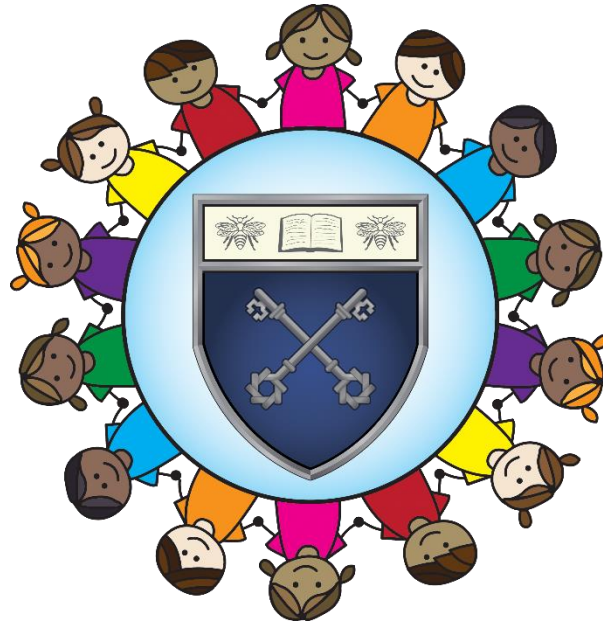


Science Curriculum



Substantive and Disciplinary
Knowledge

Our science curriculum provides pupils with an understanding of both substantive and disciplinary knowledge.

Substantive knowledge- is the subject knowledge and explicit vocabulary used to learn about the content

Disciplinary knowledge- this considers how scientific knowledge originates and is revised. It is through disciplinary knowledge that children gradually become more expert by thinking like a scientist.

Substantive Knowledge: Concepts, models, laws and theories

Biology

- Living things and their environment (Animals, humans, plants, habitats)
- Reproduction, inheritance and evolution (Evolution, inheritance, life processes, life cycles)

Chemistry

- States of matter (Solids, liquids, gases)
- Materials (properties and changes including reversible/irreversible changes,)

Physics

- Energy (Light, sound, electricity)
- Forces (Friction, air resistance, gravity, magnets)

Earth Science

- Earth and space (Seasons, day and night, solar system and beyond)
- Rocks and fossils

By the end of KS2, pupils have a deep understanding of a range of scientific ideas. Children are able to link scientific ideas to the world around them and, through research, understand how scientific ideas are developed over time. Children use secondary sources of information and practical enquiry to draw conclusions and find things out.



Substantive Knowledge Year 3 and 4

Concepts		Year 3	Year 4
Biology	Plants	- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers - Explore and describe 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	
	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	- 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
	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 and have an impact on living things
	Evolution and Inheritance		
Chemistry	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
Phyics	Light	- Recognise that we 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 eyes - Recognise that shadows are formed when the light from a light source is blocked by a solid object - Find patterns in the way that the size of shadows change	
	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
	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	
	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
Earth Science	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	



Substantive Knowledge Year 5 and 6

Concepts		Year 5	Year 6
Biology	Plants		
	Animals Including Humans	Describe the changes as humans develop to old age	- 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
	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	- 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
	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
Chemistry	States of Matter	- 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	
Phyics	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
	Sound		
	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 - 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	
	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
Earth Science	Rocks		
	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	
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Disciplinary knowledge: Working scientifically

Disciplinary knowledge is taught and embedded (through use of Plan, Do, Review) within the teaching of each unit of substantive knowledge.

- **Ask questions and plan enquiries**
- **Set up enquiries** (experimentation, fair testing)
- **Observe and measure** (accurate measurement using apparatus)
- **Record** (collecting and recording data, carrying out procedures safely and accurately)
- **Interpret and report** (processing and presenting data, exploring relationships, communicating results in tables / graphs, identifying correlations)
- **Evaluate** (using evidence / scientific knowledge to draw conclusions, explain laws, models, concepts and findings)

As part of working scientifically which is embedded throughout all units, pupils will also learn to use a variety of enquiry strategies to answer scientific questions. Different questions lead to different types of enquiry and are not limited to fair testing. By the end of primary school, children will be able to use these enquiry strategies confidently and know that different strategies may be needed at different times.

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying, classifying and groups:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups)
- **Pattern seeking:** (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- **Comparative and fair testing:** (observing or measuring the effect of changing one variable when controlling others)
- **Research using secondary sources:** (answering questions using data or information that they have not collected first hand)



Disciplinary Knowledge Year 3 and 4

		Year 3	Year 4
Plan	Ask questions and plan enquiry	Ask relevant scientific questions and suggest how to answer eg practical test vs secondary sources	- Generate and answer scientific questions using evidence - Select most appropriate type of scientific enquiry
	Set up enquiry	- Develop different types of scientific enquiry - Set up simple practical enquiries - Understand comparative and fair tests	- Suggest, set up and carry out simple practical enquires - Understand comparative and fair tests
Do	Observe and measure	- Develop skills of systematic observation - Use a range of equipment to measure accurately eg data-loggers, thermometers	- Make systematic observations - Confidently use a range of equipment to measure accurately eg data-loggers, thermometers
	Record	Gather, record and present data in variety of ways eg drawings, labelled diagrams, charts	Gather, record, classify and present data in a wide variety of ways eg drawings, labelled diagrams, charts
Review	Interpret and report	- Use results to draw simple conclusions and make predictions - Identify similarities, differences, changes related to scientific processes and ideas - Report on findings orally and in writing using scientific language	Report on findings orally and in writing using scientific language to answer questions
	Evaluate		- Use results to draw simple conclusions, make predictions, suggest improvements and raise further questions - Explain similarities, differences, changes related to scientific processes and ideas



Disciplinary Knowledge Year 5 and 6

		Year 5	Year 6
Plan	Ask questions and plan enquiry	Use science experiences to plan different types of enquiry	- Plan different types of scientific enquiry in order to answer questions - Use science experiences to explore ideas and raise different types of question
	Set up enquiry	Recognise and control variables where necessary	- Recognise and control variables where necessary - Explain which variables need to be controlled and why
Do	Observe and measure	Independently decide which observations to make	Take measurements using a range of scientific equipment with accuracy and precision, taking repeat readings where appropriate
	Record	- Record data/results of increasing complexity using diagrams, classification keys, tables, bar and line graphs - Take measurements using a range of scientific equipment with accuracy and precision	Decide how to record data/results of increasing complexity using diagrams, classification keys, tables, scatter graphs, bar and line graphs
Review	Interpret and report	Report and present findings from enquiries, examining causal relationships and reliability of results	- Report and present findings from enquiries, examining causal relationships and reliability of results - Independently decide which observations to make
	Evaluate	- Use test results to make predictions to set up further tests (comparative/fair) - Identify scientific evidence that has been used to support/refute arguments	- Use test results to make predictions to set up further tests (comparative/fair) and explain reasoning - Interpret scientific evidence that has been used to support/refute arguments