Science Knowledge and Skills Progression

Curriculum Intent

We aim to encourage a child's natural sense of wonder about the world in which they live through first-hand practical experiences. Our science curriculum is designed to develop a sense of excitement and curiosity about natural phenomena. We want our children to ask questions about what they see, hear, feel, and experience. We want them to develop their vocabulary and use simple scientific language to talk about what they have found out. We want them to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. We want our children to build up a body of key knowledge and concepts. We want them to develop their understanding of scientific ideas and use different types of scientific enquiry to answer their own questions. This includes observing changes over a period, noticing patterns, grouping, and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information such as books, photographs, and videos.

Curriculum Implementation

- the curriculum is sequenced and well-structured with clear end points. knowledge is built on overtime and learning is broken down into component parts.
- regular professional development gives teachers' the scientific subject knowledge they need to help children make connections between scientific concepts.
- teachers have access to medium-term plans to help them to deliver high-quality teaching and makes them aware of possible scientific misconceptions.
- pedagogical choices are designed to develop the substantive knowledge (established factual knowledge) and disciplinary knowledge (knowledge of how to work scientifically) intended in each lesson.
- teachers ensure children build their knowledge of key substantive concepts such as 'plant,' 'force', material' and 'habitat'.
- teachers use well-structured enquiry questions to focus a particular activity e.g., '*How does the temperature of water affect the time taken for a substance to dissolve?*
- children's knowledge of how to work scientifically is built over time from Early Years to Year 2. This includes:
    - observing over time
    - pattern seeking
    - identifying, classifying, and grouping
    - comparative and fair testing (controlled investigations)
    - and researching using secondary sources
- time is built into the curriculum for children to learn and remember key knowledge and how this connects with what they already know about science, so they build connected knowledge.
- children will be given sufficient opportunities to practise and consolidate what they have learned before moving on to new content.
- SEND children receive additional support before a lesson, for example through pre-teaching of specific vocabulary.
- children's understanding of scientific vocabulary is developed, so children can talk about the phenomena they are learning about.
- teachers' assessment checks knowledge that children have learned in previous years.

We use a variety of teaching and learning approaches in our science lessons:

- Elicit children's existing ideas and understanding using a 'Knowledge Harvest', through discussions and practical activities.
- Modelled and intermediate investigations
- Small group and partner work.
- Opportunities to answer questions using different types of scientific enquiry methods (e.g. observations over time, fair test, pattern seeking, research, identifying and classifying)

- Practical and hands on investigations and enquires.
- Use of resources to make observations and recordings, such as rulers, stop watches, tape measurers, measuring jugs.
- Use of IT such as iPads, digital microscopes, visualisers, light boxes, cameras.
- Educational visits, local walks.
- OWL (Outdoor Wonder Learning) sessions.
- Communicating findings in different ways e.g., tables, charts, Venn diagrams, posters
- Links to other areas of curriculum e.g., literacy – factual poster

Substantive and disciplinary knowledge in science

Children need substantive knowledge in science (concepts, models, laws and theories) and disciplinary knowledge (how to work scientifically). This knowledge builds progressively to develop the children's scientific understanding and ability to work scientifically.

National Curriculum		**End of Early Years Foundation Stage**			**End of Key Stage 1**	
		ELG: **Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.**			***During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content (plants, animals including humans, everyday materials and their uses, seasonal changes, living things and their habitat), :*** • ***asking simple questions and recognising that they can be answered in different ways*** • ***observing closely, using simple equipment*** • ***performing simple tests*** • ***identifying and classifying*** • ***using their observations and ideas to suggest answers to questions*** • ***gathering and recording data to help in answering questions***	
Substantive Knowledge	**Key concept**	**Nursery**		**Reception**	**Y1**	**Y2**
		Birth-3	**3–4-year-olds**	**5-year-olds**	**6-year-olds**	**7-year-olds**
Questioning and enquiring	**Working scientifically** **Disciplinary Knowledge**	Understand simple questions about 'who', 'what' and 'where.'	Understand 'why' questions, Question why things happen and give	Ask questions to find out more and to check they understand what has been said to them.	Ask simple questions about the world around us. Begin to recognise that questions can be answered in different ways.	Ask questions about the world around us. Recognise that questions can be answered in different ways (changes over time, noticing patterns,

	Ask questions	Beginning to ask simple questions. Begin to use a variety of questions (e.g., what, where, who)	explanations. Asks 'why' 'when', 'how.' Comment and ask questions about aspects of their familiar world such as the place where they live or the natural world.	Use talk to help work out problems and organise thinking and activities. Say how things work and why they might happen.	Use simple secondary resources to find answers.	grouping, and classifying, comparative and fair tests, research). Find information using computers and books.
Investigating, recording and reporting findings, drawing conclusions	**Working scientifically** **Disciplinary Knowledge**	Explore different materials, using all their senses to investigate them. Repeat actions that have an effect. Begin to predict what happens next in predictable situations. Can talk about some of the things they have observed. Notice patterns and arrange	Make choices and explore different resources and materials. Begin to predict what might happen next in a range of situations, e.g., a story, a pattern. Talk about what they see, using a wide vocabulary. Talks about why things happen and how things work Talk about and identify the patterns around them.	Plan and think ahead about how they will explore or play with objects. Make observations and explains why some things occur and talks about changes. Spot patterns in the environment, beginning to identify the 'rule.'	Carry out simple tests with support. Recognise when a simple test is unfair. Begin to predict might happen in an investigation. Begin to say what happened in an investigation. Gather and record data with adult support. Identify patterns from the data.	Carry out simple tests independently. Recognise when a test is unfair. Predict might happen in an investigation. Say what happened in an investigation. Gather and record data. Draw conclusions from the data gathered.

		things in patterns.				
Working scientifically vocabulary		*Who?* *What?* *Where?*	*Why?* *When?* *How?* *Same* *Different* *Try* *Find out.* *Bigger* *small*	*Sort* *Group* *Test* *Explore* *Describe* *Magnifying lens* *Microscope*	*Explain* *Questions* *Answers* *Equipment,* *Gather* *Measure* *Record* *Results,* *Observe* *Compare,* *similar/ities, different/ces,* *Beaker* *Pipette* *Syringe*	*Predict* *Analyse* *Research* *Curiosity* *Natural world* *Predicting* *Mathematical knowledge* *Collecting, presenting and analysing data* *Observing over time* *Pattern seeking* *Relationships* *Presenting data* *Identifying* *Classifying and grouping* *Comparative* *Fair Testing*
Animals including humans	*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*	Closely observes what animals and people do. Is curious about people and shows interest in stories about people and animals that they are familiar with, or which fascinate them.	Talk about some of the things they have observed such as animals. Begin to understand the need to respect and care for all living things. Understand the key features of the life cycle of an animal.	Make observations of animals and explains why some things occur and talks about changes. Explore the natural world around them, making observations and drawing pictures of animals. Looks closely at similarities, differences, patterns and change in nature.	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).	Know 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.

	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.*		Use all their senses in hands on exploration.	Knows about similarities and differences in relation to living things.	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Identify and describe insects. (non-statutory)	

Animals including humans' vocabulary	**Common farm animals and their young including:** *Cow* *Pig* *Sheep* **Common wild animals and their young including:** *Monkey* *Lion* *Elephant* **Body parts including:** *Eyes* *Nose* *Mouth*	**Common farm animals and their young including:** *Goat* *Chicken* *Horse* *duck* **Common wild animals and their young including:** *Tiger* *Giraffe* *Zebra* **Body parts including:** *Head* *Ears* *Hands* *Fingers* *Feet* *Toes* *Arm* *Leg*	**Common farm animals and their young including:** *Calf* *kid* *Lamb* *Piglet* *Chick* *Duckling* **Common wild animals and their young including:** *Cub* *Calf* *Infant* **Body parts including:** *stomach* *back* *foot* *hand* *animal*	*gill* *fin* *tusk* *antler* *hoof* *tentacle* *feather* *mammal* *reptile* *amphibian* *fish* *bird* *insect* *carnivore* *omnivore* *herbivore* *human* **senses** – smell, hearing, sight, touch, taste skeleton bone joint **body parts including facial features:** *eyelash, eyebrow, nostril, joints including elbow, wrist, hip, ankle, shoulder, knee.*	*food chain* *life cycle* *reproduce* *offspring* *live young* *endangered* *extinct* **survival** *water, air, oxygen* *diet* *nutrition* *balanced diet* *carbohydrate, protein, diary, fats, sugars* *vitamins* *digestion* *hydrate/dehydrate.* *energy* *organ* *muscle* *pulse* *hygiene* *tooth decay* *disease* *germ*

Plants	*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.*	Explore natural materials, indoors and outside. Looks around with interest when in the garden or park, visually scanning the environment for novel, interesting objects and events	Can talk about some of the things they have observed such as plants and natural found objects. Plant seeds and care for growing plants. Begin to understand the need to respect and care for all living things Understand the key features of the life cycle of a plant. Use all their senses in hands on exploration of natural materials.	Explore the natural world around them, making observations and drawing pictures of plants Make observations of and plants and explains why some things occur, and talks about changes. Look closely at similarities, differences, patterns and change in nature. Know about similarities and differences in relation to living things	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.	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.
Plants vocabulary		*Tree* *Flower*	***Need of plants*** *Water* *Leaf* *Seed* *Grow* *Twig*	***Need of plants*** *Water* *Sun* *leaves* *trunk* *plant* *seed* ***Wild Flowering plants*** *Daisy* *Buttercup* ***Garden Plants*** *Bean plant* *Sunflower*	***Need of plants*** ***Trees*** *deciduous* *evergreen* ***Names of Trees*** Oak Conifer Rowan Yew Silver Birch Holly ***Wild Flowering plants*** *Buttercup*	***Need of plant*** *temperature* *germinate* *reproduce* *life cycle* *seed dispersal* *sprout* *shoot* *nutrition* ***Wild Flowering plants*** *Buttercup* *Daisy* *Poppy* *Daffodil* *Rose*

				Rose *Tulip* *Daffodil*	*Daisy* *Poppy* *Daffodil* *Rose* *Snowdrop* *Bluebell* ***Parts of a plant*** *root* *Fruits* *Stem* *petal* *bulb* ***Parts of a tree*** *branch* *crown*	*Snowdrop* *Primrose* *Bluebell* ***Garden Plants*** *Parts of a plant* *Seed* *Bulb* *Pip* *Stone* *Seed dispersal* ***Names of Trees*** *Trees growing in our school grounds*
Living Things and Their Habitats	*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*	Closely observes what animals, people do Is curious about people and shows interest in stories about people and animals that they are familiar with or which fascinate them	Talk about some of the things they have observed such as animals. Begin to understand the need to respect and care for all living things.	Make observations of animals and explains why some things occur and talks about changes. Explore the natural world around them, making observations and drawing pictures of animals. Look closely at similarities, differences, patterns and change in nature. Know about similarities and differences in relation to places.	Explore mini-beasts living in our school grounds - micro habitats. (non-statutory).	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 microhabitats. 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.

	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					
Living Things and Their Habitats vocabulary		*Spider* *Bee* *Worm*	*Caterpillar* *Butterfly* *Ladybird* *beetle*	*Minibeast* *Woodlouse* *wasp* *Ant* *Snail* *Slug* *egg* *wings* *legs*	*insect* *habitat* *woodland* *antennae*	*dead* *microhabitat* *environment* *Habitat* *desert* *coast* *rainforest* *ocean* *polar* *urban*
Seasonal Changes	*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*	Explore and respond to different natural phenomena. Explore natural materials, indoors and outside.	Talk about what they see, using a wide vocabulary. Talk about the differences between materials and changes they notice. Use all their senses in hands on exploration of natural materials.	Understand the effect of changing seasons on the natural world around them. Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	Observe changes across the 4 seasons. Observe and describe weather associated with the seasons and how day length varies.	Measure and record the temperature daily (non -statutory) Compare the weather each week. (non – statutory). Identify seasonal and daily weather patterns in the United Kingdom and the location of hot and cold areas of the world in relation to the Equator and the North and South Poles (Geography National Curriculum).

	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.			Describe what they see, hear, and feel whilst outside Look closely at similarities, differences, patterns and change in nature.		
Seasonal changes vocabulary		*Sun* *Moon*	*Hot* *Cold* *Light* *Dark* *Day* *Night*	*change* *rain* *wind* *sunshine* *fog* *snow* *autumn* *winter* *spring* *summer* *warm* *wet*	*forecast* *temperature* *rainfall* *daylight* *season* *January, February, March, April, May, June, July, August, September, October, November, December*	*hibernate* *climate* *flood* *drought* *equator* *day length*
Materials	*All objects are made of one or more materials. Some objects can be made from different materials e.g. plastic,*	Use senses to explore and play with man-made and natural objects in the indoor	Explore collections of man-made and natural materials and use simple vocabulary to describe them.	Can use simple vocabulary to talk about similarities and differences in relation to man-made and natural materials.	Identify and name a variety of man-made and natural materials, including wood, plastic, glass, metal, water, and rock.	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper, and cardboard for uses.

	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.*	and outdoor environment.		Observe changes in materials.	Describe and group a variety of everyday materials based on their physical properties.	Explain how the physical property of each material relates to its use. Find out how the shapes of solid objects made from some materials can be changed by squashing bending, twisting, and stretching.
Materials vocabulary		*Hard* *Soft*	*Wood* *paper* *water* *Shiny* *smooth* *rough*	*glass* *metal* *plastic* *brick* *stone* *Recycle*	*object* *material* *shiny/dull* *bendy/not bendy* *waterproof/not waterproof.* *absorbent/not absorbent* *flexible/stiff* *opaque/transparent* *Reuse*	*Lycra* *Stretchy/not stretchy* *suitability* *properties* *purpose* *natural* *manmade* *repurpose*