**Frimley Church of England School**

**Science - Skills and Knowledge Progression**

## Intent

Science is about children developing a sense of enquiry and extending their knowledge and understanding of themselves and the world around them through active and creative activities. At Frimley Church of England School, children are encouraged to be inquisitive and question their world through cross curricular creative topics and subject specific investigations.

Key Scientific skills: Pupils will develop their ability to: - predict what might happen, -ask relevant questions, -plan practical enquiries, -make inferences based on their findings -evaluate their results based on their own evidence and by comparing this to current scientific understanding.

## Implementation

Practical opportunities to investigate are frequent, with children regularly working co-operatively, forming their own questions and communicating scientific ideas to each other. Through careful planning, all pupils are encouraged to become naturally curious and develop a responsible attitude towards health and safety, as well as respect for all living things and the physical environment. Each class has a Scientific Toolkit which has been developed to assist the children in the planning of investigations and to help them assess which of the key Working Scientifically skills they have used.

Cross-Curricular links

Throughout key stage 2, cross-curricular links are made between Science and other subjects, particularly English, Mathematics, Computing and Personal, Social and Health Education. For example, through the reading of scales whilst measuring forces on a Newton Metre or through a discovery made by an important scientist.

Science Garden and Outdoor Learning

Our new science garden enables children to learn outdoors, exploring nature and discovering for themselves the joy of planting, watching plants grow and then tasting edible produce whilst gaining a knowledge of healthy nutrition. They can observe and compare the large variety of species that live in our extensive school grounds and grow to an understanding of the importance of caring for our environment. Additionally, the science garden provides opportunities to measure and investigate other scientific topics such as the weather, sound using the outdoor musical instruments and the effects of forces on materials.

Relevance to our World

Finally, science is made relevant through links to what is happening in the real world, with an understanding of the importance of science in current society and the environmental concerns that affect their future. This could be through the recording of information such as a bird survey for the RSPB, use of a current event such as a volcanic eruption or the use of information from current space exploration.

## Impact

- Children will have developed a love of science and an increased curiosity about our world

- They will have experienced a variety of investigations through class activities and special focus activities or visits from outside agencies
- Their subject knowledge will show good progress through the year groups
- They will have gained the scientific skills to enable them to tackle problem-solving with confidence and assessment will show good progress in Working Scientifically skills
- They will be able to use key investigational skills across many subject areas of the curriculum
- They will be able to connect their learning with what is currently happening in the world and want to learn more

**National curriculum expectations:**

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

**Pupils should be taught:**

- To develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- To 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
- The scientific knowledge required to understand the uses and implications of science, today and for the future.

**What Frimley offers to its pupils:**

| | Year 3 | **Year 4** | **Year 5** | **Year 6** |
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| **Knowledge**<br><br>**Biology**<br><br>**Chemistry**<br><br>**Physics** | **Animals inc humans**<br><br>the type and amount of nutrition that animals and humans need<br><br>how skeletons and muscles provide support, protection and movement | **Animals inc humans**<br><br>the simple functions of the digestive system in humans<br><br>types of teeth in humans and their functions<br><br>food chains: producers, predators and prey | **Animals inc humans**<br><br>how humans change as they age<br>Guidance notes : puberty<br><br>**Living things and their habitats**<br><br>differences between the life cycles of a mammal, an amphibian, an insect and a bird | **Animals inc humans**<br><br>the human circulatory system: functions of the heart, blood vessels and blood<br><br>**impact of diet**, exercise, drugs and lifestyle on our bodies<br><br>**how nutrients and water are transported in animals** |

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| | **Plants**<br><br>the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers<br><br>the requirements of plants for life and growth and differences from plant to plant<br><br>investigate water transportation within plants<br><br>the life cycle of flowering plants: pollination, seed formation and seed dispersal<br><br>**Rocks**<br><br>compare and group different kinds of rocks from their appearance and physical characteristics<br><br>describe how fossils are formed within rocks<br><br>soils are made from rocks and organic matter<br>Guidance notes: include those in the local environment<br><br>**Light**<br><br>recognise that we need light to see and that dark is the absence of light<br><br>light is reflected from surfaces | **Living things and their habitats**<br><br>the grouping of living things<br><br>use of classification keys to group, identify and name a variety of living things<br><br>changing environments and the dangers to living things<br><br>Guidance notes: identify how the local habitat changes throughout the year<br><br>**States of matter**<br><br>Compare and group materials: solids, liquids or gases<br><br>observe how materials change state when they are heated or cooled, and the temperature at which this happens (°C)<br><br>evaporation and condensation in the water cycle and changes of evaporation with temperature<br><br>**Sound**<br><br>how sounds are made and vibration<br>Guidance notes: in a range of different musical instruments from around the world | **life process of reproduction in some plants and animals (sexual and asexual)**<br><br>Guidance notes**: find out about the work of naturalists and animal behaviourists** e.g. David Attenborough or Jane Goodall<br><br>**Properties and Changes of materials**<br><br>group and compare materials on the basis of their properties: hardness, **solubility**, transparency, conductivity and response to magnets<br><br>**some materials dissolve in liquid to form a solution, and describe how to recover a substance from a solution**<br><br>use knowledge of solids, liquids and gases to decide **how mixtures might be separated**<br><br>use evidence from comparative and fair tests to explain the uses of everyday materials: metals, wood and plastic<br><br>dissolving, mixing and changes of state are **reversible changes**<br><br>**some changes result in the formation of new materials: not** | **Living things and their habitats**<br><br>how living things **(micro-organisms, plants and animals**) are classified into broad groups<br>Guidance notes**: subdivisions**<br><br>**give reasons for classifying plants and animals**<br><br>Guidance notes**: vertebrates and invertebrates**<br><br>**Evolution and Inheritance**<br><br>living things change over time and fossils provide information about Earth millions of years ago<br><br>**living things produce offspring of the same kind: normally offspring vary and are not identical to their parents**<br><br>**animals and plants are adapted to suit their environment**<br><br>Guidance notes: Mary Anning /Charles Darwin<br><br>**Light**<br><br>**light appears to travel in straight lines** |

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| | light from the sun can be dangerous and how to protect our eyes<br><br>how and why the size of shadows change<br><br>shadows are formed when the light from a light source is blocked by a solid object<br><br>Guidance notes: explore what happens when light reflects off mirrors or other reflective surfaces<br><br>**Forces and magnets**<br><br>compare how things move on different surfaces<br><br>some forces need contact between two objects but magnetic forces act at a distance<br><br>magnets attract or repel each other and attract some materials<br><br>magnets have two poles<br><br>compare, group together and identify magnetic materials<br><br>predict whether two magnets will attract or repel each other with reference to their poles | vibrations from sounds travel through a mediums to the ear<br><br>find patterns between the pitch of a sound and features of the object that produced it<br><br>sounds get fainter as the distance from the sound source increases<br><br>find patterns between the volume of a sound and the strength of the vibrations that produced it<br><br>**Electricity**<br><br>identify some electric appliances<br><br>construct a simple series electrical circuit, naming: cells, wires, bulbs, switches and buzzers<br>Guidance notes: draw the circuit as a pictorial representation<br><br>identify if a lamp will light in a simple series circuit: the need for a complete loop with a battery<br><br>switches open and close a circuit, recognise if a lamp light in a simple series circuit<br><br>conductors and insulators: metals are good conductors | **usually reversible** eg. burning and the action of acid on bicarbonate of soda<br>Guidance notes: find out how **chemists create new materials**, e.g. Spencer Silver (glue for sticky notes) or Ruth Benerito (wrinkle-free cotton)<br><br>**Earth and Space**<br><br>the movement of the Earth, and other planets, relative to the Sun to explain day and night<br><br>the movement of the Moon relative to the Earth<br><br>the Sun, Earth and Moon are approximately spherical bodies<br><br>use the Earth's rotation to explain day and night and **the apparent movement of the sun**<br><br>Guidance notes: ideas about how the solar system have developed, geocentric model of the solar system then heliocentric model: scientists such as Ptolemy, Alhazen or Copernicus.<br><br>**Forces**<br><br>**the force of gravity** acting between the Earth and a falling object<br>Guidance notes: Galileo/ Newton | light travels in straight lines and objects are seen because they give out or reflect light into the eye<br><br>light travels from light sources to our eyes or from light sources to objects and then to our eyes<br><br>**explain why shadows have the same shape as the objects that cast them**<br><br>**Electricity**<br><br>**associate the brightness** of a lamp or **the volume** of a buzzer with the **number and voltage of cells** used in a **series circuit**<br><br>**how components function**, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches<br><br>**use recognised symbols** when drawing a simple series circuit |

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| | Guidance notes: explore different magnets (e.g. bar, ring, button and horseshoe) | Guidance notes: use their circuits to create simple devices | the effects of **air resistance, water resistance** and friction, between moving surfaces<br><br>**levers, pulleys and gears** allow a smaller force to have a greater effect | |
| **Skills** | **To begin to**<br>ask relevant questions and use different types of scientific enquiries to answer them<br><br>set up simple practical enquiries, comparative and fair tests<br><br>make systematic and careful observations, taking accurate measurements using standard units, using a range of equipment<br><br>gather, record, classify and present data in a variety of ways to help in answering questions<br><br>record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables | **To be confident to**<br>ask relevant questions and use different types of scientific enquiries to answer them<br><br>**start to make their own decisions about the most appropriate type of scientific enquiry**<br><br>set up simple practical enquiries, comparative and fair tests<br><br>**recognise when a simple fair test is necessary and help to decide how to set it up**<br><br>make systematic and careful observations, taking accurate measurements using standard units, using a range of equipment | **To begin to**<br>**plan** different types of scientific enquiries to answer questions, **including recognising and controlling variables where necessary**<br><br>take measurements, using a range of scientific equipment, with **increasing accuracy and precision, taking repeat readings when appropriate**<br><br>record data and results of increasing complexity **using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs**<br><br>report and present findings from enquiries, including conclusions**, causal relationships and explanations of and degree of** | **To be confident to**<br>plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary<br><br>**select and plan the most appropriate type of scientific enquiry to use**<br><br>**set up fair tests and explain which variables need to be controlled and why**<br><br>take measurements, using a range of scientific equipment,<br><br>**choose the most appropriate equipment to make measurements** |

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| | report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions<br><br>use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br><br>identify differences, similarities or changes related to simple scientific ideas and processes<br><br>use straightforward scientific evidence to answer questions or to support their findings. | **look for naturally occurring patterns and relationships and decide what data to collect**<br><br>gather, record, classify and present data in a variety of ways to help in answering questions<br><br>**make decisions about what observations to make, how long for and the equipment that might be used.**<br><br>record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables<br><br>**help to make decisions about how to record and analyse data**<br><br>report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions<br><br>**use notes, simple tables and standard units,**<br><br>use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br><br>**draw simple conclusions and answer questions.** | **trust in results,** in oral and written forms<br><br>**use test results to make predictions to set up further comparative and fair tests identify scientific evidence that has been used to support or refute ideas or arguments**. | record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs<br><br>**use and develop keys and other information records to identify, classify and describe living things and materials**<br><br>report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms<br><br>**identify evidence that refutes or supports their ideas**<br><br>**use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas**<br><br>use test results to make predictions to set up further comparative and fair tests identify scientific evidence that has been used to support or refute ideas or arguments.<br><br>**recognise which secondary sources will be most useful and begin to separate opinion from fact.** |

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| | | identify differences, similarities or changes related to simple scientific ideas and processes<br><br>**identify new questions arising from the data, make predictions and find ways of improving what they have already done.**<br><br>use straightforward scientific evidence to answer questions or to support their findings.<br><br>**recognise when and how secondary sources might help them to answer questions** | | |