Progression in Science key strands

Biological Processes

Animals including Humans

As a child progresses through school, they will reach the following milestones by the end of:

Foundation Stage 1

The children in F1 are beginning to be aware of the need to look after the animals around them including pets. They are able to start to make healthy choices about what they eat and know the basics of keeping themselves clean and how to brush their teeth.

Foundation Stage 2

The children in F2 are aware of the need to keep healthy including the importance of limiting screen time, crossing the road safely, and healthy exercise and sleep routines. They are able to manage to take care of intimate personal hygiene in school, and understand the need to wash their hands before eating, making healthy choices about snacks.

Year 1

The children in Year 1 know the names of a variety of common animals including fish, amphibians, reptiles, birds and mammals. They can distinguish between carnivores, herbivores and omnivores and describe the structure of a variety of common animals from the groups above, including identifying which groups their pets fit into and why.

Year 2

In Year 2, they continue to build on their understanding of the structure and processes in a variety of animals including the idea that animals reproduce to have offspring that grow into adult versions of the same animal. They can describe the basic needs of all animals including water, food and air. Children can describe why exercise is important for humans and describe why they need to eat different foods to get a range of nutrients to stay healthy.

Year 3

In Year 3, pupils explore the role of different food types and why they are important for human health. They are able to identify that all animals have to consume food, unlike plants who make it in their leaves. Pupils investigate the role of the different muscles and how they make the skeleton move and are able to start to recognise some organs of the human body.

Year 4

In Year 4, are more confidently able to name and locate different organs of the human body and can explain simply the role of a few such as the brain and heart. They investigate the digestive system and are able to name the function of component parts. Pupils can name and recognise the different types of tooth and identify their function according to characteristics. They are able to use their knowledge of teeth to identify whether unknown animals are carnivores, herbivores or omnivores. They are able to construct a variety of food chains and webs, identifying consumers, predators and producers.

Year 5

In Year 5, pupils are able to discuss the life cycle of a human and describe changes as they develop from infant to old age. They are able to identify changes in their own body as they progress to adolescence and are able to link this with a basic understanding of animal reproduction. This links with the statutory Relationships and Sex Education syllabus and extends into work in Year 6, covering conception and birth which is delivered by the school nursing team.

Year 6

In Year 6 pupils can confidently name and locate the organs of the circulatory system and how they connect with the respiratory system including the name and function of the component parts of the human heart. They are able to describe the role of arteries and veins and the blood itself, discussing the impact of exercise on the circulatory system. Pupils can describe how nutrients and water are transported within animals, including humans. They recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function and are able to make informed choices about a healthy lifestyle.

As they transition to secondary school, pupils are able to transfer their understanding to the KS3 curriculum requirements.

Plants

As a child progresses through school they will reach the following milestones by the end of:

Foundation Stage 1

In F1, children will plant seeds and care for growing plants, knowing they need light and water. They will understand the key stages in the life cycle of a plant.

Foundation Stage 2

In F2, children will explore the natural world around them making observations and drawing pictures of plants they see. They know that some plants change appearance with the seasons but some look the same all year round.

Year 1

In Year 1 the children recognise and name a wide variety of common wild and garden plants, including a variety of deciduous and evergreen trees. They are able to identify the basic structure of a variety of plants, including trees and begin to associate functions with specific parts such as the roots absorbing water.

Year 2

In Year 2, the children broaden their understanding of the needs of plants, including the need for water, differing amounts of light depending on the plant and suitable temperatures for the plant to grow and stay healthy. They are able to observe and describe how seeds and bulbs grow into mature plants, sequencing stages where appropriate.

Year 3

Pupils in Year 3 accurately identify and describe the functions of different parts of flowering plants. They explore the requirements of plants for life and identify that some nutrients the plant needs to be healthy are absorbed by roots but that the plant synthesises its own food. Nutrient types needed may vary from plant to plant but children know that the process of making food is similar in all. They explore the role of flowers in the life cycle of flowering plants and investigate the process of plant reproduction and seed dispersal.

Year 4, Year 5 and Year 6

In Year 4-6, plants are not studied in a unit of their own, but their function and importance is considered as part of the strand Living Things and their Habitats.

As they transition to secondary school, pupils are able to transfer their understanding to the KS3 curriculum requirements.

Seasonal Change

As a child progresses through school they will reach the following milestones by the end of:

Foundation Stage 1

In F1, children will begin to explore the changes in plants and the natural world as the seasons change, for example, observing leaves falling from trees in Autumn and the difference in temperature between summer and winter.

Foundation Stage 2

In F2, children will understand the effect of the changing seasons on the world around them, making more sequenced observations about what they can see happening around them across the school year. They are able to identify the seasons in pictures or other contexts by linking their observations to understanding seasonal change.

Year 1

In Year 1 pupils have study the different seasons and can identify seasonal patterns throughout the year including changing temperature and day length. They can make detailed observations about the natural world as the seasons change, linking this to wider places in the world.

Year 2

Pupils have studied seasonal patterns throughout the year and can identify changes in seasonal and daily weather patterns. Pupils can locate hot and cold areas of the world and link the idea of differing seasons in differing hemispheres of the world – for example it is summer in Australia when it is winter in England, but the pattern for the changes remains the same.

Study of seasonal change becomes integral to the study of the natural world as children progress into Year 3 and beyond, with aspects of seasonal change being

studied in Year 5 – Earth and Space, when the tilt of the Earth is recognised as playing a part in seasonal changes.

Living Things and their Habitats

Year 2

Children recognise the differences between living and things, and things that have never been alive such as rocks or metals. They can identify that animals live in suitable habitats that provide for their basic needs, and that living things in a habitat can depend on each other. They are able to identify and name a variety of common plants and animals.

Year 4

By the end of Y4, children recognise that living things can be grouped in a variety of ways and that classification keys can be a useful way to identify unknown species. They are able to use such keys to identify a variety of living things in their local surroundings and habitats further afield. Children recognise that environments can change and this can sometimes pose dangers to the living things in them, such as the effects of Global Warming on a range of habitats.

Year 5

Children are able to identify the main features of lifecycles of a mammal, an amphibian, an insect and a bird, and are able to match unfamiliar creatures to a life cycle based on the features of the creature and their knowledge of the afore mentioned groups. They are able to discuss the processes of reproduction in some plants and animals, in accordance with the school's Relationship and Sex Education policy.

Year 6

Children in Year 6 are able to describe how all living things are classified into broad groups according to common observable characteristics. They are able to identify similarities and differences in all living things including micro-organisms,

plants and animals and use them to categorise an unknown species. They are able to explain why certain characteristics are used to classify creatures, such as leaf shape, and not others, such as colour.

Evolution and Inheritance - Year 6

Children can recognise that living things have changed over time and that fossils provide information about what inhabited Earth millions of years ago. They are able to identify that most living things produce similar, but not identical, offspring. The slight variations in offspring allowed some to survive challenging circumstances better than others, and over time these favourable adaptations may have led to a process of evolution that we can trace through fossil records.

As they transition to secondary school, pupils are able to transfer their Biological Processes understanding to the KS3 curriculum requirements.

Chemical Processes

Materials

Foundation Stage 1

Children can describe a range of natural materials using a wide range of vocabulary. They notice differences in materials and changes that occur in them over time where appropriate such as ice melting.

Foundation Stage 2

Children can describe what they see, hear and feel when they are exploring the natural world and what materials they encounter. They make observations about changing states of matter such as the snow is melting to make water and link this to seasonal change.

Year 1

By the end of the year, children can distinguish between an object and the material it is made from, naming and recognising a variety of common materials such as wood, plastic and glass. They can describe simple physical properties of materials and group materials according to these properties e.g. strong/brittle, waterproof/not waterproof.

Year 2

Children are able to identify and compare the suitability of a variety of everyday materials for specific jobs e.g. making windows, or building shelters. Children can investigate how the shape of some materials changes by squashing, bending, twisting and stretching, making predictions from their findings and assigning materials to different jobs.

Year 4

By the end of the year, children can group materials together according to whether they are solids, liquids and gases and describe the distinct features of each state of matter. They observe and discuss how some materials can change state when they are heated or cooled and link this to the temperature in degrees

Celsius. The change in state of water in the Water Cycle is associated with temperature of the local environment.

Year 5

Children use a wider range of properties to group everyday materials such as solubility, transparency and conductivity of heat and electricity. They know that some materials dissolve to form a solution and they can name some simple methods of recovering the material. They can make informed decisions about how to separate a variety of mixtures based on the physical properties of the components using e.g. filtering, evaporation or magnets. Children know that dissolving, mixing and changes of state are reversible physical changes but that chemical changes such as burning are irreversible.

Rocks - Year 3

By the end of the year, Y3 children can compare and group different kinds of rocks based on their appearance and physical properties. They know that soil is made from rocks and organic matter and differs in different locations according to the local rock type. They are able to link understanding of the rock cycle to actions of volcanoes studied in Y3 Geography. They are also able to link the formation of fossils to sedimentary rocks and link to the evidence scientists have for the process of evolution studied in Y6.

As they transition to secondary school, pupils are able to transfer their Chemical Processes understanding to the KS3 curriculum requirements.

Physical Processes

Magnets and forces

Foundation Stage 1

Children can talk about the different forces they encounter such as when things are pushed or when they sink.

Foundation Stage 2

Children link their understanding of forces to observations in the natural world e.g. the leaves move faster when the wind is stronger.

Year 3

By the end of the year, Y3 children can describe magnets as having two opposite poles that attract, whilst similar poles repel each other. They can identify a

variety of materials that are attracted to magnets and can test if they are correct. They notice that magnetic forces can have an effect over a distance, without materials having to touch.

Year 5

By the end of Year 5, children can explain why unsupported objects fall towards Earth because of the effect of the Earth's gravitational field strength. They can describe the action of forces on an object including pushing, pulling and turning. They can describe the forces of friction and air resistance and explain that they are opposite in action to forces moving an object. They can describe the action of some simple mechanisms such as pulleys and levers, and explain that they cause a small force to have a larger effect.

Light

Year 3

Children, by the end of the year, recognise that they need light in order to see and that absence of light is darkness. They know that light is reflected from surfaces to enable us to see and that light comes from a variety of sources including the Sun, which can damage our eyes if we don't protect them. They know haw shadows are formed and can make some links between how the size of shadows changes over a day.

Year 6

By the end of Year 6, children recognise that light travels in straight lines and can use this knowledge to explain the shape of shadows from different objects. They know that reflective surfaces allow us to see objects when a light source shine on them. They can describe how light travels into our eyes to enable us to

see, and that if there is no light source we cannot see non-luminous objects. They know that light travels a long way from the Sun to our eyes, but this only takes around 8 minutes.

Electricity

Year 4

By the end of Year 4 children can identify common appliances that use electricity. They can construct a simple circuit, naming components including bulbs, wires, cells, buzzers and switches. They can use a circuit to test if a material is an electrical conductor or insulator and can explain how switches can turn components in a circuit on and off. They can explain which circuits will light or not from diagrams, giving explanations.

Year 6

Children can associate the brightness of a bulb or the volume of a buzzer with the number and voltage of cells in a circuit. They can describe what will happen to individual components in circuits from diagrams, including how switches may control different parts of the circuit. Children use and interpret common circuit symbols in standard circuit diagrams and can draw a circuit diagram of a circuit they have constructed in class.

Sound - Year 4

Children can identify how sounds are made by vibrating objects and that the vibrations travel through a medium such as air or water to our ears. They find patterns between the pitch of an object and the features of the object that is making it – e.g. a guitar string. They identify the volume of sound with the energy the vibrations carry and know that a sound becomes fainter as it travels away from the source.

As they transition to secondary school, pupils are able to transfer their understanding to the KS3 curriculum requirements.

Earth and Space - Year 5

By the end of Year 5, children can describe the movement of the Earth and other planets in our Solar System around the Sun. They can describe the movement and apparent change in appearance of the moon as it orbits the Earth. They

understand that we have night and day as a result of the rotation of the Earth on its axis and that the stars can appear to change position in the sky for the same reason. They can describe the effects of gravity on falling objects on different planets.

As they transition to secondary school, pupils are able to transfer their Physical Processes understanding to the KS3 curriculum requirements.

Scientific Disciplinary Knowledge and Investigation

As a child progresses through school, they will reach the following milestones by the end of:

Foundation Stage 1

In F1, children can understand and answer simple cause and effect questions. They can use their senses to explore their surroundings and natural materials and identify similarities and differences. They can explore different forces and

Foundation Stage 2

In F2, children can ask questions to find out more about what has been explained to them and can describe some events they witness in some detail e.g. what

happens when we roll a ball down a ramp. They can make plausible attempts at explaining how things work and link to their own experiences.

Year 1

Pupils will be able to ask simple questions to investigate using question stems and make decisions about which ones they can find answers to practically. They can suggest a next step in a process and can begin to select simple, appropriate equipment, using it safely. They can make simple observations and take some simple measurements with support e.g. timing modelling clay sinking. They can make simple drawings using labels to present evidence and with support, can use a range of simple tables and charts to interpret information. Children can make simple comparisons between different objects or events and make some attempt to link cause and effect with support. Children can describe any difficulties they encounter completing activities.

Year 2

Pupils will be able to make suggestions for questions they can investigate, and select simple equipment from a choice given, following instructions of how to use it, sometimes without adult support. Children can make relevant observations and begin to use basic equipment for measuring length and mass. They can use drawings and labels to present evidence and use tables and charts to interpret evidence, including ICT forms. Children can describe what has happened, making comparisons where appropriate between objects or events and can sequence results e.g. from smallest to largest to identify patterns. They are able to make a link between cause and effect in simple situations and notice simple patterns in results. Children can review their work and identify difficulties they encounter, making suggestions, with support, to suggest how these could have been avoided.

Year 3

Pupils ask questions independently and generate their own ideas to explore through scientific enquiry. They recognise when to answer a question using a fair test method and when another method might be needed. They can identify in a fair test what needs to change and what needs to be kept the same. Children select from a wider range of equipment making observations of increasing accuracy and can use standard equipment to measure quantities such as volume

and temperature. Evidence can be gathered, recorded and presented in a variety of ways, sometimes using table they have created and using bar charts to display relevant data, using ICT where appropriate. Children can interpret line graphs with support and report on findings to include written and oral presentations or displays, making conclusions clear. They can make general statements about simple patterns they notice in results, providing explanations as to why they occurred suing everyday experience. Children can suggest how an enquiry can be improved and, with support, recognise the limitations of results.

Year 4

Pupils will be more confident at asking questions and offering ideas for a range of scientific enquiry. They can improve the focus of a question with support, to clarify its scientific purpose. Children know when to use fair testing and when other methods such as survey might be more appropriate. They can set up fair tests, controlling variables that need keeping the same or measuring those that change. Pupils use a wide range of equipment e.g. thermometers and data loggers correctly and safely and deal with most equipment difficulties independently, only asking for help where appropriate. Children choose a series of observations they will collect and take accurate readings, recognising when to repeat them. They select the most appropriate way to present evidence collected and record findings using a range of diagrams, tables and graphs, using ICT where appropriate. Simple scientific language is used to communicate outcomes and the evidence is used to answer the initial question or support findings, drawing valid conclusions using more than one piece of evidence. Children provide explanations for differences in readings identifying any anomalous results. They can evaluate the effectiveness of their working methods, making practical suggestions to improve them.

Year 5

Pupils can independently ask questions and offer ideas for scientific enquiry with a clear scientific purpose. They can select the most appropriate enquiry methods to generate evidence needed to solve the problem or answer questions posed. They can plan familiar types of enquiry in detail, selecting appropriate equipment and take measurements using a range of equipment with increasing accuracy and precision. Children can choose to make a series of observations or measurements that will add to the quality of evidence collected during the investigation and can record it using, where most appropriate, diagrams, classification keys, tables, bar

and line graphs and models. Findings are communicated in written form, displays or other methods using scientific language to communicate increasingly detailed analysis. Where appropriate, comparative statements are made describing relationships between factors being investigated. Simple scientific models are used to help describe scientific ideas and explanations of evidence gathered are linked to scientific knowledge and understanding. Generalisations are made about what evidence gathered seems to indicate, recognising the limitations of the evidence and suggest some reasons why it may not be trusted where appropriate. Test results are used where appropriate to set up further enquiry.

Year 6

Children are able to recognise scientific questions that do not yet have definitive answers such as 'How was the Universe created?'. They can select methods to use to solve problems or answer questions including a full range of enquiry methods which are planned in detail. Children can explain why particular pieces of equipment or information sources will provide better quality evidence and select the most appropriate for use. They can repeat sets of observations where appropriate, selecting suitable ranges and intervals to give sufficient depth of evidence. Children decide of the most appropriate formats to present a series of scientific data, such as using line graphs for continuous variables. They can communicate effectively in written form, across a range of genre and use multimedia and other forms of presentation. Scientific evidence is used to answer questions and support findings and valid conclusions are drawn using more than one piece of supporting evidence. Explanations are offered for differences in repeated observations, identifying any reasons for anomalies noticed, Children can evaluate the effectiveness of their working methods and make practical suggestions for improving them, identifying scientific evidence that has been used to support or refute ideas.

As they transition to secondary school, pupils are able to transfer their Disciplinary Knowledge and Investigative skills to the KS3 curriculum requirements.