Autumn Block 5

Rocks

White Rose SCIENCE

Rocks

Step 1	Identify rocks
Step 2	Group rocks
Step 3	Test rocks
Step 4	Local rock survey

Identify rocks

Notes and guidance

In Years 1 and 2, children looked at rocks as a type of material. They used the terms "rock", "stone" and "pebble" to describe different rocks and identified where rocks are used in the local area. In this small step, children identify granite, pumice, sandstone, chalk, marble and gneiss. They should use simple equipment, such as hand lenses, to observe these rocks closely and note any similarities or differences between them. These rocks are examples of metamorphic, sedimentary and igneous rock. In Key Stage 2, children do not need to use these terms to describe rocks, nor do they need to understand how these rocks are formed, as this concept is introduced later in the curriculum.

In this step, children begin an identifying, grouping and classifying enquiry to sort rocks based on their simple properties. Practical activities such as observing actual rocks, as well as images, will allow children to describe their properties.

Things to look out for

- Children may think that all rocks are heavy.
- Children may think that all rocks are hard.

Key questions

- What is a rock?
- What rock is this?
- What do you notice about _____?
- Are there any similarities between these two rocks?

  Are there any differences?
- Which rocks have crystals?

Enquiry question

- How can we identify and sort rocks based on their properties?

National curriculum links

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- **Working scientifically** – Making systematic and careful observations.

Identify rocks

Key vocabulary

- **granite** – a hard rock with crystals

- **pumice** – a light rock with small holes

- **sandstone** – a light-coloured rock with grains

- **chalk** – a soft white rock

- **marble** – a hard white rock

- **gneiss** – a hard rock with layers

Practical ideas

- Give children examples of granite, pumice, sandstone, chalk, marble and gneiss.

  Using hand lenses, they should observe the rocks closely, describing their appearance and features.

  Children could draw their findings and observations.

- Children could take their hand lenses outside to observe rocks in their school setting. This could include the school building as well as stones and pebbles. Children should recap the differences between rocks, stones and pebbles in this step.

Factual knowledge

- Some rocks have grains.
- Some rocks have crystals.
- Some rocks have layers.
- Some rocks are light and some are heavy.

Group rocks

Notes and guidance

In this small step, children sort and group rocks in different ways based on their simple physical appearance. Children should understand that some rocks have crystals, grains or layers and this information can be used to sort rocks into different groups.

In Year 3, children should choose their own categories to sort rocks into and should understand that rocks can be grouped in more than one way. Children could begin by sorting rocks into two pre-decided groups such as "rocks with layers" and "rocks with no layers" before choosing their own categories for grouping later in the step. Children do not need to sort the rocks into metamorphic, sedimentary and igneous rock.

This step continues with the enquiry question "How can we identify and sort rocks based on their physical properties?" Children continue an identifying, grouping and classifying enquiry to sort rocks based on their simple properties.

Things to look out for

- Children may think that all rocks are the same. Allow children to use hand lenses to observe crystals, grains and layers closely.

Key questions

- What do you notice about _____?
- Are there any similarities between these two rocks?

  Are there any differences?
- Which rocks have crystals?
- Which rocks have grains?
- Which rocks have layers?
- How can you group these rocks?

  How many ways can you think of?

Enquiry question

- How can we identify and sort rocks based on their properties?

National curriculum links

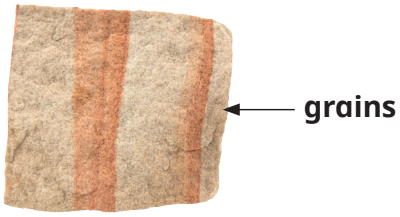
- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- **Working scientifically** – Talk about criteria for grouping, sorting and classifying (non-statutory).

Group rocks

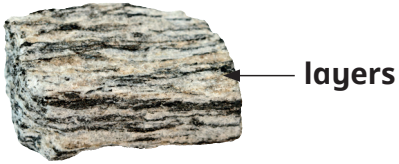
Key vocabulary

- **crystals**

- **grains**



- **layers**



- **texture** – what something looks and feels like

Practical ideas

- Children should sort rocks in different ways.

  Begin by asking the children to sort the rocks into two simple categories, such as “soft rocks” and “hard rocks”.

  Allow children to observe the rocks closely before sorting them into each group. Ask them to identify the rocks in each category.

  Repeat this process, choosing another two categories. Then allow children to choose their own categories for sorting.

  This could be extended by asking children to sort the rocks into more than two categories or to guess the sorting rule of another group.

Factual knowledge

- Rocks can be sorted in different ways.
- Some rocks have grains.
- Some rocks have crystals.
- Some rocks have layers.
- Some rocks are light and some are heavy.

Test rocks

Notes and guidance

In this small step, children perform simple tests on rocks to learn more about their different properties. Children will test granite, pumice, sandstone, chalk, marble and gneiss to further their understanding of different rock types.

By the end of this step, children should understand that rocks have different properties. They could also suggest why a type of rock would be suitable, or unsuitable, for a particular use based on their findings.

Children are introduced to the idea of "a reaction" using vinegar dropped onto the rocks. They should understand that vinegar is acidic and it can cause a reaction on some rocks and not others. A "reaction" at this stage is simply described as "a change". This can be seen with a temperature change, bubbles or a colour change.

Children also use an iron nail to test for hardness. Ensure they are aware that the nail can cause damage to themselves or others if used incorrectly.

Things to look out for

- Children may think that all rocks are hard and cannot break easily.
- Children may think that all rocks are heavy and therefore will sink.

Key questions

- What do you notice about these rocks?

  Are they all the same?

  What is different?
- Which rock is the hardest?
- Will these rocks float or sink?
- Will any of these rocks react with acid (vinegar)?

Enquiry question

- How can we identify and sort rocks based on their properties?

National curriculum links

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- **Working scientifically** – Making systematic and careful observations.

Test rocks

Key vocabulary

- **reaction** – a change, which can be seen with a temperature change, bubbles or a colour change

- **hardness** – a measure of a rock's resistance to scratching

- **float** – to sit on top of water

- **sink** – to fall below the surface of water

- **brittle** – easily broken

Practical ideas

- Children should work in groups to test the properties of different rocks.

  Ask children to begin by testing the hardness of the rocks using a nail. The harder a rock is, the less likely it is to be scratched by the nail.

  Ask children to arrange the rocks in terms of hardness.

- Children should then test to see whether the rocks float or sink.

  Encourage children to make predictions about whether each rock will float or sink before testing.

- Finally, children can test to see whether the rocks react with vinegar (an acid) or not.

  Using a pipette, children should measure the amount of vinegar to be dropped onto the rocks each time.

  Ask the children to observe closely.

  Do they notice any changes on the surface of the rock?

  Has there been a reaction?

Factual knowledge

- Some rocks are hard.
- Some rocks react with acid.
- Some rocks are brittle.
- Some rocks float and some sink.

Local rock survey

Notes and guidance

In this small step, children conduct a survey around their local area to identify rocks and observe where they are used for building materials.

Children should use their understanding of rocks to predict which rock type the building or structure is made from. They may want to use hand lenses to allow them to observe the rocks more closely and to make more accurate observations.

Children could explore how rocks have changed over time through weathering. This can be easily observed in graveyards where older gravestones are more weathered than newer gravestones.

If possible, guide children to specific structures that are built with the rock types they have learnt about. Be prepared to explain that they may also see many other rock types, especially if a particular rock that children have not studied is very common in your area.

Children should be given the opportunity to form an answer to the enquiry question within this step.

Things to look out for

- Children may think only large buildings are made from rocks. However, gravestones, cobbles, walls, tiles and stairs are also examples of structures made from different rock types.

Key questions

- What buildings are made from rock in our local area?
- Is the building made from newer or older rock?

  How do you know?
- Does the rock have crystals, grains or layers?
- How has this rock changed over time?

  Why has it changed?

Enquiry question

- How can we identify and sort rocks based on their properties?

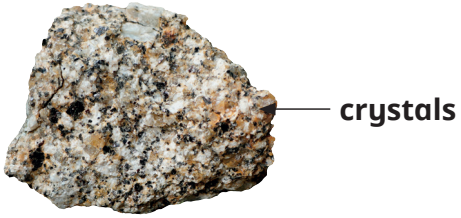
National curriculum links

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- **Working scientifically** – Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.

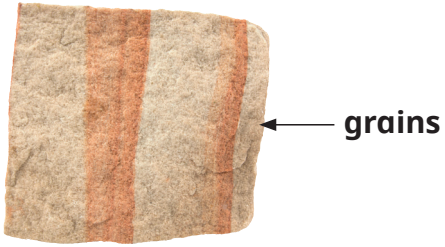
Local rock survey

Key vocabulary

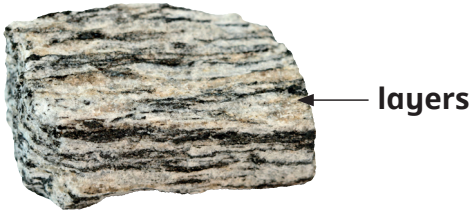
- **crystals**



- **grains**



- **layers**



- **texture** – what something looks and feels like
- **weathering** – the breaking down of rocks over time

Practical ideas

- Children should carry out a rock survey in their local area.

  Ask children to name a building or structure.

  They should then observe the rock closely using hand lenses.

  Ask children to touch and feel the rock (if appropriate) and describe its appearance and texture.

  Children can record their observations in a simple table.

- If appropriate, visit a graveyard to observe how rocks change over time.

  Do not allow children to touch the gravestones.

  Children could identify a new gravestone and an old gravestone.

  What is the difference between the gravestones?

  What do you think has happened to the rock over time?

Factual knowledge

- Rocks are used as building materials.
- Rocks have different textures and appearances.
- Some rocks change over time.

Spring Block 1

Fossils

White Rose SCIENCE

Small steps

Step 1	Explore fossils
Step 2	Fossil formation

Explore fossils

Notes and guidance

In the previous block, children learnt about different types of rock and had opportunities to group and test them. In this small step, children build on this knowledge to explore fossils. A fossil is described as the remains or trace of a living thing that lived a long time ago. Fossils have led scientists to discover important information about living things from the past, such as dinosaurs. Children should understand that fossils are usually formed from the shells or bones of living things, but can also be formed from animal tracks and footprints.

Children should be given opportunities to observe replicas of fossils, as well as pictures, to allow them to group fossils and describe their features. Additionally, children could suggest what animals and plants in the past may have looked like and compare this to modern-day animals and plants. In this step, children begin a research enquiry to explore how fossils are formed.

Key questions

- What is a fossil?
- What could this animal have looked like?
- What could this plant have looked like?
- Which parts of an animal usually turn into a fossil?
- How long does it take for a fossil to form?
- Why are fossils useful for scientists?

Enquiry question

- How are fossils formed?

Things to look out for

- Children may think that only the remains of animals can become fossils.
- Children may think that a fossil can be formed in a short period of time. Explain that it takes thousands of years for a fossil to form.

National curriculum links

- Describe in simple terms how fossils are formed when things that have lived are trapped within rock.
- **Working scientifically** – Asking relevant questions and using different types of scientific enquiries to answer them.

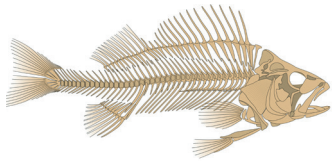
Explore fossils

Key vocabulary

- **fossil** – the remains or trace of a living thing that lived a long time ago

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

- **skeleton** – a collection of bones



- **shell** – a hard covering on the outside of an animal's body

Practical ideas

- Children could observe and draw a variety of different fossils, including replicas and/or pictures.

  They could sort the fossils into groups, for example, animal fossils and plant fossils.

- Children could observe replicas or pictures of animal fossils and draw a picture of what they think the animal looked like.

  They could use their knowledge from the skeleton block to label the main bones found in the animal.

Factual knowledge

- A fossil is the remains or trace of a living thing that lived a long time ago.
- Both animals and plants can become fossils.
- Older fossils are found deeper underground.
- Fossils are usually formed from the shells or bones of living things.
- Animal footprints and tracks can also form fossils.

Fossil formation

Notes and guidance

In this small step, explore the process of fossilisation. Children should understand that fossilisation is a rare process and will only happen under certain conditions. Usually, fossilisation occurs when an animal dies in a watery environment and is buried in mud.

By the end of this step, children should understand that after an animal dies, the soft parts of the animal's body break down, leaving behind the hard parts, such as the skeleton and teeth. The hard parts become buried by sediment. Sediment contains soil, sand, gravel and small pieces of rock. Over time, many layers of sediment build up on top of the skeleton, which leads to a lot of pressure. Eventually, sediment surrounding the skeleton begins to compact and turn to rock. Water seeps into the rock, causing the bones to break down and be replaced by minerals in the water. This leads to the formation of a fossil, which is a rock replica of the original bones or teeth.

Things to look out for

- Children may think that fossilisation always occurs when an animal or plant dies. Explain that it is a very rare process that only happens under certain conditions.

Key questions

- What is fossilisation?
- What is sediment?
- What are the key stages of fossilisation?
- What conditions are needed for fossilisation to occur?
- How has this animal turned into a fossil?
- How long does fossilisation take?

Enquiry question

- How are fossils formed?

National curriculum links

- Describe in simple terms how fossils are formed when things that have lived are trapped within rock.
- **Working scientifically** – Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

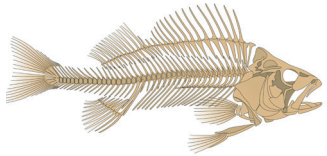
Fossil formation

Key vocabulary

- **fossilisation** – the process through which a fossil is formed

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

- **skeleton** – a collection of bones



- **fossil** – the remains or trace of a living thing that lived a long time ago

- **sediment** – small pieces of soil, sand, gravel and small rocks

Practical ideas

- Children could model the formation of fossils using plastic dinosaurs, plants or skeletons.

  Children should layer these in a suitable container, with different–coloured sand, soil or mud. If the container is transparent, children can view the layers and might be able to see the dinosaur inside.

- In groups, children could act out the process of fossilisation. They could create an action to represent each stage of the process.

Factual knowledge

- Fossilisation is the process that explains how a fossil is formed.
- Fossilisation is a rare process that only occurs under certain conditions.
- When an animal dies, the soft parts of its body break down, leaving behind the hard parts such as the skeleton.
- The process of fossilisation takes thousands of years.

Spring Block 2

Soils

White Rose SCIENCE

Small steps

Step 1	Explore soil
Step 2	The importance of soil
Step 3	Plan – soil experiment
Step 4	Investigate – soil experiment
Step 5	Evaluate – soil experiment

Explore soil

Notes and guidance

In this small step, children explore different types of soil and what they are made up of. It is important to note that children have not studied soil before. As a result, they may have a limited understanding of the key terms and the various types of soil.

Children should have opportunities to explore different types of soil, such as sandy, clay, peat and chalky soils. They can undertake simple practical activities such as closely observing the soils using hand lenses and drawing what is seen, sieving the soils to separate the larger and smaller matter and adding water to the soil to see if any parts float or sink. Testing different types of soil will allow children to describe their features and compare them.

Key questions

- What is soil?
- What are the different types of soil?
- What is soil made up of?
- What are the features of chalky soil?
- What are the features of sandy soil?
- What are the features of clay soil?
- What are the features of peat soil?
- What are the differences between these types of soil?

Things to look out for

- Children may think soil is just "mud" or "dirt". Clarify to them that soil is a complex mixture of small rocks, organic matter (remains of dead animals and plants) and water.
- Children may think that animals cannot live in soil. Discuss animals that do live in soil, such as worms.

National curriculum links

- Recognise that soils are made from rocks and organic matter.
- **Working scientifically** – Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables

Explore soil

Key vocabulary

- **soil** – a mixture of small rocks, organic matter and water

- **sandy soil** – a soil made up of lots of sand and some clay

- **clay soil** – a soil containing lots of clay which becomes sticky when wet

- **peat soil** – a soil that contains lots of water and organic matter

- **chalky soil** – a soil that contains lots of chalk or limestone

- **organic matter** – the remains of dead animals and plants

Practical ideas

- Split the class into small groups.

  Give each group four soil samples.

  Encourage them to touch and feel each soil type and observe its appearance. Is there anything in the soil that they can identify, such as twigs, sticks or stones?

  Children could draw and label diagrams of the different soils.

  Children could sieve the soil to explore the composition further. Ask them to identify whether any parts of the soil stay in the sieve.

  Finally, provide each small group with a lidded jar filled with water. Ask them to place a type of soil inside the jar, shake it and then see if anything floats or sinks. Children then note their observations and repeat with other types of soil.

Factual knowledge

- Organic matter is the remains of dead plants and animals.
- Soils are made from rocks, organic matter and water.
- There are different types of soil including sandy, chalk, clay and peat soil.
- These soils have different properties.

The importance of soil

Notes and guidance

In this small step, children learn about the importance of soil. This includes why many living things need soil to survive. It is important that children are aware of the importance of soil to both animals and plants. This includes providing nutrients and water for plants and habitats for many animals.

Children should have opportunities to research the importance of soil and ask relevant questions of their peers and adults to further their understanding. There is also an opportunity within this step for children to learn about how human activities such as deforestation and construction work may cause soil loss and the impact this has on both animals and plants.

Things to look out for

- Children may think that only plants benefit from soil and animals do not. Highlight to them that many animals depend on soil and that it provides habitats for animals, such as worms and insects.
- Children may think that the loss of soil from human activity only has an impact on animals and plants. Clarify to them that soil absorbs lots of water and if soil loss occurs due to human activity, then flooding may increase, which can impact humans.

Key questions

- Why do plants need soil?
- What does soil provide plants with?
- Why do animals need soil?
- What does soil provide animals with?
- What impact has human activity had on soil?
- How does this impact animals, plants and humans?

Sustainability link

- How has human activity caused soil loss and what is the impact on living things?

National curriculum links

- Recognise that soils are made from rocks and organic matter.
- **Working scientifically** – Using straightforward scientific evidence to answer questions or to support their findings.

The importance of soil

Key vocabulary

- **soil** – a mixture of small rocks, organic matter and water

- **nutrients** – substances found in soil which help plants grow

- **habitat loss** – the decrease in resources, such as space, for a living thing to survive

- **deforestation** – the removal of large areas of trees or plants by humans

- **habitat** – an area where animals and plants live

Practical ideas

- Allow children to go outdoors and collect some soil samples. Once back in the classroom, ask them to look at the soil with hand lenses or magnifying glasses.

  Allow the children to identify different-sized rocks, dead plant matter and any small creatures in the soil.

  Ensure children wash their hands after handling soil.

- Provide children with four small garden pots. Allow them to fill the pots with four soil samples – chalky, sandy, peat and clay – along with some seeds. Once the plants have grown, children can then observe which soil allows the plants to grow best.

Factual knowledge

- Many living things need soil to survive.
- Soils can act as a habitat for many small animals.
- Soils provide nutrients for plants.
- Soils can also prevent flooding, as they absorb water.

Plan – soil experiment

Notes and guidance

In this small step, children plan a comparative test to explore the absorbency of different soils. Children test four different soils to see if they retain the same volume of water. Children use filter funnels, measuring cylinders and filter paper. They add the same mass of soil and volume of water to each soil sample. They should then record how much water passes through the soil and filter paper into the measuring cylinder below. Encourage them to use a plan proforma in small groups for support in making a prediction and creating a logical experiment plan.

Children in Year 3 do not need to be specifically aware of the terms independent, dependent and controlled variables. However, they should be able to identify what they will change, measure and keep the same in the experiment.

Things to look out for

- Children may confuse the variables in this experiment. Highlight and make clear to them what will be changed, measured and kept the same.
- Children may struggle to measure the amount of water that enters the measuring cylinder after it has passed through the soil and may need further support with this skill.

Key questions

- What will you use to measure the amount of soil?
- What will you use to measure the volume of water?
- What types of soil are you using in this experiment?
- What will you change in this experiment?
- What will you measure in this experiment?
- What will you keep the same?
- How will you record your results?

Enquiry question

- Which soil absorbs the most water?

National curriculum links

- Recognise that soils are made from rocks and organic matter.
- **Working scientifically** – Setting up simple practical enquiries, comparative and fair tests.

Plan – soil experiment

Experiment variables

- **independent variable** (what will change) – the type of soil, such as sandy, clay, chalky and peat soil

- **dependent variable** (what will be measured) – the volume of water entering the measuring cylinder

- **controlled variable** (what is kept the same) – the mass of the soil used in the experiment, the type of filter paper, the amount of water added to each soil sample

Equipment needed

- soil – sandy, clay, chalky and peat soil
- measuring cylinders
- filter funnels
- filter paper
- scales

Practical activity

- Put children in small groups.

  Give each group the equipment needed for the experiment.

  Children should identify what the equipment is and why it is used within the experiment.

Planning sentence stems

- I predict that ...

  I think this will happen because ...
- We are changing the ...
- We are measuring the ...
- We are keeping the _____ the same.

Investigate – soil experiment

Notes and guidance

In this small step, children carry out a comparative test to explore which type of soil absorbs the most water. They should use their plans from the previous step to set up practical equipment and make careful observations throughout.

When undertaking this experiment, it is important that children measure the mass of the soil correctly. In addition, they also need to correctly measure the amount of water that enters the measuring cylinder. By the end of this step, children should compare the amount of water absorbed by different types of soil.

Key questions

- What is your experiment plan?
- What are you changing?
- What are you measuring?
- What are you keeping the same?
- What was the volume of water in the measuring cylinder?
- What was the mass of the soil?

Enquiry question

- Which soil absorbs the most water?

Things to look out for

- Children may struggle to correctly fold the filter paper and place it in the filter funnel. You may need to demonstrate this skill prior to the investigation.
- Children may need support with measuring the mass of soil and the volume of water. These skills may need modelling to children before they complete their experiment.

National curriculum links

- Recognise that soils are made from rocks and organic matter.
- **Working scientifically** – Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.

Investigate – soil experiment

Key vocabulary

- **soil** – a mixture of small rocks, organic matter and water

- **filter paper** – a piece of equipment that is used to separate materials

- **filter funnel** – a piece of equipment that allows liquids such as water to enter the measuring cylinder

- **measuring cylinder** – a piece of equipment that allows measurement of liquids

Equipment needed

- soil – sandy, clay, chalky and peat soil
- measuring cylinders (five per group)
- filter funnels (four per group)
- filter paper (four per group)
- scales

Method

1. Give each small group five measuring cylinders, four filter funnels and four pieces of filter paper.
2. Gather four soil samples – sandy, clay, chalky and peat soil.
3. Measure the mass of each soil sample.
4. Take a piece of filter paper and fold into half then into quarters.
5. Place the filter paper inside the filter funnel.
6. Repeat this for all four samples.
7. Place the soil samples inside the filter paper and add the same volume of water to each sample.
8. Leave for 10 minutes so the water can pass through the soil.
9. Observe how much water has passed through the soil into the measuring cylinder.
10. Measure the volume of water that has entered each measuring cylinder.

Evaluate – soil experiment

Notes and guidance

In this small step, children evaluate their soil experiment. They should work scientifically to analyse data, make conclusions and evaluate their experiment. Within this step, children should be given the opportunity to answer the enquiry question. This is the first time children have evaluated an experiment and therefore modelling how to write a written evaluation is essential. They should also be encouraged to think of some relevant questions for further investigations linked to soil.

Children could compare their data or results to other groups to allow them to spot patterns and whether their results are similar or different. They should also be given opportunities to reflect on their experiment and then discuss how any improvements could be made.

Key questions

- Which soil absorbed the most water?
- Which soil absorbed the least water?
- What is an experiment evaluation?
- If you were to repeat this experiment, how could you improve your results?
- What questions do you have for further investigation?

Enquiry question

- Which soil absorbs the most water?

Things to look out for

- Children may struggle to think of ways to improve their experiment and may state that by working with another group, their results would improve. Highlight to them that they must think of scientific ways to improve their experiment.

National curriculum links

- Recognise that soils are made from rocks and organic matter.
- **Working scientifically** – Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

Evaluate – soil experiment

Key vocabulary

- **soil** – a mixture of small rocks, organic matter and water

- **absorb** – to take in water

- **conclusion** – what has been found out during an investigation based on measurement and observation

Type of soil	Volume of water (ml)
sandy	15
clay	5
peat	25
chalky	10

- **evaluation** – to consider the quality of the results and suggest improvements to the investigation
- **data** – information collected, such as facts, observations or numbers

Practical ideas

- Allow children to go out and collect soil samples from their school grounds.

  They could then see how much water the soil they collected absorbs compared to the soils that they have already investigated.

  Ensure children wash their hands after collecting and handling soil samples.

- Provide children with four small pots and ask them to fill the pots with different soils, e.g. sandy, clay, peat and chalky soils.

  Add the same number of seeds of a plant into each pot. Does the growth of the plants link to the amount of water the soils absorb?

Evaluation sentence stems

- I predicted that …

  My prediction was correct/incorrect because …
- From looking at our results, I can see that …

  This happened because …
- Our results are/are not reliable because …
- To make our investigation more accurate, we could …
- For future investigation, I would like to find out …