

Autumn Block 3

Materials

Small steps

Step 1

Explore materials

Step 2

Wood, paper and cardboard

Step 3

Brick and rock

Step 4

Glass and plastic

Step 5

Metal

Step 6

Fabrics

Step 7

Same object, different material

Step 8

Test materials – bend, squash, twist and stretch

Small steps

Step 9

Plan – waterproof experiment

Step 10

Investigate – waterproof experiment

Key resources

Step 1 – Explore materials

- natural materials – wood, sand, wool
- human-made materials – plastic
- metal objects
- recyclable materials
- non-recyclable materials
- large sorting hoops



Step 2 – Wood, paper and cardboard

- paper – tracing, sugar, tissue
- cardboard – different thickness
- wooden objects



Step 3 – Brick and rock

- examples or photographs of rocks
- examples or photographs of bricks
- hand lenses



Step 4 – Glass and plastic

- flexible plastic objects – plastic bags, cling film
- rigid plastic objects – toys, lunch boxes, water bottles
- glass objects – beads, marbles, bottles
- large container – depending on testing question
- water – depending on testing question
- torches – depending on testing question



Key resources

Step 5 – Metal

- flexible metal – drinks can, tin foil
- rigid metal – coins, water bottles, pans, cutlery



Step 6 – Fabrics

- cotton
- denim
- wool
- nylon
- items made from a range of different fabrics – hats, scarves, gloves



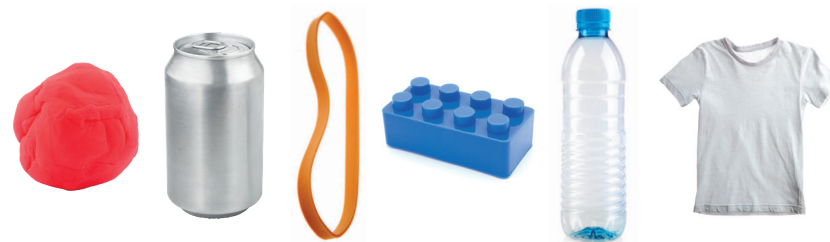
Step 7 – Same object, different material

- plastic, paper and glass plates/cups
- plastic, metal and wooden toys
- plastic, metal and wooden cutlery



Step 8 – Test materials – bend, squash, twist and stretch

- modelling clay
- metal drinks cans
- elastic bands
- building blocks
- plastic water bottles
- cotton material



Key resources

Step 9 – Plan – waterproof experiment

- foil
- nylon
- cling film
- felt
- beakers (four per group)
- elastic bands (four per group)
- pipettes (one per group)
- water
- timer



Step 10 – Investigate – waterproof experiment

- foil
- nylon
- cling film
- felt
- beakers (four per group)
- elastic bands (four per group)
- pipettes (one per group)
- water
- timer



Explore materials

Notes and guidance

In Year 1, children explored a range of familiar materials and carried out simple tests to explore floating, sinking, melting and absorbency, as well as transparent and opaque materials. In this small step, children build on this knowledge to identify, group and sort materials.

Children identify objects that are made from natural, human-made and recyclable materials. They should be encouraged to sort and group the same materials in more than one way.

This step allows children to think sustainably about different materials. They should discuss why it is important to reuse and recycle materials. This will be built upon in the later “Plastic” sustainability block.

Things to look out for

- Children may think that the term “material” is only used for objects inside the classroom such as toys or equipment. Allow children to identify materials outside in their local area to address this misconception.
- Children may think that all materials are human-made. Show examples of common natural materials such as wood, wool and sand.

Key questions

- What are natural materials?
- What are human-made materials?
- What does “recyclable” mean?
- Is _____ a recyclable material?
- How could you sort and group these materials?
How many ways can you think of?

Sustainability link

- Why is it important to reuse and recycle materials?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Identifying and classifying.

Explore materials

Key vocabulary

- **material** – what an object is made from



- **natural material** – a material that comes from animals, plants or the Earth



- **human-made material** – a material made by people



- **recycle** – to change rubbish into a material that can be used again



Practical ideas

- Carry out a material hunt outside.

What materials can children identify?

Repeat the material hunt in the classroom.

What materials can children identify inside?

How are they similar to or different from the materials outside?

- Allow children to sort and group materials based on different categories.

Use large hoops to help them sort and group correctly.

- Play games with children such as “Guess the material” to challenge their thinking. Children give clues by describing the properties of the material for other children to guess.



Factual knowledge

- Objects can be made from different materials.
- Some materials are natural, such as sand, wood and wool.
- Some are human-made such as plastic and cardboard.
- Some materials are recyclable and can be used again.

Wood, paper and cardboard

Notes and guidance

In this small step, children look at the materials wood, paper and cardboard in greater detail. They learn that paper and cardboard are made from wood.

Children perform simple tests on each material to learn more about their structure and properties. They should try to change the shape of the material through folding, tearing and squashing. To extend learning, children could suggest other ways to test the materials.

After children have carried out these tests, they should identify the simple properties of each material and discuss their suitability for a range of uses. It is important that they identify when a material is suitable as well as unsuitable for a purpose.

Things to look out for

- Children may think that all paper has the same thickness and texture. Provide a wide range of different paper and card for children to test, such as tracing paper, sugar paper and cardboard.
- Children may think that all wooden objects are heavy.

Key questions

- What is paper and cardboard made from?
- What words could you use to describe wood?
- What words could you use to describe paper?
- What words could you use to describe cardboard?
- Can you change the shape of paper, cardboard and wood?
How?
- Which material would be most suitable for a _____?
Why?
- Which material would be unsuitable for a _____?
Why?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Performing simple tests.

Wood, paper and cardboard

Key vocabulary

- **material** – what an object is made from



- **smooth** – an even surface



- **rough** – an uneven surface



- **flexible** – can change shape easily



- **rigid** – cannot change shape easily



Practical ideas

- Children carry out simple tests on wood, paper and cardboard to learn more about their physical properties. They should try to change the shape of the materials by folding, squashing and tearing.



Encourage children to think of their own categories for testing.

After testing the materials, children should discuss the suitability of each material for making different objects.

Ask children which material would be the most appropriate in different scenarios, for example, sending a parcel, writing a letter or making a chair.

Factual knowledge

- Paper and cardboard are made from wood.
- Wood, paper and cardboard come from trees.
- There are different strengths of wood, paper and cardboard.
- Wood, paper and cardboard can be recycled and used again.

Brick and rock



Notes and guidance

In this small step, children look at the materials brick and rock. Children learn that rocks are a natural material found on and underneath the Earth's surface and that brick is a man-made building material. They should be introduced to the terms "rock", "pebble" and "stone" when describing rocks.

In this step, children do not need to identify and name rocks, as this is covered within the Year 3 curriculum. Children should simply differentiate between objects and buildings made from brick and rock.

This step has strong links to traditional stories and tales of building houses using different materials. Children could use these stories as the basis of their explanations around suitability.

Things to look out for

- Children may think that all rocks are heavy.
- Children may think that all rocks are hard and cannot be broken easily.
- Children may think that rocks and stones are different materials. Explain to children that stone is a word used to describe smaller rocks.

Key questions

- What are rocks?
- What are bricks?
- Are rocks a natural or human-made material?
- Are bricks a natural or human-made material?
- Why would builders choose to build a house with bricks?
- Would it be more suitable to build a statue from rock or bricks?

Why do you think this?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (non-statutory).

Brick and rock

Key vocabulary

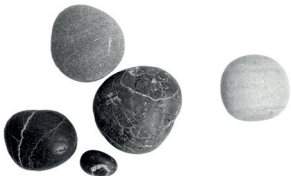
- **rock** – a natural material found on or underneath the Earth's surface



- **stone** – a small rock



- **pebble** – a small, smooth rock that has been shaped by water



- **brick** – a human-made building material



- **material** – what an object is made from

Practical ideas

- Children carry out a walk in their local area to observe, draw and label buildings or structures made from brick or stone.



This wall is made from stones.



This house is made from bricks.

- Ask children to design houses using labelled drawings. They should explain why the materials they have chosen are suitable for the purpose.
To challenge learning, children could correctly label any 2-D or 3-D shapes used within their design.

Factual knowledge

- Rock is a natural material.
- Bricks are a human-made material.
- Rock and brick can be used to build houses, buildings and walls.

Glass and plastic

Notes and guidance

In this small step, children explore the simple properties of glass and plastic and use this information to discuss the suitability of using these materials for different objects. They look at the use of glass and plastic in everyday life and identify similarities and differences between the two materials.

Children use the terms “transparent”, “translucent” and “opaque” to describe materials. There are opportunities for children to think about sustainability within this step, as they can look at how glass and some plastic can be recycled.

Children perform simple tests on glass and plastic to determine the differences between the two materials. If glass is used within the classroom, it is important that it is managed safely. Glass objects such as beads or marbles could be used.

Things to look out for

- Children may think that glass and plastic are the same material as they have a lot of similar properties.
- Children may think all plastic is hard.

Key questions

- What words could you use to describe glass/plastic?
- What are the similarities between plastic and glass?
- What are the differences between plastic and glass?
- What does “transparent” / “translucent” / “opaque” mean?
- When would glass/plastic be a suitable material for an object?
- When would glass/plastic be an unsuitable material for an object?

Sustainability link

- Why is it important to reuse and recycle materials?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Asking simple questions and recognising that they can be answered in different ways.

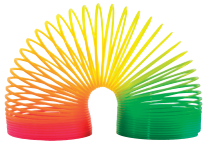
Glass and plastic

Key vocabulary

- **brittle** – easily broken



- **flexible** – can change shape easily



- **transparent** – materials you can see through



- **translucent** – materials that you cannot see clearly through



- **opaque** – materials you cannot see through



Practical ideas

- Ask children to perform tests on glass and plastic to further understand their properties. Encourage them to suggest and choose some of their own categories for testing, for example:

- Can it change shape?
- Can it bend, fold or twist?
- Does all plastic float?
- Does all glass sink?
- Is all glass/plastic transparent?



Children should then think about the suitability of the materials for different uses.



When glass is used in the classroom, it needs to be managed carefully as it can shatter.

Factual knowledge

- Glass is hard and brittle.
- Plastic can be flexible or hard.
- Some plastic can be recycled.
- All glass is recyclable.

Metal



Notes and guidance

In this small step, children focus on metals. They explore a range of metallic objects and perform simple tests to further understand the properties of metals. Children learn that there are different types of metal that are suitable for different uses. They do not need to test whether metals are magnetic, as they explore this concept in Year 3

By the end of this step, children should be able to identify when metal would be a suitable material for an object and explain why. They should also discuss when metal would be unsuitable for use. For example, they may state that aluminium foil is not a suitable material to make a set of keys from.

Things to look out for

- Children may think that all metals are silver in colour. An easy way to avoid this misconception is to allow children to explore different coins. Children could identify the different coins and sort them into groups.
- Children may think that all metals are rigid. Aluminium foil is a familiar material that can be used to show children that some metals can change shape easily.
- Children may think that all metals are heavy.

Key questions

- What objects can be made from metal?
- Are all metals rigid?
Why do you think this?
- Are all metals silver in colour?
How many metallic objects can you find that are not silver?
- Why is metal a suitable material for _____?
- Why is metal an unsuitable material for _____?
- How can you group these metal objects?
Can you group them another way?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (non-statutory).

Metal

Key vocabulary

- **hard** – not easily broken or bent



- **flexible** – can change shape easily



- **rigid** – cannot change shape easily



- **shiny** – a surface that can reflect light easily



- **dull** – not clear, bright or shiny



Practical ideas

- Allow children to observe a range of metallic objects.
Ask them to sort and group the objects in different ways.
Encourage them to group the objects in more than one way.
Play games when sorting the objects such as “Odd one out”.
Ask questions to develop their thinking. For example, “Would foil be the best material for a key?”



- Children explore their classroom, school and outside area to find where metal is used.
They record their findings using labelled drawings.
Encourage children to use key vocabulary to describe the metal objects they identify.

Factual knowledge

- Metal comes in many forms and colours.
- Some metals are flexible and can easily change shape.
- Some metals cannot change shape easily.
- Metal can be used to make many different objects.

Fabrics

Notes and guidance

In this small step, children focus on fabrics. In Year 1, they explored texture and felt a range of fabrics with different parts of their body. In this step, they identify and name a range of natural and man-made fabrics and understand that they all have different properties and uses.

Children can perform simple tests to determine which fabric would be most suitable for different purposes. For example, they could test which material would be the most suitable for a superhero costume or a PE kit.

In this small step, children should not test how waterproof a fabric is, as they complete a comparative test in steps 9 and 10 of this block to explore this concept.

Things to look out for

- Children may think that fabrics are not materials.
- Children may think that natural fabrics, such as wool and cotton, are not fabrics. Create a quick quiz to recap objects/items and where the material comes from. For example, a woollen jumper is made from the wool of a sheep.

Key questions

- What are natural fabrics?
- How many natural fabrics can you name?
- What are human-made fabrics?
- How many human-made fabrics can you name?
- Are all fabrics soft?
- What fabric would be the best for a coat?
- What fabric would be the best for a PE kit?
- Which fabric would be the most suitable for _____?
- Which fabric would be unsuitable for _____?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Observing closely, using simple equipment.

Fabrics

Key vocabulary

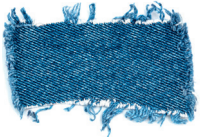
- **fabric** – a material made from weaving or knitting threads together



- **flexible** – can change shape easily



- **tough** – not easily broken



- **lightweight** – thin and light



Practical ideas

- Children perform simple tests to choose the best fabric for a particular purpose, for example, a PE kit.
 - A PE kit needs to be lightweight, flexible and easy to wash and dry.



Children compare the flexibility of a range of materials by twisting and turning the materials to see if they move easily.

They add a stain to each material to see which can be removed the quickest.

They choose a material that best meets the criteria set out and explain why they have chosen that material.

Factual knowledge

- Fabrics can be natural.
- Fabrics can be human-made.
- Fabrics have different uses.

Same object, different material

Notes and guidance

In this small step, children explore how objects can be made from different materials depending on their usage. Children explore real-life examples and discuss why a material is suitable for a particular purpose. They also identify when a material would be unsuitable for a purpose and give simple reasons why.

Children could design an object from different materials and explain the advantages of the materials they have chosen. They should be encouraged to use appropriate vocabulary when explaining why a material is suitable or not suitable for a purpose.

There are opportunities to think about sustainability within this step. Children could think of reasons why some materials have a negative impact on the planet. They may want to explore the differences between a single-use plastic water bottle and a bottle made from a harder, reusable plastic.

Things to look out for

- Children may think that objects can only be made from one material. Show them three water bottles – plastic, glass and metal. Discuss the similarities and differences between the bottles.

Key questions

- What material is this object made from?
- What is this object?
- What other material can this object be made from?
- Where have you seen this material before?
- What is similar about these materials?
- What is different about these materials?
- Why is _____ a suitable material for this object?
- Why is _____ an unsuitable material for this object?

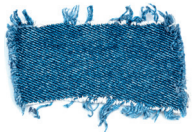
National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Using their observations and ideas to suggest answers to questions.

Same object, different material

Key vocabulary

- **tough** – not easily broken



- **brittle** – easily broken



- **hard** – not easily broken or bent



- **soft** – a material that can easily change shape or is gentle to touch



- **flexible** – can change shape easily



Practical ideas

- Show the same objects made from different materials.



Ask children to spot the similarities between the objects.

What materials are the objects made from?

Why is wood a good material for disposable cutlery?

Why is metal a good material for cutlery?

Ask children to think of a material that would not be suitable for a set of cutlery, such as paper or fabric, and ask them to explain why.

Repeat with other objects.

Factual knowledge

- Materials have particular uses.
- Some objects can be made from different materials.
- Some materials are suitable for an object.
- Some materials are unsuitable for an object.

Test materials – bend, squash, twist and stretch

Notes and guidance

In this small step, children carry out simple tests to discover whether they can change the shape of a solid material through bending, squashing, twisting and stretching. Children should use simple tables to record data from their investigations.

By the end of this step, children should understand that some solid materials can change shape if a force acts upon them and some cannot change shape. Children do not need to understand why the materials they are testing are classified as solid materials, as this concept is covered in Year 4

Things to look out for

- Children may think that all solid materials are hard.
- Children may think that all solid materials are heavy.
- Children may think that no solid materials will change shape if a force acts on them.
- Children may think that if a solid material changes shape, it cannot change back to its original shape.

Key questions

- What material is this?
 - What is the texture of this material?
 - Does the material bend?
 - Does the material squash?
 - Does the material twist?
 - Does the material stretch?
 - Can the material change shape?
 - Can the material change back to its original shape?
 - How could you sort these materials?
- How many ways can you think of?

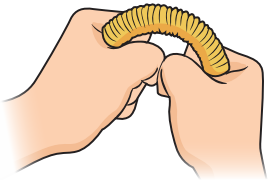
National curriculum links

- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
- **Working scientifically** – Performing simple tests.

Test materials – bend, squash, twist and stretch

Key vocabulary

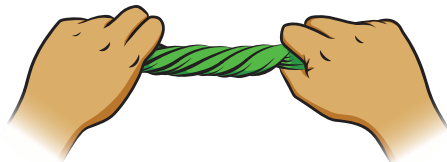
- **bend** – to force something to curve



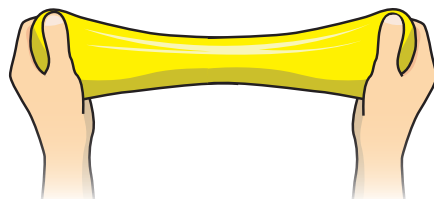
- **squash** – to crush or squeeze something



- **twist** – to bend or curl something out of shape



- **stretch** – to make something longer without ripping, breaking or tearing it



Practical ideas

- Ask children to test materials to see if they change shape through bending, squashing, twisting and stretching.



They should name the materials and sort them into different groups based on whether they think they would bend, squash, twist or stretch.

Discuss any examples that could fit into more than one group.

Children should record their findings in a simple results table.

Factual knowledge

- Some materials can change shape and some cannot.
- Some materials can be bent.
- Some materials can be twisted.
- Some materials can be squashed.
- Some materials can be stretched.

Plan – waterproof experiment

Notes and guidance

In this small step, children plan a comparative test to identify which material would be the most suitable for an umbrella. Before completing the experiment, they should discuss that the material for an umbrella needs to be waterproof, lightweight and strong. They should predict which material they think will be best and give reasons for their prediction.

Within this step, children should learn how to use the experiment equipment correctly. They will have had little practice using a pipette, so this skill will need to be modelled and practised.

Experiment variables are identified for adults. Children do not need to use these terms at this stage, but they should be able to identify what they will change and what they will keep the same when carrying out the experiment.

Things to look out for

- Children have not yet been introduced to measuring in millilitres in maths. They can use the increments on the pipette to ensure they drop the same amount onto each material. For example, they may choose to measure the water up to the fifth line but they do not need to use the term “5 millilitres”.

Key questions

- What will you change in your experiment?
- What will you keep the same in your experiment?
- What materials and equipment do you need?
- Which material do you predict will be the best for an umbrella?

Why?

Enquiry question

- Which material would be the best for an umbrella?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Asking simple questions and recognising that they can be answered in different ways.

Plan – waterproof experiment

Experiment variables

- **independent variable** (what will change) – the material



- **dependent variable** (what will be measured) – the amount of water that passes through the material



- **controlled variable** (what is kept the same) – the amount of water used, the time taken before checking the results and the size of the material squares



Equipment needed

- four beakers
- four elastic bands
- pipettes
- aluminium foil, cling film, nylon and felt
- timer



Practical activity

- Children learn how to use a pipette to drop water onto a piece of material to prepare them for the investigation step.
Allow children to practise taking a set amount of water into the pipette and slowly releasing it.

Planning sentence stems

- I think the _____ will be the best material.
I think this because ...
- We will change the ...
- We will keep the _____ the same.
- We will measure the _____.

Investigate – waterproof experiment

Notes and guidance

In this small step, children carry out a comparative test to explore which material would be the best for an umbrella. They recap that an umbrella needs to be lightweight, waterproof and strong. Children could carry out simple tests including pulling, twisting or tearing the material to test its strength before testing to see if it is waterproof. If the material breaks during this testing, it will need to be replaced before testing to see whether it is waterproof.

Children should recap the experiment variables they identified in the previous step. They do not need to use the terms “independent”, “dependent” and “controlled variables” but should explain what they are changing and keeping the same.

Things to look out for

- Children may need to recap how to use a pipette correctly. Children should practise this skill before they conduct the experiment.
- Children may need support when ranking materials from least to most suitable. They should refer to the material properties of an umbrella to support their findings.

Key questions

- What will you change in your experiment?
- What will you keep the same in your experiment?
- What was your prediction?
Was it correct or incorrect?
- How would you rank the materials from least to most suitable for an umbrella?
Why did you choose this order?

Enquiry question

- Which material would be the best for an umbrella?

National curriculum links

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- **Working scientifically** – Using their observations and ideas to suggest answers to questions.

Investigate – waterproof experiment

Key vocabulary

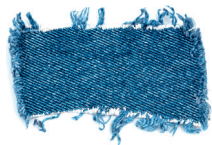
- **waterproof** – does not allow water to pass through it



- **lightweight** – thin and light



- **strong** – not easily broken



- **breakable** – easy to break



Equipment needed

- four beakers
- four elastic bands
- pipettes
- aluminium foil, cling film, nylon and felt
- timer



Method

1. Cut equal sized squares from each material.
2. Pull, twist, and tear each material to test its strength.
3. Put one material over each beaker and secure with an elastic band.
4. Measure water up to an agreed point of the pipette.
5. Drop the water on top of the material.
6. Start the timer for two minutes.
7. After two minutes, observe if water has passed through the material or not.
8. If the material is not waterproof, observe how much water has passed through.
9. Rank the materials from the least to the most suitable for an umbrella.