Westgate Primary School

Science

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Intent

At Westgate we aim to inspire pupils by providing pupils with opportunities to develop their natural curiosity in our Science lessons. Through the design of the curriculum, we aim to increase pupils' knowledge and understanding of the world around them and ensure that pupils' **scientific knowledge** alongside their **working scientifically skills** are built upon progressively, year by year, during their time at primary school.

We encourage pupils to answer questions using a range of scientific equipment, independently plan for and carry out enquiry, generate predictions and accurately articulate and explain concepts through the acquisition and use of scientific vocabulary. We ensure the pupils develop their Working Scientifically skills by testing, analysing and evaluating information, generalising and proving the wider implications of their evaluations, as well as gaining a deeper understanding of scientific laws.

Teachers create a positive attitude towards Science within their classrooms by having high expectations on what individual pupils can achieve and they provide the pupils with opportunities to connect their learning within and across subjects.

Implementation

Our Science curriculum is taught through an enquiry, skills and knowledge based approach, following The Early Years Framework and the White Rose Science Schemes of Work which enable pupils to achieve the end points of the National Curriculum. Our curriculum is broken into small steps and is built upon progressively to ensure pupils' learning is secure and embedded in their long term memory. In each unit, the overall learning challenges ensure that the pupils are exposed to both substantial and disciplinary knowledge, allowing them to embed their scientific knowledge alongside scientific enquiry. Within this, the pupils are also provided with opportunities to improve their communication and language skills by collaborating on investigations with their peers. Both our long and medium term plans set out the sequence of learning, explicitly stating what the pupils must know and when.

Scientific Enquiry

We create opportunities for pupils to explore their understanding of each topic, through the development of their Working Scientifically Enquiry Skills. These are the skills that scientists need to carry out research and are sometimes referred to as a cycle of *plan, do, review*.

Enquiry Skills						
Asking questions	**Making predictions**	**Setting up tests**	**Observing and measuring**	**Recording data**	**Interpreting and communicating results**	**Evaluating**
Asking questions that can be answered using scientific enquiry.	Using prior knowledge to suggest what will happen in an enquiry.	Deciding on the method and equipment to use to carry out an enquiry.	Using senses and measuring equipment to make observations about the enquiry.	Using tables, drawings and other means to note observations and measurements.	Using information from the data to say what was found out.	Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

Scientific Concepts

We have identified five key concepts that are covered within scientific enquiry. The following scientific concepts focus on developing the enquiry types necessary for pupils to be able to apply their knowledge and working scientifically skills. Across key stages, pupils revisit the key concepts ensuring that prior learning is revisited repeatedly with increasing complexity.

Scientific Concepts				
Comparative and Fair Testing	**Identifying and Classifying**	**Observation over time**	**Pattern Seeking**	**Research**

Science Long Term Overview:

We teach Science across the year in a series of blocks, enabling the pupils to be immersed in their learning and deepen their understanding of a scientific topic.

	Autumn	Spring	Summer
Year 1	Topic 1*: Seasonal Changes (autumn)	Topic 3**: Planting A (winter)	Topic 3**: Planting B (spring)
	Topic 2: The Human Body	Topic 4: Materials	Topic 6: Plants
	Topic 1*: Seasonal Changes (winter)	Topic 1*: Seasonal Changes (spring)	Topic 3**: Planting C (summer)
		Topic 5: Animals	Topic 1*: Seasonal Changes (summer)
Year 2	Topic 1: Animal needs for survival	Topic 3: Materials	Topic 5: Plants (light and dark) *and* Plants (bulbs and seeds)
	Topic 2: Humans	Topic 4: Living things and their habitats	Topic 6: Growing up
Year 3	Topic 1: Skeletons and Movement	Topic 3: Rocks	Topic 7: Plants
		Topic 4: Fossils	
	Topic 2: Nutrition and diet	Topic 5: Soils	Topic 8: Forces and Magnets
		Topic 6: Light	
Year 4	Topic 1: States of Matter	Topic 3: Group and classify living things	Topic 2*: Data Collection C
		Topic 3: Sound	Topic 5: Habitats

	Topic 2: Data Collection A	Topic 2*: Data Collection B	Topic 6: The Digestive System
		Topic 4: Electricity	Topic 7: Food Chains
Year 5	Topic 1: Forces	Topic 2*: Space	Topic 5: Life Cycles
	Topic 2*: Space	Topic 3: Properties of Materials	Topic 6: Reproduction
		Topic 4: Animals including Humans	Topic 7: Reversible and Irreversible Changes
Year 6	Topic 1: Living Things and their Habitats	Topic 3: Light	Topic 5: Diet, Drugs and Lifestyle
	Topic 2: Electricity	Topic 4: The Circulatory System	Topic 6: Variation and Adaptations
			Topic 7: Fossils

Science in EYFS

The Science Curriculum delivered across KS1 and KS2 builds upon the following areas of the Early Years framework: communication and language, personal, social and emotional development and understanding of the world. In the EYFS, the pupils make sense of the natural world and their community by exploring and observing the people, places, technology and environment around them. All practitioners working within EYFS encourage pupils to ask questions and expose pupils to scientific vocabulary across both child-led and adult-led activities.

Early Learning Goals from EYFS Framework	**Working Scientifically** **ELG: Speaking and listening** - Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary. **ELG: Listening, Attention and Understanding** - Make comments about what they have heard and ask questions to clarify their understanding. **ELG: Fine motor skills** - Use a range of small tools, including scissors, paint brushes and cutlery. **ELG: Building Relationships** - Work and play cooperatively	**ELG: Managing Self** • Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.	**ELG: The Natural World** • Explore the natural world around them, making observations and drawing pictures of animals and plants. • Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.
Knowledge and Skills		I can get myself dressed. I can go to the toilet by myself. I know why I need to wash my hands after using the toilet. I can name some healthy foods. I can name some unhealthy foods.	I can describe what I can see, hear and feel whilst outside. I can describe the weather and how it makes me feel. I know the seasons change the world around me. I know in Autumn the leaves change colour and fall from the trees. I know in Winter there are no leaves on the trees and it is cold. I know in Spring there is new life and flowers will grow. I know in the Summer there is colour all around and it is hot.

Key Scientific Areas

Each of the key areas taught across KS1 and KS2 link to the programme of study in the National Curriculum and reinforce principles learnt through exploring various methods and techniques.

The key areas are:

- Animals including humans
- Materials
- Living things and their habitats
- Plants
- Electricity
- Light
- Forces (and magnets)
- Sound
- Variation and Adaptations (Evolution)
- Seasonal changes
- Earth and Space

Our Content Organiser (see separate document) shows the knowledge and skills that are taught within each year group and how these skills develop to ensure that attainment targets are securely met by the end of each key stage. The learning journey within each key area is organised to ensure cognitive load is reduced and pupils are able to build upon their scientific knowledge and skills, embedding this in their long term memory. Our rationale for each of the scientific areas is outlined below:

The Learning Journey: Animals including Humans				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 1	Identify and name a variety of common animals: birds, fish, amphibians, reptiles and mammals. Identify and name a variety of common animals: carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles and mammals, and including pets). Identify, name draw and label the basic parts of the human body and say which parts of the body is associated with each sense.	Identifying animals and humans, body parts and the senses.	 Research Identify and Classifying	Building on from EYFS where pupils have explored animals in the natural world around them, in Year 1 pupils will begin to develop a knowledge of common animals by **researching** different animals and will identify which group an animal belongs to. They will classify animals accordingly by answering the question 'Can you group animals in more than one way?' through the concept of **identifying and classifying**. This prepares pupils for Year 2, where they will apply knowledge taught to different animal life cycles. Pupils will also develop a knowledge of basic human body parts and the associated senses. Pupils will deepen their knowledge of the human body when they learn about the human skeleton and muscles in Year 3.
Year 2	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.	Human Life Cycle and Being Healthy	 Observation Over Time	From EYFS pupils will already have a basic understanding that both humans and animals produce offspring through listening to and retelling 'The Very Hungry Caterpillar' and learning about the life cycle of a butterfly, as well as discussing how they - as humans - have changed since being a baby. This knowledge is built upon in Year 2, where pupils explore and **observe** the stages of growth within humans. The pupils also build upon their knowledge of animal life cycles in the Summer Term after reading 'Tadpole's Promise' in English, **researching** and writing their own explanation text about the frog's life cycle. In Year 1, pupils learn about where fruits and vegetables come from and which part of the plant is eaten. They also learn how to keep healthy through eating within their Spring PSHCE Health and Wellbeing topic.

			Pattern Seeking	Pupils are able to build on this knowledge in Year 2 by identifying foods as healthy or unhealthy and classifying food within the correct food group. They answer the question 'Which activity will make my heart rate faster?' **observing** what happens to their body after they exercise. The pupils will also take part in a **pattern seeking** investigation, answering the question 'Do older pupils/people have bigger feet?' Pupils will go on to deepen their knowledge of the different food groups when they learn about the nutrients food provides in Year 3. Additionally, pupils will apply their knowledge of food groups within the Year 3 DT topic in which they learn about seasonal foods and prepare and cook a seasonal tart.
Year 3	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 animals have skeletons and muscles for support, protection and movement.	Functions of the skeleton and muscles Nutrition	Pattern Seeking	Prior to this topic pupils will have an understanding of what different animals eat using the vocabulary carnivore, herbivore and omnivore in Year 1. This knowledge is built upon in Year 2 when pupils learn about food chains, acquiring the knowledge that animals and humans are unable to make their own food. In addition to this, the pupils will be able to consider what they learnt about being healthy in PSHCE in Year 1 and in Science in Year 2. In Science in Year 3, this is built upon by introducing the knowledge of nutrition so the pupils can develop an understanding of the importance of eating a balanced diet. The acquisition of knowledge learnt here in Year 3, will equip pupils for learning about digestion in Year 4 when they learn how nutrients are absorbed in the digestive system. Pupils will answer the question: 'Can people with longer legs jump further?' through the concept of **pattern seeking**. This question has been chosen to encompass all of the knowledge learnt about humans and their structure. Pupils here will be able to refer to prior learning from their Year 1 Science lessons where pupils identify basic body parts, as well as further refining their understanding of the human body and how it functions in their Year 3 Athletics lessons, where all pupils are challenged to jump as far as possible.
Year 4	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.	Digestive System and Teeth	Research Observation Over Time	Prior to Year 4, in the EYFS and Year 2, oral hygiene is explored and discussed creating a basic level of knowledge and understanding. Between these years, pupils in Year 1 explore the basic body parts, where teeth are explored and recognised as a part of the human body. This knowledge is built on in Year 4, where pupils **research** the functions of different teeth and name them, thinking about how and why we protect our teeth. Pupils will **observe** the effect of different drinks on teeth over a period of time using eggs. Furthering their knowledge of nutrition in Year 3, pupils in Year 4 explore how the digestive system works, the parts of it and how these nutrients would be absorbed into the body. Pupils are given the opportunity to **observe** what happens to food at the various stages of the digestive system by recreating the process using food, drinks and a pair of tights. The food chain element of this topic is a direct link to prior learning from Year 2 where they look at basic food chains. In Year 4, pupils are expected to know the breakdown of a food chain and what each part of it represents e.g. understanding the terms prey, predator, producer and consumer . This knowledge of the human body is reinforced and revisited in Year 6, where pupils will extend their understanding by looking at the human circulatory system in more detail.
Year 5	Describe the changes as humans develop from birth to old age.	Animal Life Cycles	Research	Prior to Year 5, pupils will have built up a deep understanding of changes to the human body over time including having an understanding of the human life cycle from EYFS and Year 2. In the Autumn Term of Year 5, pupils study and compare different animal life cycles in detail within the 'Living Things and their Habitats' Science topic. Using this prior knowledge of mammals, pupils will conduct **research** to answer the question 'What happens to adults as they become older?' applying their knowledge of changes to humans as they develop into a mature stage of life.

				In preparation for Relationships and Sex Education in the Summer Term, they will also look at changes which happen during puberty. Pupils will **research** the gestational periods of other animals and compare these to humans. Teaching the RSE topic alongside the Science, reduces the pupil's cognitive overload and allows them to deepen their understanding, making links between the subject areas.
Year 6	Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood. Describe the ways in which nutrients and water are transported within animals, including humans.	Human Circulatory System	 Comparative Testing Research	Prior learning in previous year groups has meant by the time pupils reach Year 6, they will have a deepened understanding of the human body parts studied in Year 1; the muscle and skeletal makeup of the body in Year 3 and have already explored internal systems within the body such as the digestive system in Year 4. Pupils then have the established vocabulary and layered knowledge to build upon this by naming and describing the functions of the circulatory system. Using this knowledge, pupils apply what they already know and learn about the circulatory system to answer the question 'What happens to the rate at which our hearts beat when we perform different exercises?' through the concept of **comparative and fair testing**. Following this, pupils can research 'What else can cause our heart rate to speed up or slow down? Here pupils are able to **research** and find out the effects of diet, exercise, drugs and lifestyle on the way their bodies function.

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The Learning Journey: Materials				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 1	Distinguish between an object and the material from which it is made. Compare and group together a variety of everyday materials on the basis of their physical properties. Identify and name a variety of everyday materials, including wood, plastic, glass, 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 physical properties.	Identifying everyday materials	 Identify and Classifying Comparative Tests	In EYFS, the pupils are exposed to a variety of natural materials within their indoor and outdoor classroom areas and the construction area of play which allows them to be exposed to key vocabulary linked to those materials. In the Autumn Term of Year 1, pupils are again exposed to materials when designing and constructing a windmill in their DT topic, using paper and card to explore structures. Building upon this, pupils then learn about the names and properties of materials in Year 1 so they are able to **identify and classify** materials. Sharing the traditional tale of The Three Little Pigs in English, also exposes the pupils to a range of materials used to build the pig's houses and encourages discussion around which material is the most suitable. Pupils will investigate materials answering questions such as, 'Which material will absorb the most water?' and 'Which materials will float and which will sink?' through the concept of **comparative testing** using the knowledge they have gained about materials and their properties. Materials are then revisited in Year 2 and knowledge is built upon enabling pupils to deepen their understanding and therefore investigate and test how the shape of materials can be changed.
Year 2	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.	Materials: Uses and Properties	 Comparative Tests	In Year 2, pupils will already have a good foundation of knowledge about materials and their properties from the Year 1 topic in the Spring Term. Within the Year 2 topic, pupils will apply previous learning to the concept of **comparative testing** by answering the questions: 'Can solid materials change shape?' and 'Which material is the best for an umbrella?' During this time, pupils will be exposed to further technical vocabulary such as waterproof, lightweight, flexible, rigid, opaque and transparent, using this to identify the properties of a range of materials. Their knowledge of material properties and their uses is further embedded in the Spring Term of Year 2 within their DT lessons when constructing a fairground wheel. This topic prepares pupils for Year 4 where pupils will study States of Matter.

Year 3	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.	Rocks and Soils	 Identify and Classifying Comparative Tests Research	In Year 1, pupils are expected to identify and name a variety of materials including rocks. Pupils learn that rock is a natural material in Year 2 but in Year 3 the knowledge is deepened to **identify** the suitability of different types of rock. Pupils will consolidate and apply this knowledge to find out the process of how fossils and soils are formed from rocks. Pupils will use the concept of **comparative and fair testing** to answer questions, such as: 'Which rock is the hardest?' and 'How do rocks react to acid?' Pupils would already have experience of testing the properties of materials in their Year 2 investigation of suitability, therefore building upon these skills. The pupils will conduct **research** to find out about Mary Anning, a significant individual, who discovered fossils along the coast of the United Kingdom. This unit aids the transition into Year 4 where the pupils begin their Geography topic focusing on coasts. Fossils are then revisited again in Year 6 within their topic of evolution, where the pupils find out that fossils provide information about living things that inhabited the Earth millions of years ago allowing pupils to revisit their prior knowledge and how fossils are formed.
Year 4	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.	States of Matter	 Comparative Tests	As part of the EYFS curriculum, pupils will explore states of matter in the natural world, e.g. water turning to ice when it is cold, ice melting in the sun, as well as exploring various solids and liquids within their exploratory play. Prior to Year 4, pupils will have looked at materials in Year 2 where they would have looked at the question 'Can solid materials change shape?' which allows pupils in Year 4 to consider the properties of solid materials before looking at the state of them. This transfers into the National Curriculum aim to **observe** that some materials change state when heated or cooled. The pupils will explore ice further, planning and conducting a **fair comparative test**, using thermometers and measuring water temperatures. This unit also builds upon pupils prior learning of the water cycle in their Year 3 Geography 'Rivers' topic which they study in more detail. Through the concept of **comparative and fair testing** the pupils will investigate how water evaporates in different locations.
Year 5	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. Understand 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.	Properties and Changes of Materials	 Identify and Classifying Comparative Tests	In this unit, pupils will recall their prior learning of materials from both Year 2 and Year 4 to gain a deeper understanding of material properties in Year 5. They will **identify and classify** materials considering their hardness, solubility, transparency, conductivity and response to magnets. Basic descriptions of material properties from Year 2 will be reapplied here in Year 5, descriptions of hardness from looking at Rocks in Year 3 will be transferred, and scientific language related to States of Matter in Year 4 will also be explored. This continual spaced recall will embed scientific vocabulary and understanding. Key vocabulary from Year 2, 3 and 4 will be reshared and discussed, further embedding this language into the long term memory. Using the knowledge gained in Year 4, pupils will layer their learning of states of matter by learning that dissolving, mixing and changes in state are all reversible changes. Pupils will test materials in different ways, exploring conductors and insulators and reversible and irreversible changes, through the concept of **comparative and fair testing**. This also allows them to apply their understanding of additional enquiry concepts when they **classify** solids after **observing** what happens to them once they have been added to a liquid answering the question, 'Do all materials dissolve in the same way?'

The Learning Journey: Living Things and their Habitats				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 2	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.	Living Things and their Habitats	 Research Pattern Seeking	In EYFS, the pupils listen to a variety of stories that expose them to animals living in different habitats, e.g. The Rainbow Fish, Owl Babies, Monkey Puzzle and That Pesky Rat. This is explored further within Year 1 when pupils find out about the climate in the Kalahari Desert when reading 'Meerkat Mail' and the climate in Antarctica within their key text 'Lost and Found. In Year 2, this knowledge is built upon through learning about the suitability of habitats for different animals. This topic is specifically taught at the end of Year 2 consecutively with the Plants science topic, to equip pupils with understanding of the animals and plants that live in their local environment and how animals rely on plants for survival. Pupils will answer the question: 'What animals and plants can be found in our local area?' through the concepts of **research** and **pattern seeking**. Prior to this, in the Autumn Term of Year 2, the pupils explore the local area within their Geography topic therefore equipping the pupils with an understanding of the local area and habitats that may be found. This also links to their learning of what animals and humans need to survive when learning about 'Animals including humans' at the beginning of the year. In Year 4, pupils will go on to look at environmental changes and the impact on animal habitats.
Year 4	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.	Classifying Living Things	 Identifying and Classifying	Pupils will already have a good understanding of this topic as in Year 2 'Living Things and Their Habitats' pupils are expected to understand and distinguish the difference between the living and dead, describe habitats and look at basic food chains. This topic is not taught in Year 3, allowing pupils to have the opportunity for spaced retrieval to strengthen their neurological pathways. When it is layered in Year 4, pupils will then be **identifying, classifying and grouping** living things in a variety of ways, applying this knowledge by creating classification keys. During their Immersive Reading sessions, pupils in Year 4 will read The Jungle Book, which demonstrates the impact of environmental changes to animal habitats. This knowledge and understanding will be reinforced further in Year 6, where pupils will be classifying microorganisms, plants and animals in greater depth.
Year 5	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.	Living Things and their Life Processes	 Research	Prior learning recall, develops pupils understanding of sequencing, starting in EYFS where pupils look at the lifecycle of a butterfly and then again in Year 2 where pupils look at the life cycle of a human. Within Year 5, pupils are able to use this prior learning of a human life cycle to then **research** and further understand life cycles of mammals, as well as strengthen their understanding of amphibians, insects and birds by studying the life cycle of each. Here they will **compare** the life cycles of each and explore the question 'How is each life cycle similar and different?' Looking ahead to Year 6, this knowledge and understanding of different life cycles and reproduction will support the pupils' learning and understanding of Evolution as they will undertake this topic with a wealth of knowledge about the different animals. Some aspects of the life cycle of a plant are previously learnt in Year 3 where pupils look at the role flowers play within the lifecycle of a flowering plant, pollen and seed dispersal. This prior knowledge will support the pupils when describing reproduction in plants.
Year 6	Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and	Classification of Living Things		Learning about life cycles in both EYFS and Year 2, gives the pupils a basic understanding of the characteristics of specific organisms. This understanding is reinforced in Year 4 where classification keys are used to identify a small range of microorganisms.

	differences, including micro-organisms, plants and animals. Give reasons for classifying plants and animals based on specific characteristics.		Identify and Classifying	This prior knowledge is directly transferred into Year 6 where pupils will classify in the same way but on a larger scale by introducing microorganisms, plants and animals. Therefore, prior knowledge of plants in Year 3 and of their Autumn Term Geography topic focusing on Biomes will also need to be applied. Pupils have therefore had the opportunity for spaced retrieval to strengthen neurological pathways and embed their learning in their long term memory. The prior learning undertaken will allow the pupils to **identify and classify** organisms following the question 'How can we distinguish organisms based on their characteristics?'

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The Learning Journey: Plants				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 1	Identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen. Identify and describe the basic structure of a variety of common plants including roots, stem/trunk, leaves and flowers.	Identifying Plants Parts of a Plant	 Observation Over Time Pattern Seeking	In EYFS, pupils explore plants in the natural world around them through mark making and drawing and they also read the traditional tale 'The Enormous Turnip' giving them a basic understanding of plants we can grow. Building on this, pupils in Year 1 will acquire the knowledge of the parts of plants and trees. In Year 1, the Plants topic is taught after the Animals including Humans topic so pupils are able to consolidate their knowledge of herbivores by learning about parts of the plant that are eaten. The pupils will also be able to recall prior learning from their autumn DT unit, where the pupils find out how and where fruit and vegetables are grown before making smoothies. These units give pupils a starting point before they begin to deepen their understanding of plants. Pupils will answer a range of questions, such as, 'Which plants are in our local environment?' and 'How are plants similar and different from each other?' by making **observations**. They will also **observe** how plants grow over time and explore the concept of **pattern seeking** by measuring how tall a plant grows. The parts of the plant and what plants need to grow is revisited in more depth in Year 2.
Year 2	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.	Growing Plants	 Comparative Tests Observation Over Time	In Year 1, pupils would have already learnt about the basic structure of a plant and observed plant growth through planting of sunflower seeds. In Year 2, pupils apply their previous knowledge of plants and use their senses to sort and compare seeds. In addition to this, the pupils find out what a plant needs to grow through the concepts of **comparative testing** and **observation over time.** They plant both seeds and beans to **compare** how they grow and answer the question: 'What do seeds need so they can grow healthily?' The pupils' observations of different plants growing will give them a simple understanding of the plant life cycle, which will be further developed in Year 3 when the pupils learn about pollination, seed formation and dispersal.
Year 3	Identify and describe the functions of different parts of plants; roots, stem, 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 ways in which water is transported within plants. Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	Functions of Plant Parts	 Observation Over Time	In this unit, pupils will be able to recall their knowledge of plant parts learnt in Year 1 and 2 and will be able to refer this to carry out scientific enquiries to explore the functions of different parts of the plant. This allows for a deepening of knowledge of plant parts and growth in Year 3 where questions such as 'What happens to plants that have no light?' and 'How can we prove that plants stems transport water?' will be answered through the concept of **observation over time**. Prior knowledge, equipped with new learning in Year 3, will enable the pupils to make predictions based on scientific knowledge using known scientific vocabulary. Where life cycles of a plant are learnt here in Year 3, comparisons can be made to prior learning on life cycles and of animals in both EYFS in Year 2, further embedding this knowledge into the long-term memory. Pupils are also able to apply the knowledge gained across Year 1, 2 and 3 to the geographical context of plants when they learn about Biomes in Year 6.

The Learning Journey: Electricity				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 4	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.	Electricity (simple circuits)	 Pattern Seeking	In Year 3, the pupils read 'Until I Met Dudley' in English which addresses the misconceptions a child has about how basic household appliances work. The main character Dudley then corrects and explains how appliances work in full scientific depth. Using this text in Year 3, provides the pupils with an understanding of common appliances that run on electricity before they begin Science in Year 4. In this unit, after learning about the components of an electrical circuit and how a circuit works, pupils will explore the concept of **pattern seeking** to identify what is wrong within an electrical circuit. Pupils will use their understanding of materials and their properties, studied in Year 1 and 2, when considering whether a material will be a conductor or insulator of electricity in Year 4. In order to strengthen the neurological pathways created within this topic, the pupils' design and technology project is to create a functioning torch which includes a simple circuit. Both the Electricity Science unit and the DT unit are taught consecutively across Summer Term so the pupils' cognitive load is reduced. This is again reinforced in Year 5, where the pupils will use the knowledge and skills learnt previously and apply them within a new context by making an electronic greeting card. Additionally, In Year 4, the pupils also write explanation texts for 'How electricity works' in English; this allows pupils to layer their understanding of electricity, appliances and how they would work on a deeper level.
Year 6	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.	Electricity	 Comparative Tests	In Year 6, pupils would have explored electricity in depth in Year 4 where they would have observed and created simple circuits, discussed what happens if a circuit is not complete and drawn a variety of simple circuits with different components connected. Here this learning will be reinforced by introducing the scientific symbols for each component already used and discussed. Pupils will also use their knowledge of simple circuits to compare and explain variations in how components function. The knowledge that pupils obtained in Year 4 is later applied in DT when they create torches using a simple circuit the following term and again in Year 5 when they create electronic greeting cards. Pupils have again had the opportunity for spaced retrieval to strengthen the neurological pathways. The knowledge learnt will then be applied to the concept of **comparative and fair testing**, where pupils will investigate voltage, e.g. 'What affects the brightness of a bulb or loudness of a buzzer in a circuit?'

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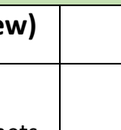
The Learning Journey: Light				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 3	Recognise that they need light in order to see things and that dark is the absence of light. Notice that light is reflected from surfaces. Recognise that light from the sun can 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 a solid object.	Light and Shadow	 Comparative Tests	Prior to Year 3, pupils will have already learnt about sun safety both within EYFS and Year 1 through observations made about the season of Summer. This will equip them with the vocabulary needed when they learn about the danger of direct sunlight in Year 3. The pupils will explore how shadows are made and then move on to answer the question 'How does the distance between the puppet and the light source affect the size of the shadow created?' through the concept of **comparative and fair testing.** To develop an understanding of how shadows are formed, the pupils will also investigate 'How does the length and place of a shadow change?'

	Find patterns in the way that the sizes of shadows change.			Pupils will then go on to explore light further in Year 6 where they will build upon this knowledge and learn about how light travels.
Year 6	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.	How Light Travels	 Comparative Tests	Within Year 3, pupils will have learnt what a light source is and how shadows are created when a solid object blocks a light source. In Year 6, pupils will need to apply the knowledge they have previously learnt to expand their understanding of light, using the knowledge that light travels in straight lines to carry out a range of investigations. Through this, pupils will use the concept of **comparative and fair testing** to explore the questions 'Which material is the best at reflecting light?' and 'Which window lets in the most amount of light?' The pupils will also explore how light travels by making their own periscope as part of a home learning project.

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The Learning Journey: Seasonal Changes				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 1	Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies.	Seasonal Changes	 Observation Over Time	In EYFS, pupils **observe** and describe the changes that happen throughout each season throughout the year. This is then built upon in Year 1 where the pupils **observe** seasonal changes throughout the whole school year in the local area. The topic Seasonal Changes is introduced in the Autumn Term and is then revisited within the Spring and Summer Terms to specifically allow for this whilst also being taught alongside weather patterns in Geography to allow a transfer of vocabulary. Pupils will use the concept of **observing over time** to answer the question 'How does our local area change throughout the seasons?' The Geography topic, taught in the Autumn term, will have allowed for observations to be made in Autumn and the Winter seasons during field trips. This can be used to collate photographic evidence by the pupils to look back at and refer to, comparing the changes through the seasons.

The Learning Journey: Forces (and magnets)				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 3	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.	Forces and Magnets	 Pattern Seeking Comparative Tests	Prior to this topic, in Year 1 and Year 2, pupils would have explored metal as a material but will now deepen their knowledge of metals by exploring in Year 3 which metals are magnetic and the function and structure of magnets. Their knowledge of metals is further explored in their Immersive Reading sessions when reading the core text 'The Iron Man'. Pupils will **identify and classify** materials according to whether they are magnetic or not. Pupils will answer the question: 'Do bigger magnets have more strength?' through the concept of **pattern seeking.** Here pupils will be able to apply knowledge acquired through Science topics of materials and the newly learnt topic of magnets and forces. Pupils will consolidate and build upon their prior knowledge of materials within Year 1 and 2 by exploring friction answering the question: 'Does surface affect how far a toy car can travel?' using the concept of **comparative and fair testing**.

	Predict whether two magnets will attract or repel each other, depending on which poles are facing.			Forces and magnets is taught in Year 3 to allow for the application of newly learnt knowledge of forces when constructing a slingshot car later in Year 4.
Year 5	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.	Forces	 Comparative Tests	Building on from Forces and Magnets in Year 3, pupils will further develop their understanding of gravity, air resistance, water resistance and friction. Pupils will already know what friction is and how we experience it. This knowledge will be transferred and applied to help them understand different forms of resistance. Pupils will apply this knowledge through the concept of **comparative and fair testing** by exploring the question 'Which material will make the best insulator and why?'. The Year 5 Design and Technology project Mechanical Systems is taught before this unit of science work. The pupils will apply their knowledge of forces using mechanisms, including levers and sliders, allowing a smaller force to have a greater effect when designing and making a pop-up book. This gives the pupils the opportunity to layer their learning and strengthen their neurological pathways.

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he Learning Journey: Sound				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 4	Identify how sounds are made, associating some of them with something vibrating. Recognise that vibrations from a sound 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.	Sound	 Comparative Tests Pattern Seeking	Before undertaking this topic in Year 4, pupils would have a basic understanding of sound due to learning about the senses and body parts (including ears) in Year 1. This would have been further reinforced within their Music lessons from Year 1 all the way through to Year 4 where volume and pitch have been defined, discussed and tested within these weekly sessions. In this unit, prior knowledge is reinforced when pupils are asked to carry out a **comparative fair test,** answering the question 'What happens to the sound of the drum when we get further away from it?' They will need to apply the knowledge covered at the start of the block in order to explain that it is due to the strength of vibrations. They will also answer the question: 'How can we alter the loudness of a sound?' Additionally, the pupils will explore the concept **of pattern seeking** investigating how the pitch of a sound can be changed.

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The Learning Journey: Earth and Space				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 5	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.	Earth and Space	 Research	To immerse the pupils into this Science topic, the pupils read 'Hidden Figures' in English, which explains the pivotal role that Katherine Johnson, Dorothy Vaughn and Mary Jackson played within the space race in the 1960s during a time of segregation based on gender. The pupils use this book as a stimulus to **research** these significant individuals and then use their knowledge of Earth and Space and scientific vocabulary to write in role. This is the first time that pupils would have looked at Earth and Space as a topic within Science during their time at school, however they would need to recall prior learning of Forces in the term before to apply and further their understanding of gravity. Within this topic of learning, pupils will be taught about gravitational pull upon the planets within our solar system which requires them to have an understanding of what gravity is and how it works. Building upon the pupils' knowledge of forces provides an opportunity for spaced retrieval which strengthens neurological pathways.

	Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.			The pupils will develop their knowledge of space through **research** finding out about The Solar System, the planets, Planet Earth, night and day and the phases of the Moon. This unit also allows the pupils to make links to what they learnt during their Art topic, 'I need Space', which is taught in Autumn Term. The pupils will have already been exposed to a range of images that focus on Space and they consider the purpose of drawings as they investigate how imagery was used to promote the 'Space Race' that began in the 1950s.

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The Learning Journey: Evolution and Inheritance				
Year Group	**National Curriculum**	**Unit (Overview)**	**Concept**	**Rationale (Why?)**
Year 6	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.	Variation and Adaptations (Evolution)	 Research Pattern Seeking	Prior to Year 6, the pupils will have developed a secure knowledge of animals, studying Animals including Humans each year from Year 1 to Year 6, as well as learning about fossils in Year 3. They will have also been introduced to the scientists Carl Linnaeus and Charles Darwin in their Drawing topic during their Art lessons in Year 3; the pupils will be able to draw upon their prior knowledge of the different parts of the plant that they developed when exploring botanical drawings and scientific plant studies from these scientists. In this unit, the pupils will learn about Charles Darwin's fundamental theory of natural selection. Pupils will explore his struggles of making his theory believed due to the lack of evidence readily available to him at the time. One of the challenges Darwin faced was the lack of fossils found during his time, linking back to the importance of fossil discoveries by Mary Anning in Year 3 topic of Rocks and Soils. Pupils will answer the question 'How did Charles Darwin change the way we look at living things?' through the concepts of **research** and **pattern seeking** and will use this knowledge to explain how animals have adapted to suit their environment, beginning to understand the theory of evolution.

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Unit Vocabulary and Transferable Vocabulary

Key vocabulary has been identified for each of the units and pupils are specifically taught and expected to use this throughout each unit and apply transferable vocabulary either within other Science units or across the curriculum.

Supporting the Least Able Pupils in Science

Our Science lessons are adapted to ensure they are inclusive of all pupils. Teachers adapt their lessons in the following ways:

- Practical lessons with the support of an adult where needed.
- Opportunities for talk partners and Kagan co-operative learning strategies.
- Reinforcement through sorting, matching or grouping.
- Visual prompts alongside key vocabulary.
- Mixed ability pairings and/or groupings.
- Word banks and sentence stems used to support the accurate sharing of ideas.
- Providing opportunities for investigations to be recorded in different ways, e.g. photographs, quotes, talking tins
- Making reference to the school's adaptive teaching overview to ensure a range of strategies are used to include and motivate all learners.

Our SENCO also supports teachers to adapt learning where necessary to ensure pupils have the same opportunity to contribute and participate in whole class Science sessions.

Supporting EAL pupils in Science

Science lessons are also adapted for EAL pupils if required to ensure EAL pupils make progress and demonstrate scientific understanding even if their English vocabulary is not yet secure. Pupils are supported by class teachers through:

- Modelling the concepts and skills to be used in the lesson.
- Using visual clues and pictures to help make the meaning clear.
- Modelling the use of scientific language in the context of the activities and repeating key points and vocabulary at different stages in the lesson.
- Pairing EAL pupils with a confident talk partner who can model and explain key vocabulary.
- Building opportunities for pupils to have oral language modelled and to rehearse what they will say before they are expected to respond to the whole class.
- Building in brief 'thinking time': allowing pupils learning EAL to reflect on the question before answering.

SMSC and Developing the Whole Child

Promoting British Values and pupils' Social, Moral, Spiritual and Cultural development, as well as adding to pupils' understanding of diversity is a key element of Science. For example, having assemblies which focus on famous scientists and how their developments shaped the world we live in teaches pupils to celebrate the achievements of others. When conducting scientific investigations, the pupils have to consider moral rules and values, to ensure investigations are carried out safely. We encourage the pupils to work collaboratively in Science lessons, and this, in return, enables them to become cooperative workers, considering others when working as part of a team.

CPD and Supporting Staff Expertise

As a school, we recognise that not every teacher is a specialist in Science. We want to ensure that our teachers are supported and have tools and resources to deliver a great curriculum. Teachers have access to a wide range of support material to develop their subject knowledge and skills, this includes a detailed scheme of work, knowledge organisers and a bank of additional resources, in order for them to develop and model the necessary scientific knowledge and working scientifically skills for the lessons. The Science Subject Lead will deliver CPD sessions if there is an identified area of need after conducting staff surveys, speaking with pupils and carrying out lesson observations.

Impact

Formative and summative assessment is used to constantly monitor the impact of the curriculum. Within lessons, teachers assess pupils against the learning objective. The pupils are encouraged to look back at their initial thoughts and questions at the start of a unit and compare them to what they know by the end of a unit. Additionally, each unit and individual lesson begins with a review of the pupils' prior learning and has an end of unit low stakes quiz to assess the knowledge and skills pupils have understood.
By the time pupils leave Westgate Primary School, they should be equipped to succeed in their secondary education and be innovative and resourceful members of society.

We expect that pupils will:

- 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.
- be equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.
- have an appreciation for key individuals, scientific inventions and scientific events from the past and present that impact our world.
- recognise where our decisions can impact the wider world in terms of community, social and environmental issues.
- self-evaluate and reflect on learning at different stages and identify areas to improve.
- meet the end of key stage expectations outlined in the National Curriculum for Science.