept map. At this stage it is helpful to have prepared labels showing the terms to be used and to use a limited number of terms.

In this concept map children will make a variety of connections *eg link change to heating and cooling; link freezing to cooling, water and ice; link ice water and steam; link toast, cake, fired clay to new materials, change and heating*.



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