Science at Claycots

Claycots Primary School

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Science Team

Mrs Ali is our Science Leader at Claycots

The vision for Science

At Claycots, we aim to inspire pupils by providing engaging and hands-on learning experiences that foster pupils' curiosity and love for scientific inquiry. We wish to provide a curriculum which allows pupils to develop a deep understanding of the natural world and which equips them with the skills and knowledge necessary to make informed decisions about scientific issues.

We aim to encourage exploration and inquiry, by providing opportunities for children to explore the natural world and to ask questions about it. We wish to foster collaboration, by providing lessons which include group projects, discussions, or problem-solving activities.

We envisage a science curriculum which provides a dynamic and engaging learning environment that inspires pupils to become lifelong learners and appreciate the wonders of the natural world.

Subject Intent

At Claycots we want children to think like scientists through a hands-on, creative and purposeful curriculum which ignites a sense of awe and wonder. As a school, we recognise that science has changed our lives and plays a vital role in the world's future prosperity and our science curriculum should develop children's scientific understanding of the natural world by making meaningful links to real life contexts, whilst enhancing working scientifically skills. We want them to aspire to become astronomers, botanists, chemists, cytologists and have no limits to their ambitions for a STEM career.

As a school, we teach the National Curriculum for science and aim to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

Subject Implementation

At Claycots, teachers use PLAN primary science resources to support their planning, teaching and assessment. PLAN science resources ensure that knowledge is carefully and progressively sequenced to ensure that pupils know and remember more over time.

Central to our pedagogical approach to teaching science is our teaching of the five types of scientific enquiry which are identified and sequentially planned for across our science curriculum:

1. observing over time
2. comparative & fair testing
3. identifying and classifying
4. pattern seeking
5. researching using secondary sources

When teaching science, teachers are expected to plan to meet the needs of all of the children in their class, providing additional scaffolds and opportunities to deepen learning as required.

Subject Implementation

Teachers plan science lessons which include the following:

- Recap of previous knowledge
- Revisit of previous learning linked to the current topic (skills/knowledge/vocab)
- Introduction of new skill/knowledge (this is modelled) and explicit teaching of new vocabulary
- Opportunity to practise the skill/contextualise knowledge
- Application Activity

In order to ensure that the school has high quality science planning, the school has worked with a Science consultant to plan all units of work alongside the year group leaders. Using the PLAN Science documentation as a starting point, the team plan a series of lessons which ensures that the key curriculum information is planned in the most appropriate way. Opportunities and tasks for pupils to record work are also clearly identified within the planning. The team also meet termly to review the previous term's plans and identify successes and areas of development, comparing actual outcomes against the planned opportunities. This approach ensures that the school has full curriculum coverage and that the Science curriculum is regularly reviewed to ensure that we are providing the best for pupils at Claycots.

Subject overview

Year Group	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Everyday Materials *(Identifying & Classifying)* Seasonal Changes – Autumn *(Observing over time)*		Animals and Humans *(Research)* Seasonal Changes – Spring *(Observing over time)*		Plants (Shoebox Garden) *(Pattern seeking)*	Scientist Study – Marie Curie *(Research)* Seasonal Changes – Summer *(Observing over time)*
Year 2	Materials *(Identifying and Classifying)*	Animals including Humans *(Pattern Seeking)*	Healthy Eating *(Pattern Seeking)*	Plants *(Observing over time)*	Scientist Study – Jane Goodall *(Research)*	Living Things *(Observing over time)*
Year 3	Rocks and Soils *(Identifying & Classifying)* Scientist Study – Mary Anning *(Research)*		Forces and Magnets *(Pattern Seeking)*	Plants – life cycles of plants *(Observing over time)*	Humans and Animals – Skeletons *(Research)*	Light and Shadows, Reflection *(Fair testing)*
Year 4	Sound *(Pattern Seeking)*	States of Matter *(Observing over time)*	Electricity	Animals including Humans *(Research)*	Living Things and their Habitats *(Identifying & Classifying)*	Scientist Study – Isaac Newton
Year 5	Earth and Space *(Research)* Scientist Study – Maggie Aderin-Pocock	Living Things and their habitats *(Observing over time)*	Forces *(Fair testing)*	Properties and Changes of Materials *(Identifying and Classifying)*	Animals including Humans (Timeline of Humans, Puberty) *(Research)*	Properties and Changes of Materials – changes of state *(Pattern Seeking)*
Year 6	Light *(Pattern Seeking)*	Electricity *(Fair testing)*	Living Things and their Habitats *(Identifying & Classifying)*	Evolution and Inheritance *(Research)* Scientist Study – Charles Darwin	Animals including Humans *(Independent enquiry)*	Animals including Humans: Diet/Drugs/Lifestyle *(Research)*

How we measure progress

At Claycots, we measure progress in Science using a range of methods, including:

- Marking of written work in pupils' books, assessing how well the children have met the learning intention and success criteria

- Specific and targeted questioning of pupils within a lesson to assess their understanding of a topic

- Observation of pupils' contributions to practical activities

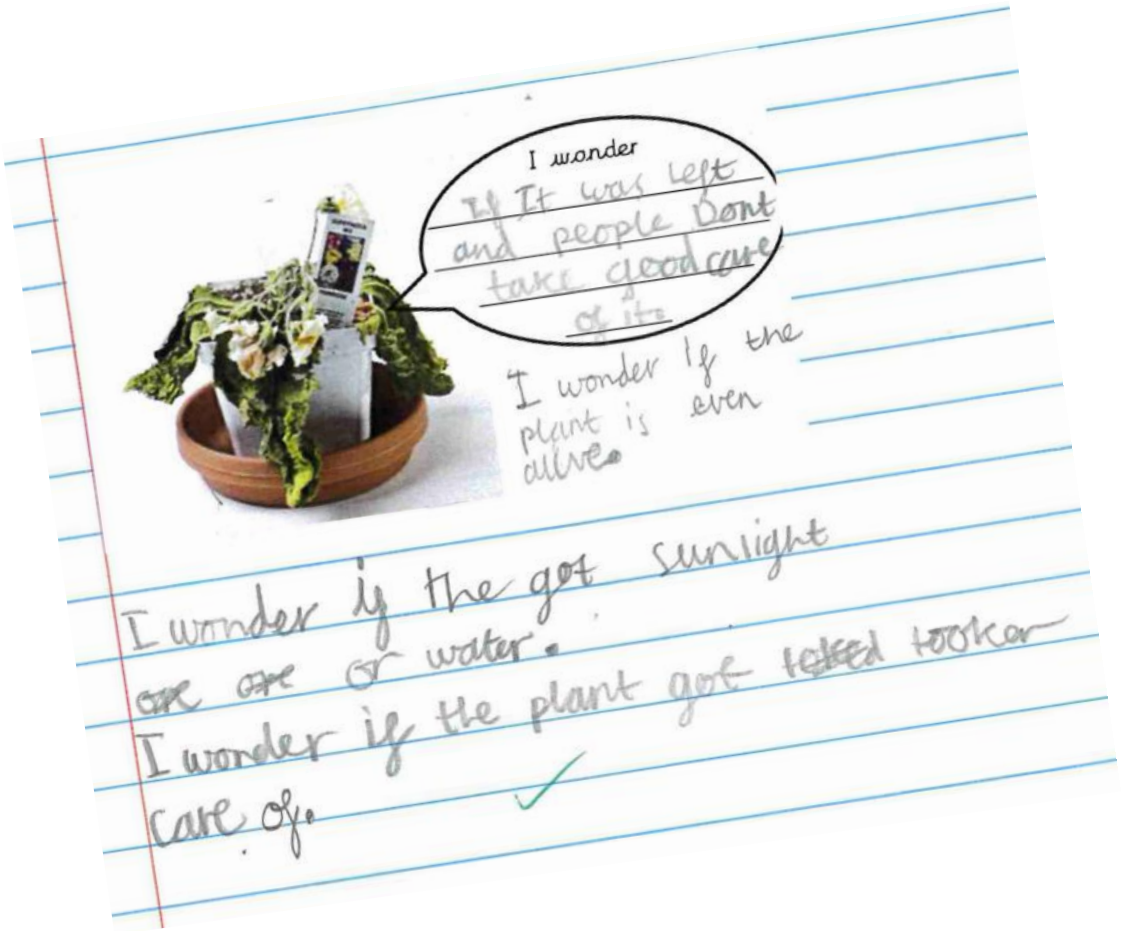
- We track children's developing knowledge and enquiry skills throughout the year, this enables us to assess children as having met or not met the expected standards at the end of each academic year

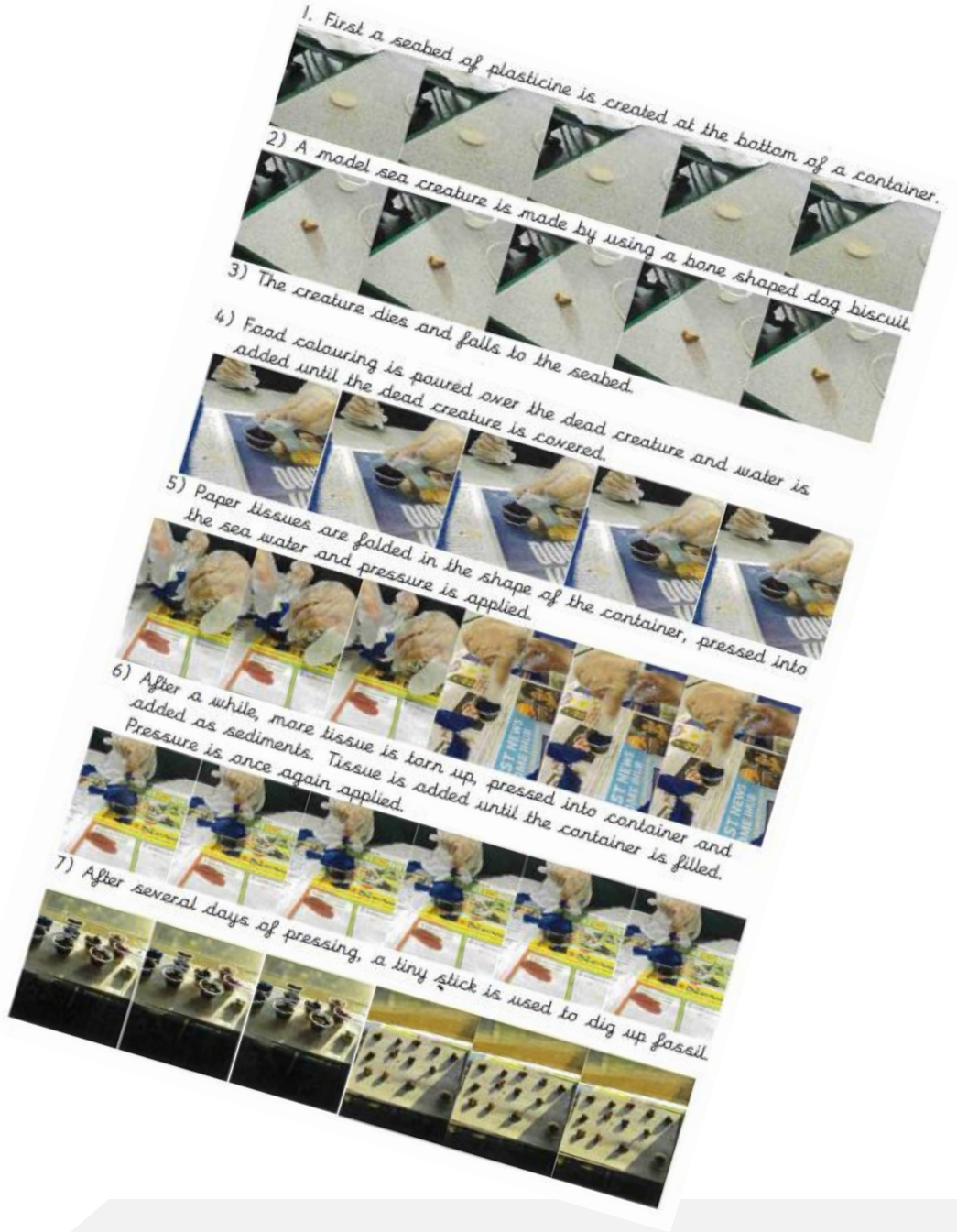
Visits and experiences

At Claycots, we enrich our Science curriculum by providing a range of visits and experiences for our children, including:

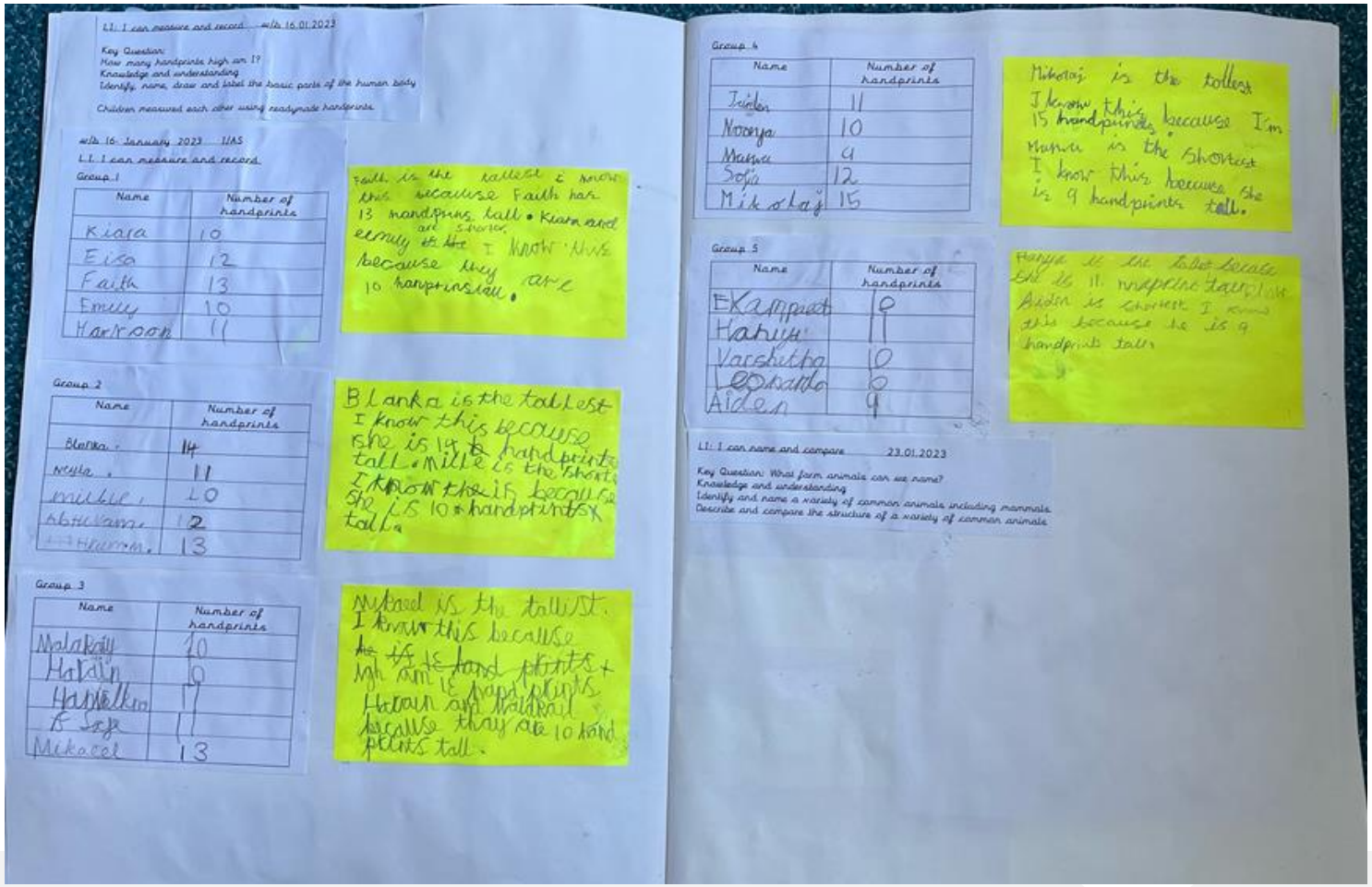
- Hands-on and practical Science lessons, for example, growing plants from seed in Y1 to conducting fair tests in electricity in Y6.
- We take the children on a range of local visits and provide in-school experiences, such as:
- Odds Farm (Reception)
- Beale Park (Y1)
- Kew Gardens (Year 2)
- Marwell Zoo (Year 3)
- Salt Hill & Kennedy Parks (Reception & Year 4)
- Natural History Museum (Year 6).
- Experiences in school, such as a visiting planetarium and reptile visits.

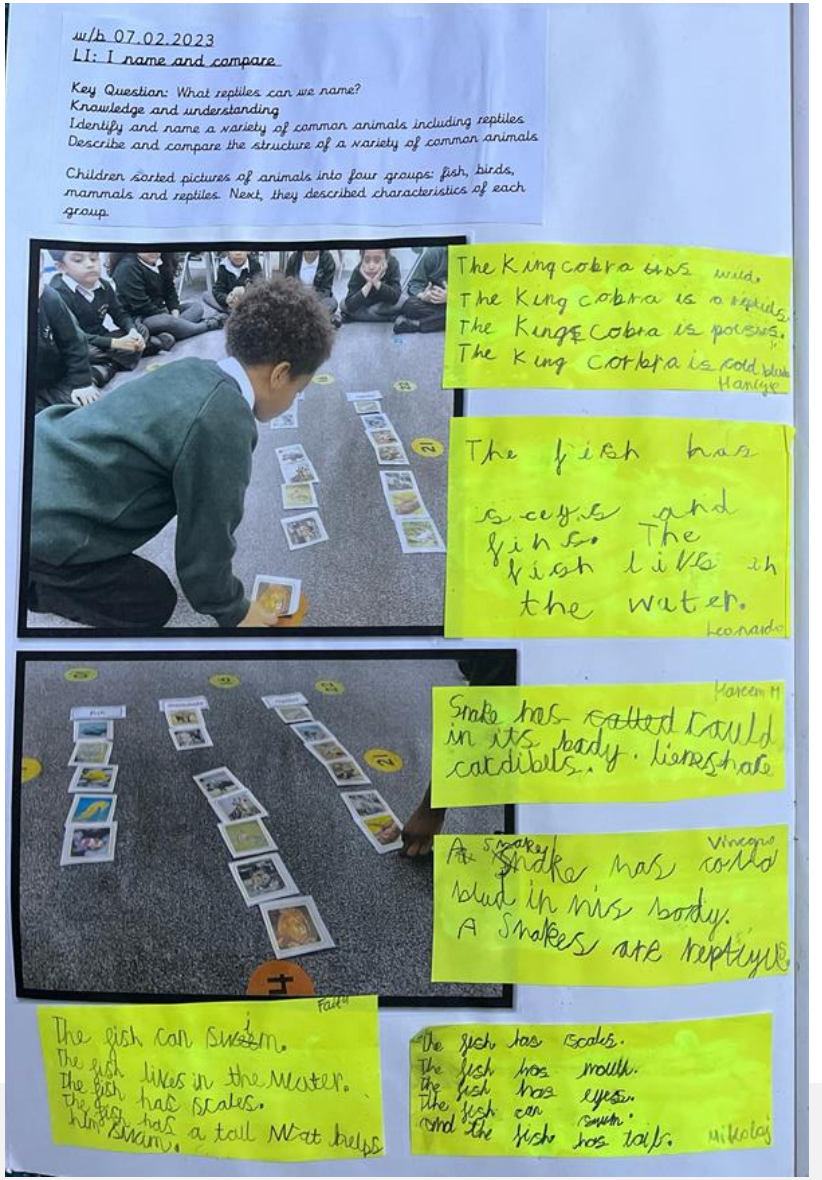
Examples of learning



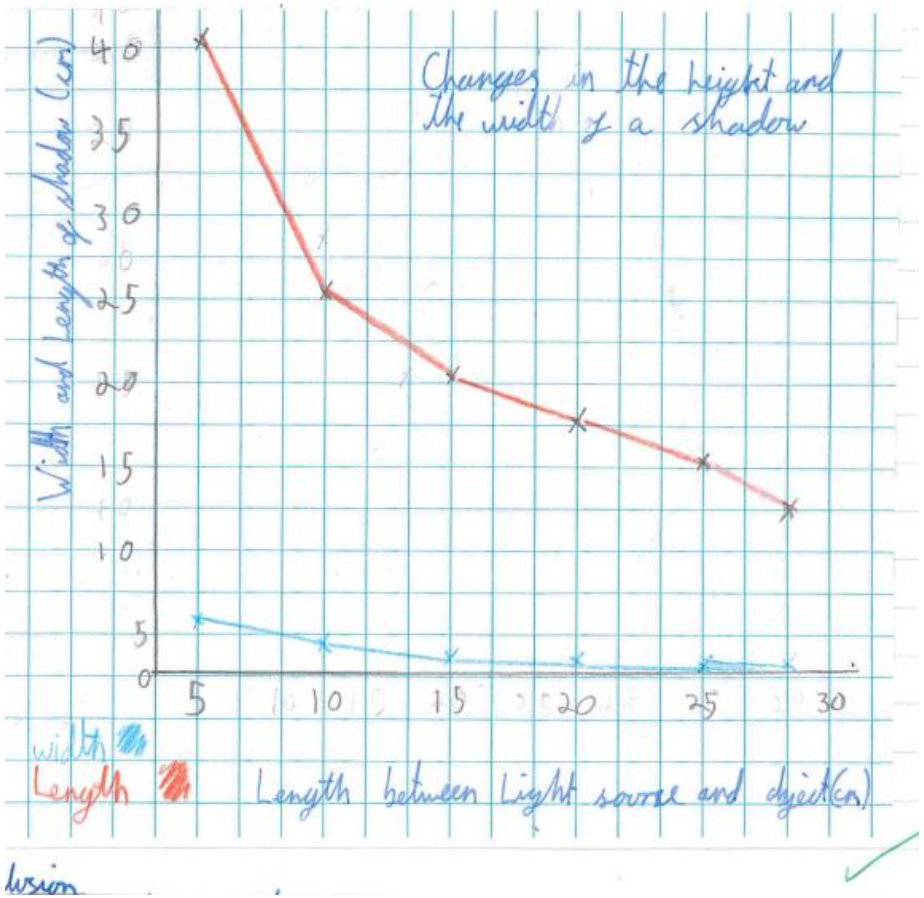


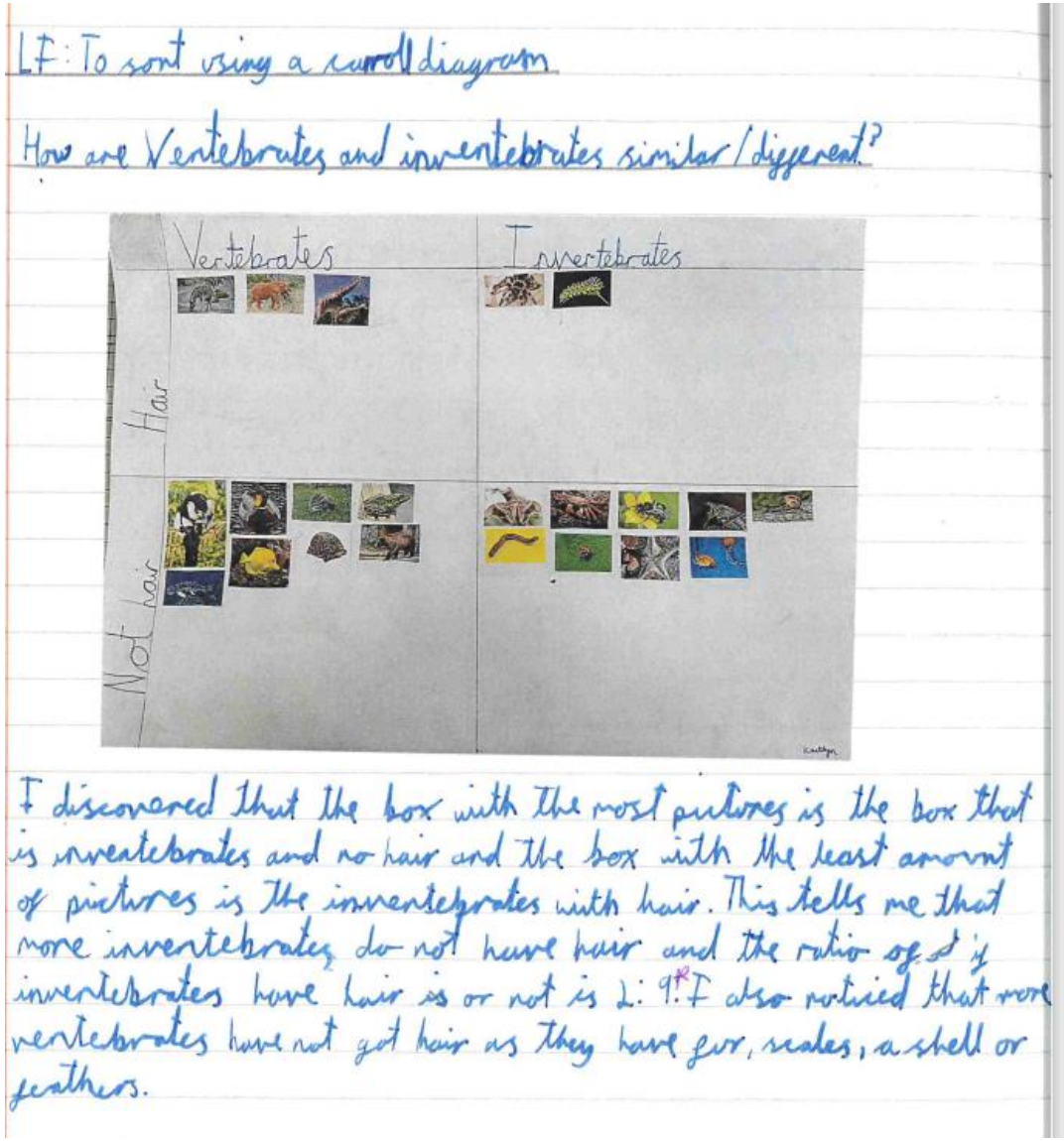
Examples of learning





Examples of learning





Examples of learning

LI: To report and present findings.

What happens if moths are not camoflaged in their environments?

Moth number	Distance away from where it is no longer seen
1	5m
2	3m 5cm
3	6 m cm
4	5m 60cm
5	7m 40cm

Today we will had tested the effectiveness of the moths camoflauge from an environment. We will had measured the distance from the environment were it won't could nt be seen. We will had used a metre stick to measure and use used a colouring pencil and m Moth template to create the camoflage. The moths is was something that will changed and the measuring device and environment will stay the same. The smaller the distance from the environment the better the camoflauge and the longer the distance from the environment the most uneffective the camoflauge.

If moths no longer camoflauged then their predators would eat them and moths would be extind.

Pupil voice

“I really like our nature topic. It helps us understand how to look after things.” *- Y2 pupil*

“Science is great because we see how things work and it makes us curious about the world.” *- Y2 pupil*

“I liked when we made healthy fruit kebabs. Bananas are my favourite!” *-Y2 pupil*

“The teachers help us and they always get different children to help with different jobs.” *- Y4 pupil*

“We get to do lots of hands-on experiments. I like when we make a mess and have to tidy up afterwards!” *- Y4 pupil*

PLAN

Planning for assessment

Knowledge matrices Y1-6

Planning for assessment

Knowledge matrices Y1

	Year	1	Topic	Plants
	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. • Identify and describe the basic structure of a variety of common flowering plants, including trees.			

Prior learning	Future learning
• Plant seeds and care for growing plants. (Nursery – Plants) • Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants) • Begin to understand the need to respect and care for the natural environment and all living things. (Nursery – Plants) • Explore the natural world around them. (Reception – Living things and their habitats) • Recognise some environments that are different to the one in which they live. (Reception – Living things and their habitats)	• Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats) • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 - Plants)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
Growing locally, there will be a vast array of plants which all have specific names. These can be identified by looking at the key characteristics of the plant. Plants have common parts, but they vary between the different types of plants. Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring.	• Can name trees and other plants that they see regularly • Can describe some of the key features of these trees and plants e.g. the shape of the leaves, the colour of the flower/blossom • Can point out trees which lost their leaves and those that kept them the whole year • Can point to and name the parts of a plant, recognising that they are not always the same e.g. leaves and stems may not be green
Key vocabulary	
Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud Names of trees in the local area Names of garden and wild flowering plants in the local area	

Common misconceptions	
Some children may think: • plants are flowering plants grown in pots with colored petals and leaves and a stem • trees are not plants • all leaves are green • all stems are green • a trunk is not a stem • blossom is not a flower.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Make close observations of leaves, seeds, flowers etc. • Compare two leaves, seeds, flowers etc. • Classify leaves, seeds, flowers etc. using a range of characteristics. • Identify plants by matching them to named images. • Make observations of how plants change over a period of time. • When further afield, spot plants that are the same as those in the local area studied regularly, describing the key features that helped them.	• Can sort and group parts of plants using similarities and differences • Can use simple charts etc. to identify plants • Can collect information on features that change during the year • Can use photographs to talk about how plants change over time

Year	1	Topic	Animals, including humans

- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores.
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).
- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

Prior learning	Future learning
• Use all their senses in hands-on exploration of natural materials. (Nursery - Humans) • Name and describe people who are familiar to them. (Reception - Humans)	• Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. (Y2 - Living things and their habitats) • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals vary in many ways having different structures e.g. wings, tails, ears etc. They also have different skin coverings e.g. scales, feathers, hair. These key features can be used to identify them. Animals eat certain things - some eat other animals, some eat plants, some eat both plants and animals. Humans have key parts in common, but these vary from person to person. Humans (and other animals) find out about the world using their senses. Humans have five senses – sight, touch, taste, hearing and smelling. These senses are linked to particular parts of the body.	• Can name a range of animals which includes animals from each of the vertebrate groups • Can describe the key features of these named animals • Can label key features on a picture/diagram • Can write descriptively about an animal • Can write a What am I? riddle about an animal • Can describe what a range of animals eat • Can play and lead 'Simon says' • During PE lessons, can follow instructions involving parts of the body

Key vocabulary	
• Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves • Names of animals experienced first-hand from each vertebrate group • Parts of the body including those linked to PSHE teaching (see joint document produced by the ASE and PSHE Association) • Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue **N.B.** The children need to be able to name and identify a range of animals in each group e.g. name specific birds and fish. They do not need to use the terms mammal, reptiles etc. or know the key characteristics of each, although they will probably be able to identify birds and fish, based on their characteristics. The children also do not need to use the words carnivore, herbivore and omnivore. If they do, ensure that they understand that carnivores eat other animals, not just meat. Although we often use our fingers and hands to feel objects, the children should understand that we can feel with many parts of our body.	• Can label parts of the body on pictures and diagrams • Can explore objects using different senses

Common misconceptions
Some children may think: • only four-legged mammals, such as pets, are animals • humans are not animals • insects are not animals • all ‘bugs’ or ‘creepy crawlies’, such as spiders, are part of the insect group • amphibians and reptiles are the same.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Make first-hand, close observations of animals from each of the groups. • Compare two animals from the same or different groups. • Classify animals using a range of features. • Identify animals by matching them to named images. • Classify animals according to what they eat. • Make first-hand close observations of parts of the body e.g. hands, eyes. • Compare two people. • Take measurements of parts of their body. • Compare parts of their own body. • Look for patterns between people e.g. Do people with big hands have big feet? • Classify people according to their features. • Investigate human senses e.g. Which part of my body is good for feeling, which is not? Which food/flavours can I identify by taste? Which smells can I match?	• Can sort and group animals using similarities and differences • Can use simple charts etc. to identify unknown animals • Can create a drawing of an imaginary animal labelling its key features • Can use secondary resources to find out what animals eat, including talking to experts e.g. pet owners, zookeepers etc. • Can use first-hand close observations to make detailed drawings • Can name body parts correctly when talking about measurements and comparisons e.g. “My arm is x straws long.” “My arm is x straws long and my leg is y straws long. My leg is longer than my arm.” “We both have hands, but his are bigger than mine.” “These people have brown eyes and these have blue.” • Can talk about their findings from investigations using appropriate vocabulary e.g. “My fingers are much better at feeling than my toes” “We found that the crisps all taste the same.”

Year	1	Topic	Everyday materials

- Distinguish between an object and the material from which it is made.
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.
- Describe the simple physical properties of a variety of everyday materials.
- Compare and group together a variety of everyday materials on the basis of their simple physical properties.

Prior learning	Future learning
• Use all their senses in hands-on exploration of natural materials. (Nursery - Materials, including changing materials) • Explore collections of materials with similar and/or different properties. (Nursery - Materials, including changing materials) • Talk about the differences between materials and changes they notice. (Nursery - Materials, including changing materials)	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All objects are made of one or more materials. Some objects can be made from different materials e.g. plastic, metal or wooden spoons. Materials can be described by their properties e.g. shiny, stretchy, rough etc. Some materials e.g. plastic can be in different forms with very different properties.	• Can label a picture or diagram of an object made from different materials • Can describe the properties of different materials
Key vocabulary	
Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through	

Common misconceptions	
Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word ‘rock’ describes an object rather than a material • ‘solid’ is another word for hard.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Classify objects made of one material in different ways e.g. a group of object made of metal. • Classify in different ways one type of object made from a range of materials e.g. a collection of spoons made of different materials. • Classify materials based on their properties. • Test the properties of objects e.g. absorbency of cloths, strength of party hats made of different papers, stiffness of paper plates, waterproofness of shelters.	• Can sort objects and materials using a range of properties • Can choose an appropriate method for testing an object for a particular property • Can use their test evidence to answer the questions about properties e.g. “Which cloth is the most absorbent?”

Year	1	Topic	Seasonal changes
• Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.			

Prior learning	Future learning
• Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans) • Explore the natural world around them. (Reception – Seasonal changes) • Describe what they see, hear and feel whilst outside. (Reception – Seasonal changes) • Understand the effect of changing seasons on the natural world around them. (Reception – Seasonal changes)	• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. (Y5 - Earth and space) • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
In the UK, the day length is longest at mid-summer (about 16 hours) and gets shorter each day until mid-winter (about 8 hours) before getting longer again. The weather also changes with the seasons. In the UK, it is usually colder and rainier in winter, and hotter and dryer in the summer. The change in weather causes many other changes. Some examples are: numbers of minibeasts found outside; seed and plant growth; leaves on trees; and type of clothes worn by people.	• Can name the four seasons and identify when in the year they occur • Can describe weather in different seasons over a year • Can describe days as being longer (in time) in the summer and shorter in the winter • Can describe other features that change through the year

Key vocabulary	
• Weather (sunny, rainy, windy, snowy etc.) • Seasons (winter, summer, spring, autumn) • Sun, sunrise, sunset, day length	

Common misconceptions

Some children may think:

- it always snows in winter
- it is always sunny in the summer
- there are only flowers in spring and summer
- it rains most in the winter.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Collect information about the weather regularly throughout the year. • Present this information in tables and charts to compare the weather across the seasons. • Collect information, regularly throughout the year, of features that change with the seasons e.g. plants, animals, humans. • Present this information in different ways to compare the seasons. • Gather data about day length regularly throughout the year and present this to compare the seasons.	• Use the evidence gathered to describe the general types of weather and changes in day length over the seasons. • Use their evidence to describe some other features of their surroundings, e.g. themselves, animals, plants that change over the seasons • Demonstrate their knowledge in different ways e.g. making a weather forecast video, writing seasonal poetry, creating seasonal artwork

PLAN

Planning for assessment

Knowledge matrices Y2

	Year	2	Topic	Living things and their habitat
	• Explore and compare the differences between things that are living, dead, and things that have never been alive • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • Identify and name a variety of plants and animals in their habitats, including micro-habitats • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food			

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Observe changes across the four seasons. (Y1 - Seasonal changes)	• Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
All objects are either living, dead or have never been alive. Living things are plants (including seeds) and animals. Dead things include dead animals and plants and parts of plants and animals that are no longer attached e.g. leaves and twigs, shells, fur, hair and feathers (This is a simplification, but appropriate for Year 2 children.) An object made of wood is classed as dead. Objects made of rock, metal and plastic have never been alive (again ignoring that plastics are made of fossil fuels). Animals and plants live in a habitat to which they are suited, which means that animals have suitable features that help them move and find food and plants have suitable features that help them to grow well. The habitat provides the basic needs of the animals and plants – shelter, food and water. Within a habitat there are different micro-habitats e.g. in a woodland – in the leaf litter, on the bark of trees, on the leaves. These micro-habitats have different conditions e.g. light or dark, damp or dry. These conditions affect which plants and animals live there. The plants and animals in a habitat depend on each other for food and shelter etc. The way that animals obtain their food from plants and other animals can be shown in a food chain.	• Can find a range of items outside that are living, dead and never lived • Can name a range of animals and plants that live in a habitat and micro-habitats that they have studied • Can talk about how the features of these animals and plants make them suitable to the habitat • Can talk about what the animals eat in a habitat and how the plants provide shelter for them • Can construct a food chain that starts with a plant and has the arrows pointing in the correct direction
Key vocabulary	
• Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed • Names of local habitats e.g. pond, woodland etc. • Names of micro-habitats e.g. under logs, in bushes etc.	

Common misconceptions	
Some children may think: • an animal's habitat is like its 'home' • plants and seeds are not alive as they cannot be seen to move • fire is living • arrows in a food chain mean 'eats'.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Explore the outside environment regularly to find objects that are living, dead and have never lived. • Classify objects found in the local environment. • Observe animals and plants carefully, drawing and labelling diagrams. • Create simple food chains for a familiar local habitat from first-hand observation and research. • Create simple food chains from information given e.g. in picture books (Gruffalo etc.).	• Can sort into living, dead and never lived • Can give key features that mean the animal or plant is suited to its micro-habitat • Using a food chain can explain what animals eat • Can explain in simple terms why an animal or plant is suited to a habitat e.g. the caterpillar cannot live under the soil like a worm as it needs fresh leaves to eat; the seaweed we found on the beach cannot live in our pond because it is not salty

Year	2	Topic	Plants

- Observe and describe how seeds and bulbs grow into mature plants.
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)	• Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 - Plants) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Plants may grow from either seeds or bulbs. These then germinate and grow into seedlings which then continue to grow into mature plants. These mature plants may have flowers which then develop into seeds, berries, fruits etc. Seeds and bulbs need to be planted outside at particular times of year and they will germinate and grow at different rates. Some plants are better suited to growing in full sun and some grow better in partial or full shade. Plants also need different amounts of water and space to grow well and stay healthy.	• Can describe how plants that they have grown from seeds and bulbs have developed over time • Can identify plants that grew well in different conditions
Key vocabulary	
As for Year 1 plus light, shade, sun, warm, cool, water, grow, healthy	

Common misconceptions	
Some children may think: • plants are not alive as they cannot be seen to move • seeds are not alive • all plants start out as seeds • seeds and bulbs need sunlight to germinate.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Make close observations of seeds and bulbs. • Classify seeds and bulbs. • Research and plan when and how to plant a range of seeds and bulbs. • Look after the plants as they grow – weeding, thinning, watering etc. • Make close observations and measurements of their plants growing from seeds and bulbs. • Make comparisons between plants as they grow.	• Can spot similarities and difference between bulbs and seeds • Can nurture seeds and bulbs into mature plants identifying the different requirements of different plants

Year	2	Topic	Animals, including humans

- Notice that animals, including humans, have offspring which grow into adults.
- Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

Prior learning	Future learning
• Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	• Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be young, such as babies or kittens, that grow into adults. In other animals, such as chickens or insects, there may be eggs laid that hatch to young or other stages which then grow to adults. The young of some animals do not look like their parents e.g. tadpoles. All animals, including humans, have the basic needs of feeding, drinking and breathing that must be satisfied in order to survive. To grow into healthy adults, they also need the right amounts and types of food and exercise. Good hygiene is also important in preventing infections and illnesses.	• Can describe how animals, including humans, have offspring which grow into adults, using the appropriate names for the stages • Can state the basic needs of animals, including humans, for survival • Can state the importance for humans of exercise, eating the right amounts of different types of food, and hygiene • Can name foods in each section of the Eatwell Guide

Key vocabulary	
Offspring, reproduction, growth, child, young/old stages (examples - chick/hen, baby/child/adult, caterpillar/butterfly), exercise, heartbeat, breathing, hygiene, germs, disease, food types (examples – meat, fish, vegetables, bread, rice, pasta)	

Common misconceptions
Some children may think: • an animal's habitat is like its 'home' • all animals that live in the sea are fish • respiration is breathing • breathing is respiration.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Ask people questions and use secondary sources to find out about the life cycles of some animals. • Observe animals growing over a period of time e.g. chicks, caterpillars, a baby. • Ask questions of a parent about how they look after their baby. • Ask pet owners questions about how they look after their pet. • Explore the effect of exercise on their bodies. • Classify food in a range of ways, including using the Eatwell Guide. • Investigate washing hands, using glitter gel.	• Can describe, including using diagrams, the life cycle of some animals, including humans, and their growth to adults e.g. by creating a life cycle book for a younger child • Can measure/observe how animals, including humans, grow. • Show what they know about looking after a baby/animal by creating a parenting/pet owners' guide • Explain how development and health might be affected by differing conditions and needs being met/not met

	Year	2	Topic	Uses of everyday materials
	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.			

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
All objects are made of one or more materials that are chosen specifically because they have suitable properties for the task. For example, a water bottle is made of plastic because it is transparent allowing you to see the drink inside and waterproof so that it holds the water. When choosing what to make an object from, the properties needed are compared with the properties of the possible materials, identified 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 the material or depend on how the material has been processed e.g. thickness.	• Can name an object, say what material it is made from, identify its properties and make a link between the properties and a particular use • Can label a picture or diagram of an object made from different materials • For a given object can identify what properties a suitable material needs to have

Key vocabulary	
Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard Properties of materials – as for Year 1 plus opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching	• Whilst changing the shape of an object can describe the action used • Can use the words flexible and/or stretchy to describe materials that can be changed in shape and stiff and/or rigid for those that cannot • Can recognise that a material may come in different forms which have different properties

Common misconceptions
Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word rock describes an object rather than a material • solid is another word for hard.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Classify materials. • Make suggestions about alternative materials for a purpose that are both suitable and unsuitable • Test the properties of materials for particular uses e.g. compare the stretchiness of fabrics to select the most appropriate for Elastigirl's costume, test materials for waterproofness to select the most appropriate for a rain hat	• Can sort materials using a range of properties • Can explain using the key properties why a material is suitable or not suitable for a purpose • Can begin to choose an appropriate method for testing a material for a particular property • Can use their test evidence to select appropriate material for a purpose e.g. Which material is the best for a rain hat?

Planning for assessment

Knowledge matrices Y3

Year	3	Topic	Plants

- Identify and describe the functions of different parts of flowering plants: roots; stem/trunk; leaves; and flowers.
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.
- Investigate the way in which water is transported within plants.
- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Prior learning	Future learning
• Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)	• Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.	• Can explain the function of the parts of a flowering plant • Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal, and germination • Can give different methods of pollination and seed dispersal, including examples
Key vocabulary	
Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)	

Common misconceptions	
Some children may think: • plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Observe what happens to plants over time when the leaves or roots are removed. • Observe the effect of putting cut white carnations or celery in coloured water. • Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. • Spot flowers, seeds, berries and fruits outside throughout the year. • Observe flowers carefully to identify the pollen. • Observe flowers being visited by pollinators e.g. bees and butterflies in the summer. • Observe seeds being blown from the trees e.g. sycamore seeds. • Research different types of seed dispersal. • Classify seeds in a range of ways, including by how they are dispersed. • Create a new species of flowering plant.	• Can explain observations made during investigations • Can look at the features of seeds to decide on their method of dispersal • Can draw and label a diagram of their created flowering plant to show its parts, their role and the method of pollination and seed dispersal

Year	3	Topic	Animals, including humans

- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food – they get nutrition from what they eat.
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Prior learning	Future learning
• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)	• Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need. Food contains a range of different nutrients – carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre that are needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.	• Can name the nutrients found in food • Can state that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients

Key vocabulary	
Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine	• Can name some bones that make up their skeleton, giving examples that support, help them move or provide protection • Can describe how muscles and joints help them to move

Common misconceptions

Some children may think:

- certain whole food groups like fats are 'bad' for you
- certain specific foods, like cheese are also 'bad' for you
- diet and fruit drinks are 'good' for you
- snakes are similar to worms, so they must also be invertebrates
- invertebrates have no form of skeleton.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence

• Classify food in a range of ways.
• Use food labels to explore the nutritional content of a range of food items.
• Use secondary sources to find out the types of food that contain the different nutrients.
• Use food labels to answer enquiry questions e.g. How much fat do different types of pizza contain? How much sugar is in soft drinks?
• Plan a daily diet to contain a good balance of nutrients.
• Explore the nutrients contained in fast food.
• Use secondary sources to research the parts and functions of the skeleton.
• Investigate patterns asking questions such as:
  ▪ Can people with longer legs run faster?
  ▪ Can people with bigger hands catch a ball better?
• Compare, contrast and classify skeletons of different animals.
	• Can classify food into those that are high or low in particular nutrients
	• Can answer their questions about nutrients in food, based on their gathered evidence
	• Can talk about the nutrient content of their daily plan
	• Use their data to look for patterns (or lack of them) when answering their enquiry question
	• Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons

Year	3	Topic	Rocks

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- Describe in simple terms how fossils are formed when things that have lived are trapped within rock.
- Recognise that soils are made from rocks and organic matter.

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)	• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance) • The composition of the Earth. (KS3) • The structure of the Earth. (KS3) • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.	• Can name some types of rock and give physical features of each • Can explain how a fossil is formed • Can explain that soils are made from rocks and also contain living/dead matter

Key vocabulary	
Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil	

Common misconceptions

Some children may think:

- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe rocks closely. • Classify rocks in a range of ways, based on their appearance. • Devise a test to investigate the hardness of a range of rocks. • Devise a test to investigate how much water different rocks absorb. • Observe how rocks change over time e.g. gravestones or old building. • Research using secondary sources how fossils are formed. • Observe soils closely. • Classify soils in a range of ways based on their appearance. • Devise a test to investigate the water retention of soils. • Observe how soil can be separated through sedimentation. • Research the work of Mary Anning.	• Can classify rocks in a range of different ways, using appropriate vocabulary • Can devise tests to explore the properties of rocks and use data to rank the rocks • Can link rocks changing over time with their properties e.g. soft rocks get worn away more easily • Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc. • Can identify plant/animal matter and rocks in samples of soil • Can devise a test to explore the water retention of soils

Year	3	Topic	Light

- Recognise that they need light in order to see things, and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
- Find patterns in the way that the size of shadows change.

Prior learning	Future learning
• Explore how things work. (Nursery – Light) • Talk about the differences in materials and changes they notice. (Nursery – Light) • Describe what they see, hear and feel whilst outside. (Reception – Light) • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)	• Recognise that light appears to travel in straight lines. (Y6 - Light) • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. (Y6 - Light) • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. (Y6 - Light) • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 - Light)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective. The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.	• Can describe how we see objects in light and can describe dark as the absence of light • Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses • Can define transparent, translucent and opaque • Can describe how shadows are formed

Key vocabulary	
Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	

Common misconceptions

Some children may think:

- we can still see even where there is an absence of any light
- our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow
- shadows result from objects giving off darkness.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explore how different objects are more or less visible in different levels of lighting. • Explore how objects with different surfaces, e.g. shiny vs matt, are more or less visible. • Explore how shadows vary as the distance between a light source and an object or surface is changed. • Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground. • Choose suitable materials to make shadow puppets. • Create artwork using shadows.	• Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change • Can clearly explain, giving examples, that objects are not visible in complete darkness • Can describe and demonstrate how shadows are formed by blocking light • Can describe, demonstrate and make predictions about patterns in how shadows vary

Year	3	Topic	Forces and magnets

- Compare how things move on different surfaces.
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Observe how magnets attract or repel each other and attract some materials and not others.
- Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.
- Describe magnets as having two poles.
- Predict whether two magnets will attract or repel each other, depending on which poles are facing.

Prior learning	Future learning
• Explore how things work. (Nursery – Forces) • Explore and talk about different forces they can feel. (Nursery – Forces) • Talk about the differences between materials and changes they notice. (Nursery – Forces) • Explore the natural world around them. (Reception – Forces) • Describe what they see, hear and feel whilst outside. (Reception – Forces) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces) • Magnetic fields by plotting with compass, representation by field lines. (KS3) • Earth's magnetism, compass and navigation. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.	• Can give examples of forces in everyday life • Can give examples of objects moving differently on different surfaces • Can name a range of types of magnets and show how the poles attract and repel • Can draw diagrams using arrows to show the attraction and repulsion between the poles of magnets

For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.	
Key vocabulary	
Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	

Common misconceptions

Some children may think:

- the bigger the magnet the stronger it is
- all metals are magnetic.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc. • Explore what materials are attracted to a magnet. • Classify materials according to whether they are magnetic. • Explore the way that magnets behave in relation to each other. • Use a marked magnet to find the unmarked poles on other types of magnets. • Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table. • Devise an investigation to test the strength of magnets.	• Can use their results to describe how objects move on different surfaces • Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface • Can use classification evidence to identify that some metals, but not all, are magnetic • Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles • Can use test data to rank magnets

PLAN

Planning for assessment

Knowledge matrices Y4

Year	4	Topic	Living things and their habitats

- Recognise that living things can be grouped in a variety of ways.
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.
- Recognise that environments can change and that this can sometimes pose dangers to living things.

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)	• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	• Can name living things living in a range of habitats, giving the key features that helped them to identify them • Can give examples of how an environment may change both naturally and due to human impact

Key vocabulary	
Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate	

Common misconceptions

Some children may think:

- the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
- there is always plenty of food for wild animals
- animals are only land-living creatures
- animals and plants can adapt to their habitats, however they change
- all changes to habitats are negative.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe plants and animals in different habitats throughout the year. • Compare and contrast the living things observed. • Use classification keys to name unknown living things. • Classify living things found in different habitats based on their features. • Create a simple identification key based on observable features. • Use fieldwork to explore human impact on the local environment e.g. litter, tree planting. • Use secondary sources to find out about how environments may naturally change. • Use secondary sources to find out about human impact, both positive and negative, on environments.	• Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) • Can use classification keys to identify unknown plants and animals • Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter

Year	4	Topic	Animals, including humans

- Describe the simple functions of the basic parts of the digestive system in humans.
- Identify the different types of teeth in humans and their simple functions.
- Construct and interpret a variety of food chains, identifying producers, predators and prey.

Prior learning	Future learning
• Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)	• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. (Y6 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans) • Describe the ways in which nutrients and water are transported within animals, including humans. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing).	• Can sequence the main parts of the digestive system • Can draw the main parts of the digestive system onto a human outline • Can describe what happens in each part of the digestive system • Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for • Can name producers, predators and prey within a habitat

Living things can be classified as producers, predators and prey according to their place in the food chain.	• Can construct food chains
Key vocabulary	
Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	

Common misconceptions

Some children may think:

- arrows in a food chains mean ‘eats’
- the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain
- there is always plenty of food for wild animals
- your stomach is where your belly button is
- food is digested only in the stomach
- when you have a meal, your food goes down one tube and your drink down another
- the food you eat becomes “poo” and the drink becomes “wee”.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Research the function of the parts of the digestive system. • Create a model of the digestive system using household objects. • Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing). • Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls. • Use food chains to identify producers, predators and prey within a habitat. • Use secondary sources to identify animals in a habitat and find out what they eat.	• Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part • Can record the teeth in their mouth (make a dental record) • Can explain the role of the different types of teeth • Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores • Can create food chains based on research

	Year	4	Topic	States of matter
	• Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.			

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials) • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials) • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials) • Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials) • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. (Y5 - Properties and changes of materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0°C. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100°C. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	• Can create a concept map, including arrows linking the key vocabulary • Can name properties of solids, liquids and gases • Can give everyday examples of melting and freezing • Can give everyday examples of evaporation and condensation • Can describe the water cycle
Key vocabulary	
Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	

Common misconceptions

Some children may think:

- ‘solid’ is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances
- all liquids boil at the same temperature as water (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)

- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe closely and classify a range of solids. Observe closely and classify a range of liquids. • Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. • Classify materials according to whether they are solids, liquids and gases. • Observe a range of materials melting e.g. ice, chocolate, butter. • Investigate how to melt ice more quickly. • Observe the changes when making rocky road cakes or ice-cream. • Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. • Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). • Observe water evaporating and condensing e.g. on cups of icy water and hot water. • Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. • Use secondary sources to find out about the water cycle.	• Can give reasons to justify why something is a solid liquid or gas • Can give examples of things that melt/freeze and how their melting points vary • From their observations, can give the melting points of some materials • Using their data, can explain what affects how quickly a solid melts • Can measure temperatures using a thermometer • Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup • From their data, can explain how to speed up or slow down evaporation • Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet

	Year	4	Topic	Sound
	• Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.			

Prior learning	Future learning
• Explore how things work. (Nursery – Sound) • Describe what they see, hear and feel whilst outside. (Reception – Sound) • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3) • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3) • Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3) • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3) • Auditory range of humans and animals. (KS3) • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3) • Waves transferring information for conversion to electrical signals by microphone. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	• Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases
Key vocabulary	
Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation	

Common misconceptions

Pitch and volume are frequently confused, as both can be described as high or low.

Some children may think:

- sound is only heard by the listener
- sound only travels in one direction from the source
- sound can't travel through solids and liquids
- high sounds are load and low sounds are quiet.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Classify sound sources. • Explore making sounds with a range of objects, such as musical instruments and other household objects. • Explore how string telephones or ear gongs work. • Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks. • Measure sounds over different distances. • Measure sounds through different insulation materials.	• Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume

	• Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium

Year	4	Topic	Electricity

- Identify common appliances that run on electricity.
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.
- Recognise some common conductors and insulators, and associate metals with being good conductors.

Prior learning	Future learning
• Explore how things work. (Nursery - Electricity)	• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. (Y6 - Electricity) • Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off. Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.	• Can name the components in a circuit • Can make electric circuits • Can control a circuit using a switch • Can name some metals that are conductors • Can name materials that are insulators

Key vocabulary	
Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol **N.B.** Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.	

Common misconceptions
Some children may think: • electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • electricity works by simply coming out of one end of a battery into the component.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Construct a range of circuits. • Explore which materials can be used instead of wires to make a circuit. • Classify the materials that were suitable/not suitable for wires. • Explore how to connect a range of different switches and investigate how they function in different ways. • Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. • Apply their knowledge of conductors and insulators to design and make different types of switch. • Make circuits that can be controlled as part of a DT project. **N.B.** Children should be given one component at a time to add to circuits.	• Can communicate structures of circuits using drawings which show how the components are connected • Use classification evidence to identify that metals are good conductors and non-metals are insulators • Can incorporate a switch into a circuit to turn it on and off • Can connect a range of different switches identifying the parts that are insulators and conductors • Can add a circuit with a switch to a DT project and can demonstrate how it works • Can give reasons for choice of materials for making different parts of a switch • Can describe how their switch works

Planning for assessment

Knowledge matrices Y5

Year	5	Topic	Living things and their habitats

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.
- Describe the life process of reproduction in some plants and animals.

Prior learning	Future learning
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects.	• Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles • Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways

Key vocabulary	
Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings	

Common misconceptions

Some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals. • Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. • Look for patterns between the size of an animal and its expected life span. • Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. • Take cuttings from a range of plants e.g. African violet, mint. • Plant bulbs and then harvest to see how they multiply. • Use secondary sources to find out about pollination.	• Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game • Can identify patterns in life cycles • Can compare two or more animal life cycles they have studied • Can explain how a range of plants reproduce asexually

Year	5	Topic	Animals, including humans
• Describe the changes as humans develop to old age.			

Prior learning	Future learning
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below: • statutory guidance on Physical health and mental wellbeing (primary and secondary). Other useful guidance includes: • Joint briefing on teaching about puberty in KS2 from PHSE Association and Association for Science Education • Briefing on humans development and reproduction in the Primary Curriculum from PHSE Association and Association for Science Education.	• Can explain the changes that takes place in boys and girls during puberty • Can explain how a baby changes physically as it grows, and also what it is able to do

Key vocabulary	
Puberty – the vocabulary to describe sexual characteristics	

Common misconceptions
Some children may think: • a baby grows in a mother's tummy • a baby is "made".

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher.	• Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions'

	Year	5	Topic	Properties and changes of materials
	• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.			

Prior learning	Future learning
• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)	• Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.	• Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings • Can explain what dissolving means, giving examples • Can name equipment used for filtering and sieving • Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving • Can describe some simple reversible and non-reversible changes to materials, giving examples
Key vocabulary	
Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	

Common misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. • Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate. • Investigate rates of dissolving by carrying out comparative and fair test.	• Can create a chart or table grouping/comparing everyday materials by different properties • Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose

• Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture. • Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. • Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).	• Can group solids based on their observations when mixing them with water • Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water • Can explain the results from their investigations

Year	5	Topic	Earth and space

- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Describe the Sun, Earth and Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

Prior learning	Future learning
• Explore the natural world around them. (Reception – Earth and space) • Describe what they see, hear and feel whilst outside. (Reception – Earth and space) • Observe changes across the four seasons. (Y1 - Seasonal changes) • Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)	• Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3) • Our Sun as a star, other stars in our galaxy, other galaxies. (KS3) • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3) • The light year as a unit of astronomical distance. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.	• Can create a voice over for a video clip or animation • Can show, using diagrams, the movement of the Earth and Moon • Can explain the movement of the Earth and Moon • Can show using diagrams the rotation of the Earth and how this causes day and night • Can explain what causes day and night
Key vocabulary	
Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets	

Common misconceptions	
Some children may think: • the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth. • Use secondary sources to help make a model to show why day and night occur. • Make first-hand observations of how shadows caused by the Sun change through the day. • Make a sundial. • Research time zones. • Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel.	• Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth • Can demonstrate and explain verbally how day and night occur • Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model • Can explain how a sundial works • Can explain verbally, using a model, why we have time zones • Can describe the arguments and evidence used by scientists in the past

Year	5	Topic	Forces

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effects of air resistance, water resistance and friction that act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Prior learning	Future learning
• Compare how things move on different surfaces. (Y3 - Forces and magnets) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Describe magnets as having two poles. (Y3 - Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)	• Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long	• Can demonstrate the effect of gravity acting on an unsupported object • Can give examples of friction, water resistance and air resistance • Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance • Can demonstrate how pulleys, levers and gears work

distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.	
Key vocabulary	
Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	

Common misconceptions

Some children may think:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter. • Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water. • Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats. • Explore how levers, pulleys and gears work. • Make a product that involves a lever, pulley or gear. • Create a timer that uses gravity to move a ball. • Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.	• Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down • Can demonstrate clearly the effects of using levers, pulleys and gears

PLAN

Planning for assessment

Knowledge matrices Y6

	Year	6	Topic	Living things and their habitats
	• Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. • Give reasons for classifying plants and animals based on specific characteristics.			

Prior learning	Future learning
• Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)	• Differences between species. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	**Possible evidence**
Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other livings things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot. Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.	• Can give examples of animals in the five vertebrate groups and some of the invertebrate groups • Can give the key characteristics of the five vertebrate groups and some invertebrate groups • Can compare the characteristics of animals in different groups

Key vocabulary	• Can give examples of flowering and non-flowering plants
Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering	

Common misconceptions

Some children may think:

- all micro-organisms are harmful
- mushrooms are plants.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important. • Use first-hand observation to identify characteristics shared by the animals in a group. • Use secondary sources to research the characteristics of animals that belong to a group. • Use information about the characteristics of an unknown animal or plant to assign it to a group. • Classify plants and animals, presenting this in a range of ways e.g. Venn diagrams, Carroll diagrams and keys. • Create an imaginary animal which has features from one or more groups.	• Can use classification materials to identify unknown plants and animals • Can create classification keys for plants and animals • Can give a number of characteristics that explain why an animal belongs to a particular group

Year	6	Topic	Animals, including humans

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.
- Describe the ways in which nutrients and water are transported within animals, including humans.

Prior learning	Future learning
• Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)	• The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3) • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3) • The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3) • The mechanism of breathing to move air in and out of the lungs. (KS3) • The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system. Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE. The new statutory requirements for relationships and health education can be found below:	• Can draw a diagram of the circulatory system and label the parts and annotate it to show what the parts do • Produces a piece of writing that demonstrates the key knowledge e.g. explanation text, job description of the heart

- statutory guidance on Physical health and mental wellbeing (primary and secondary).

Key vocabulary

Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle

Common misconceptions

Some children may think:

- your heart is on the left side of your chest
- the heart makes blood
- the blood travels in one loop from the heart to the lungs and around the body
- when we exercise, our heart beats faster to work the muscles more
- some blood in our bodies is blue and some blood is red
- we just eat food for energy
- all fat is bad for you
- all dairy is good for you
- protein is good for you, so you can eat as much as you want
- foods only contain fat if you can see it
- all drugs are bad for you.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence

• Create a role play model for the circulatory system.
• Carry out a range of pulse rate investigations:
  ▪ fair test – effect of different activities on my pulse rate
  ▪ pattern seeking – exploring which groups of people may have higher or lower resting pulse rates
  ▪ observation over time - how long does it take my pulse rate to return to my resting pulse rate (recovery rate)
  ▪ pattern seeking – exploring recovery rate for different groups of people.
• Research the negative effects of drugs (e.g. tobacco) and the benefits of a healthy diet and regular exercise by asking an expert or using carefully selected secondary sources.
	• Use the role play model to explain the main parts of the circulatory system and their role
	• Can use subject knowledge about the heart whilst writing conclusions for investigations
	• Can explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body
	• Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body

Year	6	Topic	Evolution and inheritance

- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.
- Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Prior learning	Future learning
• Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats) • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5)	• Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3) • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3) • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3) • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited	• Can explain the process of evolution • Can give examples of how plants and animals are suited to an environment • Can give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth

characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution. Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.	• Give examples of living things that lived millions of years ago and the fossil evidence we have to support this • Can give examples of fossil evidence that can be used to support the theory of evolution
Key vocabulary	
Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils	

Common misconceptions

Some children may think:

- adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
- offspring most resemble their parents of the same sex, so that sons look like fathers
- all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- cavemen and dinosaurs were alive at the same time.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Design a new plant or animal to live in a particular habitat. • Use models to demonstrate evolution e.g. 'Darwin's finches' bird beak activity. • Use secondary sources to find out about how the population of peppered moths changed during the industrial revolution. • Make observations of fossils to identify living things that lived on Earth millions of years ago. • Identify features in animals and plants that are passed on to offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs. • Compare the ideas of Charles Darwin and Alfred Wallace on evolution. • Research the work of Mary Anning and how this provided evidence of evolution.	• Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat • Can link the patterns seen in the model to real examples • Can explain why the dominant colour of the peppered moth changed over a very short period of time

Year	6	Topic	Light

- Recognise that light appears to travel in straight lines.
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Prior learning	Future learning
• Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light) • Notice that light is reflected from surfaces. (Y3 - Light) • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light) • Find patterns in the way that the size of shadows change. (Y3 - Light) • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)	• The similarities and differences between light waves and waves in matter. (KS3) • Light waves travelling through a vacuum; speed of light. (KS3) • The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3) • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. (KS3) • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3) • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.	• Can describe, with diagrams or models as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes • Can describe, with diagrams or models as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape

Key vocabulary	
As for Year 3 - Light, plus straight lines, light rays	

Common misconceptions

Some children may think:

- we see objects because light travels from our eyes to the object.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. • Explore the uses of the behaviour of light, reflection and shadows, such as in periscope design, rear view mirrors and shadow puppets.	• Can explain how evidence from enquiries shows that light travels in straight lines • Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope • Can predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied

Year	6	Topic	Electricity

- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
- Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.
- Use recognised symbols when representing a simple circuit in a diagram.

Prior learning	Future learning
• Identify common appliances that run on electricity. (Y4 - Electricity) • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity) • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. (Y4 - Electricity) • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity) • Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)	• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3) • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3) • Differences in resistance between conducting and insulating components (quantitative). (KS3) • Static electricity. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well. You can use recognised circuit symbols to draw simple circuit diagrams.	• Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages • Can draw circuit diagrams of a range of simple series circuits using recognised symbols

Key vocabulary	
Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage **N.B.** Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words “cells” and “batteries” are now used interchangeably.	

Common misconceptions
Some children may think: • larger-sized batteries make bulbs brighter • a complete circuit uses up electricity • components in a circuit that are closer to the battery get more electricity.

Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	**Possible evidence**
• Explain how a circuit operates to achieve particular operations, such as to control the light from a torch with different brightnesses or make a motor go faster or slower. • Make circuits to solve particular problems, such as a quiet and a loud burglar alarm. • Carry out fair tests exploring changes in circuits. • Make circuits that can be controlled as part of a DT project.	• Can incorporate a switch into a circuit to turn it on and off • Can change cells and components in a circuit to achieve a specific effect • Can communicate structures of circuits using circuit diagrams with recognised symbols • Can devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test • Can predict results and answer questions by drawing on evidence gathered

PLAN

Planning for assessment

EYFS Matrices

Opportunities for science in the common EYFS themes

Click on the links in the table below to be taken to the relevant matrix.

Theme	Nursery	Reception
Dinosaurs	Animals, excluding humans	Animals, excluding humans
Farms	Animals, excluding humans Plants	
Food	Materials, including changing materials Plants	
People who help us	Humans Plants	Humans
Pirates	Materials, including changing materials Forces	Materials, including changing materials Forces
Robots	Materials, including changing materials Electricity Light Sound	Materials, including changing materials Earth and space
Space and the planets	Materials, including changing materials	Materials, including changing materials Earth and space Forces
Superheroes	Materials, including changing materials Humans	Materials, including changing materials Earth and space
Vehicles	Materials, including changing materials Electricity Light	Materials, including changing materials Forces Earth and space

	Forces Sound	
Building and construction	Materials, including changing material Electricity Forces Light	Forces Sound
All about me	Humans	Humans
The high street	Humans Materials, including changing materials Electricity Light	Humans
Holidays	Materials, including changing materials	Animals, excluding humans
Castles	Materials, including changing materials	
In the garden	Animals, excluding humans Living things and their habitats Plants	Living things and their habitats Animals, excluding humans
At the seaside	Animals, excluding humans	Animals, excluding humans Living things and their habitats
Under the sea	Animals, excluding humans	Animals, excluding humans
In the woods	Animals, excluding humans	Animals, excluding humans Living things and their habitats
Weather and seasons	Living things and their habitats	Seasonal changes Materials, including changing materials Living things and their habitats Sound Light
Animals	Animals, excluding humans	Animals, excluding humans Living things and their habitats Seasonal changes
Magic, witches and wizards	Materials, including changing materials Light	

PLAN

Planning for assessment

Nursery

Year	Nursery (3 & 4-year-olds)	Topic	Animals, excluding humans

Understanding the World

- Understand the key features of the life cycle of a plant and an animal.
- Begin to understand the need to respect and care for the natural environment and all living things.

Links with other areas of learning

Mathematics

- Talk about and identify the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs' etc.

Expressive Arts and Design

- Create closed shapes with continuous lines, and begin to use these shapes to represent objects.
- Draw with increasing complexity and detail, such as representing a face with a circle and including details.

Prior learning	Future learning
• Explore natural materials, indoors and outside. (Birth to three)	• Recognise some environments that are different to the one in which they live. (Reception) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 – Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 – Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to learn about the life cycles of animals • Caring for eggs and the young animals that emerge, such as chicks, caterpillars, frogs • Sharing books with information about animal life cycles (fiction and non-fiction) • Looking at and matching pictures of animals and their young • Watching videos of animals and their young and how they change over time	• Encourage children to observe young animals closely and talk about how they change over time. • Encourage children to name and describe animals and their young, including how they change over time, while reading books, watching videos, looking at pictures or playing matching games. • Encourage children to ask questions about different animals and their young.

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- Playing games involving matching or describing animals and their young
- Playing with small world animals, matching adults to their young
- Visiting a farm, zoo or pet shop, particularly to see young animals
- Talking about the sounds adult and young animals make and comparing them
- Drawing adult animals and their young

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- Encourage children to talk about similarities and differences between animals and their young, including patterns, spots or stripes.
- Encourage children to draw animals and their young.

Encouraging scientific enquiry

Observing over time
- How does the … change over time?

Researching using secondary sources
- Find out more about the life cycles of the animals observed.

Classification
- Match animals and their young.

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<td>Vocabulary</td>
<td>Common misconceptions</td>
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Model and encourage children to use vocabulary such as:

- egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young, fur, feathers, scales, tail, wings, beak, claws, paws, hooves, swim, walk, run, jump, jump, fly, patterns, spots, stripes

Expose children to supplementary vocabulary such as:

- life cycle, mane, webbed feet

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Some children may think:

- all animals lay eggs
- the young animal is fully formed inside an egg and just waiting to hatch
- the young animal is fully formed inside an egg and just grows until it is big enough to hatch
- animals are assembled from body parts within the egg
- all animal young are just small versions of the adult and get bigger
- animals such as cows and hens “make” milk and lay eggs for us [humans]
- humans are not animals.

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Traditional stories and nursery rhymes
- The Ugly Duckling
- Old MacDonald had a Farm

Other texts
- The Very Hungry Caterpillar & The Mixed-Up Chameleon by Eric Carle
- Counting Creatures & Monkey Puzzle by Julia Donaldson
- Who is in the egg? by Alexandra Milton
- The Odd Egg & Monkey and Me by Emily Gravett
- Owl Babies by Martin Waddell
- Baby Goz by Steve Weatherill
- Cock-A-Doodle-Moo by Bernard Most

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Opportunities in the role-play corner to care for adult animals and their young

- Vet
- Zookeeper
- Farmer
- Pet shop
- Animal hospital
- Stable

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• Brown Bear, Brown Bear, What Do You See? & Polar Bear, Polar Bear, What Do You Hear? by Bill Martin Jr • Wibbly Pig Picks a Pet by Mick Inkpen • Farmyard Hullabaloo by Giles Andreae & David Wojtowycz • Rosie's Walk by Pat Hutchins • Little Chick's First Day by Paula McBride • Poo at the Zoo by Sarah Eason • Lucky Little Mouse by A H Benjamin • Dora's Egg by Julie Sykes • The Trouble with Tadpoles by Sam Godwin • Stellaluna by Janell Cannon • Moo, Baa, La La La! by Sandra Boynton	

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • learning about the life cycles of animals • comparing adult animals to their young • observing how young animals change over time. **Children sort:** • animals and their young. **Children record their observations when:** • comparing animals and their young • observing how young animals change over time.	• Can name and describe animals they have encountered. • Can talk about how they cared for the eggs/animals. • Can describe how the animals changed over time. • Can match animals to their young and name them.

Year	Nursery (3 & 4-year-olds)	Topic	Humans

Understanding the World

- Use all their senses in hands-on exploration of natural materials.
- Begin to make sense of their own life-story and family's history.
- Understand the key features of the life cycle of a plant and an animal.

Links with other areas of learning

Personal, Social and Emotional Development

- Be increasingly independent in meeting their own care needs, e.g. brushing teeth, using the toilet, washing and drying their hands thoroughly.
- Make healthy choices about food, drink, activity and toothbrushing.

Expressive Arts and Design

- Create closed shapes with continuous lines, and begin to use these shapes to represent objects.
- Draw with increasing complexity and detail, such as representing a face with a circle and including details.

Prior learning	Future learning
• Explore natural materials, indoors and outside. (Birth to three) • Make connections between the features of their family and other families. (Birth to three) • Notice differences between people. (Birth to three)	• Talk about members of their immediate family and community. (Reception) • Name and describe people who are familiar to them. (Reception) • Describe what they see, hear and feel whilst outside. (Reception) • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 – Animals, including humans)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to learn about the life cycles of humans • Looking at photographs of the children as babies • Sharing books about how to look after a baby • Talking to an expectant mother, parent with a baby and elderly person • Talking to adults about photographs of the adults at different ages • Identifying pictures of babies, toddlers, children, adults and old people in magazines or other media • Drawing humans at different ages **Opportunities to learn about how to take care of themselves** • Talking about how they look after their own health and hygiene • Noticing when they feel hot and cold and how to respond to this • Choosing appropriate materials to protect themselves from the Sun **Opportunities to learn about their senses** • Exploring the natural environment with their senses • Exploring objects using their senses e.g. smelling pots, feely bags, listening pots etc. • Sorting collections of natural objects using their senses e.g. bark, pebbles, feathers, seeds, cones, leaves, sticks • Looking closely at natural objects using a magnifying glass or app on a tablet • Going on a sound walk • Playing guessing games where children pick an object and either describe it or are asked questions in order to identify it • Playing listening games • Sharing books about senses and sensory impairments • Tasting food	• Encourage children to describe how they have changed since they were babies. • Encourage children to talk about how to care for a baby. • Encourage children to ask questions of an expectant mother, parent with a baby and elderly person. • Encourage children to talk about what they can do now that they were not able to do when they were babies, including how to look after themselves. • Encourage children to talk about objects using their senses to describe them. **Encouraging scientific enquiry** *Classification* • Sort images of humans according to their age. • Sort using different senses. Which do you like/not like? *Observing over time* • How does a baby change over time? • *Research using secondary sources* • Find out about the human life-cycle from an expectant mother, parent with a baby and elderly person.

Vocabulary	Common misconceptions
Model and encourage children to use vocabulary such as: • grow, change, baby, toddler, child, adult, old person, smell, taste, touch, feel, hear, see, blind, deaf Expose children to supplementary vocabulary such as: • life cycle, senses, elderly, die (if appropriate)	Some children may think: • babies are in a mummy's stomach.
Linked texts	**Linked careers**
Traditional stories and nursery rhymes • Goldilocks and the Three Bears *Other texts* • Handa's Surprise by Eileen Brown • Za-za's Baby Brother by Lucy Cousins • My Mum and Dad Make Me Laugh by Nick Sharratt • My Grandpa by Marta Altés • I Want My Potty! by Tony Ross • How Do Your Senses Work? by Judy Tatchell • That's Not My Collection by Usborne • Once There Were Giants by Martin Waddell	**Opportunities in the role-play corner to learn about the lifecycle of humans** • Midwife • Hospital • Retirement home

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • learning about the life cycles of humans • learning about how to take care of themselves • learning about their senses. **Children sort:** • humans by age/life stage • objects using their senses. **Children record their observations when:** • observing humans at different ages/life stages.	• Can talk about how they have changed since they were babies. • Can describe humans at different ages/life stages. • Can talk about how they look after themselves and compare this to how a baby is looked after. • Can compare smells, sounds, tastes and textures. • Can talk about what they see when using a magnifying glass or an app on a tablet. • Can talk about how they use their senses when exploring the world around them and natural objects.

Year	Nursery (3 & 4-year-olds)	Topic	Living things and their habitats

Understanding the World

- Use all their senses in hands-on exploration of natural materials.
- Explore collections of materials with similar and/or different properties.
- Begin to understand the need to respect and care for the natural environment and all living things.

Links with other areas of learning

Mathematics

- Describe a familiar route.
- Discuss routes and locations, using words like 'in front of' and 'behind'.
- Talk about and identify the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs' etc.
- Extend and create ABAB patterns – stick, leaf, stick, leaf.

Expressive Arts and Design

- Create closed shapes with continuous lines, and begin to use these shapes to represent objects.
- Draw with increasing complexity and detail, such as representing a face with a circle and including details.

Prior learning	Future learning
• Explore natural materials, indoors and outside. (Birth to three)	• Draw information from a simple map. (Reception) • Explore the natural world around them. (Reception) • Describe what they see, hear and feel whilst outside. (Reception) • Recognise some environments that are different to the one in which they live. (Reception)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to explore the surrounding natural environment • Going on local nature walks • Identifying natural objects and things left by humans • Gathering natural objects from nature walks to include in a collection for the nature table e.g. stones, leaves, seeds, conkers, pinecones, acorns, twigs, bark, shells, feathers	• Encourage children to use all appropriate senses to explore the parts of plants on the walk, including the leaves, stems/trunks, flowers, seeds, berries and fruit. • Encourage children to identify things left by humans in the surrounding natural environment e.g. litter. • Remind children not to damage the plants in any way and only gather natural objects from the ground.

<table>
<tr><td>Opportunities to explore natural objects from the surrounding environment
Using a magnifying glass or a tablet with an app to observe the natural objects in a collection closely
Drawing natural objects in the collection
Grouping together natural objects that are similar in the collection
Using natural objects to make pictures and patterns</td><td>Encourage children to talk about the objects in the collection, including where they came from on the walk and whether they were part of a plant, animal or neither.
Encourage children to talk about the natural objects that they are observing closely, drawing and sorting.
Encourage children to look for patterns on the natural objects in the collection.
Encourage children to identify items in the collection that are the same or similar.
Encourage children to ask questions about the surrounding natural environment and the natural objects in the collection.
Encouraging scientific enquiry

Classification
Find and identify natural objects to include in the collection.
Which natural objects are from plants, animals or neither?</td></tr>
<tr><td>Vocabulary</td><td>Common misconceptions</td></tr>
<tr><td>Model and encourage children to use vocabulary such as:
natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern
Expose children to supplementary vocabulary such as:
living, dead, similar</td><td>Some children may think:
shells are only found at the beach
feathers are from dead birds.</td></tr>
<tr><td>Linked texts</td><td>Linked careers</td></tr>
<tr><td>Other texts
Percy the Park Keeper by Nick Butterworth</td><td>Opportunities in the role-play corner to explore the surrounding natural environment
Tree surgeon
Park keeper
Farmer
Gardener</td></tr>
</table>

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring the surrounding natural environment • exploring natural objects from the surrounding environment. **Children sort:** • natural objects. **Children record their observations when:** • drawing natural objects from the collection.	• Can name and describe objects in the collection, including patterns they notice on them. • Can group similar objects together. • Can draw natural objects, including some patterns observed on them. • Can identify natural objects that have come from plants and animals. • Children do not damage the living things they encounter in the natural environment. • Children show care and encourage others to care for things they encounter in the natural environment.

Year	Nursery (3 & 4-year-olds)	Topic	Plants

Understanding the World

- Use all their senses in hands-on exploration of natural materials.
- Explore collections of materials with similar and/or different properties.
- Plant seeds and care for growing plants.
- Understand the key features of the life cycle of a plant and an animal.
- Begin to understand the need to respect and care for the natural environment and all living things.

Links with other areas of learning

Mathematics

- Talk about and identify the patterns around them. For example: stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs' etc.

Expressive Arts and Design

- Create closed shapes with continuous lines, and begin to use these shapes to represent objects.
- Draw with increasing complexity and detail, such as representing a face with a circle and including details.

Prior learning	Future learning
• Explore natural materials, indoors and outside. (Birth to three)	• Observe and describe how seeds and bulbs grow into mature plants. (Y2 – Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 – Plants) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 – Plants)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to grow plants • Visiting a garden centre • Gathering seeds from the surrounding natural environment • Gathering seeds from fruit • Observing collections of seeds and bulbs using a magnifying glass or an app on a tablet • Drawing seeds and bulbs • Planting and caring for seeds and bulbs • Growing vegetable tops	• Encourage children to talk about the range of seeds, bulbs, plants and gardening tools they saw on their trip to the garden centre. • Encourage children to talk about the seeds they gathered from the ground from the surrounding natural environment, from pieces of fruit and plants they have grown. • Remind children not to damage the plants in any way and only gather seeds from the ground. • Encourage children to describe and compare seeds and bulbs, including any patterns on them that they notice.

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<td>

- Observing and photographing/drawing how plants grow and die
- Observing and photographing/drawing what happens when fruit, vegetables and flowers are left to decay
- Gathering seeds and digging up bulbs of the plants they grow
- Designing seed packets
- Using what they grow to make food to eat
- Sharing books about plants and growing plants

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- Encourage children to separate seeds from bulbs.
- Encourage children to use non-standard measures, such as a spacing stick, to space seeds and bulbs appropriately to give them space to grow.
- Encourage children to talk about plants as they grow.
- Encourage children to talk about plants they have at home.
- Encourage children to talk about how fruit and vegetables decay and flowers die.
- Encourage children to use all their appropriate senses to explore the parts of plants, including the leaves, stems/trunks, flowers, seeds, berries and fruit, as they grow.
- Encourage children to ask questions about growing plants.

Encouraging scientific enquiry

Comparative testing

- Compare how quickly different seeds/bulbs germinate.
- Compare how different vegetable tops grow.

Observing over time

- How does a plant change as it grows?
- What happens to fruit, vegetables and flowers when left over time?

Researching using secondary sources

- Look at seed and bulb packets to learn how to plant and care for them.

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<tr>
<td>Vocabulary</td>
<td>Common misconceptions</td>
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<td>

Model and encourage children to use vocabulary such as:

- plant, leaf, stem, trunk, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil

Expose children to supplementary vocabulary such as:

- seedling, healthy, unhealthy, strong, sturdy, wilting, decay, mould, life cycle

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Some children may think:

- trees are not plants
- there is a young plant inside a seed or bulb
- bulbs are big seeds
- big plants grow from big seeds and big bulbs
- fruit and vegetables come from the supermarket
- plants grow at night or when we are not watching them.

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<tr>
<td>Linked texts</td>
<td>Linked careers</td>
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<td>

Traditional stories and nursery rhymes

- Jack and the Beanstalk
- The Giant Turnip

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Opportunities in the role-play corner to explore growing plants

- Greengrocer/farm shop
- Gardener/allotment owner
- Farmer

</td>
</tr>
</table>

Other texts • Jim and the Beanstalk by Raymond Briggs • Titch by Pat Hutchins • Oliver's Vegetables by Alison Bartlett & Vivian French • We Planted a Pumpkin by Rob Ramsden	• Orchard worker • Market gardener • Garden centre manager

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • growing plants. **Children use equipment to measure when:** • planting seeds and bulbs. **Children sort:** • seeds and bulbs. **Children record their observations when:** • photographing/drawing seeds and bulbs • photographing/drawing seeds and bulbs as they grow over time • photographing/drawing vegetables and fruit as they decay and flowers as they die.	• Can describe some differences between seeds and bulbs. • Can identify seeds and bulbs. • Can talk about how they planted and cared for seeds and bulbs. • Can explain that a seed or bulb grew into a plant and then died. • Children do not damage the living things they encounter in the natural environment. • Children show care and encourage others to care for things they encounter in the natural environment.

	Year	Nursery (3 & 4-year-olds)	**Topic**	Materials, including changing materials

Understanding the World

- Use all their senses in hands-on exploration of natural materials.
- Explore collections of materials with similar and/or different properties.
- Talk about the differences between materials and changes they notice.

Links with other areas of learning

Expressive Arts and Design

- Explore different materials freely, in order to develop their ideas about how to use them and what to make.
- Develop their own ideas and then decide which materials to use to express them.
- Join different materials and explore different textures.

Prior learning	Future learning
• Explore materials with different properties. (Birth to three) • Explore natural materials, indoors and outside. (Birth to three)	• Explore the natural world around them. (Reception) • Describe what they see, hear and feel whilst outside. (Reception) • Distinguish between an object and the material from which it is made. (Y1 – Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 – Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 – Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 – Everyday materials)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do to support this
Opportunities to explore a range of materials in a sensory way especially through touch, including more unusual materials • Exploring oobleck (cornflour and water), gellibaff, shaving foam, foam burst shower gel etc.	• Encourage children to talk about the materials they explore, using their senses. • Encourage children to choose from a range of materials when making models. • Encourage children to join materials together to make something. • Support children to name the material they have used. • Encourage children to talk about why they have chosen a particular material, naming at least one property.

<table>
<tr>
<td>Opportunities to shape and join materials
• Building junk models using a range of materials
• Shaping and joining materials using equipment e.g. scissors, hole punch, including when using wood e.g. a hammer and nail

Opportunities to change materials
• Making smoothies
• Mixing ingredients to make playdough, cakes, biscuits, bread, jelly etc.
• Melting chocolate for decorating bakes/biscuits or to combine with other ingredients e.g. refrigerator cake, chocolate crispy cakes
• Comparing cooked and uncooked pasta, noodles, rice or potatoes
• Cooking popcorn in a microwave
• Cooking cakes, biscuits, bread etc.
• Making ice lollies and ice-cream
• Using medical ice packs including self-activated cool pads
• Removing toys from ice
• Adding baking soda and fizzy bath bombs to water
• Adding coloured sweets to water
• Adding currants to fizzy water/lemonade
• Adding bicarbonate of soda to vinegar to make a bubbling potion</td>
<td>• Support children to measure out ingredients following a recipe.
• Encourage children to talk about ingredients.
• Encourage children to talk about the changes when ingredients are mixed, cooked, heated and cooled, frozen and blended.
• Encourage children to ask question about the materials they encounter.

Encouraging scientific enquiry

Classification
• Sort materials using simple properties.
Observing over time
• How does the cake mixture change?
• How does chocolate change when heated?
• How does fruit juice change when put in the freezer?
• How does fruit change when blended?</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Common misconceptions</td>
</tr>
<tr>
<td>Model and encourage children to use vocabulary such as:

• mix, stir, cook, hot, oven, microwave, change, burn, melt, hard, runny, set, freeze, freezer, cold, blended, hard, soft, bendy, stiff, wobbly, wood, plastic, paper, card, fabric

Expose children to supplementary vocabulary such as:

• solid, liquid, rigid, stronger, weaker</td>
<td>Some children may think that:

• a material is better to use because it is ‘bigger’ not thicker, rigid etc.
• the material is ‘box’ not cardboard.</td>
</tr>
<tr>
<td>Linked texts</td>
<td>Linked careers</td>
</tr>
<tr>
<td>Traditional stories and nursery rhymes
• Gingerbread Man
• Pat a Cake
• Little Red Hen</td>
<td>Opportunities in the role-play corner to shape, join and change materials

• Baker
• Chocolatier
• Laboratory scientist
• Craftsperson in a workshop</td>
</tr>
</table>

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring a range of materials • shaping and joining materials • change materials. **Children use equipment to measure when:** • combining and mixing ingredients. **Children sort:** • materials.	• Can name the material they are using. • Can talk about one property of a material. • Can talk about ingredients for recipes. • Can talk about how mixtures change when ingredients are added. • Can talk about how materials change when cooked. • Can talk about how materials change when heated. • Can talk about how materials change when frozen.

	Year	Nursery (3 & 4-year-olds)	Topic	Electricity
	Understanding the World			
	• Explore how things work.			

Prior learning	Future learning
• Repeat actions that have an effect. (Birth to three)	• Identify common appliances that run on electricity. (Y4 - Electricity)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to identify electrical devices • Spotting devices that are plugged into power sockets in the classroom • Spotting devices that use batteries in the classroom • Sorting objects/photographs of objects according to whether they use electricity or not • Sorting objects/photographs of objects according to whether they use batteries and/or mains electricity. • Looking at shopping catalogues that include electrical devices **Opportunities to use battery-powered devices** • Using Code-a-Pillars, Bee-Bots, shopping tills, torches, remote control cars, talk cards/recording devices, hand-held fans **Opportunities to talk about how electrical devices work** • Describing what the devices do e.g. make a sound, make light, move • Suggesting that batteries may need charging or replacing when a device does not work	• Encourage children to find devices that are plugged into sockets. • Tell them to never plug in or unplug devices without adult supervision. • Encourage children to take photographs of electrical devices at home. • Encourage children to switch devices on and off that use batteries. • Tell children to never open the battery compartment of electrical devices without adult supervision. • Encourage children to talk about what electrical devices do. • Encourage children to talk about recharging devices e.g. remote control cars, hearing aids, tablets. • Encourage children to ask questions about electrical devices and how they work. • Encourage children to remind adults to switch off electrical devices to conserve electricity. **Encouraging scientific enquiry** *Classification* • Identify objects that use electricity to work. • Identify devices that use batteries and/or mains electricity.

Vocabulary	Common misconceptions
Model and encourage children to use vocabulary such as: • battery, plug, socket, electricity, wire, sound, light, move Expose children to supplementary vocabulary such as: • mains electricity, device, appliance, electrical	Some children may think: • all batteries can be recharged • rechargeable devices do not have batteries.
Linked texts	**Linked careers**
	Opportunities in the role-play corner to talk about objects that use electricity • Electrician • Electrical goods retailer

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • identifying electrical devices • using battery-powered devices. **Children sort:** • electrical devices.	• Can identify devices that use batteries. • Can identify devices that use mains electricity. • Can switch battery-powered devices on and off. • Can describe what electrical devices do.

	Year	Nursery (3 & 4-year-olds)	Topic	Light
	Understanding the World			
	• Explore how things work. • Talk about the differences in materials and changes they notice.			

Prior learning	Future learning
• Repeat actions that have an effect. (Birth to three)	• Describe what they see, hear and feel whilst outside. (Reception) • Recognise that they need light in order to see things and that dark is the absence of light. (Y3 – Light) • Notice that light is reflected from surfaces. (Y3 – Light) • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 – Light) • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 – Light) • Find patterns in the way that the size of shadows change. (Y3 – Light)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to explore light sources • Switching light sources on and off • Comparing the brightness of light sources • Using different light sources in dark dens with reflective and fluorescent stickers	• Model asking questions about light sources. • Encourage children to compare the brightness of different light sources. • Encourage children to talk about what they see in the dark den and how it changes when a light source is on or off. • Encourage children to talk about what they see when they shine light onto or through different objects or materials. • Encourage children to talk about how their reflection changes in different mirrors. • Support children to notice that they see their reflection on shiny objects and encourage them to predict which objects they will see their reflection in. • Encourage children to draw what they see in different mirrors. • Encourage children to ask questions about light sources.

<table>
<tr><td>Opportunities to shine light on or through different materials
• Shining light on or through different objects and materials e.g. reflective, non-reflective, transparent, translucent, opaque, coloured filters, holographic paper, glitter ball
• Looking at their reflection in different types of mirrors e.g. plane, convex, concave and wobbly
• Looking for their reflection in other objects
• Making glitter pictures or pictures with reflective materials</td><td>Encouraging scientific enquiry

Comparative testing
• Compare how bright different light sources are.
• Compare how reflective different materials are.
Classification
• Which materials are reflective to use for an outside mobile?
• Which fabrics are reflective to help us be seen at night?
• Which materials block light to help us protect ourselves from the Sun?</td></tr>
<tr><td>Vocabulary</td><td>Common misconceptions</td></tr>
<tr><td>Model and encourage children to use vocabulary such as:
• light, torch, bulb, lamp, spotlight, shiny, bright, brighter, brightest, Sun, shine, glow, mirror
Expose children to supplementary vocabulary such as:
• light source, reflective, non-reflective, dim, dimmer, dimmest</td><td>Some children may think:
• light is only found in bright places
• shiny objects are light sources
• the moon is a light source.</td></tr>
<tr><td>Linked texts</td><td>Linked careers</td></tr>
<tr><td>Other texts
• We’re Going on a Bear Hunt by Michael Rosen
• Alfie Goes Camping by Shirley Hughes
• Can’t You Sleep Little Bear by Martin Waddell
• The Rabbit, the Dark and the Biscuit Tin by Nicola O'Byrne</td><td>Opportunities in the role-play corner to explore light sources
• Lighthouse keeper
• Railway signal person
• Theatre lighting designer
• Night construction worker
• Miner
• Road crossing supervisor</td></tr>
</table>

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring light sources • shining light on or through different materials. **Children sort:** • light sources • materials. **Children record their observations when:** • looking at their reflection in different mirrors.	• Can name different light sources. • Can describe and compare the brightness of light sources. • Can identify reflective and non-reflective materials. • Can identify materials that block light. • Can spot their own reflection in objects.

Year	Nursery (3 & 4-year-olds)	Topic	Forces

Understanding the World

- Explore how things work.
- Explore and talk about different forces they can feel.
- Talk about the differences between materials and changes they notice.

Links with other areas of learning

Expressive Arts and Design

- Join different materials and explore different textures.

Prior learning	Future learning
• Repeat actions that have an effect. (Birth to three)	• Explore the natural world around them. (Reception) • Describe what they see, hear and feel whilst outside. (Reception) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 – Uses of everyday materials) • Compare how things move on different surfaces. (Y3 – Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 – Forces and magnets) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 – Forces and magnets) • Describe magnets as having two poles. (Y3 – Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 – Forces and magnets) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 – Forces)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to feel forces • Pushing floating objects under water e.g. balloons, table tennis balls etc. • Exploring magnets of different shapes and sizes	• Encourage children to push floating objects under water and talk about how it feels the further they push the object under the water. • Encourage children to talk about what happens when they release an object under the water.

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- Exploring springs of different sizes, both compression and extension springs
- Using bikes and scooters on different surfaces and ramps

Opportunities to explore how things work

- Testing a range of objects to find out if they float or sink
- Playing games that contain springs e.g. bagatelle
- Playing with wind-up toys
- Racing wind-up toys
- Playing with gears and pulleys e.g. sets of gears, large playground pulleys etc.
- Playing with magnetic toys e.g. train carriages joined by magnets, magnetic construction kits etc.

Opportunities to explore how objects/materials are affected by forces

- Pushing, pulling, twisting and bending malleable (e.g. modelling clay, playdough, springs, pipe cleaners, elastics, sponges etc.) and non-malleable objects/materials
- Cutting and joining objects/materials e.g. wood, building kits with nuts and bolts etc.

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- Encourage children to play with the magnets talking about how they push away or pull towards each other.
- Encourage children to use bikes and scooters on different surfaces.
- Encourage children to ride scooters and bikes up and down ramps.
- Encourage children to drop objects into water and observe what happens.
- Encourage children to predict whether objects will float or sink.
- Encourage children to talk about how they change the shape of objects.
- Encourage children to talk about how they join materials together using different forces.
- Encourage children to talk about what they feel when using the woodwork tools and building kits.
- Encourage children to talk about how toys containing springs and elastics work.
- Encourage children to talk about how wind-up toys, pulleys and gear toys work.
- Encourage children to ask questions about forces, such as “What happens if I …?”

Encouraging scientific enquiry

Comparative testing

- Compare the path of different wind-up toys.
- Compare how far different wind-up toys move.
- Compare the speed and direction of gears.
- Compare how easy or hard it is to lift an object with or without a pulley.
- Compare how easy it is to ride a scooter or bike on different surfaces.

Classification

- Sort objects according to whether they float or sink.
- Sort objects/materials according to whether their shape can be changed.

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<tr>
<td>Vocabulary</td>
<td>Common misconceptions</td>
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Model and encourage children to use vocabulary such as:

- object, float, sink, water, up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow

Expose children to supplementary vocabulary such as:

- rising, falling, attract, repel, faster, slower, pulley, gear, elastic

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Some children may think:

- big objects sink
- heavy objects sink
- an object such as an ice cube which is partially submerged is floating and sinking at the same time.

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Linked texts	Linked careers
Traditional stories and nursery rhymes • Wind the Bobbin Up *Other texts* • And Everyone Shouted "Pull" by Claire Llewellyn • Oscar and the Cricket by Geoff Waring • Newton and Me by Lynne Mayer • Astrokittens: Cosmic Machines by Dominic Walliman & Ben Newman • The Little Red Train: The Runaway Train by Benedict Blathwayt • Dig Dig Digging by Margaret Mayo • It's Only Stanley by Jon Agee	**Opportunities in the role-play corner to use forces to cut and join materials and objects** • Builder • Plumber • Carpenter • Engineer

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • feeling forces • exploring how things work • exploring how objects/materials are affected by forces. **Children sort:** • objects that float and sink • malleable and non-malleable materials.	• Can identify objects that float and sink. • Can identify objects whose shape can be changed and talk about how they changed their shape. • Can describe what they feel when exploring magnets. • Can describe what they feel and see when pushing, pulling, bending and twisting objects e.g. springs, elastics, wind-up toys, gears, pulleys etc. • Can describe what they feel when riding bikes and scooters on different surfaces and ramps.

Year	Nursery (3 & 4-year-olds)	Topic	Sound

Understanding the World

- Explore how things work.

Links with other areas of learning

Expressive Arts and Design

- Use drawing to represent ideas like movement or loud noises.
- Listen with increased attention to sounds.
- Respond to what they have heard, expressing their thoughts and feelings.
- Explore different materials freely, in order to develop their ideas about how to use them and what to make.
- Develop their own ideas and then decide which materials to use to express them.
- Join different materials and explore different textures.

Prior learning	Future learning
• Repeat actions that have an effect. (Birth to three)	• Describe what they see, hear and feel whilst outside. (Reception) • Identify how sounds are made, associating some of them with something vibrating. (Y4 – Sound) • Recognise that vibrations from sounds travel through a medium to the ear. (Y4 – Sound) • Find patterns between the pitch of a sound and features of the object that produced it. (Y4 – Sound) • Find patterns between the volume of a sound and the strength of the vibrations that produced it. (Y4 – Sound) • Recognise that sounds get fainter as the distance from the sound source increases. (Y4 – Sound)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to listen to sounds • Listening to the sounds around them at different times and in different places • Playing listening games • Listening to recordings of different sounds and identifying what they are • Listening to visiting musicians • Making artwork based on the sounds that they hear	• Encourage children to describe the sounds they hear. • Encourage children to talk about how they make sounds using their bodies and musical instruments. • Encourage children to adapt the instruments they make, e.g. changing elastic bands on guitars, using different materials for drum skins etc., and talk about how the sound changes. • Encourage children to talk about how sounds and music make them feel.

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- Recording sounds they hear

Opportunities to make sounds

- Making sounds using their bodies
- Singing songs and rhymes
- Exploring toys and other objects that make a noise
- Hitting different objects with beaters of different materials to notice the different sounds they make
- Playing musical instruments
- Making and playing musical instruments e.g. shakers drums, guitars, kazoos and rainmakers etc.
- Recording the sounds they make

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- Encourage children to ask questions about sounds and how they are made.

Encouraging scientific enquiry

Comparative testing

- Compare the sound produced by shakers made with different materials.
- Compare the sound produced by different drums.
- Compare the sound produced by different elastic bands on their ‘guitar’.

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<td>Vocabulary</td>
<td>Common misconceptions</td>
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Model and encourage children to use vocabulary such as:

- sound, noise, loud, quiet, high, low, music, bang, blow, pluck, soft, hard, fast, slow, names of instruments

Expose children to supplementary vocabulary such as:

- musician, notes, vibrate, vibration, pitch, rhythm, pulse, volume

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Some children may think:

- for a sound to be heard the listener has to actively concentrate on it first
- sounds travel only to someone who is listening for them
- sounds cannot go through obstacles
- volume and pitch are the same thing
- not all sounds are caused by vibrations.

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Traditional stories and nursery rhymes

- The Wheels on the Bus
- Old MacDonald had a Farm

Other texts

- Peace at Last by Jill Murphy
- All Join In by Quentin Blake
- Pip and Posy: The Friendly Snail by Camilla Reid
- The Flute by Ken Wilson Max
- Mr Brown can moo, can you? by Dr Seuss
- Dinosaurs Roar by Henrietta Strickland
- Barnyard Banter by Denise Fleming
- Cats go … by Annie Horwood
- Sheep in a Jeep by Nancy Shaw
- Dogs go… by Annie Horwood

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Opportunities in the role-play corner to make and listen to sounds

- Musician
- Conductor
- Recording studio technician

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HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • listening to sounds • making sounds. **Children record their observations when:** • listening to and making sounds • making artwork about the sounds they hear.	• Can make sounds using a range of objects. • Can recognise and describe the sounds made by different objects.

Planning for assessment

Reception

	Year	Reception	Topic	Animals, excluding humans
	Understanding the World			
	• Recognise some environments that are different to the one in which they live.			
	Links with other areas of learning			
	Physical Development • Revise and refine the fundamental movement skills they have already acquired: rolling; crawling; walking; jumping; running; hopping; skipping; climbing.			

Prior learning	Future learning
• Understand the key features of the life cycle of a plant and an animal. (Nursery) • Begin to understand the need to respect and care for the natural environment and all living things. (Nursery)	• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 – Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 – Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to learn about animals from a different habitat • Sharing books about animals in the local area and animals in other countries e.g. jungle, polar regions, desert, ocean • Looking at pictures of animals in different habitats • Watching videos of animals in different habitats • Playing games involving matching animals to their habitats • Playing with small world animals in different habitats • Visiting the zoo, focusing on animals that live in different habitats • Caring for pets from a different habitat e.g. tropical fish • Creating pictures of animals in their habitats • Pretending to be animals • Naming and describing animals they see in books, pictures, videos or while on a trip • Describing different habitats	• Encourage children to name and describe animals that live in different habitats while reading books, watching videos, looking at pictures or playing matching games. • Encourage children to ask questions about different animals and the habitats they live in. • Encourage children to describe habitats. • Encourage children to talk about how animals are cared for when they live outside their natural habitat. • Encourage children to move like different animals. **Encouraging scientific enquiry** *Classification* • Sort animals according to where they live.

	Researching using secondary sources • Learn how animals from a different habitat are cared for. • Learn about animals in a different habitat.
Vocabulary	**Common misconceptions**
Model and encourage children to use vocabulary such as: • names of animals, live, on land, in water, jungle, desert, North Pole, South Pole, sea, hot, cold, wet, dry, snow, ice Expose children to supplementary vocabulary such as: • environment, polar regions, ocean, camouflage	Some children may think: • animals are furry and have four legs • a bee is not an animal because it is an insect • animals adapt to their surroundings, e.g. a brown bear turns white and becomes a polar bear • animals living in the soil breathe by coming to the surface • dragons and other mythical creatures are real animals.
Linked texts	**Linked careers**
Other texts • Lost and Found by Oliver Jeffers • Shark in the Park by Nick Sharratt • One Day on our Blue Planet: In the Antarctic by Ella Bailey • Poles Apart by Jeanne Willis • Monkey with a Bright Blue Bottom by Steve Smallman • Walking through the Jungle by Julie Lacome • How many legs? by Kes Gray • What do you do with a tail like this? by Steve Jenkins • The Rainbow Bear by Michael Morpurgo • We're Going on a Bear Hunt by Michael Rosen and Helen Oxenbury • Bears by Sally Morgan • Usborne Beginners Bears by Helen Helbrough	**Opportunities in the role-play corner to care for animals that live in different environments** • Zookeeper • Safari centre • Aquarium • Explorer/Naturalist

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they have found out about: • animals from a different habitat. **Children sort:** • animals.	• Can name and describe animals that live in different habitats. • Can describe different habitats.

Year	Reception	Topic	Humans

Understanding the World

- Talk about members of their immediate family and community.
- Name and describe people who are familiar to them.

Links with other areas of learning

Personal, Social and Emotional Development

- See themselves as a valuable individual.
- Manage their own needs.

Physical Development

- Know and talk about the different factors that support their overall health and wellbeing: regular physical activity; healthy eating; toothbrushing; sensible amounts of 'screen time'; having a good sleep routine; being a safe pedestrian.
- Further develop the skills they need to manage the school day successfully: lining up and queuing; mealtimes; personal hygiene.

Mathematics

- Compare length, weight and capacity.

Prior learning	Future learning
• Use all their senses in hands-on exploration of natural materials. (Nursery) • Begin to make sense of their own life-story and family's history. (Nursery) • Understand the key features of the life cycle of a plant and an animal. (Nursery) • Begin to understand the need to respect and care for the natural environment and all living things. (Nursery)	• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 – Animals, including humans)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to describe people who are familiar to them • Talking about themselves, friends, family and community using photographs • Using mirrors to look at their faces • Creating pictures or collages of themselves, friends, family and community • Making hand and footprints using paint • Making fingerprints using ink pads	• Encourage children to look at photographs of different people and to describe them. • Encourage children to describe their friends and family using photographs to help them. • Encourage children to talk about how their friends and family are the same and different. • Encourage children to compare themselves to characters in books.

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- Using a ‘magic’ mirror which shows everything about them and getting children to describe themselves and how they are special
- Sharing books about different types of families

Opportunities to learn about how to take care of themselves

- Demonstrating and talking about how they look after themselves
- Talking about other people that look after them
- Talking to a dentist, nurse, meal supervisor/school cook, road crossing supervisor etc.
- Sharing videos of people who care for us and how we look after ourselves

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- Encourage children to compare their hand, foot and fingerprints with their friends.
- Encourage children to talk about the people who look after them, both within their family and the wider community e.g. teachers, doctors, dentists etc.
- Encourage children to ask a dentist, nurse, meal supervisor/school cook, road crossing supervisor etc. questions.

Encouraging scientific enquiry

Classification

- Sort images of people according to their characteristics.

Researching using secondary sources

- *Find out information from visitors (dentist, nurse etc.).*

Pattern seeking

- *Are taller children faster?*
- *Are taller children stronger?*

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Model and encourage children to use vocabulary such as:

- hair (black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (blue, brown, green, grey), skin (black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman

Expose children to supplementary vocabulary such as:

- bald, elderly, wrinkles, male, female, freckles

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Some children may think:

- sons look like their fathers and daughters look like their mothers.

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Other texts

- I Love My Hair by Natasha Anastasia Tarpley
- What I Like About Me by Alia Zobel-Nolan

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Opportunities in the role-play corner to show how people take care of them

- Doctor
- Nurse
- Dentist
- Optician

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HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • describing people who are familiar to them • learning about how to take care of themselves. **Children sort:** • humans by their characteristics. **Children record their observations when:** • drawing themselves, their family, friends and community.	• Can describe themselves, family, friends and community. • Can create pictures of themselves, family, friends and community and identify their distinguishing features. • Can talk about what they see when using a mirror. • Can compare hand, foot and fingerprints and talk about how they are different. • Can talk about how they look after themselves and how other people look after them.

	Year	Reception	Topic	Living things and their habitats
	Understanding the World			
	• Draw information from a simple map. • Explore the natural world around them. • Describe what they see, hear and feel whilst outside. • Recognise some environments that are different to the one in which they live.			

Prior learning	Future learning
• Use all their senses in hands-on exploration of natural materials. • Explore collections of materials with similar and/or different properties. • Begin to understand the need to respect and care for the natural environment and all living things.	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 – Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 – Plants) • Explore and compare the differences between things that are living, dead, and things that have never been alive. (Y2 – Living things in their habitat) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 – Living things in their habitat)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to explore the plants in the surrounding natural environment • Taking photographs of the plants they find in the school grounds • Observing closely and drawing the plants in the school grounds • Finding plants in the school grounds to match with photographs of them • Looking at aerial views to count the number of trees in the school grounds • Using a map of the school grounds, with pictures of where specific plants can be found, to find those plants • Creating a map to show how to find their favourite plants in the school grounds **Opportunities to explore the animals in the surrounding natural environment** • Finding minibeasts in the school grounds • Taking photographs of the minibeasts they find in the school grounds	• Support children to identify different plants e.g. trees, bushes, flowers, vegetables, herbs. • Ensure children are careful when exploring the plants and do not damage them in any way. • Encourage children to touch and smell the plants, when appropriate. • Encourage children to talk about the plants they find. • Support children to name the plants they find. • Encourage children to find the same plant in a different place. • Ensure children are careful when observing minibeasts and return them to where they found them. • Encourage children to talk about the minibeasts they find. • Support children to name the minibeasts they find.

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- Matching the minibeasts they find to pictures that identify them
- Observing the minibeasts closely, using a magnifying glass or app on a tablet
- Drawing pictures of the minibeasts
- Creating a map to show where they found each type of minibeast
- Sharing books about minibeasts
- Playing with small world minibeasts
- Building minibeast homes

Opportunities to explore plants and animals in a contrasting natural environment

- Visiting a contrasting natural environment e.g. forest, beach, etc.
- Finding and taking photographs of plants and animals in the contrasting natural environment
- Sharing non-fiction and fiction books about the contrasting natural environment visited

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- Encourage children to identify similarities and differences between the plants and animals they find in the surrounding natural environment and the contrasting one they visit.
- Encourage children to ask questions about the plants and animals they find.

Encouraging scientific enquiry

Classification

- Name and describe plants and animals they find in the school grounds.

Pattern seeking

- Look for minibeasts in different areas of the school grounds.
- Look for plants in different areas of the school grounds.

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<td>Vocabulary</td>
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Model and encourage children to use vocabulary such as:

- plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment e.g. beach, forest

Expose children to supplementary vocabulary such as:

- environment

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Some children may think:

- trees are not plants
- trees are not living as they do not seem to change or grow
- weeds are bad plants.

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Traditional stories and nursery rhymes

- Incey, Wincey Spider
- Ladybird, Ladybird Fly Away Home

Other texts

- Bad-Tempered Ladybird by Eric Carle
- Mad About Minibeasts by David Wojtowycz & Giles Andreae
- Ben Plants a Butterfly Garden by Kate Petty
- Norman the Slug with the Silly Shell by Sue Hendra
- Aargh a Spider by Lydia Monks
- Insects: A Close-up Look by Peter Seymour

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Opportunities in the role-play corner to explore and compare plants and animals in the surrounding natural environment and a contrasting one

- Botanist
- Naturalist
- Entomologist
- Ecologist
- Environmentalist
- Environmental scientist
- Beekeeper

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• Down at the Cool of the Pool by Tony Mitton • Over and Under the Pond by Kate Messner • Red Knit Cap Girl by Naoko Stoop	

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Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring the plants in the surrounding natural environment • exploring the animals in the surrounding natural environment • exploring plants and animals in a contrasting natural environment. **Children record their observations when:** • drawing plants and animals they find.	• Can name and describe plants and animals in the school grounds and their environment. • Can talk about how another environment is different to their surrounding natural environment. • Children do not damage the living things they encounter in the natural environment.

	Year	Reception	Topic	Seasonal changes
	Understanding the World			
	• Explore the natural world around them. • Describe what they see, hear and feel whilst outside. • Understand the effect of changing seasons on the natural world around them.			

Prior learning	Future learning
• Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans)	• Observe changes across the four seasons. (Y1 – Seasonal changes) • Observe and describe weather associated with the seasons and how day length varies. (Y1 – Seasonal changes)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to play and explore outside in all seasons and in different weather • Playing in the rain and snow • Drawing around puddles • Catching rain and hail in buckets • Catching snowflakes on frozen black paper and looking at them with magnifying glasses or an app on a tablet • Making icicles • Using scarves or pinwheels to explore the strength and direction of the wind • Looking at photographs of different seasons and types of weather • Sharing books about different seasons and types of weather **Opportunities to observe living things throughout the year** • Sharing books about the seasons • Going on seasonal walks to observe key features of the seasons • Making artwork with seasonal found objects • Visiting a canal or pond to look for birds and their young in spring • Visiting a farm to see the young animals in the spring	• Encourage children to talk about how they feel in different types of weather/seasons. • Encourage children to talk about the clothes they wear in different seasons and why. • Encourage children to talk about the weather throughout the year. • Encourage children to find shelter or make shelters to keep themselves dry in the rain or shade themselves when it is sunny. • Encourage children to talk about how the ground changes when it rains. • Encourage children to measure the size of puddles using their feet after it rains. • Encourage children to talk about how puddles change over time after it rains. • Encourage children to talk about the animals and plants that they find in different seasons. • Encourage children to ask questions about the weather and seasonal changes.

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- Finding minibeasts in the school grounds at different times in the year
- Taking photographs of the minibeasts they find in the school grounds at different times in the year
- Looking for birds and other animals throughout the year using binoculars
- Sharing books and videos about animals that migrate or hibernate over winter, gather food in autumn, build nests and lay eggs in spring etc.
- Taking photographs of the plants they find in the school grounds at different times in the year
- Observing closely and drawing the plants in the school grounds at different times in the year
- Matching animals and plants they find to pictures that identify them

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Encouraging scientific enquiry

Classification

- Which clothes are suitable for each season?

Observing over time

- How does a puddle change over time?
- How does a snowman change as it melts?
- How does the natural world change with the seasons?

Researching using secondary sources

- Find out about how animals behave in different seasons.
- Find out about the weather and seasons.

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Vocabulary

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Common misconceptions

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Model and encourage children to use vocabulary such as:

- spring, summer, autumn, winter, seasons, sunny, cloudy, hot, warm, cold, shower, raining, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, windy, rainbow, animals, young, plants, flowers

Expose children to supplementary vocabulary such as:

- hibernate, migrate, snowflake

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Some children may think:

- it always snows in winter
- it is always hot in the summer
- all babies and young animals are born in spring
- plants only have flowers in the spring and summer
- animals sleep during winter
- it rains to help the plants grow
- when it is hotter, it is because the Sun is closer
- God controls the weather.

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Linked texts

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Linked careers

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Traditional stories and nursery rhymes

- Rain, Rain Go Away
- Rain on the Green Grass
- It's Raining, It's Pouring
- I Hear Thunder

Other texts

- Seasons by Anna Pang
- Autumn is Here by Heidi Pross Gray
- Spring is Here by Will Hillenbrand
- One Springy Day by Nick Butterworth
- WOW! It's Night-time by Tim Hopgood
- Tree - Seasons Come, Seasons Go by Britta Teckentup

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Opportunities in the role-play corner to talk about the weather throughout the year

- Meteorologist
- Weather presenter

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• The Snowy Day by Ezra Jack Keats • The Snowman by Raymond Briggs	

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
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Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • playing and exploring outside in all seasons and in different weather • observing living things throughout the year. **Children use equipment to measure when:** • exploring the size of puddles. **Children sort:** • clothes for different seasons. **Children record their observations when:** • observing plants, animals and puddles.	• Can talk about different types of weather. • Can talk about the four seasons. • Can talk about the living things they see in the playground and on visits during each season.

	Year	Reception	Topic	Materials, including changing materials
	Understanding the World			
	• Explore the natural world around them. • Describe what they see, hear and feel whilst outside.			

Prior learning	Future learning
• Use all their senses in hands-on exploration of natural materials. (Nursery) • Explore collections of materials with similar and/or different properties. (Nursery) • Talk about the differences between materials and changes they notice. (Nursery)	• Distinguish between an object and the material from which it is made. (Y1 – Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 – Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 – Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 – Everyday materials)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to explore a range of materials in a sensory way, including natural materials • Looking for dew, ice, icicles and frost in the playground • Using their senses to explore natural materials in the environment, such as stones, twigs, leaves, feathers, seeds, flowers etc. • Gathering natural materials to make collections **Opportunities to make objects from different materials, including natural materials** • Making pictures using natural materials they have gathered from the environment • Making dens, nests, bug hotels etc. using natural materials • Making ice pictures by putting water in a shallow tray and adding natural objects gathered from the environment and then leaving them outside to freeze or putting them in the freezer	• Encourage children to talk about the natural materials they explore, using their senses. • Encourage children to talk about the materials they are using when making pictures. • Encourage children to choose from a range of materials, including natural materials, when making models and identify a key property that was required. • Encourage children to reuse materials and talk about what can be recycled to care for the natural world. • Support children to list the properties the material has. • Encourage children to test that their model is fit for purpose and that the materials are suitable. • Encourage children to compare and describe how materials change over time and in different conditions.

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- Making junk models with a range of materials, including natural materials they have gathered from the environment

Opportunities to compare how materials change

- Making popcorn in a microwave and on a fire
- Making pizza dough with different flours
- Baking bread in different tins or for different times to compare the outcome
- Baking cupcakes and removing one after every five minutes
- Choosing where to put ice cubes in the playground and observing how quickly they melt
- Observing how a large block of ice changes over time, using string to measure around it
- Putting wax crayons in different areas of the playground and observing how they change
- Making a snowman and observing how it changes over time
- Making snowballs and putting them in different parts of the playground and observing how they change over time

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- Encourage children to take photographs or draw pictures to record how materials change.
- Encourage children to measure how objects change when they melt.
- Encourage children to ask questions about materials and how they change.

Encouraging scientific enquiry

Comparative testing

- How does popcorn made in a microwave compare to popcorn made on a fire?
- How quickly do ice cubes melt in different areas of the playground?
- How are pizza bases different when made with different flours?
- How does a loaf cook differently in different tins?
- How do cupcakes cook if they have different amounts of mixture?

Observing over time

- How does the block of ice change over time?
- How does a snowman change over time?
- How does cake mixture/bread dough change as it is cooked?

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Model and encourage children to use vocabulary such as:

- ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest, hard, soft, bendy, rigid, wood, plastic, paper, card, metal, strong, weak, hot, apply heat, waterproof, soggy, not waterproof, best, change, change back

Expose children to supplementary vocabulary such as:

- solid, liquid, gas, most suited

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Some children may think:

- material only means fabric
- all plastic/wood etc. is the same.

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<tr>
<td>Linked texts</td>
<td>Linked careers</td>
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Opportunities in the role-play corner to compare materials and explore how they change

- Recycling centre worker
- Product designer
- Builder
- Chef

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</table>

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations using simple equipment and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring a range of materials in a sensory way, including natural materials • making objects from different materials, including natural materials • comparing how materials change. **Children use equipment to measure when:** • observing how objects melt. **Children sort:** • materials, including natural materials. **Children record their observations when:** • materials are changing over time or in different conditions.	• Can name the material they are using and why. • Can talk about multiple properties of the material and why it is suited for its purpose. • Can observe changes in their natural world and say why it is different now or will change in the future. • Can compare and describe how materials change over time and in different conditions.

	Year	Reception	Topic	Light
	Understanding the World			
	• Describe what they see, hear and feel whilst outside.			
	Links with other areas of learning			
	Personal, Social and Emotional Development • Manage their own needs.			

Prior learning	Future learning
• Explore how things work. (Nursery) • Talk about the differences in materials and changes they notice. (Nursery)	• Recognise that they need light in order to see things and that dark is the absence of light. (Y3 – Light) • Notice that light is reflected from surfaces. (Y3 – Light) • Recognise that light from the Sun can be dangerous and that there are ways to protect their eyes. (Y3 – Light) • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 – Light) • Find patterns in the way that the size of shadows change. (Y3 – Light)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to explore shadows • Looking for shadows created by the Sun on cloudy and non-cloudy days • Drawing around shadows and comparing their shape and size • Making shadows using their bodies, both outside using the Sun and inside using torches • Making shadows using transparent and opaque objects/materials • Putting hands in a beam of light and making shadow shapes • Making shadows using shadow puppets or other objects • Observing a toy outside and noticing how the shadow changes during the day • Observing what areas are sunny and shady at different times in the day • Sharing books about shadows	• Encourage children to talk about the shadows that they see inside and outdoors. • Support children to identify the light source and the object that is making the shadow. • Support children to identify that see-through objects make pale shadows and non-see-through objects make dark shadows. • Support children to measure shadows using their feet or other non-standard units. • Encourage children to draw around shadows throughout the day to record how they change over time. • Encourage children to talk about changes they feel when the clouds cover and uncover the Sun. • Encourage children to talk about the changes to the shadows when the clouds cover and uncover the Sun.

<table>
<tr><td>Opportunities to explore rainbows
• Making rainbows from sunlight e.g. bubbles, water sprinkler, holographic paper, CDs etc.
• Sharing books about rainbows</td><td>• Support children to choose appropriate clothing when they are hot or out in the Sun.
• Encourage children to ask questions about the shadows and rainbows that they see.

Encouraging scientific enquiry

Comparative testing
• Compare the shape of shadows made by different objects.
Classification
• Which objects/materials make dark shadows?
Observing over time
• How do the Sun and shade change during the day?
• How does a toy’s shadow change during the day?
Researching using secondary sources
• Find out about shadows.
• Find out about rainbows.</td></tr>
<tr><td>Vocabulary</td><td>Common misconceptions</td></tr>
<tr><td>Model and encourage children to use vocabulary such as:
• Sun, sunny, light, shadow, shady, clouds, torch, see-through, non-see-through, source, light source
Expose children to supplementary vocabulary such as:
• casting a shadow, pale, dark, transparent, opaque</td><td>Some children may think:
• shadows are only caused by the Sun
• all shadows are black.</td></tr>
<tr><td>Linked texts</td><td>Linked careers</td></tr>
<tr><td>Other texts
• Suddenly by Colin McNaughton
• Where is the Dragon? By Leo Timmers</td><td>Opportunities in the role-play corner to use shadows
• Puppeteer</td></tr>
</table>

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring shadows • exploring rainbows. **Children use equipment to measure when:** • comparing the size of shadows. **Children sort:** • objects/materials that make dark or pale shadows. **Children record their observations when:** • shadows change throughout the day.	• Can point out shadows in the playground. • Can explain when shadows can be seen in the playground. • Can talk about how shadows changes during the day. • Can identify the light source and the object making a shadow. • Can identify shadows that are dark and pale. • Can identify and describe a rainbow.

Year	Reception	Topic	Forces

Understanding the World

- Explore the natural world around them.
- Describe what they see, hear and feel whilst outside.

Prior learning	Future learning
• Explore how things work. (Nursery) • Explore and talk about different forces they can feel. (Nursery) • Talk about the differences between materials and changes they notice. (Nursery)	• Compare how things move on different surfaces. (Y3 – Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 – Forces and magnets) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 – Forces and magnets) • Describe magnets as having two poles. (Y3 – Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 – Forces and magnets) • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 – Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 – Forces)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING

What adults might provide	What adults might do
Opportunities to explore how to change how things work • Adapting objects to see if they can be made to float or sink e.g. cutting and peeling fruit and vegetables, reshaping plasticene etc. • Testing how many small objects different foil containers can hold before sinking • Testing how toy cars move down ramps and gutters • Testing how wheels turn when sand or water is poured through them • Testing how objects fall with and without a parachute attached	• Encourage children to talk about how they changed objects to make them float or sink. • Encourage children to count and record how small objects different 'boats' can hold before they sink. • Encourage children to talk about how they changed how the cars rolled down ramps/gutters. • Encourage children to talk about what happened when they poured sand/water through wheels and down gutters and how they changed this.

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- Testing how different balls bounce
- Making and testing paper aeroplanes
- Designing different marble runs or routes for water/sand to travel down gutters or pipes

Opportunities to explore how objects move in air

- Identifying objects being blown around outdoors
- Observing how different objects fall e.g. scarves, feathers
- Observing how toys/objects move in the wind e.g. streamers, balloons, pinwheels, bubbles etc.
- Comparing the movements of a ball and a balloon when bouncing or throwing and catching

Opportunities to explore how objects move in water

- Exploring how a marble moves through different liquids in sealed bottles
- Observing how sailing boats move through water

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- Encourage children to compare how objects fall, including with or without parachutes.
- Encourage children to explore and talk about how they changed how different balls bounced.
- Encourage children to make different aeroplanes and compare how far they fly by marking where they land.
- Encourage children to describe how sand or water moves down pipes or gutters, or marbles travel down a marble run, and how they changed this.
- Encourage children to notice and talk about the objects in the playground that are moved by the wind.
- Encourage children to explore and talk about what they observe when turning bottles filled with different liquids and a marble upside down.
- Encourage children to ask questions about forces, such as “What happens if I …”

Encouraging scientific enquiry

Comparative testing

- How many cubes/small plastic animals can fit in different ‘boats’?
- Compare how cars move down ramps/gutters.
- Compare how wheels turn when sand or water is poured through.
- Compare how objects fall.
- Compare how objects fall with and without parachutes.
- Compare how different balls bounce.
- Compare how things move when blown.
- Compare how a marble moves through different liquids.
- Compare how different paper aeroplanes fly.

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<tr>
<th>Vocabulary</th>
<th>Common misconceptions</th>
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Model and encourage children to use vocabulary such as:

- float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, wind, air, water, blow, bounce

Expose children to supplementary vocabulary such as:

- force, rotate, solid, liquid, gravity

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Some children may think:

- all light objects float and all heavy objects sink
- objects made of the same material will always float or sink.

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Linked texts	Linked careers
Traditional stories and nursery rhymes • Billy Goats Gruff • Gingerbread Man *(making boats to cross the river)* *Other texts* • Mr Gumpy's Outing by John Burningham • Mr Archimedes' Bath by Pamela Allen • Who sank the boat? by Pamela Allen • Stickman by Julia Donaldson • Flotsam by David Wiesner • Blown Away by Rob Biddulph	**Opportunities in the role-play corner to explore how to change how things work** • Boat builder • Aircraft engineer • Rocket designer • Engineer

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • exploring how to change how things work • exploring how the wind can move objects • exploring how objects move in water. **Children use equipment to measure when:** • pouring water and sand. **Children record their observations when:** • testing boats and aeroplanes.	• Can talk about how they changed objects to make them float or sink. • Can talk about how they changed how cars move down ramps or gutters. • Can talk about how they changed how wheels turn when sand or water is poured through them. • Can talk about how they changed how balls bounce. • Can compare how different boats and aeroplanes performed. • Can describe how objects fall with and without a parachute. • Can describe how a marble moves through different liquids.

	Year	Reception	Topic	Sound
	Understanding the World			
	• Describe what they see, hear and feel whilst outside.			

Prior learning	Future learning
• Explore how things work. (Nursery)	• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 – Animals, including humans) • Identify how sounds are made, associating some of them with something vibrating. (Y4 – Sound) • Recognise that vibrations from sounds travel through a medium to the ear. (Y4 – Sound) • Find patterns between the pitch of a sound and features of the object that produced it. (Y4 – Sound) • Find patterns between the volume of a sound and the strength of the vibrations that produced it. (Y4 – Sound) • Recognise that sounds get fainter as the distance from the sound source increases. (Y4 – Sound)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to listen to sounds outside and identify the source • Going on a sound walk • Closing eyes and listening to the sounds around them when outside • Listening to rain, wind, thunder • Recording sounds when outside • Playing sound identification games • Catching rain in metal buckets or saucepans **Opportunities to make sounds**	• Encourage children to describe the sounds they hear. • Support children to identify what is making each sound. • Encourage children to ask questions about the sounds they hear and what is making them. **Encouraging scientific enquiry** *Comparative testing* • How does rain sound different when it lands in different containers?

• Making noise by blowing on a blade of grass • Making wind chimes • Using voices, instruments and other objects to mimic sounds they hear outdoors	*Observing over time* • Listen to the siren of an emergency vehicle as it approaches and moves away.
Vocabulary	**Common misconceptions**
Model and encourage children to use vocabulary such as: • sound, noise, listen, hear, music, voices, bird song, traffic, sirens, thunder, high, low, loud, quiet, soft, volume, crackle, thunder, hum, buzz, roar Expose children to supplementary vocabulary such as: • source, crescendo, vibration, pitch	Some children may think: • sounds do not travel through solids and liquids.
Linked texts	**Linked careers**
Traditional stories and nursery rhymes • One Coconut, Two Coconuts • Pass the Secret Round *Other texts* • Splish, Splash, Splosh by Mick Manning • Alfie's Weather by Shirley Hughes • Polar Bear, Polar Bear, What Do You Hear? by Eric Carle • The Very Quiet Cricket by Eric Carle • The Very Clumsy Click Beetle by Eric Carle	**Opportunities in the role-play corner to listen to sounds** • Sound effect artist

HOW CHILDREN MIGHT SHOW THEIR LEARNING	
Characteristics of effective teaching and learning	
• Playing and exploring – children investigate and experience things, and 'have a go' • Active learning – children concentrate and keep on trying if they encounter difficulties, and enjoy achievements • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things	
Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • listening to sounds outside and identifying the source making the sounds. **Children record their observations when:** • listening to sounds.	• Can describe sounds they hear. • Can identify the source of sounds. • Can describe how they make sounds.

	Year	Reception	Topic	Earth and space
	Understanding the World			
	• Explore the natural world around them. • Describe what they see, hear and feel whilst outside.			

Prior learning	Future learning
• Explore and respond to different natural phenomena in their setting and on trips. (Birth to three)	• Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. (Y5 – Earth and space) • Describe the movement of the Moon relative to the Earth. (Y5 – Earth and space) • Describe the Sun, Earth and Moon as approximately spherical bodies. (Y5 – Earth and space) • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. (Y5 – Earth and space)

CREATING APPROPRIATE EXPERIENCES TO INITIATE LEARNING	
What adults might provide	**What adults might do**
Opportunities to learn about the Earth, Sun, Moon, planets and stars • Observing that the Sun appears to move across the sky • Observing that it is warmer and brighter when the Sun is shining than when it is behind the clouds • Observing that they can see the Moon at night and sometimes in the day • Observing that they can only see the stars at night • Making model planets e.g. with papier-mâché or Modroc and balloons • Modelling a cratered moon landscape with papier-mâché or Modroc • Observing distant objects, including the Moon, with binoculars or a small telescope • Sharing books and video clips about the Earth, Sun, Moon, planets and stars • Talking about what happens and what they can see and hear in the daytime and at night	• Encourage children to safely observe changes in the sky at different times of the day. • Support children to link changes in the sky to other observations e.g. changes in temperature and brightness. • Encourage children to observe the evening/night sky with their family. • Model asking questions about space and space travel. • Encourage children to ask questions about space and space travel. • Encourage children to move as if they were in space or on the Moon. • Encourage children to use observations from books and video clips when painting their model planets. • Encourage children to talk about how binoculars or a telescope make distant objects appear larger and closer. • Encourage children to sort animals by when they are active. • Support children to decide criteria for the 'best' rocket.

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- Sorting small world animals into those that are active in the daytime and those that are active at night

Opportunities to learn about space travel

- Joining materials to make model rockets, Moon buggies/Mars rovers and space stations
- Making and testing simple air-propelled card or plastic bottle rockets
- Sharing books and video clips about space exploration including video clips of astronauts walking on the Moon and floating in the space station

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- Support children to describe the movements of astronauts.

Encouraging scientific enquiry

Comparative testing

- Make and testing air-propelled rockets to find out which is the ‘best’.

Pattern seeking

- Find simple patterns in how light levels and temperature change with the movement, or obscuring of, the Sun.

Research using secondary sources

- Find out about the Solar System, stars and space travel.
- Find out about nocturnal animals.

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<tr><th>Vocabulary</th><th>Common misconceptions</th></tr>
<tr><td>

Model and encourage children to use vocabulary such as:

- Sun, Moon, Earth, star, planet, sky, day, night, space, round, bounce, float

Expose children to supplementary vocabulary such as:

- sunrise, sunset, astronaut, astronomer, constellation, orbit, nocturnal, slow-motion, magnify

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Some children may think:

- the Earth is flat
- the Moon and Sun are discs
- stars are a pointed ‘star’ shape
- the Moon appears only at night
- at night, the Sun is turned off
- at night, the Sun goes behind the clouds.

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<tr><th>Linked texts</th><th>Linked careers</th></tr>
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Traditional stories, songs and nursery rhymes

- Twinkle, Twinkle Little Star

Other texts

- Whatever Next! by Jill Murphy
- Astro Girl by Ken Wilson-Max
- Look Up! by Nathan Bryon
- How to Catch a Star by Oliver Jeffers
- Owl Babies by Martin Waddell

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Opportunities in the role-play corner to learn about space

- Astronomer
- Astronaut on a space station or rocket
- Rocket designer

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HOW CHILDREN MIGHT SHOW THEIR LEARNING	
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Demonstrating skills and showing understanding	
What a child might be doing	**Possible evidence of learning**
Children ask questions, make observations and talk about what they are doing and have found out while carrying out a range of activities, such as: • learning about the Earth, Sun, Moon, planets and stars • learning about space travel. **Children record their observations when:** • making models of Earth, Sun, Moon, planets and stars • drawing things that happen in the daytime and at night.	• Can identify the Sun, Moon and stars and talk about how they are different from Earth. • Can identify differences between day and night. • Can talk about animals that are active at night. • Can talk about some differences between being on Earth and travelling in space.

Progression in Vocabulary

Introduction

- Bullet points denote statements from Science Programme of Study: Key Stage 3: National Curriculum in England or Development Matters.
- The vocabulary included for Nursery and Reception are words that children should be exposed to. They should use some correctly in a scientific context.
- The vocabulary included from Year 1 onwards are the words that children should know and use correctly in a scientific context. They should be able to define the specialist scientific vocabulary included.
- The vocabulary in **red** is from other linked topics. The topic they come from is indicated.
- The working scientifically vocabulary identified in the first table of this document should be taught through the topics in each year-group during practical work or scientific enquiry.

Working scientifically

Year-group(s)	Vocabulary/Statement(s)
Nursery & Reception	look closely, observe, watch, touch, feel, smell, listen, same, different, compare, ask questions, record, sort, group
Years 1 & 2	observe, changes, patterns, grouping, sorting, compare, same, different, identify (name), measure, data, record results, drawing, picture, table, tally chart, present, pictogram, block chart, Venn diagram, ask questions, test, investigate, explore, equipment, resources, magnifying glass, hand lens, ruler, tape measure, metre stick, pipette, syringe, spoon, teaspoon, answer questions, interpret results, scientific enquiry, pattern seeking, comparative testing, observing over time, classifying, researching using secondary sources
Years 3 & 4	practical work, fair testing, relationships, accurate, thermometer, data logger, stopwatch, timer, estimate, data, diagram, identification key, chart, bar chart, prediction, similarity, difference, evidence, information, findings, criteria, values, properties, characteristics, conclusion, explanation, reason, evaluate, improve
Years 5 & 6	variables, independent variable, dependent variable, control variable, evidence, justify, argument (science), causal relationship, accuracy, precision, scatter graphs, bar graphs, line graphs, force meter

Plants

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore natural materials, indoors and outside.
Nursery	plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil, names of plants they grow
Reception	tree, bush, herb, names of plants they see (Reception - Living things and their habitats)
Year 1	leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, names of trees in the local area, names of garden and wild flowering plants in the local area
Year 2	light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling names of plants in local habitats and micro-habitats (Y2 - Living things and their habitats)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport
Year 4	classification, classification keys (Y4 - Living things and their habitats)
Year 5	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)
Year 6	flowering, non-flowering, mosses, ferns, conifers (Y6 - Living things and their habitats)
Key Stage 3	• Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms

Living things and their habitats

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore natural materials, indoors and outside.
Nursery	natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil (Nursery - Plants)
Reception	plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment (e.g. beach, forest)
Year 1	names of garden and wild flowering plants in the local area (Y1 - Plants) head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group (Y1 - Animals, including humans) weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length (Y1 - Seasonal changes)
Year 2	living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, names of local habitats (e.g. pond, woodland etc.), names of micro-habitats (e.g. under logs, in bushes etc.), conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold, names of living things in the habitats and micro-habitats studied light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants) offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, cat/kitten, caterpillar/butterfly) (Y2 - Animals, including humans)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport
Year 4	classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)
Year 5	life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, cuttings
Year 6	vertebrates, fish, amphibians, reptiles, birds, mammals, warm-blooded, cold-blooded, invertebrates, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers

Key Stage 3	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes • The structure and functions of the gas exchange system in humans, including adaptations to function • The mechanism of breathing to move air in and out of the lungs • The impact of exercise, asthma and smoking on the human gas exchange system

Animals, including humans

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore natural materials, indoors and outside. • Make connections between the features of their family and other families. • Notice differences between people.
Nursery	egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young, fur, feathers, scales, tail, wings, beak, claws, paws, hooves, swim, walk, run, jump, fly, patterns, spots, stripes, grow, change, baby, toddler, child, adult, old person, smell, taste, touch, feel, hear, see, blind, deaf
Reception	names of animals, live, on land, in water, jungle, desert, North Pole, South Pole, sea, hot, cold, wet, dry, snow, ice, hair (e.g. black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (e.g. blue, brown, green, grey), skin (e.g. black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman
Year 1	head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group, parts of the human body including those within the school's RSE policy, senses, touch, see, smell, taste, hear, fingers, skin, eyes, nose, ears, tongue
Year 2	offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, kitten/cat, caterpillar/butterfly), survive, survival, water, food, air, exercise, heartbeat, breathing, hygiene, germs, disease, food types (e.g. meat, fish, vegetables, bread, rice, pasta, dairy) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival (Y2 - Living things and their habitats)
Year 3	nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine
Year 4	digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, large intestine, rectum, anus, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey
Year 5	puberty, the vocabulary to describe sexual characteristics in line with the school's RSE policy life cycle, foetus, baby, child, adolescent, adult, reproduce, sexual, sperm, fertilises, egg, live young (Y5 - Living things and their habitats)
Year 6	heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, cycle, circulatory system, diet, drugs, lifestyle

Key Stage 3	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes • The structure and functions of the gas exchange system in humans, including adaptations to function • The mechanism of breathing to move air in and out of the lungs • The impact of exercise, asthma and smoking on the human gas exchange system

Evolution and inheritance

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Make connections between the features of their family and other families. • Notice differences between people.
Nursery	natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern (Nursery - Living things and their habitats)
Reception	plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment (e.g. beach, forest) (Reception - Living things and their habitats)
Year 1	leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud (Y1 - Plants)
Year 2	light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold (Y2 - Living things and their habitats)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil (Y3 - Plants) soil, fossil, bone, flesh, minerals (Y3 - Rocks)
Year 4	environment, habitat, human impact, positive, negative, migrate, hibernate (Y4 - Living things and their habitats) herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)
Year 5	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)
Year 6	offspring, sexual reproduction, vary, characteristics, adapted, inherited, species, evolve, evolution
Key Stage 3	• Heredity as the process by which genetic information is transmitted from one generation to the next • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction

Seasonal changes

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore natural materials, indoors and outside.
Nursery	grow, shoot, die, dead (Nursery - Plants) egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young (Nursery - Animals, excluding humans)
Reception	spring, summer, autumn, winter, seasons, sunny, cloudy, hot, warm, cold, shower, raining, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, windy, rainbow, animals, young, plants, flowers
Year 1	weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length
Year 2	
Year 3	
Year 4	
Year 5	
Year 6	
Key Stage 3	• The seasons and the Earth's tilt, day length at different times of year, in different hemispheres

Materials

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore materials with different properties. • Explore natural materials, indoors and outside.
Nursery	mix, stir, cook, hot, oven, microwave, change, burn, melt, hard, runny, set, freeze, freezer, cold, blended, hard, soft, bendy, stiff, wobbly, wood, plastic, paper, card, fabric
Reception	ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest, hard, soft, bendy, rigid, wood, plastic, paper, card, metal, strong, weak, hot, apply heat, waterproof, soggy, not waterproof, best, change, change back
Year 1	object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through
Year 2	opaque, transparent, translucent, reflective, non-reflective, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching
Year 3	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay) (Y3 - Rocks) magnetic force, magnet, attract, magnetic material, metal, iron, steel (Y3 - Forces and magnets)
Year 4	solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle electrical conductor, electrical insulator, metal, non-metal (Y4 - Electricity)
Year 5	thermal insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material
Year 6	
Key Stage 3	• Chemical reactions as the rearrangement of atoms • Representing chemical reactions using formulae and using equations • Combustion, thermal decomposition, oxidation and displacement reactions • Defining acids and alkalis in terms of neutralisation reactions • The pH scale for measuring acidity/alkalinity; and indicators

Rocks

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore materials with different properties. • Explore natural materials, indoors and outside.
Nursery	natural, shells, pebbles, stones
Reception	
Year 1	object, material, rock, brick, clay, hard, soft, waterproof, absorbent, rough, smooth, shiny, dull, see-through, not see-through (Y1 - Everyday materials)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay)
Year 4	
Year 5	
Year 6	evolution
Key Stage 3	• The composition of the Earth • The structure of the Earth • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks

Light

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Repeat actions that have an effect.
Nursery	light, torch, bulb, lamp, spotlight, shiny, bright, brighter, brightest, Sun, shine, glow, mirror
Reception	Sun, sunny, light, shadow, shady, clouds, torch, see-through, not see-through, source, light source
Year 1	senses, see, eyes (Y1 - Animals, including humans) shiny, dull, see-through, not see-through (Y1 - Materials)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	light, light source, dark, absence of light, surface, shadow, reflect, mirror, Sun, sunlight, dangerous
Year 4	
Year 5	
Year 6	straight lines, light rays
Key Stage 3	• The similarities and differences between light waves and waves in matter • Light waves travelling through a vacuum; speed of light • The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection

Forces

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Repeat actions that have an effect.
Nursery	object, float, sink, water, up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow
Reception	float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, wind, air, water, blow, bounce
Year 1	
Year 2	flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching (Y2 - Uses of everyday materials)
Year 3	force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole
Year 4	
Year 5	force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears
Year 6	
Key Stage 3	• Magnetic fields by plotting with compass, representation by field lines • Earth's magnetism, compass and navigation • Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • Moment as the turning effect of a force • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water • Forces measured in Newtons, measurements of stretch or compression as force is changed

Sound

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Repeat actions that have an effect.
Nursery	sound, noise, loud, quiet, high, low, music, bang, blow, pluck, soft, hard, fast, slow, names of instruments
Reception	sound, noise, listen, hear, music, voices, bird song, traffic, sirens, thunder, high, low, loud, quiet, soft, volume, crackle, thunder, hum, buzz, roar
Year 1	senses, hear, ear (Y1 - Animals, including humans)
Year 2	
Year 3	
Year 4	sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, quiet, loud, insulation
Year 5	
Year 6	
Key Stage 3	• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound • Sound needs a medium to travel, the speed of sound in air, in water, in solids • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • Auditory range of humans and animals • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound • Waves transferring information for conversion to electrical signals by microphone

Electricity

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Repeat actions that have an effect.
Nursery	battery, plug, socket, electricity, wire, sound, light, move
Reception	
Year 1	
Year 2	
Year 3	
Year 4	electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
Year 5	
Year 6	circuit diagram, circuit symbol, voltage
Key Stage 3	• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Static electricity

Earth and space

Year-group(s)	Vocabulary/Statement(s)
Birth to 3	• Explore and respond to different natural phenomena in their setting and on trips.
Nursery	
Reception	Sun, Moon, Earth, star, planet, sky, day, night, space, round, bounce, float
Year 1	
Year 2	
Year 3	light, light source, Sun, sunlight, dangerous (Y3 - Light)
Year 4	
Year 5	Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit
Year 6	
Key Stage 3	• Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) • Our Sun as a star, other stars in our galaxy, other galaxies • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres • The light year as a unit of astronomical distance

Progression in working scientifically skills

This document shows how the working scientifically statements from the science National Curriculum for England are linked and built on across the three phases in Key Stage 1 and 2. To highlight the links, the working scientifically skills statements are grouped under the following broader skills definitions.

- Asking questions and recognising that they can be answered in different ways
- Making observations and taking measurements
- Engaging in practical enquiry to answer questions
- Recording and presenting evidence
- Answering questions and concluding
- Evaluating and raising further questions and predictions
- Communicating their findings.

The working scientifically statements from the science National Curriculum for England are presented in bold. The bullet points that follow each statement are additional guidance that clarifies the expectations.

Working scientifically statements that feature in more than one of the broader skills definitions are shown in italics.

In the EYFS, the characteristics of effective learning from the Statutory Framework for the Early Years Foundation Stage are the foundations on which the working scientifically skills build in Key Stage 1. While children are playing and exploring, teachers should be modelling, encouraging and supporting them to do the following:

- show curiosity and ask questions
- make observations using their senses and simple equipment
- make direct comparisons
- use equipment to measure
- record their observations by drawing, taking photographs, using sorting rings or boxes and, in Reception, on simple tick sheets
- use their observations to help them to answer their questions
- talk about what they are doing and have found out
- identify, sort and group.

NB - The National Curriculum statements in italics in these tables indicate that they feature more than once.

Year 1 & 2	Year 3 & 4	Year 5 & 6
Asking questions and recognising that they can be answered in different ways		
Asking simple questions and recognising that they can be answered in different ways • While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions. • The children answer questions developed with the teacher often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.	**Asking relevant questions and using different types of scientific enquiries to answer them** • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.	***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary*** • Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. • Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.

Making observations and taking measurements		
Observing closely, using simple equipment • Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units.	**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers** • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate** • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).

Engaging in practical enquiry to answer questions		
Performing simple tests • The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. **Identifying and classifying** • Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing.	**Setting up simple practical enquiries, comparative and fair tests** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking. **Explanatory note** A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome. A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.	***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary*** • The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

Recording and presenting evidence		
Gathering and recording data to help in answering questions • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings.	**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions** **Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables** • The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams, Carroll diagrams. • Children are supported to present the same data in different ways in order to help with answering the question.	**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs** • The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.

Answering questions and concluding		
Using their observations and ideas to suggest answers to questions • Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.	**Using straightforward scientific evidence to answer questions or to support their findings** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.	**Identifying scientific evidence that has been used to support or refute ideas or arguments** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding.
Using their observations and ideas to suggest answers to questions • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	**Identifying differences, similarities or changes related to simple scientific ideas and processes** • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. ***Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions*** • They draw conclusions based on their evidence and current subject knowledge.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.

Evaluating and raising further questions and predictions		
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. • They identify any limitations that reduce the trust they have in their data.
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.	**Using test results to make predictions to set up further comparative and fair tests** • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

Communicating their findings		
	Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • They communicate their findings to an audience using relevant scientific language and illustrations.

Summary of Science in EYFS

Topic	Nursery	Reception
Animals, excluding humans	• Learn about the life cycles of animals • Compare adult animals to their babies • Observe how baby animals change over time	• Name and describe animals that live in different habitats. • Describe different habitats
Humans	• Learn about the life cycles of humans • Learn about how to take care of themselves • Learn about their senses	• Describe people who are familiar to them • Learn about how to take care of themselves
Living things and their habitats	• Explore the surrounding natural environment • Explore natural objects from the surrounding environment	• Explore the plants in the surrounding natural environment • Explore the animals in the surrounding natural environment • Explore plants and animals in a contrasting natural environment
Plants	• Grow plants	
Seasonal changes		• Play and explore outside in all seasons and in different weather • Observe living things throughout the year
Materials, including changing materials	• Explore a range of materials • Shape and join materials • Combine and mix ingredients • Change materials by heating and cooling, including cooking	• Explore a range of materials, including natural materials • Make objects from different materials, including natural materials • Observe, measure and record how materials change when heated and cooled • Compare how materials change over time and in different conditions
Electricity	• Identify electrical devices • Use battery-powered devices	
Light	• Explore light sources • Shine light on or through different materials	• Explore shadows • Explore rainbows
Forces	• Feel forces • Explore how things work • Explore how objects/materials are affected by forces	• Explore how to change how things work • Explore how the wind can move objects • Explore how objects move in water
Sound	• Listen to sounds • Make sounds	• Listen to sounds outside and identify the source • Make sounds
Earth and space		• Learn about the Earth, Sun, Moon, planets and stars • Learn about space travel