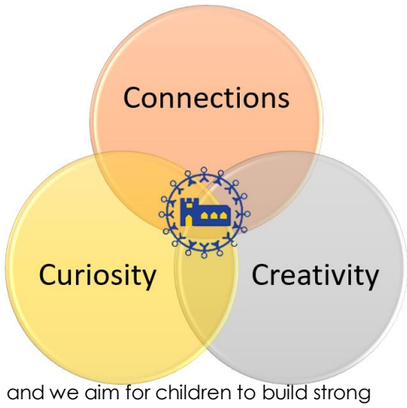

Science – Knowledge and Skills Progression

Intent

From EYFS, we aim to ensure that all pupils:

- Develop their scientific knowledge and conceptual understanding which builds on previous learning.
- Ask questions about the world around them and answer through scientific investigations.
- Are equipped with skills to work scientifically to complete enquiries.
- Have a love for science and understand its importance in the world around them, now and in the future.

Whilst not all knowledge topic areas are covered within every year group, many topics are introduced in earlier years and then built upon in later years. We ensure recap of previous topics are strong and we aim for children to build strong branches of connections across a range of scientific ideas. Furthermore, children develop their skills to work scientifically when investigating throughout their time at Lyne and Longcross. They make connections with previous investigation skills and build on what they have previously learnt. Working scientifically and opportunities to investigate take equal weight within the curriculum as knowledge learning and both knowledge and investigation are interlinked.

Implementation

Our science curriculum is mapped and planned to allow for maximum engagement and to encourage children to make connections and see science in the world around them. Our EYFS take a 'hands on' immersive approach to their science, exploring what they see around them and their science learning is linked to times of year and seasons. This is continued into year 1 for the autumn term, before more independent style learning is then introduced. Our curriculum, split into science knowledge and working scientifically skills, is broken down and mapped out for each group, allowing full coverage of the national curriculum and to encourage strong recap across years. Whilst not all topic areas are covered within every year group, many topics are introduced in earlier years and then built upon in later years e.g light is seen in both year 3 and 6. Where this occurs, we ensure previous learning is recapped and revisited whilst new teaching points are covered creatively. Although key learning is revised to ensure it forms a foundation to new learning, knowledge is continuously progressed and building to new heights.

Furthermore, to assist strong recap of previous topics, each year group, except year 4, will have a half term where no new science learning is planned. Over a series of 'recap objectives' teachers will revisit key learning from previous year groups throughout their lessons. Recapping content is the main focus; progression is only appropriate where a child might extend themselves to apply their knowledge to new challenges. To group and organise this, recap lessons may be themed around an 'idea' not necessarily titles from the science curriculum. Each lesson will have a few bullet points of curriculum to revisit, discuss and complete activities for.

We encourage wide exploration of topics within our science learning and across the year, children will enjoy workshops, trips and other engaging experiences to expand their science learning further. We also encourage links with our community through parents in STEM careers delivering sessions for the children at Lyne and Longcross and showing them how science could play a big part in their future jobs. Science weeks and days are big events in our school calendar and we enjoy opportunities for the children to experience science beyond their curriculum.

<u>Knowledge</u>
Children use their scientific knowledge regularly within lessons. Through real life examples, exploratory questions, use of resources and scientific investigations, children will apply their knowledge to different contexts to remind them how the facts and information fit within our wider world. Where possible, strong links are made with class themes, allowing further connections and cross-curricular relationships to be made.

<u>Working scientifically</u>
In connection to the topic they are learning, children will be asked questions to investigate and will get their own opportunities to answer questions they may have. Encouraging curiosity, children will be able to plan and carry out fun investigations, with growing independence as they advance through the school. Each topic has a key investigation question, however further exploration and questions will be included also. Working scientifically and opportunities to investigate take equal weight within the curriculum as knowledge learning and both knowledge and investigation will be interlinked.

Throughout the years, children develop their skills to work scientifically, building on what they have previously learnt. All skills are mapped out in the knowledge and skills progression map showing the skills each year group covers, and how that is built upon in future stages. Children become familiar with the process of investigating throughout their time at school. Working scientifically skills are separated into 'questions', 'observations', 'presentation', 'analysis' and finally 'concluding (in year 3 upwards) and this structure is maintained from Reception to Year 6. These skills are shown in different forms in our lessons and marked with a letter coding in books to represent the skill. Symbols to match the skills are also shown in the front of the children's books and on science displays.

Impact

Within lessons, children have a sense of security in what they have previously learnt and an excitement to discover new knowledge within that area. Children feel confidence when faced with questions and challenges when applying their knowledge and can use what they have learnt in new and exciting contexts. Furthermore, they become familiar with the process of investigating throughout their time at school meaning children build familiarity with skills needed to investigate.

By the time children leave Lyne and Longcross they have:

- Security in their scientific knowledge
- confidence when applying their science knowledge to new contexts and future learning they may explore
- A secure rage of skills to explore and investigate questions
- A love for science and the role it has in the sider world including STEM careers

Children should be taught to: (Key Stage 1, Lower Key Stage 2 and Upper Key Stage 2)

	Scientific knowledge	Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics within the topics of: Animals including humans, materials, living things and their habitats, plants and seasonal changes. Animals including humans, materials, living things and their habitats, plants, light, forces and magnets and electricity as well as rocks, sound states of matter, earth and space and evolution and inheritance Children are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future
Working scientifically	**Exploring questions through testing**	Ask simple questions and recognising that they can be answered in different ways performing simple tests Ask relevant questions and using different types of scientific enquiries to answer them setting up simple practical enquiries, comparative and fair tests Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
	Making observations	Identify and classifying Observe closely, using simple equipment Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Take measurements, using a range of scientific equipment, with increasing accuracy and precision, take repeat readings when appropriate
	Answering questions and making conclusions	Use their observations and ideas to suggest answers to questions Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Identify differences, similarities or changes related to simple scientific ideas and processes Use straightforward scientific evidence to answer questions or to support their findings. Using test results to make predictions to set up further comparative and fair tests Report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations Identify scientific evidence that has been used to support or refute ideas or arguments
	Gathering and recording data	Gather and recording data to help in answering questions Gather, record, classify and present data in a variety of ways to help in answering questions Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

EYFS

Unlike the National Curriculum objectives outlined above, EYFS outcomes and objectives can be delivered through the seven areas of learning rather than being a discrete subject. The below statements are examples of how children in the Early Years develop so that they can build and develop their science knowledge and understanding in preparation for the National Curriculum.

Understanding the world	• Talk about their family, family history and community • Understand that people are different in many ways • Explore the natural world and different materials with their senses. Describe and explain what they can see, hear and feel when outside • Talk about and understand a change in seasons including a change in materials as a result (e.g ice melting) • Explain the life cycle of an animal • Talk about and what they notice in the environment including living things. Discuss what living things need to grow.
Expressive arts and design	• Explore materials freely and explore the different textures
Physical development	• Make healthy choices about food and drink • Talk about how to have good oral health • Use tools with increasing control
Mathematics	• Spot things that are the same and things that are different • Begin to explore patterns and relationships
PSHE	• Talk about the effects of exercise on their body and why their bodies need to rest • Say what foods are healthy and unhealthy and explain why their bodies need a healthy, balanced diet • Explain how they change as they grow

In Reception, children will cover science knowledge and understanding through the topics in the table below:

	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Topics	My family and me Weather and Season Hibernation and Animals	Winter		Life Cycles Spring		Plants

Curriculum Knowledge and Skills Progression

Subject knowledge

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans	• I can identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • I can identify and name a variety of common animals that are carnivores, herbivores and omnivores • I can describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) • I can identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	• I can notice that animals, including humans, have offspring which grow into adults • I can find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • I can describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	• I can 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 • I can identify that humans and some other animals have skeletons and muscles for support, protection and movement	• I can describe the simple functions of the basic parts of the digestive system in humans • I can identify the different types of teeth in humans and their simple functions • I can construct and interpret a variety of food chains, identifying producers, predators and prey	• I can describe the changes as humans develop to old age	• I can identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • I can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • I can describe the ways in which nutrients and water are transported within animals, including humans
Key Vocabulary	*amphibians, fish, reptiles, mammals, birds, herbivore, omnivore, carnivore head, nose, ear, neck, shoulder, arm, elbow, wrist, hand, back, leg, knee, foot, wing, beak, tail, fin, sight, smell, touch, taste, hearing*	*survival, water, air, food reproduce, adult, baby, offspring, exercise, hygiene, balanced, diet*	*skeleton, skull, bones, muscles, movement, support, protection, nutrition*	*mouth, oesophagus, stomach, intestine, nutrients, absorb, canine, incisor, molar, producer, consumer, apex, predator, producers, prey*	*womb, foetus, embryo, gestation, baby, toddler, teenager, elderly, growth, development, puberty*	*circulatory system, oxygen, heart, lungs, cells, heart rate, saliva, Enzymes, transport, oxygenated, deoxygenated, lifestyle, drug*
Materials	• I can distinguish between an object and the material from which it is made • I can identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • I can describe the simple physical properties of a variety of everyday materials • I can compare and group together a variety of everyday materials on the basis of their simple physical properties	• I can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • I can find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching		**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	• I can 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 • I know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • I can use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • I can give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic	

					● I can demonstrate that dissolving, mixing and changes of state are reversible changes ● I can 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	
Key Vocabulary	***wood, plastic, glass, paper, metal, rock, hard, soft, rough, smooth, shiny, dull, bendy, stiff, properties, compare***	*brick, fabric, elastic, foil, solid, waterproof, absorbent, opaque, transparent, squash, bend, flexible, twist, stretch, push, pull*		*solid, liquid, gas, evaporation, condensation, particle, temperature, freezing, heating*	*conductivity (electrical and thermal), solubility, solution, dissolve, filter, evaporate, sieve, reversible, irreversible, burning, acid*	
Living things and their habitats		● I can explore and compare the differences between things that are living, dead, and things that have never been alive ● I can 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 ● I can identify and name a variety of plants and animals in their habitats, including microhabitats ● I can 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		● I can recognise that living things can be grouped in a variety of ways ● I can explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment ● I can recognise that environments can change and that this can sometimes pose dangers to living things	● I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird ● I can describe the life process of reproduction in some plants and animals	● I can 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 ● I can give reasons for classifying plants and animals based on specific characteristics
Key Vocabulary		*living, dead, habitat, woodland, meadow, hedgerow, pond, depend, microhabitats, food chain, producer, consumer*		*environment, habitat, classification key, threat, danger*	*life process, life cycles, reproduction*	*characteristic, classification, micro-organism, spine, live-young*
Plants	● I can identify and name a variety of common wild and garden plants, including deciduous and evergreen trees ● I can identify and describe the basic structure of a variety of	● I can observe and describe how seeds and bulbs grow into mature plants ● I can find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	● I can identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers ● I can explore the requirements of plants for life and growth (air, light, water, nutrients from soil,			

	common flowering plants, including trees		and room to grow) and how they vary from plant to plant ● I can investigate the way in which water is transported within plants ● I can explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal			
Key Vocabulary	*deciduous, evergreen, tree, leaf, flower, petals, fruit, bulb, seed, roots, stem, trunk, branches*	*growth, germinate, light, temperature, mature plants, healthy*	*Function, air, water, transportation, nutrients, soil, reproduction, seed formation, seed dispersal, pollination*			
Light			● I can recognise that we need light in order to see things and that dark is the absence of light ● I can notice that light is reflected from surfaces ● I can recognise that light from the sun can be dangerous and that there are ways to protect my eyes ● I can recognise that shadows are formed when the light from a light source is blocked by an opaque object ● I can find patterns in the way that the size of shadows change			● I can recognise that light appears to travel in straight lines ● I can 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 ● I can 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 ● I can use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them
Key Vocabulary			*light source, mirror, reflect, protection, shadow, blocked, transparent, translucent, opaque*			*Rainbow*
Forces and magnets			● I can compare how things move on different surfaces ● I can notice that some forces need contact between 2 objects, but magnetic forces can act at a distance ● I can observe how magnets attract or repel each other and attract some materials and not others ● I can compare and group together a variety of everyday materials on the basis of whether they are attracted to		●I can explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object ●I can identify the effects of air resistance, water resistance and friction, that act between moving surfaces ●I can recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	

			a magnet, and identify some magnetic materials ● I can describe magnets as having 2 poles ● I can predict whether 2 magnets will attract or repel each other, depending on which poles are facing			
Key Vocabulary			*force, contact, surface, magnetic, attract, repel, poles*		*air resistance, water resistance, friction, gravity, lever, gear, pulley, Newtons*	
Electricity				●I can identify common appliances that run on electricity ●I can construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers ●I can 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 ●I can recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit ●I can recognise some common conductors and insulators, and associate metals with being good conductors		● I can associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit ● I can 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 ● I can use recognised symbols when representing a simple circuit in a diagram
Key Vocabulary				*appliance, battery power, main power, circuit, series, cell, battery, wire, bulb, switch, break in circuit, conductor, insulator*		*voltage, components, buzzer, motor, circuit symbols, amps*
	<u>Seasonal changes</u> ● I can observe changes across the 4 seasons ● I can observe and describe weather associated with the seasons and how day length varies		**<u>Rocks</u>** ● I can compare and group together different kinds of rocks on the basis of their appearance and simple physical properties ● I can describe in simple terms how fossils are formed when things that have lived are trapped within rock	**<u>Sound</u>** ● I can identify how sounds are made, associating some of them with something vibrating ● I can recognise that vibrations from sounds travel through a medium to the ear ● I can find patterns between the pitch of a sound and features of the object that produced it ● I can find patterns between the volume of a sound and the	**<u>Earth and Space</u>** ●I can describe the movement of the Earth and other planets relative to the sun in the solar system ●I can describe the movement of the moon relative to the Earth ●I can describe the sun, Earth and moon as approximately spherical bodies ●I can use the idea of the Earth's rotation to explain day and night	**<u>Evolution and inheritance</u>** ● I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago ● I can recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents

				• I can recognise that soils are made from rocks and organic matter	strength of the vibrations that produced it • I can recognise that sounds get fainter as the distance from the sound source increases	and the apparent movement of the sun across the sky	• I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
	Key Vocabulary	*season, spring, summer, autumn, winter, month, year, day, night, sun, light, dark, warm, cold, sunshine, rain*		*fossil, sandstone, granite, marble, pumice, absorbent, crumble, sediment, layer, igneous, magma, lava, metamorphic, pressure*	*vibration, wave, volume, pitch, distance*	*Earth, sun, moon, solar system, axis of rotation, day, night, phases of the moon, star, sphere*	*adaptation, evolution, characteristics, genetics, survival, extinct*
Working scientifically	**Exploring questions through testing *(Question)***	• I can ask simple questions • I can perform simple tests	• I can ask simple questions and discuss how they can be answered in different ways. • I can explore the questions by performing simple tests.	• I can set up simple practical enquiries	• I can set up simple practical enquires that test fairly	• I can plan different types of scientific enquiries to answer questions	• I can plan different types of scientific enquiries to answer questions and recognise and control variables.
				• I can ask questions relevant to the learning • I can explore the questions through scientific enquires			
	Making observations *(Observation)*	• I can make observations and comment • I can identify and group	• I can make observations using simple equipment (tbc) and comment • I can identify and classify explaining connections	• I can make careful observations using a range of equipment	• I can make systematic observations taking measurements using standard units (thermometers and data loggers)	• I can take measurements, using a range of scientific equipment, with increasing accuracy and precision	• I can take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
	Answering questions and making conclusions *(Analysis and conclusions)*	• I can answer questions using ideas	• I can answer questions using ideas and observations	• I can use scientific evidence to answer questions • I can report on findings and results through oral and written explanations • I can make predictions for new values	• I can use scientific evidence to support their own findings • I can report on findings results and conclusions through oral and written explanations • I can suggest improvements and raise further questions	• I can report and present findings including: o Conclusions o Casual relationships o Use test results to make predictions of further tests	• I can report and present findings including: o Conclusion o Casual relationships o Trust in results o Use test results to make predictions to set up further fair tests
				• I can identify differences, similarities or changes related to simple scientific ideas and processes		• I can identify scientific evidence that has been used to support or refute ideas or arguments	
	Gathering and recording data *(Present)*	• I can gather and note down findings to answer questions	• I can gather and record data to answer questions	• I can gather and record data in a variety of ways to answer questions • (scientific language, drawings, labelled diagrams)	• I can gather, record and present data to answer questions (keys, bar charts and tables)	• I can record data using scientific diagrams and labels, tables and scatter graphs	• I can record data using classification keys, bar and line graphs
	Key Vocabulary	*question, answer, observe, equipment, identify, sort, group, compare, differences, similarities, describe, results, diagram, chart, analysis*		*Enquiry, fair testing, scientific evidence, predictions, scientific processes, key, bar chart, table, units, conclude, evidence, improve*		*Plan, variables, measurements, accuracy, repeat readings, patterns, scatter graphs, bar graph and line graphs, casual relationships, trust, support, refute*	