

# GROUPING AND CLASSIFYING MATERIALS

## on the basis of their simple properties

### Science background for teachers

#### VOCABULARY

*Names of a variety of materials; wood, metal, plastic, paper, rock, sand, chalk, fabric, leather, cotton, oil, wax, natural, man-made*

*Words to describe materials using the senses; shiny, dull, transparent, soft, hard, rough, smooth, including 'smelling' and listening words such as smells 'peppery', sounds loud*

*Words to describe properties; solid, liquid, strong, tough, magnetic, bendy, squashy, elastic, waterproof, floater, sinker*

For children, 'materials' often mean fabrics or textiles when in fact we can use it to mean any substance. Materials exist as solids, liquids or gases and as mixtures of these and when introducing their classification it is worth beginning with this grouping especially with young children, since, for example, many of them think of liquids as being only water. Materials are also natural or man-made. Confusion often arises for children because man-made materials can be divided into two groups; those that are derived from natural products but are refined or altered by man for his use, and synthetic products originally derived from substances from the Earth and then changed chemically into new products. A further complication comes from the fact that some things originally made from the natural material like candles from beeswax, are now more commonly man-made, in this case from paraffin wax. At this stage it is also worthwhile discussing the term man-made where the word man is used generically and not specifically.

**Natural materials** include wool, cotton, linen, leather, wood, cork, stone, gravel, sand, salt, coal, gypsum, talc, some metals eg gold and silver, silk, oil, gemstones, beeswax.

**Converted raw materials** include pottery, china, earthenware, most metals eg steel and aluminium, coke, charcoal, rubber, paints, some medicines and drugs, paper and viscose.

**Synthetics** include plastics, polyester, acrylic, PVC, nylon, polythene, glass, some other medicines and drugs.

Materials are used for different jobs on the basis of their properties, so young children need to begin to identify such properties before they can consider the suitability of materials for different uses. They can group materials on the basis of the simple properties that they can experience with their senses, beginning with simple ideas such as texture, and building up to more complex concepts, such as elasticity. A large amount of descriptive vocabulary can be introduced in this context.

Most towns and villages have areas where glass, paper and metals can be taken, sorted and put into the appropriate bins for recycling. This science topic is an ideal opportunity to raise the children's awareness of this idea.

- SKILLS**
- Describing with increasing accuracy using the senses.
  - Grouping according to different and given criteria.
  - Carrying out simple tests.
  - Working cooperatively.
  - Recording in different ways.
  - Use software to combine words and pictures about objects.



Key ideas and activities

The senses can be used to explore the differences and similarities between materials

- (a) **Tactile** Prepare a 'feely' bag with different objects inside which have a variety of tactile properties. Pass the bag round, let the children feel an object without looking and describe what they feel, then pass the bag on. Include bendy, stretchy and squasy objects.
- (b) **Observation** Children draw some objects and describe them; include transparent and shiny objects. Encourage the children to name the material the objects are made from.
- (c) **Sense of smell** Prepare some 'smelly' materials and put them in opaque jars or boxes with lids. The children take off the lids and describe the smells without looking inside. (Use small pieces of soap, spices, onion, herbs, cotton wool soaked in vinegar, lemon juice, coffee.)
- (d) **Hearing** Show the children a tray of objects, then unseen you tap the object (set up a screen or get the children to turn round) and the children guess which one it was and describe the sound. Include soft items such as a cushion so that they hear nothing even though you are hitting it. (Noise pollution is often a consideration in using a material eg rubber feet on furniture.)
- (e) **All the senses** Give the children different objects which they describe using all their senses.
- (f) **Sorting materials using the senses** Children can begin to classify and sort objects and the materials from which they are made. Set up different tables displaying different types of materials eg a table of shiny things, transparent things, soft things, and get the children to record the object, material and its property.

Include a table of materials that may be stretchy or squasy, older children can be introduced into the idea of materials being 'elastic'.



Object	Material	Properties
 Bear	Wool	Soft, Warm, Squidgy
 Car	Metal	Hard, Cold, Shiny

Toys on our table.

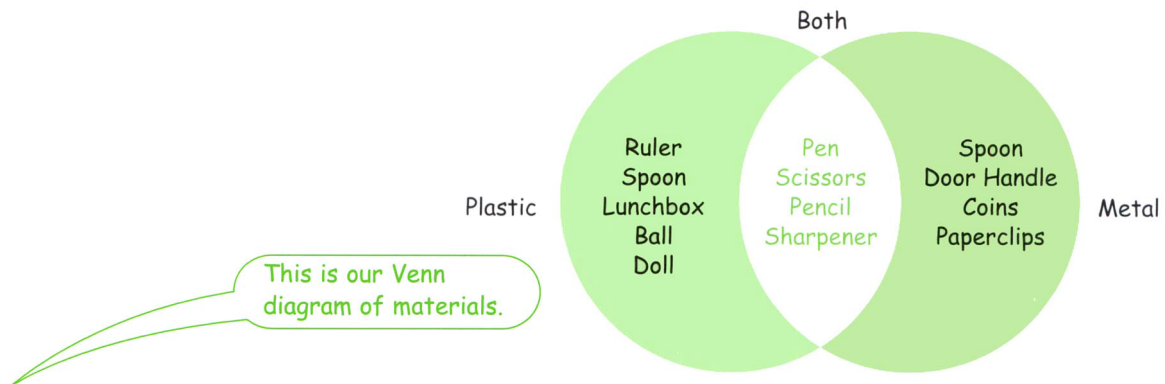
- (g) **Materials may be sorted in various ways** Re-sort some of the materials in a different way eg a glass is transparent and hard.
- (h) **Recognising materials/objects using a verbal description** Play an 'I spy' game, describe an object or material and the children guess what it is from your description.

**ART ACTIVITIES**

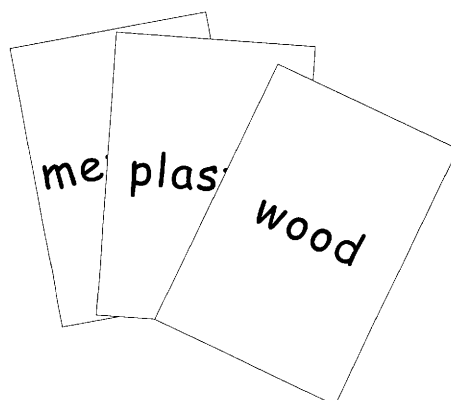
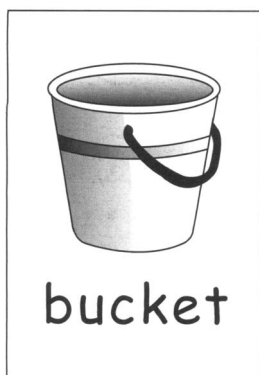
such as drawing, painting and using materials to make collage can be used here very effectively. For example, get the children to make collage using only paper, only shiny materials, only natural materials etc.

**Recognising, naming and sorting common types of material including those which are found naturally**

- (a) **Naming and sorting** As in activity (f) above set up tables of different, named materials – wood, metal and plastic, and get the children to record in this way. They can begin to do Venn activities using hoops to sort the materials and eventually recording using Venn diagrams. At this point it is worth discussing how objects do not always look as though they are made from the same material, even though they are, and this is because of the variation within the same material, eg different types of woods and plastics. Older children can be introduced to specific names of materials, such as polythene bag instead of plastic bag, stainless steel rather than metal.



- (b) **Matching card game** Make or purchase a matching materials card game for the children to play, where children match a picture with the name of a material that it may be made from. So they may match a picture of a bucket with 'plastic' or 'metal'.



We made a matching card game about materials.

Materials have a variety of uses and the same object may be made from different materials

Objects and materials have different properties that can be tested, and may be grouped according to those properties



Branching database  
Venn diagrams

### Safety!

- Carry out an assessment of the hazards and risks of using elastic bands and rulers.
- Goggles should be worn.

- (c) **Natural and manufactured materials** Begin to discuss the idea of natural materials using obvious examples such as wood as natural and plastic as man-made and get the children to record some and say their origin, eg draw a wooden object and a tree. A **sorting activity** could be done also using natural and man-made as the criteria. Older children can consider sorting man-made products into synthetics (raw materials that have been chemically changed such as nylon) and non-synthetics (converted raw materials such as pottery).
- (a) **Different uses for the same material** Using for example, a 'wood' table, discuss the uses of the different objects made of wood and get the children to record these or their own objects or collect pictures and record the uses. Do this for a variety of materials.
- (b) **Objects used for the same purpose made from different materials** Look at a collection of similar objects eg mugs and discuss what they are made of. Do this for some other objects, eg shoes, hats.

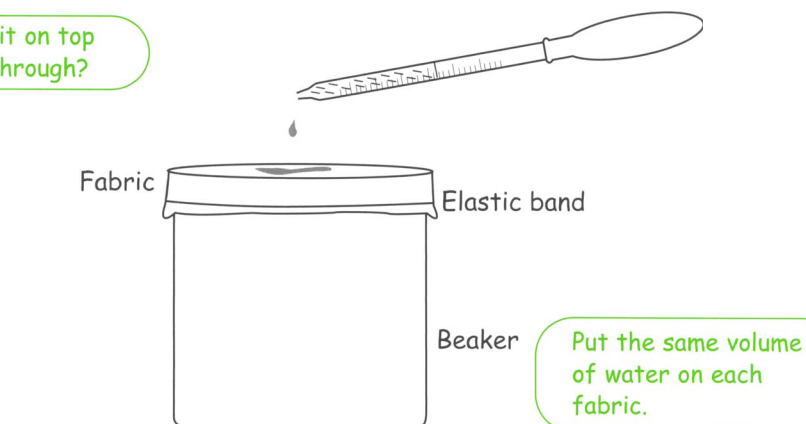
Some of these activities may be set up as simple classification **investigations** by asking the children how they would find out which things were for example **magnetic** or **floated**. Older children could **investigate** Are all metals magnetic? Which is the best magnet?

- (a) **Ability to float** Get the children to test a range of objects and materials using bowls or plastic boxes of water. Get them to change the shapes of some materials to see if it makes a difference, eg foil and plasticine screwed up and made flat.
- (b) **Magnetic or non-magnetic** Give the children magnets and a selection of objects including metals and non-metals to find out which are magnetic. This can be used as a simple classification activity which they can record in chart form.
- (c) **Ability to change its shape** Which materials will change their shape and remain in the new shape (plastic) or return to their original shape (elastic)? Give a variety of materials to test including, clay, (part of an art activity), plasticene, Blu-tack®, foam sponge, elastic bands, nylon, rubber ball, plastic rulers.

Object	Material	Change Shape	Go back again
Ball	Rubber	Yes	Yes
Lump	Plasticene	Yes	No

- d) **Waterproof** Which materials are waterproof? A simple way to carry out this activity is to lay different materials onto paper and, using a dropper, drop water onto the materials. If the water goes through, the material is not waterproof, if it sits on the top it is. Alternatively, stretch equal sized pieces of material over jam jars and drop equal quantities of water from a dropper onto the fabric. Water will sit on the top of waterproof materials. A chance to discuss 'fair testing'.
- (e) **Absorbency** If a material is not waterproof then it may be absorbent and sometimes absorbency is a quality that we want, for example, in blotting paper and babies' nappies. Absorbent materials will hold a lot of water in their fibres. The waterproof activity above can also be used to test for absorbency. Instead of dropping equal quantities of water onto the fabric, water is dropped on continually until the fabric will hold no more and the water just drips into the jar underneath. The amount of water absorbed by each fabric can then be recorded. The most absorbent fabric is the one that holds the most water. Older or more able children could plan their own **investigation**; 'Which is the most absorbent cloth?'

Does it sit on top or soak through?



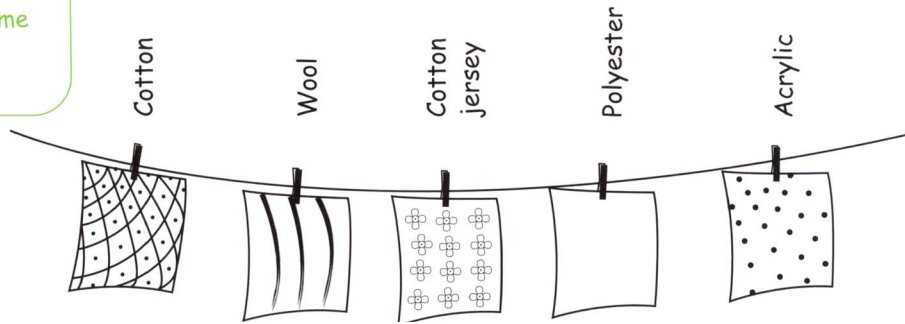
Put the same volume of water on each fabric.

## Safety!

- Goggles should be worn when testing some elastic materials eg elastic bands, and plastic rulers.
- Care should be taken when handling glass.
- Collections of objects may present potential hazards – sharp, small and may be swallowed, etc.

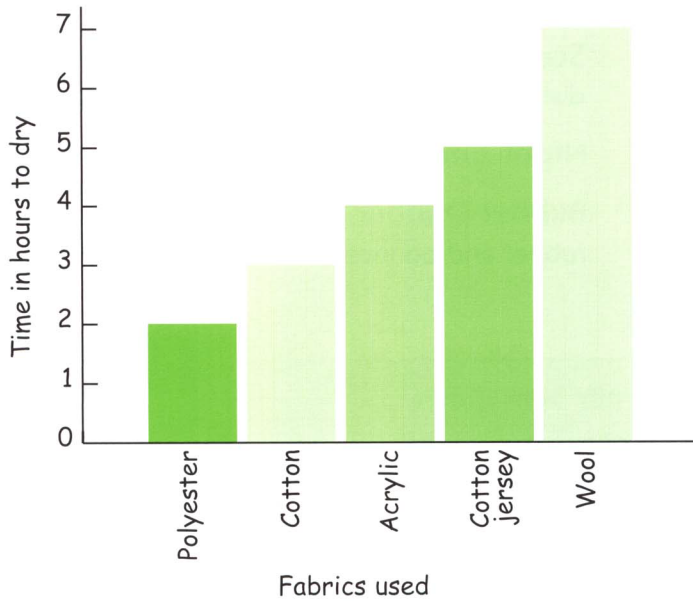
- (f) **Making waterproof paper** This activity can have cross-curricular links with art. Rubbing or drawing with wax crayon or candle onto paper then washing over the picture with a paint or ink wash. Children can see that the wash does not go where the wax has been.
- (g) **Drying fabric Investigate** Which fabric dries the fastest? An opportunity to involve fair testing using equal sized pieces of fabric, measured equal volumes of water, timing, and recording results in a block graph. This is also an opportunity to use science in an example of an everyday activity.

Use the same size fabric and the same volume of water each time.



Where shall we put our washing line?

A graph to show the time taken for fabrics to dry



h) **Transparent papers** Which papers can you see through clearly (transparent), which show the light through (translucent) and which show nothing through (opaque)? Children can **investigate** papers and put them in an order of transparency. Older children can learn the correct terms.

(i) **Writing/drawing paper** Is all paper good for drawing on? **Investigate** which is the best. This activity is beginning to look at the specific uses of a material for a purpose, and is very appropriate for young children. All children have experienced the



Writing Tool	Type of Paper			
	Cartridge	Tissue	Tracing	Newsprint
Lead Pencil	Good	Tears it	Good	Faint
Coloured Pencil				
Wax Crayon				
Pastel				
Chalk (White)				

frustration of paper that you can't draw on properly. This **investigation** is simple, keeps the variables to a minimum and they can use the paper they test as a record for their results. They could also try different writing implements on different paper. The children can chart their results.

**Woolly Saucepan** The wrong materials used for things, as the name suggests.

**Bottle Bank** At the bottle bank, things are sorted according to the colour they are.

**Grandparents House** In the house there are lots of interesting things made from different materials.

**Scoop a Gloop** Clay is a very tactile material, which also has a distinctive smell. It can change its shape and finally becomes hard.

**Night-time Kitchen** The different materials used in the kitchen.

**Rubber Dubber** Balls are made of various materials, this one is rubber and bounces.

star\*  
Poetry

by Michael Rosen

### Woolly Saucepan

Could I have  
a woolly saucepan  
a metal jumper  
a glass chair  
and a wooden window-pane please?

Er-sorry – I mean  
a woolly chair  
a glass jumper  
a wooden saucepan  
and a metal window-pane please?

Er-sorry – I mean  
Oh – blow it!  
You know what I mean, don't you?



### Bottle Bank

The bottle bank  
gobbled up my bottle  
and the bottle bank  
went clank.

That's bad. Look at all the work I do  
giving it hundreds of bottles to chew.

And that's not all:  
at home,  
we've got three bins:  
one for bottles,  
one for paper  
and one for tins.

After all that work  
I don't think  
a bottle bank  
should just say clank.  
I think  
bottle banks  
should say thanks.



### Grandparents' House

At my grandparents' house  
they've got a very old plate  
with a gold edge round it  
and my grandad says,  
it's real gold  
that's so thin it's like paper.

At my grandparents' house  
they've got a very old picture  
made of wood,  
and my grandma says  
that her grandad made it  
by cutting out lots of tiny bits  
of different kinds of wood  
to make all the colours.

At my grandparent's house  
they've got a very old newspaper that tells the story of how  
when my grandparents  
were teenagers  
they once rowed out to sea  
and nearly drowned  
and the paper has gone all brown.

At my grandparents' house  
they've just fitted a new kitchen  
and it looks like it's made of wood  
with all the lines and whirly bits  
but really it's plastic.

I love going to my grandparents' house  
and looking at all their stuff.

### Scoop a Gloop

Scoop a gloop  
of slimy clay  
squeeze it, knead it,  
pummel it, stretch it  
roly poly, roll it  
into long, thin  
sausages.

Bend them, coil them  
one on top  
of one another  
up and up  
and round and round  
to make a  
pot.

It's still soft  
and leans a bit  
but wait –  
and wait –  
it slowly hardens  
sits dry and dusty  
crisp as a biscuit.

Don't tap  
or drop  
it'll crack  
or crumble.

Take it gently  
to the kiln  
and under fire  
of fantastic heat  
it strengthens  
toughens  
enough  
to let you  
use your spoon  
or run your  
thumbnail  
up and down  
your clever coils.

### Night-time Kitchen

It was all dark in the kitchen  
Everyone was in bed,  
when suddenly the saucepan said  
'It's time I had a bit of respect  
around here.

I get thrown about, banged down,  
scraped with a spoon,  
left for hours covered in old food.

I am made of the finest steel.  
I want everyone to know  
that if it wasn't for steel  
and all the other metals round  
here this whole place would  
grind to a standstill.

Without us, there would be **nothing**.

We are the most important.  
They wouldn't be able to cook  
without their metal cooker.  
They wouldn't be able to eat  
without their metal knives and forks.  
They wouldn't be able to drink  
and keep clean  
if it wasn't for all the metal pipes.

From now on  
everyone round here  
should call us Lord.  
Lord Saucepan, Lord Spoon,  
Lord Tap and – '

The breadboard had been listening  
to all this  
and was getting cross.

'Hang on there, Potty!  
Those of us round here  
who are made of wood  
think we've got a case.'  
'Huh!' said the saucepan,  
'hark at old Blockhead!'

'No, listen.

Without wooden table and chairs  
they'd be eating off the floor.

But without wooden floorboards  
they'd be eating off the ground.

But without the wooden beams  
the house would fall down  
on everyone

so no one would be left alive  
to use you, Mr Potty.

If anyone round here ought  
to be called Lord  
it's people like Floorboard.'

'So,' said the saucepan,  
turning to the window,  
'who's the most important  
round here?  
Metal or Wood?'

And the window said,  
'This is crazy.

We don't think either of you  
should boss over the rest of us.  
You're both great stuff –  
different but both great.

But watch it –  
You saucepan. They're making  
glass saucepans, these days.  
And you, table!  
Glass tables are really rather fancy.'

And at that  
metal and wood  
agreed to respect each other  
though they're still arguing  
they would stop rowing  
though they're arguing over  
which of them  
should be the door handle!

### Rubber Dubber

Rubber dubber  
flouncer bouncer  
up the wall  
and in and outer  
under over  
bouncing backer  
mustn't dropper  
mustn't stopper  
in betweener  
do a clapper  
in betweener  
do a spinner  
faster faster  
to and fro-er  
rubber dubber  
flouncer bouncer  
BUT

then oh bother!  
Butter finger  
dropped the ball  
and pitter patter  
patter pitter  
rubber ball  
ran right away.

