The Science Curriculum at Lighthouse Schools Partnership

Science at Lighthouse Schools Partnership

We believe that 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; all pupils at LSP are taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils are taught to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are taught to understand how science can be used to explain what is occurring, predict how things will behave and analyse causes.

Our science curriculum aims to ensure that all pupils:

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

Scientific knowledge and conceptual understanding

The long-term curriculum overview describes a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop a secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data.

The nature, processes and methods of science

'Working scientifically' specifies the understanding of the nature, processes and methods of science. It should not be taught as a separate strand. Within the LSP science curriculum 'working scientifically' is embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions including: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Within units of work pupils seek answers to questions through collecting, analysing and presenting data.

An overview of progression through our vertical concepts

Physics

What happens when you push or pull an object?

Where does light come from?

What happens when you stretch or squash a material like clay?

How do magnets attract or repel each other?

Why do shadows change size during the day?

What happens when you add more batteries to a circuit?

Why do sounds get quieter as you move away?

Why do we have day and night?

Chemistry

What are objects like spoons, tables, and clothes made of?

Can you describe what happens when ice melts into water?

Which materials are good conductors of heat or electricity?

What happens to a candle when it burns? Is this change reversible or irreversible?

What do you see when you mix vinegar and baking soda? What causes the bubbles?

Biology

What happens to a seed when you plant it in soil and water it?

What do animals eat? Are they carnivores, herbivores, or omnivores?

Can you name the five senses and what they help you do?

What are microorganisms, and where can you find them?

What is adaptation, and how does it help animals survive?

	Biology			Physics	
EYFS	**Plants and animals** Describe what plants and animals need to survive and grow	**Habitats** Describe what a habitat is	**Seasons** Observe and describe changes across the seasons	**Early forces and changes of state** Observing push, pull, floating and sinking and changes with ice	**Light and dark** Describing sources of light and observing shadows

	Biology				Chemistry
	Plants	**Animals including humans**	**Living things and habitats**	**Seasonal change (Physics)**	**Materials**
Y1	**Plants and trees** Identify and name common plants and their basic structure	**Body Parts** Identify, name, draw, and label the basic parts of the human body	**Different types of animals** Identifying and comparing common animals	**Seasons** Observe changes across the seasons and record findings	**Everyday materials** Exploring properties and uses of materials
Y2	**Growing plants** Investigating growth from Seeds and bulbs linking to the need for water, light and warmth	**Animal survival** Recognising that animal offspring grow into adults as long as their basic needs are met	**Where things live and grow** Understanding that living things live in habitats that meet their basic needs and that these are different for different living things		**Material properties** Investigating the properties and uses of materials and exploring how to change the shape of solid objects

	Biology			Chemistry	Physics				
	Plants	**Animals including humans**	**Living things and habitats**	**Materials**	**Forces**	**Sound**	**Light**	**Solar system**	**Electricity**
Y3	**Plant life cycles** Investigating plant life cycles, nutrition, the requirements for growth and their	**Diet and exercise** Understanding the importance of exercise and nutrition. Investigating		**Rocks, soils and fossils** Understanding different types of rocks and soils	**Forces and Magnets** Exploring forces and understanding magnetism		**Light and shadows** Investigating how light travels and how shadows are formed		

	importance to our environment	the function of skeletons & muscles							
Y4		**Food and digestion** Exploring the digestive system and teeth	**Habitats around the world** Studying how different habitats support a range of animals and plants	**Changing States** Understanding the different states of matter and how they can change		**Changing sounds** Investigating how sound is made and how it travels			**Building circuits** Understanding circuits and how electricity is conducted

	Biology			**Chemistry**	**Physics**				
	Plants	**Animals including humans**	**Living things and habitats**	**Materials**	**Forces**	**Sound**	**Light**	**Solar system**	**Electricity**
Y5	**Life cycles** Exploring the life cycle of animals and plants including non-flowering plants			**Changing Materials** Understanding reversible and irreversible changes	**Working with and against forces** Investigating forces such as gravity, air resistance, and friction			**The Solar System** Studying the Earth's movement in relation to the sun and the moon	
		Human changes Understanding the stages of a human life cycle including reproduction							
Y6	**The Theory of Evolution** Understanding inheritance and adaptation		**Classification Studying** grouping living things including microorganisms				**How light travels** Investigating how light travels and		**Changing circuits** Understanding how to build electrical

		Body systems Exploring the importance of healthy eating and exercise					how it can be reflected and refracted		circuits to change their outputs

LSP Primary Science Long-Term Plan Overview

This long-term plan outlines the primary science curriculum from EYFS to Year 6. It is designed to ensure a progressive development of scientific knowledge, skills, and understanding, aligned with key curriculum goals. Each year builds on the knowledge and skills acquired in the previous years, promoting cumulative learning and a deepening of scientific understanding.

Year group and term	National Curriculum/ Development Matters Mapping	Substantive Knowledge	Disciplinary Knowledge	Enquiry Question	Important scientists
EYFS Terms 1-6	• Understand the effect of changing seasons on the natural world around them	**Biology and physics: Seasons** Observe and describe changes across	Communication: speaking and listening	How do seasons affect the world around us?	
EYFS Term 2	• Observe and interact with natural processes, such as ice melting, a sound causing a vibration, light travelling through transparent material, an object casting a shadow, a magnet attracting an object and a boat floating on water	**Physics: Light and dark** Describing sources of light and observing shadows	Communication: speaking and listening	What is the difference between light and dark?	
EYFS Term 4	• Name and describe some plants and animals children are likely to see, encouraging children to recognise familiar plants and animals whilst outside	**Biology: Plants and animals** Describe what plants and animals need to survive and grow	Communication: speaking and listening	What do plants and animals need to live and grow?	
EYFS Term 5	• Observe and interact with natural processes, such as ice melting, a sound causing a vibration, light	**Physics: Early forces and changes of state**	Communication: speaking and listening	What is a force and how can ice change?	

	travelling through transparent material, an object casting a shadow, a magnet attracting an object and a boat floating on water	Observing push, pull, floating and sinking			
EYFS Term 6	• Recognise some environments that are different from the one in which they live • Name and describe some plants and animals children are likely to see, encouraging children to recognise familiar plants and animals whilst outside	**Biology: Habitats** Describe what a habitat is	Communication: speaking and listening	What is a habitat?	
Year 1 Term 1	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • Identify and describe the basic structure of common flowering plants, including trees	**Biology: Plants** Identify and name common plants and their basic structure	Asking questions Making observations Recording and communicating findings	How can we identify different plants and trees in our local environment and describe their main parts?	**Maria Sibylla Merian** (1647-1717) was a scientific illustrator most renounced for her detailed drawings of plants
Year 1 Term 2	• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	**Biology: Animals, including humans** Identify, name, draw, and label the basic parts of the human body	Asking questions Making observations Recording and communicating findings	How are our senses connected to different parts of our body?	**Miller Hutchinson** (1876-1944) invented the first hearings aid
Year 1 Term 3	• Distinguish between an object and the material from which it is made • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • Describe the simple physical properties of a variety of everyday materials • Compare and group together a variety of everyday materials on	**Chemistry: Everyday materials** Exploring properties and uses of materials	Asking questions Conducting investigations Recording and communicating findings	What objects are made of different materials, and how do they feel and look? What is the best material for….?	**John Dunlop** (1840–1921) inventor of the pneumatic rubber tyre

	the basis of their simple physical properties				
Year 1 Term 4	• Observe changes across the four seasons • Observe and describe weather associated with the seasons and how day length varies	**Biology and Physics: Seasonal changes** Observe changes across the seasons and record findings	Predicting and hypothesising Making observations Recording and communicating findings	What changes do we observe in the weather throughout the year? How does the weather and the length of the day change with each season throughout the year?	**Marie Tharp** (1920–2006) explored how climate and weather affect the Earth
Year 1 Term 5/6	• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • Identify and name a variety of common animals that are carnivores, herbivores and omnivores • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)	**Biology: Animals, including humans** Identifying and comparing common animals	Asking questions Making observations Recording and communicating findings	How are baby animals similar to and different from their parents? How can we identify and compare animals?	**Jane Goodall** (1934–Present) is a primatologist known for her work with chimpanzees
Year 2 Term 1/2	• Notice that animals, including humans, have offspring which grow into adults • Find out about and describe the basic needs of animals for survival (water, food and air) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	**Biology: Animals, including humans** Recognising that animal offspring grow into adults as long as their basic needs are met	Asking questions Making observations Recording and communicating findings	What do animals, including humans, need to survive and grow healthily?	**Florence Nightingale** (1820–1910): Known as the founder of modern nursing
Year 2 term 3	• Identify and compare the suitability of a variety of everyday materials , including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses	**Chemistry: Uses of everyday materials** Investigating the properties and uses of	Predicting and Hypothesising Making observations	What makes a material suitable for its purpose?	**Charles Mackintosh** (1766 - 1843) invented the waterproof raincoat

	• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	materials and exploring how to change the shape of solid objects	Conducting investigations Recording and communicating findings		
Year 2 term 4	• Observe and describe how seeds and bulbs grow into mature plants • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	**Biology: Plants** Investigating growth from seeds and bulbs linking to the need for water, light and warmth	Asking questions Making Observations Conducting investigations Recording and communicating findings	What do plants need to grow and survive?	**Beatrix Potter** (1866–1943) was also a passionate botanist who studied fungi and plants
Year 2 term 5/6	• Explore and compare the differences between things that are living, dead, and things that have never been alive • 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 • Identify and name a variety of plants and animals in their habitats • Describe how animals obtain their food from plants and other animals and identify and name different sources of food	**Biology: Living things and their habitats** Understanding that living things live in habitats that meet their basic needs and that these are different for different living things	Asking questions Recording and Communicating Findings	Why do living things live in the habitat that they do?	**Edward Osborne Wilson** (1929–2021) is a biologist known for his work on biodiversity

Year 3 Term 1	• Identify that animals need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • Identify that humans and some other animals have skeletons and muscles for support, protection and movement	**Biology: Animals, including humans** Understanding the importance of exercise and nutrition. Investigating the function of skeletons & muscles	Asking questions and defining problems Analysing data and drawing conclusions Communicating scientifically	What do humans need to stay fit and healthy?	**Elsie Widdowson** (1906-2000) was a British dietician and nutritionist **Greg Whyte** (born 1967) is a former Olympian and a sports scientist
Year 3 Term 2	• Recognise that they need light in order to see things and that dark is the absence of light • Notice that light is reflected from surfaces • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes • Recognise that shadows are formed when the light from a light source is blocked by an opaque object • Find patterns in the way that the size of shadows changes	**Physics: Light** Investigating how light travels and how shadows are formed	Planning and carrying out investigations Analysing data and drawing conclusions Evaluating evidence and scientific explanations Predicting and hypothesising	How do shadows form and how can I change their appearance?	**Ibn al-Haytham** (born in 965BC) was the first person to prove that we see because light reflects off objects and into our eyes **Percy Shaw** (1890 - 1976) was an engineer who designed the Cat's Eye
Year 3 Term 3	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • Describe in simple terms how fossils are formed when things that have lived are trapped within rock • Recognise that soils are made from rocks and organic matter	**Chemistry: Rocks** Understanding different types of rocks and soils	Asking questions and defining problems Planning and carrying out investigations Analysing data and drawing conclusions Communicating scientifically	How are rocks and soils formed?	**Mary Anning** (1799-1847) was a famous British fossil hunter **Dr Anjana Khatwa** is a geologist

Year 3 Term 4	• Compare how things move on different surfaces • Notice that some forces need contact between two objects, but magnetic forces can act at a distance • Observe how magnets attract or repel each other and attract some materials and not others • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • Describe magnets as having two poles • Predict whether two magnets will attract or repel each other, depending on which poles are facing	**Physics: Forces and Magnets** Exploring forces and understanding magnetism	Planning and carrying out investigations Analysing data and drawing conclusions Evaluating evidence and scientific explanations Communicating scientifically	Why do magnets attract or repel certain materials?	**William Gilbert** (1544-1603) the first person to prove that the earth was a giant magnet **Mary Somerville** (1780-1872) the first woman to be elected to the Royal Institute of Physics
Year 3 Term 5/6	• Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • Investigate the way in which water is transported within plants • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	**Biology: Plants** Investigating plant life cycles, nutrition, the requirements for growth and their importance to our environment	Asking questions and defining problems Planning and carrying out investigations Analysing data and drawing conclusions Communicating scientifically	What do plants need to grow well in different conditions?	**Katherine Esau** (1898-1997) worked on the structure and workings of plants **Agnes Arber** (1879–1960) studied plant structures
Year 4 Term 1	• Identify how sounds are made, associating some of them with something vibrating	**Physics: Sound**	Planning and carrying out investigations	How does sound travel?	**Alexander Graham Bell** (1847-1922**)** invented the telephone in 1876

	• Recognise that vibrations from sounds travel through a medium to the ear • Find patterns between the pitch of a sound and features of the object that produced it • Find patterns between the volume of a sound and the strength of the vibrations that produced it • Recognise that sounds get fainter as the distance from the sound source increases	Investigating how sound is made and how it travels	Analysing data and drawing conclusions Evaluating evidence and scientific explanations		**Robert Boyle** (1627–1691) discovered that sound couldn't travel in a vacuum
Year 4 Term 2	• Identify common appliances that run on electricity • Construct a simple series electrical circuit, identifying and naming its basic parts , including cells, wires, bulbs, switches and buzzers • Identify whether or not a lamp will light in a simple series circuit • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • Recognise some common conductors and insulators, and associate metals with being good conductors	**Physics: Electricity** Understanding circuits and how electricity is conducted	Asking questions and defining problems Analysing data and drawing conclusions Evaluating evidence and scientific explanations	Why do circuits need to be complete?	**Thomas Edison** (1847–1931) invented the light bulb **Lewis Howard Latima** (1848-1928-) developed an electric street lighting system
Year 4 Term3/4	• 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	**Chemistry: States of matter** Understanding the different states of matter and how they can change	Asking questions and defining problems Analysing data and drawing conclusions Evaluating evidence and scientific explanations	How do solids, liquids and gases change from one state to another?	**Dorothy Hodgkin (**1910-1994**)** is the only British woman to have won the Noble Prize for Chemistry **Daniel Gabriel Fahrenheit** (1686 – 1736) invented the

	the water cycle and associate the rate of evaporation with temperature		Communicating scientifically		mercury-in glass thermometer
Year 4 Term 5	• Describe the simple functions of the basic parts of the digestive system in humans • Identify the different types of teeth in humans and their simple functions • Construct and interpret a variety of food chains, identifying producers, predators and prey	**Biology: Animals including humans** Exploring the digestive system and teeth	Asking questions and defining problems Planning and carrying out investigations Evaluating evidence and scientific explanations	How do humans eat and digest food?	**Pierre Fauchard** (1679-1761) wrote the first complete scientific description of dentistry **William Beaumont**, (1785 - 1853) was an army surgeon, was the first person to observe and study human digestion as it occurs in the stomach
Year 4 Term 6	• Recognise that living things can be grouped in a variety of ways • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • Recognise that environments can change and that this can sometimes pose dangers to living things	**Biology: Living things and their habitats** Studying how different habitats support a range of animals and plants.	Asking Questions and Defining Problems Analysing Data and Drawing Conclusions Communicating Scientifically	How can we classify living things?	**Rachel Carson** (1907-1964) founding member of ecological movement **Sylvia Earle** (1935–Present) is a marine biologist
Year 5 Term1/2	• Compare and group together everyday materials on the basis of their properties , including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • Use knowledge of solids, liquids and gases to decide how mixtures	**Chemistry: Properties and changes of materials** Understanding reversible and irreversible changes	Asking questions and defining problems Planning and carrying out Investigations Analysing data and drawing conclusions	Which changes are reversible and which are irreversible?	**Hypatia** (355-415) a famous Greek mathematician who discovered that elements can take different forms (ice/water/steam) but still be the same element **Ahmed Zewail** (1946-2016) was known as the father of

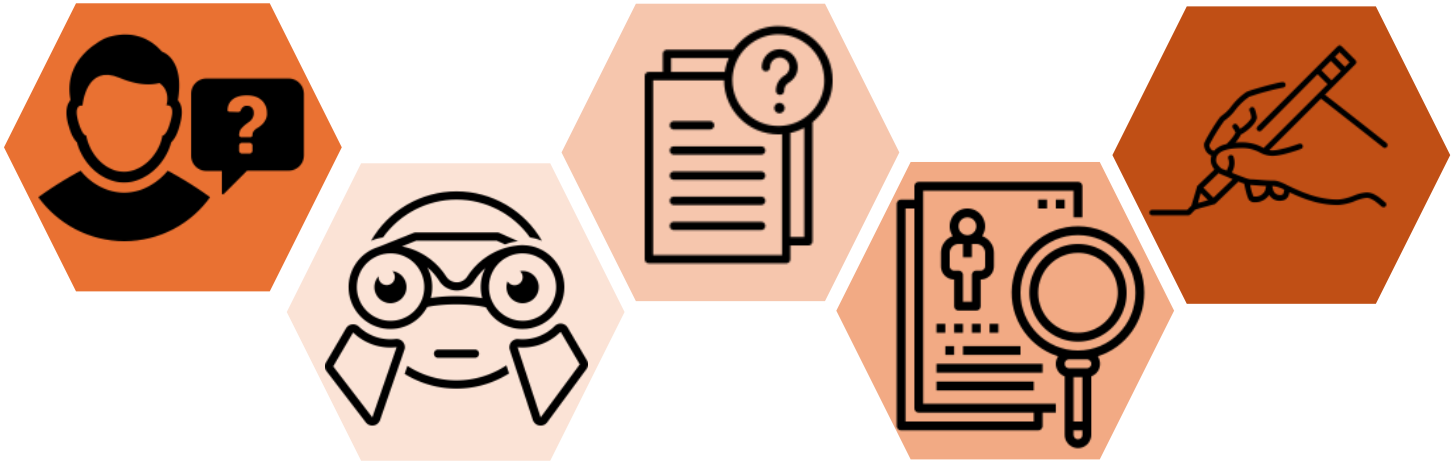
	might be separated, including through filtering, sieving and evaporating • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials , including metals, wood and plastic • Demonstrate that dissolving, mixing and changes of state are reversible changes • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible , including changes associated with burning and the action of acid on bicarbonate of soda				femtochemistry which is the study of chemical reactions over very short periods of time
Year 5 Term 3	• Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	**Physics: Earth and space** Studying the Earth's movement in relation to the Sun and the Moon.	Planning and carrying out investigations Evaluating evidence and scientific explanations Communicating scientifically	How do planets move around the Sun?	**Galileo** (1564-1642) invented the optical telescope **Tim Peaks**(born in 1972) was the eighth British person to go into space and the first official British astronaut to walk in space

Year 5 Term 4	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect	**Physics: Forces** Investigating forces such as gravity, air resistance, and friction.	Planning and carrying Out investigations Analysing data and drawing conclusions Evaluating evidence and scientific explanations	How do forces affect objects' movement?	**Sir Isaac Newton** (1642-1726) first to explained the force **Brahmagupta** (598-668AD) was a mathematician and astronomer who was the first scientist to talk about the notion of gravity
Year 5 Term 5	• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • Describe the life process of reproduction in some plants and animals	**Biology: Living things and their habitats** Exploring the life cycle of animals and plants including non-flowering plants	Asking questions and defining problems Analysing data and drawing conclusions Communicating scientifically	How do living things reproduce?	**Sir David Attenborough** (1926–Present)**,** a naturalist, who has dedicated his life to the study of natural history **Wangari Maathai** (1940–2011) is an active environment conservationist
Year 5 Term 6	• Describe the changes as humans develop to old age	**Biology:** Animals including humans Understanding the stages of a human life cycle including reproduction	Asking questions and defining problems Analysing data and drawing conclusions Communicating scientifically	What happens to humans as they age?	**Robert Winston** (.1940-present) is a professor of fertility and reproduction in humans **Virginia Apgar** (1909–74). developed the Apgar Score System, a method of evaluating the well-being of new-born's
Year 6 Term 1	• Recognise that light appears to travel in straight lines • Use the idea that light travels in straight lines to explain that	**Physics: Light** Investigating how light travels and how it can	Asking questions and defining problems	How do we see objects?	**Ḥasan Ibn al-Haytham** (965–1040) is referred to as "the father of modern optics

	objects are seen because they give out or reflect light into the eye • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	be reflected and refracted.	Planning and carrying out investigations Analysing data and drawing conclusions Evaluating evidence and scientific explanations Communicating scientifically		**Thomas Young** (1773–1829) was a physicist who helped explain how light behaves in different situations
Year 6 Term 2	• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit • Compare and give reasons for variations in how components function • Use recognised symbols when representing a simple circuit in a diagram	**Physics: Electricity** Understanding how to build electrical circuits to change their outputs	Asking questions and defining problems Planning and carrying out investigations Analysing data and drawing conclusions Communicating scientifically	What effects the output of an electrical circuit?	**Mildred S Dresselhaus** (1930-2017) developed rechargeable batteries **Nikola Tesla** (1856-1943) without his development of a type of electrical circuit (AC) we would not have electric lights in our homes
Year 6 Term 3	• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	**Biology: Evolution and inheritance** Understanding inheritance and adaptation	Asking questions and defining problems Evaluating evidence and scientific explanations Communicating scientifically	What evidence is there to support the theory of evolution?	**Charles Darwin (1809-1882)** was an English scientist best known for his theory of evolution **Emma Dunne** is a palaeobiologist who investigates how ancient climate change affected the evolution of different species

Year 6 Term 4	• 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 • Give reasons for classifying plants and animals based on specific characteristics	**Biology: Living things and their habitats** Studying and grouping living things including microorganisms	Asking questions and defining problems Analysing data and drawing conclusions Communicating scientifically	How are living things classified, and what similarities and differences do they have?	**Carl Linnaeus** (1707-1778) was a botanist, zoologist and physician famous for simplifying the naming system scientists use to describe the millions of species on Earth **Agnes Arber** (1879-1960) was a botanist and the first woman to become a fellow of the Royal Society
Year 6 Term 5/6	• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • Describe the ways in which nutrients and water are transported within animals, including humans	**Biology: Animals including humans** Exploring the importance of healthy eating and exercise	Asking questions and defining problems Evaluating evidence and scientific explanations Communicating scientifically	How does the circulatory system work to help support our body's functions?	**Barbara Casadei** (1959-present day) is a researcher helping The **British Heart Foundation** find cures for cardiovascular conditions **William Harvey** (1578-1657) was the doctor who discovered the nature of blood circulation and the function of the heart as a pump)

Progression of Disciplinary Skills for LSP Primary Science Curriculum



The following grid outlines the progression of key disciplinary skills across the primary science curriculum from Reception to Year 6. These skills are designed to develop students' abilities to think scientifically and engage in scientific inquiry.

This skills progress document ensures that students develop a thorough understanding and proficiency in disciplinary science skills as they progress through to the end of Key Stage 2. Each year builds on the previous year's learning, ensuring a comprehensive and cohesive science education.

Integration with Substantive Knowledge:

Teaching Sequence: Each year's teaching sequence introduces new substantive knowledge aligned with the national curriculum. For example, in Year 3, students learn about rocks and soils, which is complemented by developing skills in conducting investigations and analysing rock samples.

Progression: Disciplinary skills progress alongside substantive knowledge. As students advance through the curriculum, they not only deepen their understanding of scientific concepts but also enhance their ability to think critically, solve problems, and communicate effectively about science.

By aligning disciplinary skills with the teaching sequence of substantive knowledge, primary science education fosters a holistic approach to scientific learning, preparing students to engage confidently and proficiently in scientific inquiry and discovery.

The Natural World		
Nursery (3 and 4)	**Reception**	**ELG**
▪ Use all their senses in hands-on exploration of natural materials	▪ Explore the natural world around them ▪ Observe and interact with natural processes, such as ice melting, a sound causing a vibration, light	**Children at the expected level of development will:**

▪ Explore collections of materials with similar and/or different properties ▪ Explore how things work ▪ Plant seeds and care for growing plants ▪ Understand the key features of the life cycle of a plant and an animal ▪ Begin to understand the need to respect and care for the natural environment and all living things ▪ Explore and talk about different forces they can feel ▪ Talk about the differences between materials and changes they notice	travelling through transparent material, an object casting a shadow, a magnet attracting an object and a boat floating on water ▪ Describe what they see, hear and feel whilst outside ▪ Name and describe some plants and animals children are likely to see, encouraging children to recognise familiar plants and animals whilst outside ▪ Recognise some environments that are different from the one in which they live ▪ Understand the effect of changing seasons on the natural world around them	▪ Explore the natural world around them, making observations and drawing pictures of animals and plants ▪ Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class ▪ Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter
Communication – listening and attention		
Nursery (3 and 4)	**Reception**	**ELG**
▪ Enjoy listening to longer stories and can remember much of what happens ▪ Understand 'why' questions, like: "Why do you think the caterpillar got so fat?"	▪ Understand how to listen carefully and why listening is important ▪ Learn new vocabulary ▪ Listen to and talk about stories to build familiarity and understanding ▪ Listen to and talk about selected non-fiction to develop a deep familiarity with new knowledge and vocabulary	**Children at the expected level of development will:** ▪ Listen attentively and respond to what they hear with relevant questions, comments and actions when being read to and during whole class discussions and small group interactions ▪ Make comments about what they have heard and ask questions to clarify their understanding ▪ Hold conversation when engaged in back-and-forth exchanges with their teacher and peers
Communication – speaking		
Nursery (3 and 4)	**Reception**	**ELG**
▪ Use a wider range of vocabulary ▪ Use longer sentences of four to six words. ▪ Develop their communication but may continue to have problems with irregular tenses and plurals, such as 'runned' for 'ran', 'swimmed' for 'swam' ▪ Be able to express a point of view and to debate when they disagree with an adult or a friend, using words as well as actions	▪ Use new vocabulary through the day ▪ Ask questions to find out more and to check they understand what has been said to them ▪ Articulate their ideas and thoughts in well-formed sentences ▪ Connect one idea or action to another using a range of connectives ▪ Describe events in some detail	**Children at the expected level of development will:** ▪ Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary ▪ Offer explanations for why things might happen, making use of recently introduced vocabulary from stories, non-fiction, rhymes and poems when appropriate

▪ Start a conversation with an adult or a friend and continue it for many turns ▪ Use talk to organise themselves and their play: “Let’s go on a bus... you sit there... I’ll be the driver.”	▪ Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen. ▪ Engage in non-fiction books	▪ Express their ideas and feelings about their experiences using full sentences, including use of past, present, and future tenses and making use of conjunctions, with modelling and support from their teacher.

Skill Areas KS1	Year 1	Year 2
Asking Questions	Begin by asking simple questions about the natural world, such as "Why do plants need water?"	Develop more specific questions based on their observations, such as "How do animals adapt to their habitats?"
Making Observations	Learn to use their senses to make basic observations about plants, animals, and materials.	Refine their observational skills to notice more details and patterns in the natural world, such as changes in the seasons.
Predicting and Hypothesising	Begin to make simple predictions based on their observations, e.g., predicting what will happen when seeds are planted.	Develop hypotheses to explain natural phenomena, such as why some materials float and others sink.
Conducting Investigations	Participate in structured activities and experiments to explore scientific concepts, e.g., investigating which materials are waterproof	Conduct more independent investigations, planning and carrying out fair tests to answer scientific questions
Recording and Communicating Findings	Start recording their observations using drawings, simple charts, and labels	Begin to use written descriptions, tables, and diagrams to present their findings clearly to others.
End of year outcomes	Children develop basic questioning, observational, and prediction skills through hands-on activities and simple experiments.	Skills progress to include more independent investigations and improved communication of findings

Skill areas KS2	Year 3	Year 4	Year 5	Year 6
Asking Questions and Defining Problems	learn to ask relevant questions and recognize when and how to use different types of scientific questions.	Develop more specific and scientifically driven questions and define problems to investigate. E.g.: "How does the environment affect the types of animals found there?"	Formulate testable hypotheses and define complex problems for investigation. E.g. "How do gravity and air resistance affect falling objects?"	Ask complex questions and define significant scientific problems for investigation. E.g. "How do inherited traits influence an organism's survival?"

Planning and Carrying Out Investigations	Begin to plan investigations, identify variables, and carry out simple, structured tests	Design investigations considering fairness, identifying variables, and predicting outcomes. E.g. "How does temperature affect the state of water?"	Plan detailed investigations with consideration for controlling variables and ensuring repeatability. E.g. : "What materials are best for thermal insulation?"	Design comprehensive investigations, consider ethical issues, and ensure safety in procedures. E,g. : "How does changing the circuit components affect the brightness of a bulb?"
Analysing Data and Drawing Conclusions	Collect data using simple equipment, record observations, and begin to identify patterns	Use standard units to record measurements and identify relationships in data	Analyse patterns in data and use results to support scientific conclusions	Analyse data rigorously, use statistical methods where appropriate, and draw well-supported conclusions
Evaluating Evidence and Scientific Explanations	Compare findings with predictions and suggest improvements for investigations	Critically evaluate methods and suggest alternative approaches	Evaluate the validity and reliability of evidence and scientific explanations.	Critically evaluate scientific evidence and explanations, considering alternative interpretations
Communicating Scientifically	Use basic scientific vocabulary to explain observations and results	Present data in various forms, including graphs and charts, and use scientific language accurately	Communicate complex scientific ideas using precise vocabulary and various presentation methods	Use advanced scientific vocabulary and a range of communication methods to present scientific ideas
End of year outcomes	Introduction to more structured scientific enquiry, planning investigations, and analysing data to draw basic conclusions.	Further development in planning investigations, analysing data with greater complexity, and beginning to evaluate evidence.	Advanced skills in questioning, evaluating evidence critically, and communicating scientific knowledge effectively.	Mastery of all disciplinary skills, including the ability to define complex problems, conduct thorough investigations, and communicate scientific findings confidently.

Planning and delivering the curriculum

All units within the curriculum are planned around an enquiry question that pupils will answer by the end of the unit of work as a result of direct instruction, guided practice and independent application. All lessons have been intentionally chosen and sequence to support pupils to develop a rich schema within the unit being taught and the overall concept over time. This means that sequences of learning are carefully designed to ensure that the identified knowledge is focussed within the scientific concept being taught and stops us from teaching a surface level fact file on the rainforest or teaching a meaningless collection of facts about materials.

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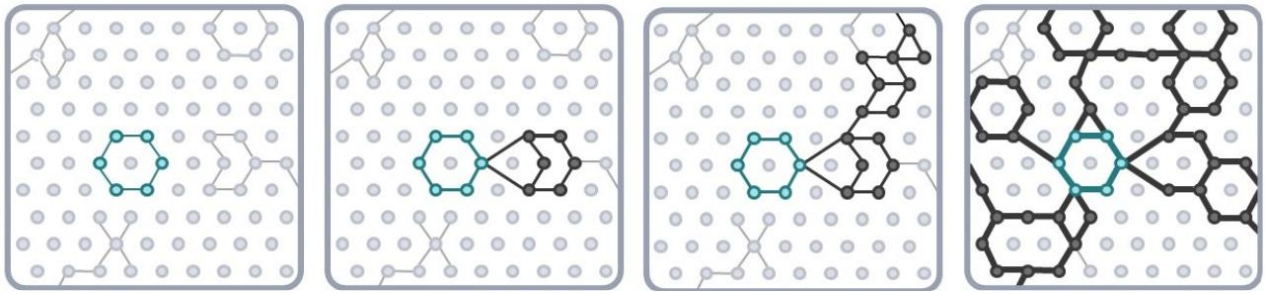


An illustration of how knowledge and understanding builds across a unit and over time through our units of work

A journey through the LKS2 unit 'How are rocks and soils formed?'

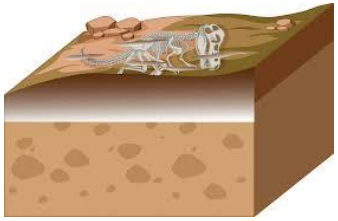
Compare and group different kinds of rocks based on their appearance and physical properties

Identify and describe the physical properties that distinguish different types of rocks to classify them

Plan and carry out investigations to explore fossil formation

Recognise and describe the components of soil

Analyse the effects of weathering and erosion on rocks and soils over time



Applying the LSP Pedagogy to Science

At LSP our pedagogical approach is based on Barak Rosenshine's Principles of Instruction. All lessons in the science curriculum are designed to be taught using this approach because when skilfully applied this will ensure that every pupil receives high quality, evidence informed teaching in every lesson, every day.

Our core pedagogical approach includes but is not limited to:

- A rigorous and sequential approach to the curriculum with a long-term approach to learning over time.
- All staff demonstrating through actions a culture of belief that everyone can achieve, succeed and master the taught programme of study.
- Teaching and learning which draws on cognitive learning theory and is demonstrated through action.
- An explicit instruction approach to teaching and learning which is implemented consistently and reflectively by all members of staff to enable mastery of the taught programme of study
- Use of 'I do, we do, you do'. This will ensure that children are clear what they need to do; have been shown how to do it; have appropriate scaffolds when needed and receive effective feedback to keep on track.
- Carefully planned adaptations to teaching and learning for those who need this.
- Regular, reflective, purposeful use of assessment for learning to ensure that teaching is effective so that children are successful.
- Active engagement and participation of all pupil throughout the learning journey.
- A collective approach to ensuring that children 'keep-up' with their learning as a result of well-planned and strategically implemented high-quality instruction.

LSP Assessment Principle	LSP Assessment Procedures to Support this Principle
Daily/last lesson review	Learning from the previous lessons can be resurfaced. This is a powerful technique for building fluency and confidence and is important when we are about to introduce new learning.
Weekly /monthly/ termly review	Previously learned material is not forgotten and frequent revisiting of a range of materials forms a more extensive schemas in our students.
Questioning and checking for understanding	**We ask more questions, to more students, in more depth so that...**
Ask questions	Effective questioning lies at the heart of great teaching and is a highly interactive, dynamic and responsive process.
Checking for understanding	To give us feedback about how well the material we've taught has been understood, and to ensure misconceptions are flushed out and tackled.
Sequencing concepts; modelling and scaffolding	**We plan these elements of instruction before we get into the classroom so that ...**
Present new materials using small steps	Practice with each stage by breaking down our concepts and procedures into small steps so that each can be practised.
Provide models	Models are a central feature of providing good explanations and help students to learn to solve problems faster.
Provide scaffolds for difficult tasks	Students develop expertise so scaffolds can be gradually withdrawn.
Stages of practice	**We present new material in small steps with student practice after each step so that...**
Guide student practice	We closely supervise students' initial attempts to build confidence and make sure they don't make too many errors.
Obtain a high success rate	We set tasks that, with sufficient practice, allow students a high success rate. Tasks with high success rates allow students to reinforce error free, secure learning, improving fluency.
Independent practice	We make time for students to do the things they've been taught (when they are ready!)

Retrieval practice

In LSP science lessons every lesson begins with a 5-10 minutes (including feedback) 'Do Now' activity. This is a retrieval practice starter based on the current and previous units of work. The principle of this is based on practicing what we did yesterday, earlier this week, last week and in the last unit. Pupils complete these activities on whiteboards before moving on to the main session.

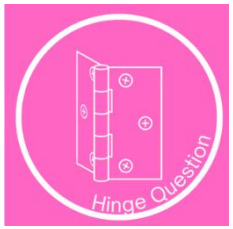
Knowledge organisers

Every unit of work has a pupil knowledge organiser, this is one of the resources which teachers use deliberately with pupils as part of the approach to practice and retrieval. It is recommended that the knowledge organiser is stuck into the science book at the beginning of a unit. These demarcates the beginning of the unit and means it is an accessible document for pupils during the unit. Knowledge organisers contain key information that children should have learnt by the end of a learning sequence, and contain key images; therefore, they act as a tool in supporting pupils to retain and retrieve knowledge and build a secure schema. They are designed to be quizzable (to build connections across knowledge rather than facts in isolation) and should be used with pupils during the unit particularly as part of 'Do Now's' and during assessments at the end of the unit.

Assessment within Science

Assessment should check that curriculum content is learnt and committed to long-term memory. Pupils should be able to demonstrate that they know more, remember more and are able to do more as a result of the explicit teaching they have encountered. Teachers should use formative and summative assessment to build an understanding of pupil's prior knowledge and performance to help draw out common misconceptions or gaps which can be addressed in future curriculum planning and delivery.

When assessment and feedback is sharply focused on the curriculum, and used as a tool of good pedagogy, teachers can maximise its value to improve the responsiveness of their teaching. This is important because we need to capture information on pupil achievement of the range of historical knowledge and skills that pupils will have been taught and have learnt within the context and concept being studied.



Regular formative assessment

Throughout units it is essential that teachers regularly check for understanding using a range of strategies. This enables teachers to identify gaps in pupils knowledge and understanding so they can respond in an appropriate way to secure achievement of core concepts, knowledge and skills. Lessons across units have been intentionally designed so that:

- pupils engage in regular low stakes testing of knowledge and deliberate practise of skills taught to date. This takes place at the beginning of each lesson through 'do now' tasks. These tasks have been crafted so that pupils retrieve knowledge from previous lessons and units; as a result, knowledge is more likely to embed in pupils long-term memory.
- teachers use a variety of ways to make sure that pupils are keeping up with the learning through opportunities for cold calling, think, pair, share, hinge questions and white board work etc. Teachers use the information gained to make in the moment decisions about next steps so that learning sequences can be adapted appropriately.
- pupils engage in 'exit tickets' based on knowledge gained during the session. This is another way to engage in low stakes quizzes or to make links in learning within and across sessions.

At the end of each session teachers review learning including outcomes produced by individuals, groups and the class as a whole and use this information to inform future sessions to ensure that pupils stay 'on track' throughout the unit.

Summative assessment

Summative assessment in science allows teachers to identify whether curriculum goals have been achieved. When a unit of learning is completed, teachers collect and connect the information and evidence gained from: outcomes produced in sessions over time; active engagement and demonstration of understanding in lessons to assess whether pupils have achieved the defined knowledge and skills within the concept for the taught unit.

Information gained from these sources is used by the teacher to record using the assessment tracking grids pupils who are working at or above the age related expectations.

Adapting the curriculum for pupils with SEND in Science

We believe that all pupils should be able to access a full curriculum offer. Teachers make adaptions for pupils with SEND based on knowledge of the pupils needs and in line with individual target plans. Examples of adaptions which may be taken include but are not limited to:

- Adaptive teaching takes place.
- For sensory or physically impaired pupils, science learning may necessitate enlarging texts, using clear fonts, using visual overlays, or audio description of images.
- Dyslexic pupils may benefit from well-spaced print.
- Teachers identify and break down the components of the subject curriculum into manageable chunks for pupils who find learning more difficult, particularly those with cognition and learning needs. These may be smaller 'steps' than those taken by other pupils to avoid overloading the working memory.
- A variety of additional scaffolds may be used in lessons, such vocabulary banks, additional visual stimuli or adult support.