

## Year 2

### Materials and Properties (follow on from Year 1)

#### Background information

This unit builds on the work done in year one where children identified different materials and their properties by relating the properties a material has to its use. It provides the opportunity for lots of investigative work. Higher order thinking skills can be developed by using activities such as positive, minus and interesting when considering a chocolate tea pot for example or odd one out where a range of materials are shown and they would have to identify why each material would be the odd one out. They could also think of the most ridiculous object that could be made out of a material e.g. a glass football. Riddles and rhymes could also be used to identify materials; I could be a bottle bobbing about in a fast flowing stream. I could be a spoon mixing and stirring delicious porridge, I could be the last block in a toppling tower. I could be a Frisbee swirling through the air. What material am I? The children could then go on to write their own.

The absorbency test would be best delivered in a context e.g. best material for mopping up spills. The property of shock absorbency could be linked to books such as Egg Drop by Mini Grey and could link with making egg parachutes or through the nursery rhyme Humpty Dumpty. Stretchy/non stretchy could be investigated by stretchy a range of materials. The transparency investigation would link to making windows. **Avoid the properties of waterproofing/ strength as these have been investigated in year 1.** You might want to look at the curly wurly stretching record as part of your forces on materials lesson and could challenge the children to change a fixed amount of playdough into the longest length possible.

All objects are made of one or more materials that are chosen specifically because they have suitable properties for a task. For example, a water bottle is made of plastic because it is transparent allowing you to see the drink inside and waterproof so it holds the water. When choosing what to make an object from, the properties need to be compared with the properties of possible materials, identifying through simple tests and classifying activities. A material can be suitable for different purposes and an object can be made of different materials.

Objects made of some materials can be changed in shape by bending, stretching, squashing and twisting. For example clay can be shaped by squashing, stretching, rolling, pressing etc. this can be a property of a material or depend how the material has been processed e.g. thickness.

#### Common misconceptions.

- Only fabrics are materials.
- The word "rock" describes an object rather than a material.
- Solid is another word for hard.

Also see

Explorify <https://explorify.uk/teaching-support/teaching-science/materials-tackle-the-tricky-bits>

BBC Bitesize clips including – what are objects made from: Materials and their uses;/Materials and their properties;/Which material do we use?/ What materials are waterproof

BP educational Services – introducing materials <http://bpes.bp.com/primary-resources/science/ages-4to-7/uses-of-everyday-materials/introducingmaterials>

Further ideas <https://explorify.uk/teaching-support/teaching-science/materials-explore-with-your-class>

Famous women inventors. [www.women-inventors.com/Margaret-Knight.asp](http://www.women-inventors.com/Margaret-Knight.asp)

Duct Tape Teddy Bear Tent. [www.youtube.com/watch?v=py-EN3Z3G3Q](http://www.youtube.com/watch?v=py-EN3Z3G3Q)

*Activities in italics are optional*

#### **What children should already know / can do**

I can distinguish between an object and the material it is made from.

I can explain the materials an object is made from.

I can name wood, plastic, glass, metal, water and rock.

I can describe the properties of everyday materials. (hard, soft, stretchy, stiff, shiny, dull, rough, smooth etc.)

I can group objects based on the materials they are made from.

National Curriculum Objectives	Children's objectives
<ul style="list-style-type: none"> <li>● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.</li> <li>● Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.</li> </ul>	<ul style="list-style-type: none"> <li>● I can identify and name a range of materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard.</li> <li>● I can suggest why a material might or might not be used for a specific job.</li> <li>● I can explore how shapes can be changed by squashing, bending, twisting and stretching.</li> <li>● I can research scientists who have found useful new materials.</li> </ul>
<p><u>Scientific enquiry.</u></p> <ul style="list-style-type: none"> <li>● Performing simple tests.</li> <li>● Using their observations and ideas to suggest answers to questions.</li> <li>● Gathering and recording data to help in answering questions.</li> </ul>	<ul style="list-style-type: none"> <li>● I can carry out simple tests independently investigating the properties of materials.</li> <li>● I can sort and group objects identifying my own criteria for sorting.</li> <li>● I can record what I have found out.</li> <li>● I can explain how I found something out.</li> <li>● I can make measurements using non- standard units. (amount of water for absorbency , length for stretchiness)</li> <li>● I can draw a simple table to record my results.</li> <li>● I can use simple data to answer a question.</li> <li>● I can use and spell simple scientific language.</li> </ul>

## Assessment

- Name the material your object is made from. What are its properties?
- Name 5 things made of metal, paper etc.
- Why are windows made of glass? (relating materials to properties)
- Name or sort materials that are natural/ man-made.
- Which material was the most absorbent? How did you find out?
- How did we find out which material stretches the most, absorbs the most shock or is the most transparent?
- Give the children playdough and ask them to make an animal describing the movements they make.
- What did our famous scientist invent? Tell me some facts about them.

Working towards	Expected	Exceeding
<p>I can identify a range of different materials and state some of their properties. I can say which material is most suitable for a specific purpose. I can make a prediction. I can perform a simple test recording my findings in a simple table with support. I can say which material I think would be best for a specific purpose. I can say why a material can or cannot be used for a specific purpose. I can change some materials by squashing, bending, twisting and stretching. I can state the material a famous scientist has developed with help.</p>	<p>I can identify a range of different materials and state their properties. I can say why a material is suitable for a specific purpose making reference to its properties. I can make a sensible prediction. I can perform a simple test recording my findings in a simple table. I can say which material would be useful for a specific purpose using my results. I can say why a material can or cannot be used for a specific purpose giving reasons. I can recognise that some materials can be changed by squashing, bending, twisting and stretching and identify some that can't. I can state the material a famous scientist has developed.</p>	<p>I can identify a range of different materials and state their properties. I can say why a material is suitable for a specific purpose giving reasons related to its properties. I can make a reasoned prediction. I can perform a simple test independently recording my findings in a table. I can say which material would be useful for a specific purpose using my results and giving a reason why. I can say why a material can or cannot be used for a specific purpose referring to their properties. I can recognise that some materials can be changed by squashing, bending, twisting and stretching and identify some that can't, suggesting why. I can state the material a famous scientist has developed and state some facts about them.</p>

## Key vocabulary

Names of materials; **wood, metal, plastic, glass, brick, rock, paper, cardboard.**

Types of movement; **push/pull, twist, squash, bend, stretch.**

**Absorbent**; able to soak up a liquid.

**Flexible**; can be bent.

**Manufactured**; a new material made by humans.

**Material**; something an object is made of.

**Natural**; a material found in the local environment.

**Opaque**; doesn't allow light through.

**Property**; a quality of a material.

**Rigid**; can't be bent.

**Translucent**; allows some light through.

**Transparent**; allows light through.

**Observe**; look closely.

**Predict**; state what might happen.

**Table**; a way of organising our results.

**Test** or **investigate**; a way to find out.



## Character Opportunities

Curiosity and critical thinking - asking questions about the world around them

Ambition - recognising opportunities available

Resilience - sticking at something in order to find the answer

## Some STEM careers linked to unit

Builder (builds structures)

Designer (designs objects or interiors to fulfill a purpose)

Materials scientist (researches structures and properties of materials)

Sports equipment design engineer (designs sports equipment)

*Activities in italics serve as suggestions for ideas*

Lesson Objectives	Working Scientifically	Activities	Thinking skills / metacognition opportunities and creative suggestions
<ul style="list-style-type: none"> <li>● To revise the names of common materials</li> <li>● To introduce the idea that there are different uses for materials</li> <li>● To understand that materials can be <b>natural and man made</b></li> </ul>	<ul style="list-style-type: none"> <li>● Observing</li> <li>● Gathering and recording data</li> <li>●</li> </ul>	<ul style="list-style-type: none"> <li>● Read the poem 'Woolly Saucepan' Michael Rosen</li> <li>● Prepare a lucky dip box for each group. Take turns to put hand in and describe the <b>properties</b> of the object modelling appropriate language, eg squashy, stretchy etc. Children ask questions to help identify object. Reveal and discuss why material is suitable for the purpose</li> <li>● Draw picture of object and label with <b>material and properties</b></li> <li>● Children sort objects in to groups with similar properties</li> <li>● Include <b>opaque, transparent and translucent</b> materials</li> <li>● Group into <b>natural</b> and <b>man made</b> materials</li> </ul>	<ul style="list-style-type: none"> <li>● Look for objects that are made from several different materials</li> <li>● How many different 'plastics' can children find – Consider why this is so (plastics can be made cheaply. Consider plastic waste and how long it takes to degrade</li> <li>● Make up a 'Woolly saucepan' style poem of their own</li> </ul>
<ul style="list-style-type: none"> <li>● Understand that different materials can be used for different things</li> <li>● To identify and discuss uses of everyday materials</li> </ul>	<ul style="list-style-type: none"> <li>● Observation and using these to suggest answers to questions</li> </ul>	<p>Consider the <b>absorbency</b> of different types of materials</p> <p>Set up a simple test to find which is the most/least absorbent. This could be in the form of testing different kitchen towels or cloths. <b>Observe</b> what happens.</p> <p>Record results in a <b>table</b></p>	<p>Create an advert showing how good the chosen product is.</p>
<p>To know that different materials have different properties</p>	<ul style="list-style-type: none"> <li>● Observation and using these to suggest answers to questions</li> </ul>	<p>Children investigate a range of materials to investigate what happens when a force is applied. Forces to include twisting, squashing, bend and stretch.</p> <p>Using these forces - test different types of sweets eg jelly worms, liquorice allsorts - children <b>predict, observe and record</b> what happens. Consider whether any changes that happen are reversible (does a squashed sweet go back into shape)</p>	

<ul style="list-style-type: none"> <li>● Understand that different materials can be used for different things</li> <li>● To identify and discuss used of everyday materials</li> </ul>	<ul style="list-style-type: none"> <li>● Observation and using these to suggest answers to questions</li> <li>● Record findings in different ways</li> </ul>	<p>Set up a <b>test/ investigation</b> to find the most shock absorbing material eg using an egg drop test with sponge, tissue paper, polystyrene etc etc</p>	
<ul style="list-style-type: none"> <li>● Understand that different materials can be used for different things</li> <li>● To identify and discuss used of everyday materials</li> </ul>	<ul style="list-style-type: none"> <li>● Observation and using these to suggest answers to questions</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Evaluate</b> products look at different styles of the same product eg pen tidies. Give each group an example of the pen tidy and get them to decide if it is suitable to use and its effectiveness. Groups present their ideas back to class. Are materials suitable? Which other materials could have been used for the same purpose and would they have been better or worse. If they made their own, what would they use?</li> <li>● Provide children with a variety of items and materials to make pen tidies eg cardboard tubes boxes, paper cups etc, corrugated plastic etc. Ch sort items into whether they think they are useful for making desk tidy. Design in groups and feedback to class in terms of the properties of the materials they used (eg were they easy to cut/shape; were they too <b>rigid/flexible</b></li> </ul>	<ul style="list-style-type: none"> <li>● Diamond rank the properties of a pen tidies–</li> <li>● BBC Bitesize – grouping and changing materials</li> <li>● Modelling/drama – children mime eg climbing a metal ladder then swapping it for a one made from eg jelly or paper</li> <li>● Hot seating – rest of class asks questions on design</li> </ul>
<ul style="list-style-type: none"> <li>● Understand that different materials can be used for different things</li> <li>● To identify and discuss used of everyday materials</li> </ul>	<ul style="list-style-type: none"> <li>● Gathering and recording data</li> <li>● Performing simple tests</li> <li>● Using observations and ideas to suggest answers to questions</li> </ul>	<ul style="list-style-type: none"> <li>● Research Margaret Knight and the flat bottomed paper bag. Explore different types of paper bags and discuss their uses. Is paper a good material to make a bag. What other materials could be used?</li> <li>● Investigation -Children are asked what the best type of paper to make a paper bag is. What does it need to be (strong, stretchy, bendy, hard etc) Consider the design of the bag and the purpose. Design, make, test and review</li> </ul>	<p>Use photos as a way of recording results for children to easily record findings</p> <p><u>Talking points – True, false or not sure</u></p> <p>Is it better to make bottles out of plastic or paper?</p> <p>Is it better to make a bouncy ball out of stone rather than rubber?</p> <p>Is it better to make a hat out of glass rather than metal?</p> <p>Is it better to make a knife out of paper than metal</p> <p>Children make up own questions</p>

<ul style="list-style-type: none"> <li>● To understand that different materials have different properties</li> <li>● To understand that the properties of a material make it suitable for particular purposes</li> </ul>	<ul style="list-style-type: none"> <li>● Gathering and recording data</li> <li>● Performing simple tests</li> <li>● Using observations and ideas to suggest answers to questions</li> </ul>	<ul style="list-style-type: none"> <li>● Design and make a tent for teddy investigation – identify requirements (eg waterproof, windproof, easy to fold into a bag etc) <i>Groups set own criteria</i></li> <li>● Test the suitability of different materials for a lace for a shoe</li> <li>● Decide on the suitability of materials for a parachute for an egg</li> <li>● Effect of different types of paper for making paper aeroplane</li> <li>● How can materials be strengthened (folding, laminating (sticking layers together), woven etc)</li> </ul> <p><i>You have been asked by Amazon to test different types of packaging for boxes</i></p> <ul style="list-style-type: none"> <li>● <i>Investigate paper versus corrugated card. How can materials be made stronger? Carry out tests on different types of cardboard packaging to see which is the strongest. Try dry/damp card,</i></li> </ul>	<p>Children design their own investigation for testing tent materials</p>
<ul style="list-style-type: none"> <li>● To investigate how the shape of a material can be changed by stretching/bending/twisting it</li> </ul>	<ul style="list-style-type: none"> <li>● Performing simple tests</li> <li>● Gathering and recording data</li> </ul>	<ul style="list-style-type: none"> <li>● <i>Test how far elastic bands will stretch and measure the results</i></li> <li>● <i>What about a curly whirly or a Mars bar - what are the properties of the different parts eg the chocolate, nougat and toffee?</i></li> <li>● <i>Make dough and cook bread rolls</i></li> <li>● <i>Make a model using twisting of materials – is change permanent or not</i></li> <li>● <i>Investigate theraputty versus blue tac and plasticine – what is the difference between the three materials?</i></li> </ul>	
<p>To explore how Dunlop invented inflatable tyres Or Charles Mackintosh invented waterproof material</p>	<ul style="list-style-type: none"> <li>● Use observations and ideas to suggest answers to questions</li> </ul>	<ul style="list-style-type: none"> <li>● Research inventors online through books</li> </ul>	<p>Imagine you have Invented a new material. What is it called, What are it's properties and what could it be used for. Design a poster/write a letter to the patent office</p>
<ul style="list-style-type: none"> <li>●</li> </ul>	<ul style="list-style-type: none"> <li>● Use observations and ideas to suggest answers to questions</li> </ul>	<p><i>Investigate the structure of a range of different materials using magnifiers eg wool and cotton fabrics. Does the weave affect how the material behaves?</i></p>	

<ul style="list-style-type: none"><li>● To know that when materials are combined together they can affect the properties of other materials</li></ul>	<ul style="list-style-type: none"><li>● Use observations and ideas to suggest answers to questions</li></ul>	<ul style="list-style-type: none"><li>● <i>Make simple pizzas using yeast mixture. Make close observations throughout. Observe what happens to the yeast in warm water. How does this affect the pizza base? Make pizza base without adding yeast and compare.</i></li></ul>	
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