Autumn
Scheme of learning
Year 4

White Rose SCIENCE

The **White Rose Science** schemes of learning

Schemes of learning

Our research-based schemes of learning are designed to teach the aims and objectives of the National Curriculum.

Content over time

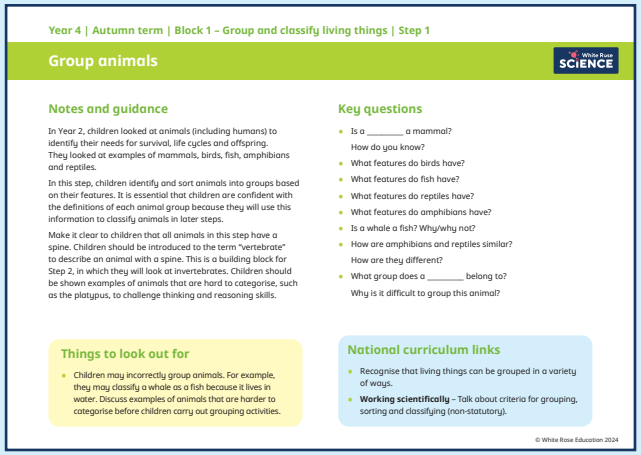
Our schemes are written for content rather than time. This ensures that children are developing a solid understanding of scientific processes and concepts.

Substantive knowledge

Our schemes of learning ensure full coverage of the scientific content as stated within the National Curriculum.

Disciplinary knowledge (Working scientifically)

Each step has a working scientifically skill focus. Working scientifically skills are developed across years and year groups.



Year 4 | Autumn term | Block 1 – Group and classify living things | Step 1

Group animals

Notes and guidance

In Year 2, children looked at animals (including humans) to identify their needs for survival, life cycles and offspring. They looked at examples of mammals, birds, fish, amphibians and reptiles.

In this step, children identify and sort animals into groups based on their features. It is essential that children are confident with the definitions of each animal group because they will use this information to classify animals in later steps.

Make it clear to children that all animals in this step have a spine. Children should be introduced to the term "vertebrate" to describe an animal with a spine. This is a building block for Step 2, in which they will look at invertebrates. Children should be shown examples of animals that are hard to categorise, such as the platypus, to challenge thinking and reasoning skills.

Key questions

- Is a _____ a mammal?
  How do you know?
- What features do birds have?
- What features do fish have?
- What features do reptiles have?
- What features do amphibians have?
- Is a whale a fish? Why/why not?
- How are amphibians and reptiles similar?
  How are they different?
- What group does a _____ belong to?
  Why is it difficult to group this animal?

Things to look out for

- Children may incorrectly group animals. For example, they may classify a whale as a fish because it lives in water. Discuss examples of animals that are harder to categorise before children carry out grouping activities.

National curriculum links

- Recognise that living things can be grouped in a variety of ways.
- **Working scientifically** – Talk about criteria for grouping, sorting and classifying (non-statutory).

Working practically

Research shows that children learn best from a 'hands on and heads on' approach whereby practical activities are engaging and relevant. This features throughout our schemes of learning.

Experiments

Children carry out experiments following a plan, investigate and evaluate (KS2) model. Children plan their investigations, carry out their experiments and conclude and provide evaluations.

Modelling

Modelling is used wherever possible to explain abstract scientific ideas and concepts. This makes it easier for children to apply their knowledge and improve their understanding. In Upper KS2, children are introduced to the limitations of models.

Outdoor learning

Children are encouraged to work outside the classroom wherever possible to help provide relevancy to scientific concepts.

Scientific enquiry

There is one enquiry question per block covering the five enquiry types. This allows children to develop answers to a range of relevant scientific questions.

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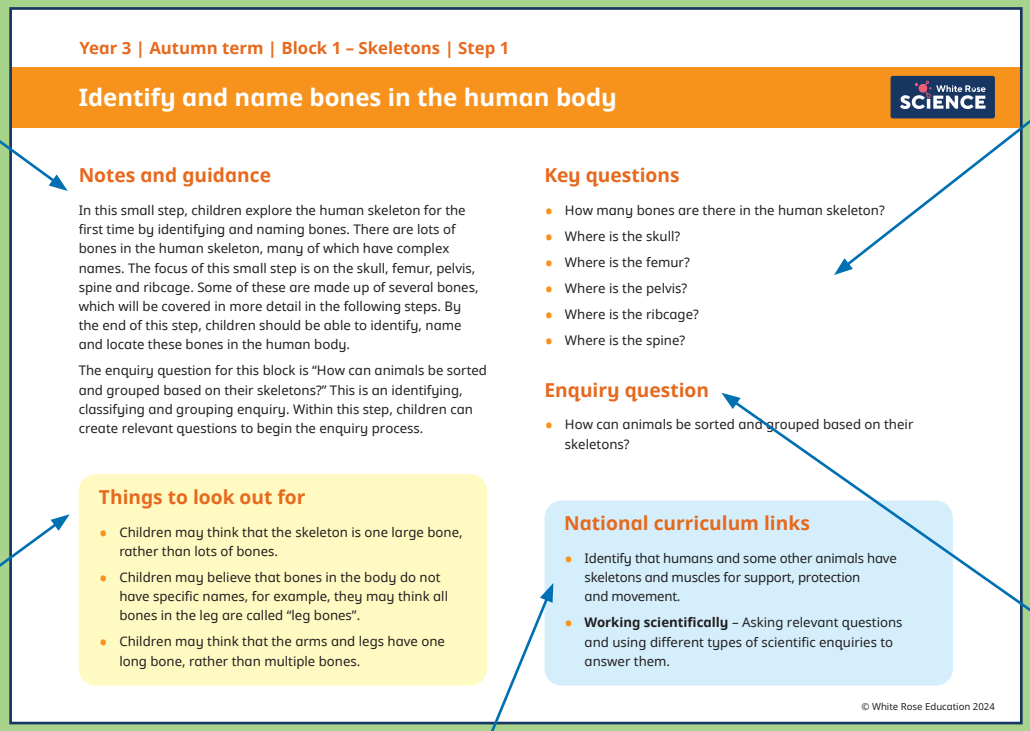
Teacher guidance

Every block in our schemes of learning is broken down into manageable small steps, and we provide comprehensive teacher guidance for each one. Here are the features included in each step.

Notes and guidance that provide an overview of the content of the step and ideas for teaching, along with advice on progression and where a topic fits within the curriculum.

Things to look out for, which highlights common mistakes, misconceptions and areas that may require additional support.



Year 3 | Autumn term | Block 1 – Skeletons | Step 1

Identify and name bones in the human body

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Notes and guidance

In this small step, children explore the human skeleton for the first time by identifying and naming bones. There are lots of bones in the human skeleton, many of which have complex names. The focus of this small step is on the skull, femur, pelvis, spine and ribcage. Some of these are made up of several bones, which will be covered in more detail in the following steps. By the end of this step, children should be able to identify, name and locate these bones in the human body.

The enquiry question for this block is "How can animals be sorted and grouped based on their skeletons?" This is an identifying, classifying and grouping enquiry. Within this step, children can create relevant questions to begin the enquiry process.

Key questions

- How many bones are there in the human skeleton?
- Where is the skull?
- Where is the femur?
- Where is the pelvis?
- Where is the ribcage?
- Where is the spine?

Enquiry question

- How can animals be sorted and grouped based on their skeletons?

Things to look out for

- Children may think that the skeleton is one large bone, rather than lots of bones.
- Children may believe that bones in the body do not have specific names, for example, they may think all bones in the leg are called "leg bones".
- Children may think that the arms and legs have one long bone, rather than multiple bones.

National curriculum links

- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.
- **Working scientifically** – Asking relevant questions and using different types of scientific enquiries to answer them.

Key questions that can be posed to children to develop their scientific understanding and reasoning skills.

National Curriculum links to indicate the objective(s) being addressed by the step.

Enquiry questions are highlighted when children are undertaking the scientific enquiry process. Each block has one enquiry question and there is coverage of the five enquiry types across a year.

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Teacher guidance

During **experiment steps**, experiment variables and **equipment** are clearly identified.

The **key vocabulary** section highlights essential vocabulary and definitions.

Relevant and purposeful **practical ideas** to encourage a 'hands on and heads on' approach.

Year 5 | Autumn term | Block 1 – Forces | Step 3

Plan – parachute experiment

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Experiment variables

- **independent variable** (what is changed) – the size of the parachute

- **dependent variable** (what is measured) – the time it takes for the parachute to fall to the ground

- **controlled variables** (what is kept the same) – the material that the three parachutes are made from, the object that is attached to both parachutes, and the height that the parachutes are dropped from

Equipment needed

- plastic bags
- scissors
- 12 pieces of string 30 cm each
- ruler
- 12 paper clips
- stopwatch
- scales
- modelling clay to attach to the strings

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 ...
- The independent/dependent variable is ...
- The controlled variables are ...

Year 3 | Autumn term | Block 1 – Skeletons | Step 2

Functions of the skeleton

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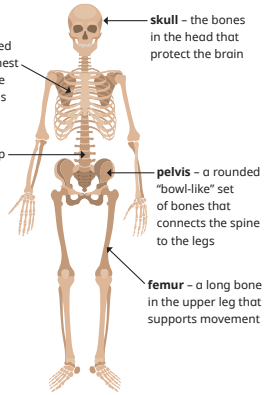
Key vocabulary

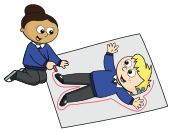
- **skeleton** – a collection of bones that provides protection and supports movement



Practical ideas

- Children work in pairs to draw around the outline of their partner's body on a large sheet of paper.

  Children then correctly identify and label the locations of the bones learnt in Step 1



skull	ribcage	femur	pelvis	spine

Children should add labels to describe the functions of each of the bones.
(Note: If drawing around a partner's body is not appropriate, a printed outline could be used.)

Factual knowledge

- Bones have specific functions.
- The skull protects the brain.
- The femur helps humans to stand and move.
- The pelvis helps to support the spine.
- The spine helps humans to twist and stay upright.
- The ribcage protects the heart and lungs.

Sentence stems to help promote the use of scientific talk in the classroom.

Factual knowledge written in clear, child-friendly language.

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Symbols

Key Stage 1 and 2 symbols

The following symbols are used to indicate:

Children are answering an enquiry question

Highlights when and how health and safety measures need adhering to

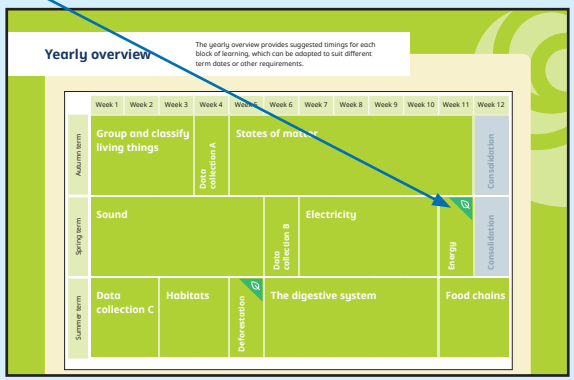
An outside activity or one that uses resources from nature

Children talk about and compare their answers and reasoning

A question that should really make children think. The question may be structured differently or require a different approach from others and/or tease out common misconceptions.

Sustainability

Sustainability blocks are highlighted with a leaf symbol.



Each year group has two blocks dedicated to sustainability.
We want to help children to:

- Understand the current issues around sustainability and climate change.
- Identify that they have a role to play in creating a more sustainable future for themselves and others.
- Think of ways to make a positive impact on their local and wider environments.
- Have a positive and proactive mindset when it comes to making sustainable changes.

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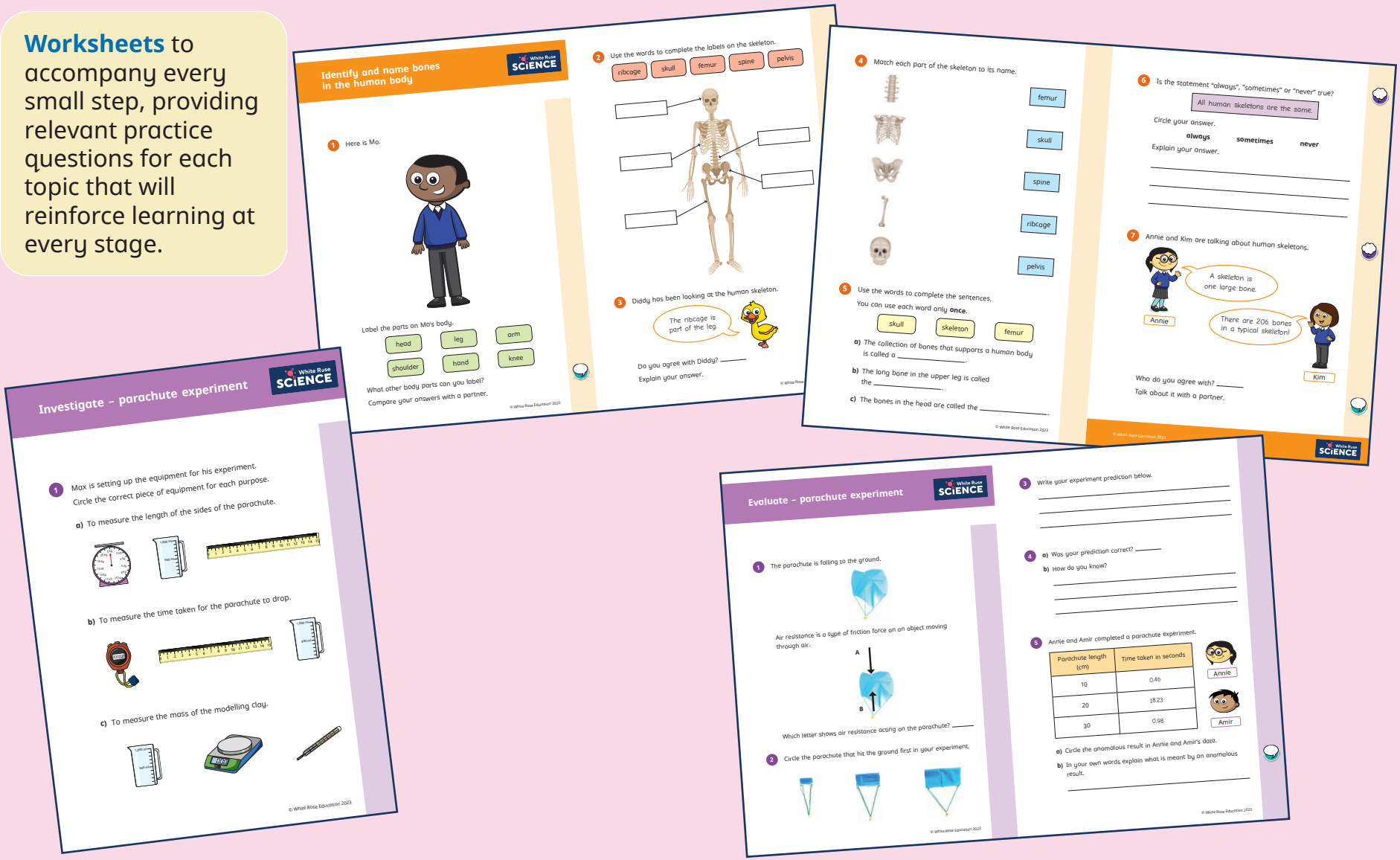
Premium supporting materials

Worksheets to accompany every small step, providing relevant practice questions for each topic that will reinforce learning at every stage.



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Meet the characters

Our class of characters brings the schemes to life and will be sure to engage learners of all ages and prior attainments. Follow the children and their class pet, Diddy the duck, as they explore new scientific concepts and ideas.

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Yearly overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn term	Group and classify living things			Data collection A	States of matter							Consolidation
Spring term	Sound					Data collection B	Electricity				Energy	Consolidation
Summer term	Data collection C		Habitats		Deforestation	The digestive system					Food chains	

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Autumn Block 1

Group and classify living things

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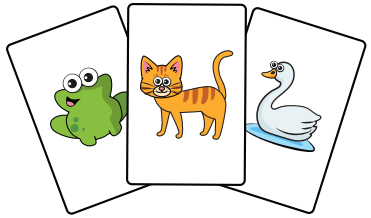
Small steps

Step 1	Group animals
Step 2	Vertebrates and invertebrates
Step 3	Classification keys (animals)
Step 4	Group plants
Step 5	Classification key (plants)

Key resources

Step 1 – Group animals

- animal playing cards – these can be images of animals stuck onto small rectangles of paper



Step 2 – Vertebrates and invertebrates

- hand lenses

Step 3 – Classification keys (animals)

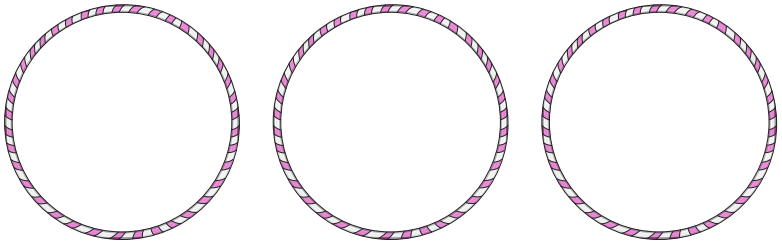
- large hoops
- string
- images of animals printed onto A4 paper

Step 4 – Group plants

- physical examples of different plants
- hand lenses
- leaves from evergreen/deciduous trees

Step 5 – Classification keys (plants)

- large hoops
- string
- images of plants printed onto A4 paper or physical examples used in the previous step



Group animals

Notes and guidance

In Year 2, children looked at animals (including humans) to identify their needs for survival, life cycles and offspring. They looked at examples of mammals, birds, fish, amphibians and reptiles.

In this step, children identify and sort animals into groups based on their features. It is essential that children are confident with the definitions of each animal group because they will use this information to classify animals in later steps.

Make it clear to children that all animals in this step have a spine. Children should be introduced to the term "vertebrate" to describe an animal with a spine. This is a building block for Step 2, in which they will look at invertebrates. Children should be shown examples of animals that are hard to categorise, such as the platypus, to challenge thinking and reasoning skills.

Key questions

- Is a _____ a mammal?

  How do you know?
- What features do birds have?
- What features do fish have?
- What features do reptiles have?
- What features do amphibians have?
- Is a whale a fish? Why/why not?
- How are amphibians and reptiles similar?

  How are they different?
- What group does a _____ belong to?

  Why is it difficult to group this animal?

Things to look out for

- Children may incorrectly group animals. For example, they may classify a whale as a fish because it lives in water. Discuss examples of animals that are harder to categorise before children carry out grouping activities.

National curriculum links

- Recognise that living things can be grouped in a variety of ways.
- **Working scientifically** – Talk about criteria for grouping, sorting and classifying (non-statutory).

Group animals

Key vocabulary

- **mammal** – an animal with a spine, fur or hair on its body, and feeds its young on milk

- **bird** – an animal with a spine, feathers, wings and a beak

- **fish** – an animal with a spine, fins and gills, that lives in water

- **amphibian** – an animal with a spine that can live on land and in water

- **reptile** – an animal with a spine and dry scales on its body

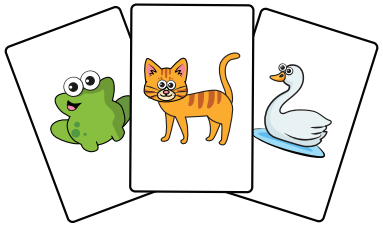
- **vertebrate** – an animal with a spine

Practical ideas

- Children play animal snap with cards that each have a picture of an animal. This will help them to identify animal characteristics.

  Children play in pairs. They have an equal number of cards. Together, they put their cards on the table, one by one, face up in a pile. If both animals have a similar feature, for example, they both have scales, the children say "Snap!" The child who says "Snap!" first takes the other child's pile of cards. Then they start again.

  The child that ends up with all the cards is the winner.



Factual knowledge

- Animals with a spine are called vertebrates.
- All mammals, birds, fish, amphibians and reptiles are vertebrates.
- Each vertebrate group has different physical features.

Vertebrates and invertebrates

Notes and guidance

In Step 1, children used the term "vertebrate" to describe an animal with a spine. In this step, children are introduced to the term "invertebrate" to describe an animal without a spine.

Children identify and name familiar animals from insect, spider and soft-bodied invertebrate groups. Children group animals based on easily identifiable features.

The enquiry question for this block is introduced in this step. Children are completing an identifying, grouping and classifying enquiry.

Children should use their understanding of vertebrates and invertebrates to begin grouping animals.

Things to look out for

- Children may incorrectly group worms and spiders as insects. They are classified in a different category of invertebrate.
- Children may think that all invertebrates have an exoskeleton.
- Children may think that all invertebrates move in the same way.

Key questions

- What is a vertebrate?
- What is an invertebrate?
- What is an exoskeleton?
- What features do insects have?
- What features do spiders have?
- How can invertebrates be grouped?
- How many ways can you find to group these invertebrates?

Enquiry question

- How can living things be grouped and classified?

National curriculum links

- Recognise that living things can be grouped in a variety of ways.
- **Working scientifically** – Asking relevant questions and using different types of scientific enquiries to answer them.

Vertebrates and invertebrates

Key vocabulary

- **vertebrate** – an animal with a spine

- **invertebrate** – an animal without a spine

- **exoskeleton** – a type of skeleton on the outside of an animal's body that provides support and protection

- **insect** – an invertebrate that has three body sections, six legs and two antennae

- **spider** – an invertebrate that has two body sections and eight legs

- **soft-bodied invertebrate** – an invertebrate with a soft body such as a slug or a snail

Practical ideas

- Children can explore their local area to identify different invertebrates. In this step, children should simply identify and count the animals they find. They will gather and record data using their local area in more detail in the next block.

- Children can group images of invertebrates based on different physical characteristics.

  Children should be encouraged to group the images in more than one way.

Factual knowledge

- Animals with a spine are called vertebrates.
- Animals without a spine are called invertebrates.
- Insects and spiders are invertebrates.
- Slugs and snails are soft-bodied invertebrates.

Classification keys (animals)

Notes and guidance

So far, children have sorted vertebrates and invertebrates into groups. In this small step, children are introduced to classification keys. These are sets of questions that help people to classify living things. In this step, children use simple keys to sort animals correctly. It is important that children have a clear understanding of the physical features of each animal group, because they will use this knowledge to create questions.

Children should create closed questions that can be answered with either "yes" or "no". They may need support with creating these questions. For example, the question "How furry is it?" would not help children to classify an animal. A better question would be, "Does it have fur?". If further support is needed, generate a whole-class question bank, which children can then use when creating classification keys.

Key questions

- What is a vertebrate?
- What is an invertebrate?
- What features do mammals/birds/fish/amphibians/reptiles have?
- What features do insects/spiders/snails have?
- What is a classification key?
- Why would scientists use a classification key?

Enquiry question

- How can living things be grouped and classified?

Things to look out for

- Children may use questions that are based on opinion rather than factual knowledge when trying to classify.
- Children may create questions that are too broad and therefore do not help to classify. Model writing a broad question and also a specific question. Allow the children to discuss which example is more useful and why.

National curriculum links

- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.
- **Working scientifically** – Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.

Classification keys (animals)

Key vocabulary

- **vertebrate** – an animal with a spine

- **invertebrate** – an animal without a spine

- **insect** – an invertebrate that has three body sections, six legs and two antennae

- **spider** – an invertebrate that has two body sections and eight legs

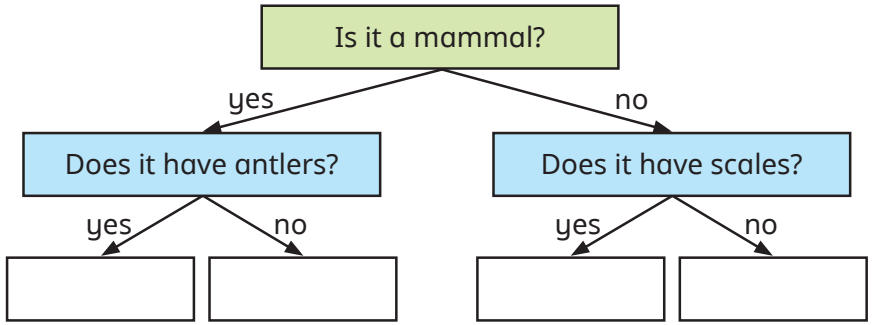
- **soft-bodied invertebrate** – an invertebrate with a soft body such as a slug or a snail

Practical ideas

- Create a large-scale classification key in the playground. Children can each have a picture of an animal on a sheet of to sort using the classification key.




Adults can facilitate the questions to allow children to move down the classification key answering "yes" or "no" to the questions.



This could also be completed using hoops and string to represent the classification key.

Factual knowledge

- Classification keys can be used to classify animals.
- Closed questions are used in classification keys.

Group plants

Notes and guidance

In KS1, children identified common wildflowers, garden plants and deciduous and evergreen trees. In this step, children build on this knowledge to group plants in different ways.

By the end of this step, children should know that flowering plants produce flowers and fruit and non-flowering plants do not. This step lends itself to practical activities in which children can observe plants closely and group them based on different features.

Initially, children may group plants based on categories such as colour or size. To extend learning, they can sort and group plants based on more complex categories such as their leaf structure. Allow children to continue to develop their answers to the enquiry question throughout this step.

In Year 3, children used the term "stamen" to describe a male reproductive part in a plant, and "pistil" to describe a female part. They do not need to use the terms "anther", "filament", "ovule", "ovary", "stigma" and "style" until Year 5

Things to look out for

- Some children may think that only the fruit that they eat are fruits.

Key questions

- What is a flowering/non-flowering plant?
- What is the difference between deciduous and evergreen trees?
- What are the female and male reproductive parts in plants called?
- How can you sort and group these plants?

  How many ways can you find?
- Look at the leaves.

  How are they similar? How are they different?

Enquiry question

- How can living things be grouped and classified?

National curriculum links

- Recognise that living things can be grouped in a variety of ways.
- **Working scientifically** – Talk about criteria for grouping, sorting and classifying (non-statutory).

Group plants

Key vocabulary

- **flowering plant** – a plant that can produce flowers and fruit

- **non-flowering plant** – a plant that does not produce flowers and fruit

- **stamen** – the male parts of a flowering plant

- **pistil** – the female part of a flowering plant

Practical ideas

- Children should look at physical examples of plants to allow them to observe them closely and talk about criteria for grouping, sorting and classifying.

  Large hoops can be used to sort and group these plants in different ways. Hand lenses would help children to make more accurate observations.

- Children can collect leaves from deciduous and evergreen trees to sort and classify them based on their leaf structure.

Factual knowledge

- Non-flowering plants include mosses and ferns.
- Flowering plants can produce flowers and fruit.
- Deciduous trees lose their leaves in autumn.
- Evergreen trees keep their leaves all year round.

Classification keys (plants)

Notes and guidance

In this small step, children use classification keys to classify plants based on simple physical features. This step allows children to revisit the skills they learnt when classifying animals in Step 3

Children should now be more confident with using classification keys, but may still need support with generating succinct, closed questions. Model examples of open and closed questions so children can select the most appropriate questions for their classification key.

In this step, children will provide an answer to the enquiry question. They may choose to show their findings in classification keys, presentations, or in simple written and verbal responses.

Things to look out for

- Children may think that plants are not living things.
- Children may create classification questions that are based on opinion rather than factual knowledge.
- Children may create questions that are too broad and therefore do not help to classify. Model writing a broad question and also a specific question. Allow the children to discuss which example is more useful and why.

Key questions

- What is a flowering plant?
- What is a non-flowering plant?
- What features do ferns and mosses have?
- What features do flowering plants have?
- Do all plants have petals? Explain your thinking.
- Do all plants have roots? Explain your thinking.
- How can these plants be classified?

Enquiry question

- How can living things be grouped and classified?

National curriculum links

- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.
- **Working scientifically** – Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

Classification keys (plants)

Key vocabulary

- **flowering plant** – a plant that can produce flowers and fruit

- **pollination** – the transfer of pollen from the male parts to the female parts

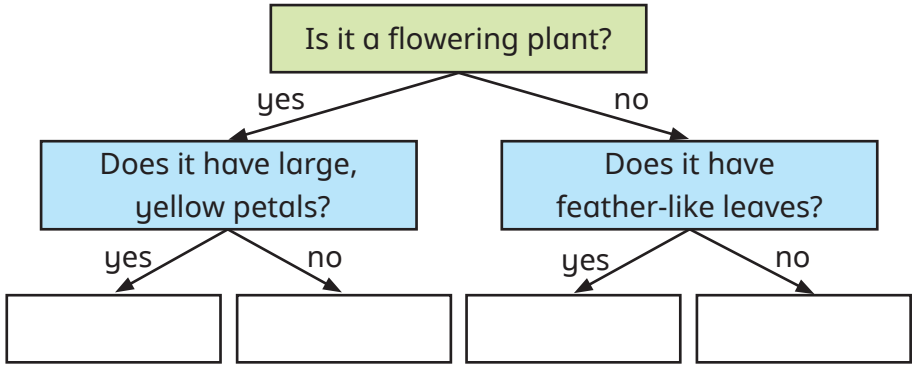
- **non-flowering plant** – a plant that does not produce flowers or fruit

- **fern** – a non-flowering plant with long stems and feather-like leaves

- **moss** – a non-flowering plant that grows in damp, moist conditions

Practical ideas

- Create open and closed question cards that children can sort to help them understand the difference between question types. Children can classify the plants they looked at in Step 4



Large hoops and string can be used to represent the classification key.

Factual knowledge

- Classification keys can be used to classify plants.
- Closed questions are used in classification keys.