# Science Curriculum Overview

WORKING TOGETHER TO MAKE A POSITIVE DIFFERENCE FOR EVERY CHILD

# The Curriculum – our approach

## Introduction

Our curriculum raises the ambition of our pupils. It ensures that all pupils have the chance for success, regardless of their starting points. We strive to provide meaningful experiences, allowing children to appreciate the wider world and recognise the opportunities that exist outside of our community. We have a clear focus on progression by carefully sequencing knowledge, providing clarity about what 'getting better' at a subject means and making explicit connections and links between the different subjects and experiences. **Key concepts, knowledge and skills** have been identified and organised into subject specific progressive objectives. These are sequenced to ensure they build and develop as pupils' move through the school; ensuring learning becomes embedded. These progressive objectives are used to inform planning and sequences of lessons across all subjects. Clear end points are identified in all subjects and teaching and learning builds towards achieving these. The whole curriculum is underpinned by 5 Pastoral Drivers (see below). These drivers ensure we meet the holistic needs of our pupils and allow them to **REACH** their full potential.

**Subject Specific Sequencing:**

Each subject discipline has been planned to ensure that knowledge and skills are sequenced form Early Years to Year 6.

**Key Concepts:**

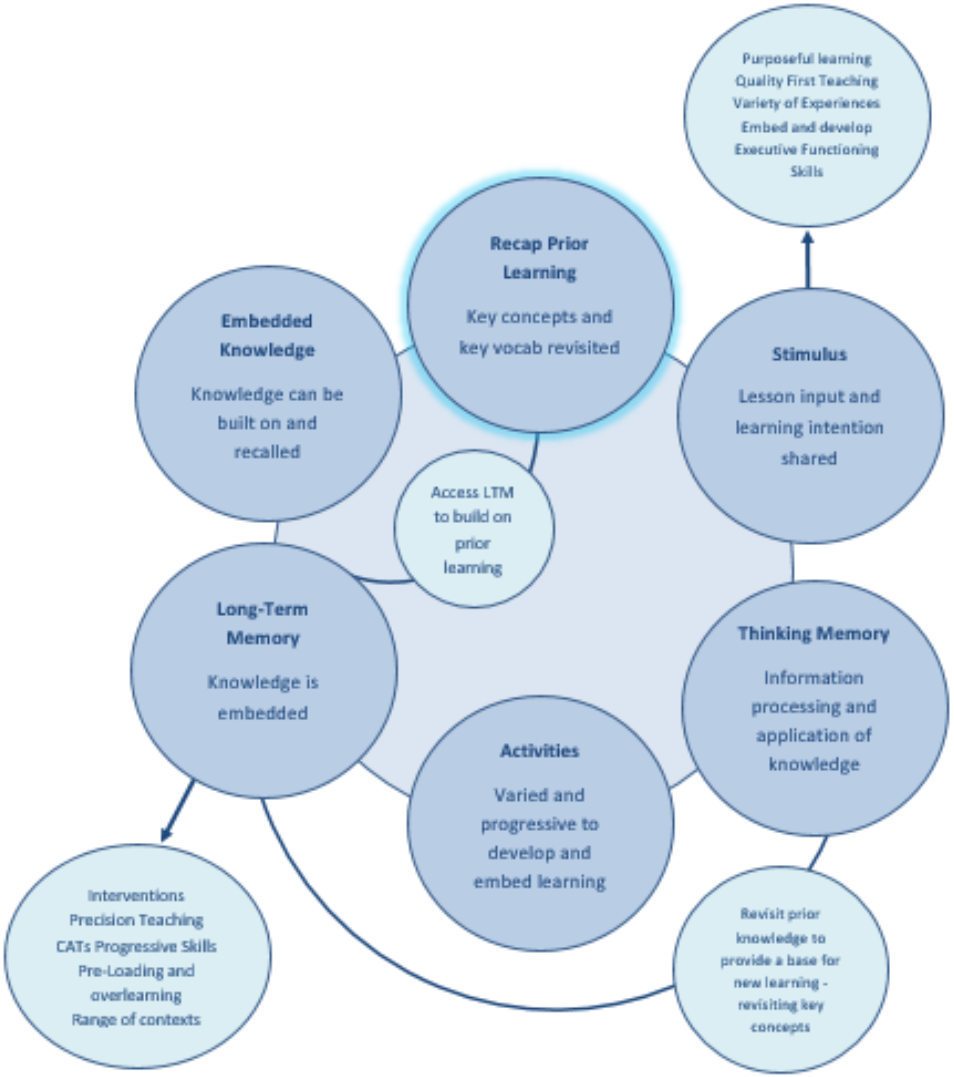
For each subject, a set of key concepts have been identified. These are the subject specific 'big ideas' that children will learn about, return to and revisit and they progress through the school. They will have opportunities to link new learning to prior knowledge within a key concept to build a rich and deep knowledge of the big ideas in each subject. Knowledge is empowering and provides a foundation for success. We accept that the more children know, the more they can learn. The subject overviews provide specific, progressive objectives that allow teachers to be precise in planning. Retrieval practice forms part of regular teaching to allow pupils to secure long-term knowledge.

**Second Order Concepts:**

These relate to the transferable knowledge that pupils can use and apply across different curriculum subjects. For example, in all areas of the curriculum, children will build an understanding of 'significance'; learning about significant authors, artists, scientific discoveries, pieces of music, figures and events from history etc…. These are summarised on pages 8 to 10 of our whole school curriculum overview to outline how these apply across a range of subjects. They aim to develop **flexible knowledge and skills** that children can apply to multiple curriculum areas.

## Working Memory Model

With the collation of all this extensive research, we have generated a 'Working Memory Model' which enables teachers to ensure that learning is robust and that all pupils are using their interconnected schema to their full potential.



| | Science LTP and Key Concept Mapping | | | | | |
|---|---|---|---|---|---|---|
| | **Autumn One** | **Autumn Two** | **Spring One** | **Spring Two** | **Summer One** | **Summer Two** |
| **N** | Senses | Change, Energy and Light | Weather and Seasons | Forces and Energy | Lifecycles | Growth |
| **R** | | | | | | |
| **Y1** | Animals Including Humans (classification of animals) | Seasons (OCW) | Materials | Plants, Animals and Seasons (OCW) | Plants<br><br>Seasons (OCW) | Senses<br><br>Seasons(OCW) |
| **Y2** | Habitats (including OCW) | Materials | Materials | Plants (Apprentice gardener) | Animals Including Humans (Growing up, OCW) | Animals Including Humans (Take care) |
| **Y3** | Animals including humans (nutrition, being healthy, muscles & skeleton) | Light | Rocks and Fossils | Plants<br>Links with OCW | Forces and Magnets | |
| **Y4** | Animals Including Humans (digestive system & teeth) | Electricity | States of Matter & Changing States* (water cycle)<br><br>**include human impact within states* | | Living Things* (habitats, food chains, classification)<br><br>**include human impact on food chains* | Sound |
| **Y5** | Forces | Materials | Properties and Changes of Materials | Earth and Space | Living Things (life cycles) | Animals including humans (reproduction and puberty) |
| **Y6** | Light | Animals including humans (circulatory system) | Evolution and Inheritance | Living Things and their Environment | Animals including humans (diet and exercise) | Electricity |

## Key concepts (Big Ideas) in Science

*Pupils build substantive knowledge of the main **concepts**, **models**, **laws** and **theories** across the three disciplines of science: biology, chemistry and physics. They will also learn about significant scientists and discoveries and the impact of these on our lives. Through each unit, pupils will develop their disciplinary knowledge as they learn how to work scientifically.*

**Working scientifically***

This is embedded through all units. Pupils will learn how scientific enquiry is used to grow and develop knowledge in science. They will learn how scientists 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. Pupils will learn to use these enquiry strategies confidently and know that different strategies may be needed at different times. Through different units of science, pupils will learn the following:

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying and classifying:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups.)
- **Looking for patterns:** (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)
- **Answering questions using secondary sources of evidence:** (answering questions using data or information that they have not collected first hand)
- **Using models:** (Developing or evaluating a model or analogy that represents a scientific idea, phenomenon or process)

**Biology**: 

**Animals including humans**  **Plants**  **Living things and their habitats** 

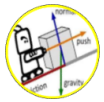
Pupils will develop an understanding of **living things and their environments** through the study of animals, humans, plants and habitats. They will learn about reproductions, inheritance and evolution through the study of life processes and life cycles.

**Chemistry**: 

**Materials**  **States of matter** 

Pupils will learn about states of matter through the study of solids, liquids and gases. They will look at the properties of materials including rocks and fossils and will study reversible and irreversible changes in materials.

**Physics**: 

**Energy**  **Forces**  **Earth Sciences** 

Pupils will develop an understanding of the concepts and laws that apply to physics. They will study the concept of **energy** by learning about light, sound and electricity. They will develop an understanding of **forces** by studying and investigating friction, air resistance, gravity and magnets. They will learn about **Earth and space**, studying seasons, day and night, the solar system and beyond.

*These concepts are studied in all units of science

| Knowledge and skills sequencing | | SCIENCE | | | | | | |
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| | | EYFS | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |

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| WORKING SCIENCTIFALLY | Observing over time<br><br>Using observations and data to draw conclusions | I can make observations and explain what I can see | I can use observations and ideas to suggest answers to questions | I can observe changes over time<br><br>I can ask questions about what I notice | I make careful and systematic observations and take accurate measurements using standard units<br><br>I can use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br><br>I can record findings using bar charts keys, tables and labelled diagrams | I can take measurements, using a wider range of scientific equipment, with increasing accuracy and precision and taking repeat reading when appropriate<br><br>I can report and present findings from enquiries including conclusions, explanations, data and diagrams including scatter graphs and line graphs. | I use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where appropriate<br><br>I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions including observing changes over different periods of time<br><br>I draw conclusions, explain and evaluate my methods and findings, communicating these in a variety of ways<br><br>I am evaluate my results |
| | Identifying /classifying | I can sort objects into groups | I can identify and classify according to simple criteria | I can group and classify things | I can gather, record, classify and present information in a variety of different ways to help me answer questions | I can classify materials and identify why they are / are not fit for purpose | I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables and grouping and classifying things |
| | Looking for patterns | | I can perform simple tests, involving observations and the gathering and recording of data | I can use different types of Scientific enquiry to gather and record data, using simple equipment<br><br>I notice patterns in my observations or data | I can identify differences, similarities or changes related to simple scientific ideas and processes | I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables and noticing patterns | |
| | Comparative and fair testing | | | I can carry out simple | I can ask relevant questions and use different types of scientific enquiry to | I can plan and carry out scientific enquiry using a | I ask my own questions about the scientific phenomena |

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| | | | | comparative tests | answer them, including comparative and fair tests<br><br>I can record findings and present data using simple scientific language, explanations, diagrams, pictures, keys, bar charts and tables. | range of scientific equipment and variables in order to answer questions<br><br>I can use test results to make predictions to set up further comparative and fair tests | that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables where necessary and carrying out comparative and fair tests<br><br>I draw conclusions, explain and evaluate my methods and findings, communicating these in a variety of ways |
| | Using secondary sources of evidence | | | I can find things out using secondary sources of information | I can identify scientific evidence that has been used to support or refute ideas or arguments | I describe and evaluate my own and others' scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources<br><br>I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions including finding things out using a wide range of secondary sources | |
| | Using models | | | | Understand how models can explain progresses that can't be fully observed eg: how light/sound travel, magnetism, the water cycle<br><br>Understand how models explain how molecules behave when substances change shape. | Understand how models about space and the solar system explain processes that can't be observed. | |

| | | EYFS | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
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| BIOLOGY | Living things and their habitats  | To understand the difference between plants and animals through observation (similarity and difference)<br><br>To understand the need to respect and care for the natural environment and all living things (responsibility)<br><br>To observe, recognise and comment on the life cycle of plants and animals | | To identify whether things are alive, dead or have never lived<br><br>To name different plants and animals and describe how they are suited to different habitats<br><br>To describe how animals get their food from plants and other animals, using the idea of a simple food chain to describe this relationship | | To explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.<br><br>To recognise that living things can be grouped in a variety of ways<br><br>To recognise that environments can change and that this can sometimes pose dangers to living things. | To describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.<br><br>To describe the life process of reproduction in some plants and animals. | To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals.<br><br>To give reasons for classifying plants and animals based on specific characteristics.<br><br>To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.<br><br>To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.<br><br>To identify how animals and plants |

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| | | | | | | | | are adapted to suit their environment in different ways and that adaptation may lead to evolution. |
| | Animals including humans  | To observe, recognise and comment on the life cycle of plants and animals.<br><br>To use my senses in hands on explanations (similarity and difference)<br><br>To name my 5 senses (similarity and difference)<br><br>To explain what my 5 senses are (similarity and difference) | To describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).<br><br>To identify, name, draw and label the basic parts of the human body.<br>To say which part of the body is associated with each sense.<br><br>To group animals according to what they eat | To describe the basic needs of animals for survival and the main changes as young animals (including humans) grow into adults<br><br>To notice that animals, including humans, have offspring that grow into adults.<br><br>To describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. | To 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.<br><br>To identify that humans and some other animals have skeletons and muscles for support, protection and movement. | To describe the simple functions of the basic parts of the digestive system in humans.<br><br>To identify the different types of teeth in humans and their simple functions.<br><br>To construct and interpret a variety of food chains, identifying producers, predators and prey. | To describe the changes as humans develop to old age. | To identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.<br><br>To describe the effects of diet, exercise, drugs and lifestyle on how the body functions<br><br>To describe the ways nutrients and water are transported within animals, including humans. |
| | Plants  | To begin to understand the need to respect and care for the natural environment and all living things<br><br>To observe, recognise and comment on the life cycle of plants and animals. | To name, identify and describe the basic structure of a variety of common flowering plants including trees.<br><br>To identify and name a variety of common wild and garden plants, including deciduous and evergreen. | To describe the basic needs of plants for survival and the impact of changing these<br><br>To observe and describe the main changes as seeds and bulbs grow into mature plants. | To identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers<br><br>To explore the requirements of plants for life and growth (air, light, water, nutrients | | | |

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| | | | | | from soil, and room to grow) and how they vary from plant to plant<br><br>To understand the way in which water is transported within plants.<br><br>To explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. | | | |
| | | EYFS | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
| CHEMISTRY | Materials<br>  | To explore collections of materials and talk about similarities and differences<br><br>To explore and talk about collections of materials (shiny, soft, etc)<br><br>To observe and comment on the characteristics of liquids and solids<br><br>To explore and talk about how light can shine through some materials but not others | To name, compare and group a variety of everyday materials and describe their simple, physical properties.<br><br>To distinguish between an object and the materials from which it is made<br><br>To identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. | To identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.<br><br>To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. | To compare and group together different kinds of rocks and soil on the basis of their appearance and simple physical properties.<br><br>To describe in simple terms how fossils are formed when things that have lived are trapped within rock.<br><br>To recognise that soils are made from rocks and organic matter. | | To compare and group together everyday materials on the basis of their properties<br><br>To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. | |

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| | | **To e**xamine materials and consider appropriate uses (for a pair of shoes for example)<br><br>To experiment and talk about various items and discover if they float or sink | To describe the simple physical properties of a variety of everyday materials. | | | | | |
| | States of matter<br><br>  | | | | | To describe the characteristics of different states of matter and group materials on this basis<br><br>To 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.<br><br>To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. | To 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.<br><br>To know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.<br><br>To use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through | |

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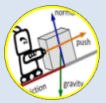
| | | | | | | | filtering, sieving and evaporating.<br><br>To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.<br><br>To demonstrate that dissolving, mixing and changes of state are reversible changes. | |
| **PHYSICS** | Forces<br><br>  | To talk about why things happen and how things work<br><br>To explore how things work (wind up toys, pulleys, etc)<br><br>To explore and talk about different forces they can feel<br><br>To observe, interact with and talk about natural processes such as ice melting, sound vibrations and magnet forces | | | To notice contact and non-contact forces and observe similarities and differences.<br><br>To describe how magnetic forces act at a distance<br><br>To describe magnets as having two poles.<br><br>To compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet | | To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.<br><br>To identify the effects of air resistance, water resistance and friction that act between moving surfaces.<br><br>To recognise that some mechanisms, including levers, pulleys and gears, | |

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| | | | | | To predict and explain whether two magnets will attract or repel each other, depending on which poles are facing.<br><br>To compare how things move on different surfaces. | | allow a smaller force to have a greater effect. | |
| | | EYFS | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
| | Energy<br><br>• Light<br>• Sound<br>• Electricity<br><br>  | | | | **Light**<br>To recognise and understand the properties of light.<br><br>To recognise that shadows are formed when the light from a light source is blocked by a solid object.<br><br>To find patterns in the way that the size of shadows changes.<br><br>To recognise that they need light in order to see things and that dark is the absence of light.<br><br>To notice that light is reflected from surfaces. | **Sound**<br>To identify how sounds are made, associating some of them with something vibrating.<br><br>To recognise that vibrations from sounds travel through a medium to the ear.<br><br>To recognise that sounds get fainter as the distance from the sound source increases<br><br>To describe the relationship between the pitch of a sound and the features of its source | | **Light**<br>To use the idea that light travels in straight lines and enters our eyes to explain how we see things<br><br>To use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.<br><br>To 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 |

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| | | | | | | To describe the relationship between the volume of a sound, the strength of the vibrations and the distance from its source<br><br>**Electricity**<br>To construct and name the basic parts of a simple series circuit, including cells, wires, bulbs, switches and buzzers.<br><br>To identify whether or not a lamp will light in a simple series circuit<br><br>To recognise that a switch opens and closes a circuit<br><br>To recognise and explain why materials are good conductors and insulators.<br><br>To identify common appliances that run on electricity. | | **Electricity**<br>To use simple apparatus to construct & control a series circuit, and describe how the circuit may be affected when changes are made to it<br><br>To use recognised symbols when representing a simple circuit in a diagram.<br><br>To associate brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a circuit. |

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| | Earth science  | To name and identify some different types of weather<br><br>To Identify and discuss natural features in the school grounds, discussing changes throughout the year. | To explain how the weather changes throughout the year and name the seasons (link to geography) | | | | To describe the movement of the Earth, and other planets, relative to the Sun in the solar system.<br><br>To describe the movement of the Moon relative to the Earth.<br><br>To use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. | |