

Scientific
enquiry

Life
processes
and living
things

Materials
and their
properties

Physical
processes

Scientific
terminology

Loughborough Primary School Science Progression Document

Science at Loughborough Primary School		
Intent	Implementation	Impact
What we do	How we do it	How we assess it
<p>Loughborough Primary School’s science curriculum is designed to teach learners scientific knowledge and skills through structured and sequenced lessons. Science at Loughborough Primary follows the National Curriculum and provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Our science curriculum gives our children opportunities to explore essential aspects of the knowledge, methods, processes and uses of science through engaging lessons coupled with exciting opportunities, both theoretical and practical. Through building up a body of key foundational knowledge and concepts, our pupils are encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. We recognise the importance of raising children as responsible, curious thinkers who can process new information, reflect on it, think critically, and apply knowledge and skills to overcome challenges in our ever-changing world. Our science curriculum ensures that our children are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.</p>	<p>At Loughborough Primary School, we teach science in a planned, coherent way which is sequenced logically, ensuring that our children develop a secure understanding of each key block of knowledge and concepts in order to progress to the next stage. During their science lessons, our children are specifically taught scientific language, allowing them to build up an extended specialist vocabulary. Similarly, our children are encouraged to apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. In our Phiz lab, pupils learn to use a variety of approaches to answer relevant scientific questions. They are taught the importance of observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. In Key Stage 1, our children experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions. Our children work scientifically to provide solutions for a torn umbrella and advise the three little pigs in their building material choices. In Key Stage 2, we build on the foundations set in Key Stage 1 and pupils develop a deeper understanding of a range of scientific ideas. Our children begin to plan more sophisticated types of scientific enquiries to answer questions, for example: why do boats float and what packaging material is best for takeaway orders? In Key Stage 2, children apply their scientific knowledge to create dimmer switches and periscopes. Across both key stages, children have a range of opportunities to experience science</p>	<p>By the end of their education at Loughborough, our learners will have gained a rich body of scientific knowledge and a wide range of transferable skills, which they can apply to other subjects and contexts.</p> <p>We assess regularly in order to build a rounded picture of each child as a scientist, using practical opportunities, quizzes, discussions and presentations. This enables teachers to set appropriate, progressive targets and challenge children in their thinking and learning.</p> <p>All children will use geographical vocabulary and gain a deep understanding of the Earth’s key physical and human processes. Children will begin to make relevant links from science to other curriculum subjects, such as maths and English. We measure our impact based on pupils’ confidence to ask and explore questions to further their own scientific knowledge and understanding.</p> <p>Our children will be inquisitive young learners and citizens who explore ideas and raise different kinds of questions; able to discuss, communicate and justify their scientific ideas and talk about how scientific ideas have developed over time. We aspire for our children to leave Loughborough equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. In this way, we prepare our learners fully for transition to secondary school and transition into becoming global citizens.</p>

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through practical engaging tasks both within and beyond the classroom.

	EYFS	KS1		KS2		
		Year 1	Year 2	Year 3	Year 4	Year 5
Working Scientifically	<ul style="list-style-type: none"> - Choose the resources needed for chosen activities - Handle equipment and tools effectively - Make observations of animals and plants and explain why some things occur, and talk about changes - Develop own narratives and explanations by connecting ideas or events - Talk about the features of own immediate environment and how environments might vary from one another - Express effectively when talking about events - Represent own ideas, thoughts and feelings through using media and materials - Answer 'how' and 'why' questions about experiences 	<ul style="list-style-type: none"> - asking simple questions and recognising that they can be answered in different ways - observing closely, using simple equipment - performing simple tests - identifying and classifying - using their observations and ideas to suggest answers to questions - gathering and recording data to help in answering questions 	<ul style="list-style-type: none"> - asking relevant questions and using different types of scientific enquiries to answer them - setting up simple practical enquiries, comparative and fair tests - making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers - gathering, recording, classifying and presenting data in a variety of ways to help in answering questions - recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables - reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions - using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions - identifying differences, similarities or changes related to simple scientific ideas and processes - using straightforward scientific evidence to answer questions or to support their findings. 	<ul style="list-style-type: none"> - planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary - taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate - recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs - using test results to make predictions to set up further comparative and fair tests - reporting and presenting 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 - identifying scientific evidence that has been used to support or refute ideas or arguments 		

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		<p><u>Plants, Animals & humans</u></p> <ul style="list-style-type: none"> - identify and name a variety of common wild and garden plants, including deciduous and evergreen trees identify and describe the basic structure of a variety of common flowering plants, including trees - 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) - identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. 	<p><u>Plants, Animals & humans</u></p> <ul style="list-style-type: none"> - 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, including microhabitats - 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 - 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 - notice that animals, including humans, have 	<p><u>Plants, Animals including humans</u></p> <ul style="list-style-type: none"> - 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 - 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 - identify that humans and some other animals have skeletons and muscles for support, protection and movement - comparing the effect of different factors on plant 	<p><u>Living things and their habitats & Animals including humans</u></p> <ul style="list-style-type: none"> - 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 - 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 - begin to group vertebrate animals: fish, amphibians, reptiles birds and mammals and invertebrate into: snails & slugs, worms, spiders and insects. - explore examples of human impact (both positive and negative) on environments. - use and/or make simple guides of keys to explore and 	<p><u>Living things and their habitats & Animals including humans</u></p> <ul style="list-style-type: none"> - 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 - describe the changes as humans develop to old age - find out about the work of naturalists and animal behaviourists. - research different types of reproduction (sexual and asexual reproduction in plants and sexual in animals) - grow new plants from different parts of the parent plant: seeds, stem cuttings, bulbs etc. - compare how different animals reproduce and grow - draw timeline to indicate stages in the growth and development of humans inc. changes experienced in puberty. - research the gestation periods of other animals and comparing them with humans - investigating and recording the length and mass of a baby as it grows. 	<p><u>Living things and their habitats & Animals including humans</u></p> <ul style="list-style-type: none"> - 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 - give reasons for classifying plants and animals based on specific characteristics - 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 - build on understanding of classification from year 4: introduce the idea of subdivision and the significance of the work
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		<ul style="list-style-type: none"> - use the local environment to explore plants and animals over the year - observe the growth of flowers and vegetables they have planted - keep records of how the plants have changed, including labelled diagrams - compare and contrast different plants and animals and group them - use their senses to compare different textures, sounds and smells 	<p>offspring which grow into adults</p> <ul style="list-style-type: none"> - find out about and describe the basic needs of animals, including humans, for survival (water, food and air) - describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene - compare animals and plants from familiar habitats with animals and plants in less familiar habitats - sort and classify things according to whether they are: living, dead or were never alive - understand the requirements of plants and animals for germination/reproduction, growth and survival - examples: egg, caterpillar, frogspawn 	<p>growth: fertiliser, amount of light</p> <ul style="list-style-type: none"> - transportation of water: white carnations in food colouring - exploring & comparing skeletons - research food groups and healthy diets 	<p>identify local plants and animals</p> <ul style="list-style-type: none"> - raise and ask questions based on their observations of animals and what they researched. - compare the teeth of different carnivores and suggest reasons for differences - find out what damages teeth and explore the different functions of the digestive system. 	<p>of scientists such as Carl Linnaeus.</p> <ul style="list-style-type: none"> - use classification systems and keys to identify animals and plants in the immediate environment. - build on the learning from LKS2 (digestive system) & expanding to the circulatory system, skeletal and muscular system - learn how to keep their bodies healthy & how their bodies might be damaged including drugs and other harmful substances.
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		<p><u>Everyday materials</u></p> <ul style="list-style-type: none"> - 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 the basis of their simple physical properties - explore and experiment with a wide variety of materials e.g. brick, paper, elastic, foil. - performing simple tests to explore questions e.g. what is the best material for a gymnast's leotard? 	<p><u>Everyday materials</u></p> <ul style="list-style-type: none"> - identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses - find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching - discuss the uses of different everyday materials: how some materials are used for more than one thing and how different materials are used for the same thing. - observing closely, identifying and classifying the uses of different materials & recording their observations. 	<p><u>Rocks</u></p> <ul style="list-style-type: none"> - 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 - linked work with geography, exploring different kinds of rocks inc. the local environment. - exploring different types of soils and how rocks change over time e.g. gravestones. 	<p><u>States of matter</u></p> <ul style="list-style-type: none"> - 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 - explore the effect of temperature on substances such as chocolate, butter, cream (example: chocolate crispy cakes and ice-cream) - observe water as a solid, a liquid and a gas and note the changes to water when it is heated or cooled. - research the temperature at which materials change state e.g. iron melts or oxygen condenses. - observe and record evaporation over time - investigate the impact of temperature on washing drying or snowmen melting 	<p><u>Properties and changes of materials</u></p> <ul style="list-style-type: none"> - 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 might be separated, including through filtering, sieving and evaporating - give reasons, based on evidence from comparative and fair tests, for the 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 - explore reversible and irreversible changes 	<p><u>Evolution & Inheritance:</u></p> <ul style="list-style-type: none"> - 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 - building on what they learnt about rocks in Yr 3, pupils should find out more about how living things on earth have changed over time. - idea that characteristics are passed from parents to offspring, for example dog breeds & what happens when Labradors are crossed with poodles - explore variation in offspring over time & how this makes animals more or less able to survive in particular environments e.g.
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						<ul style="list-style-type: none">- research how chemists create new materials: Spencer Silver – sticky notes- research how chemical reactions have an impact on our lives- discuss the creative use of new materials such as polymers, super-sticky and super-thin materials	<ul style="list-style-type: none">giraffes or insulating fur (arctic fox)- explore the work of palaeontologists such as Mary Anning/Charles Darwin/ Alfred Wallace.- analyse the advantages and disadvantages of specific adaptations such as being on 2 feet rather than 4, long/short break/gills or lungs and adaptations for extreme conditions such as cacti/penguins/camels.
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		<p><u>Seasonal changes</u></p> <ul style="list-style-type: none"> - observe changes across the 4 seasons - observe and describe weather associated with the seasons and how day length varies - make tables and charts about the daily weather 		<p><u>Light, Forces & Magnets</u></p> <ul style="list-style-type: none"> - 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 change - compare how things move on different surfaces - notice that some forces need contact between 2 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 based on whether they are attracted to a magnet, and identify some magnetic materials 	<p><u>Sound & Electricity</u></p> <ul style="list-style-type: none"> identify how sounds are made, associating some of them with something vibrating - 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 - 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, based on whether or not the lamp is part of a complete loop with a battery - 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 	<p><u>Earth and Space, Forces</u></p> <ul style="list-style-type: none"> - 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 - 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 - 8 planets (Pluto is a dwarf planet) and the moon is a celestial body that orbits the earth. - understand how ideas about the solar system have developed: geocentric and 	<p><u>Light & Electricity</u></p> <ul style="list-style-type: none"> - recognise that light appears to travel in straight lines - 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 - 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 - 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, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches - use recognised symbols when representing a
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				<ul style="list-style-type: none"> - describe magnets as having 2 poles - predict whether 2 magnets will attract or repel each other, depending on which poles are facing - play mirror games - explore how important it is to protect our eyes from the sun - explore shadows and light sources and the behaviour of different magnets - identify how the properties make magnets useful in everyday life & suggest creative uses for magnets 	<p>associate metals with being good conductors</p> <ul style="list-style-type: none"> - find patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses - investigate what materials provide best insulation against sound (create earmuffs) - make and create own musical instruments based on an understanding of pitch and volume - draw circuits pictorially (symbols are introduced in Yr 6) 	<p>heliocentric models of the solar system</p> <ul style="list-style-type: none"> - Stonehenge as an astrological clock - comparing the time in different countries around the world - creating simple shadow clocks and sundials - explore the effects of air resistance, friction, levers, pulleys and simple machines on movement. 	<p>simple circuit in a diagram</p> <ul style="list-style-type: none"> - deciding where to place rear-view mirrors on cars - making a periscope & use the idea that light appears to travel in straight lines - extend their experience of light by looking at a range of phenomena including rainbows, soap bubbles, objects looking bent in water and coloured filters - construct simple series circuits using a range of components and represent circuits as diagrams using recognised symbols. - N.B: series circuits, not parallel circuits. - might design a set of traffic lights or a burglar alarm for example.
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Communication: Vocabulary</p>	<p>Materials Senses e.g. taste, see, smell, touch, taste Animal names e.g. farm animals, wild animals, under the sea Mini-beast Habitat Growth Basic body parts e.g. hand, leg, arms Push and pull Planet names e.g. Earth, Sun, Moon</p>	<p>Materials e.g. wood, plastic, glass, rock Solids, liquids, gases Temperature including freezing and melting Floating and sinking Food chains Evergreen and deciduous trees Flowers e.g. leaves, flowers, petals, bulb, seeds, stem Types of animals e.g. reptiles, birds, mammals Carnivores and herbivores Seasons e.g. winter, spring, summer, autumn</p>	<p>Materials e.g. wood, plastic, glass, rock, brick, metal, cardboard Properties of materials e.g. bendy, twisty, flexible Life cycles Food sources Habitats and micro-habitats Plants e.g. root, petal, stem, growth, survival, germination Offspring Hygiene Exercise Body parts including organs Digestion</p>	<p>Plants e.g. stem to collect nutrients from the soil Plant life cycle e.g. pollination, seed dispersal, seed formation Skeletons Muscles e.g. protection, movement Fossils Rocks e.g. chalk, sedimentary, igneous, matter Light – reflection, shadows, opaque Magnets e.g. attract, repel, poles, magnetic,</p>	<p>Changes of state e.g. solid, liquid and gas Water cycle including evaporation, condensation Degrees Celsius Environment Producers and consumers Vertebrate and invertebrate Skeleton including endo and exo Sound e.g. vibrations, volume and pitch Electricity e.g. buzzers, bulbs, circuits, switches, battery, cell, conductors and insulators Variables</p>	<p>Changes of state e.g. dissolve, solutions Reversible and irreversible Burning Thermal Transparent, translucent, opaque Forces e.g. air and water resistance Mechanisms Reproduction Puberty Gestation periods Light – reflect, refract Space e.g. orbit, rotation, solar system (including all planets and dwarf) Polymers Components</p>	<p>Evolution e.g. inhabitants Adaptation Inheritance Microorganism Vertebrates Characteristics Species Genes Organs including reproduction systems and circulatory system e.g. blood vessels</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Enrichment opportunities</p>							

Statutory National Curriculum Compliance
Suggested additional content

Loughborough Primary School Science Progression Document

Science Topic Coverage:

Each **block** contains six **sessions** and can be completed within a half-term. Working scientifically, investigations and meaningful outcomes are incorporated into each block. All content available from <https://www.hamilton-trust.org.uk/science/> . Hamilton's science scheme uses hands-on investigative science activities to promote a deep understanding of scientific concepts and help children develop effective methods of scientific enquiry.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn 1	Ourselves	Healthy Animals	Keeping healthy	It's electric	Space Presenters	Crime Lab Investigation
Autumn 2	Our Pets	Habitats	Light and Shadows	States of matter scientists	May the forces be with you	Electric celebration
Spring 1	Let's Build	Materials Matter	Rocks and Fossils	Listen Up!	Music festival materials	Classification Connoisseurs
Spring 2	Marvellous Materials	Squash, bend, twist stretch.	Amazing magnets	Name that living thing	Changing materials	The Game of Survival
Summer 1	Wonderful Weather	Ready, steady, grow!	Roots and shoots	Are these your teeth?	The Art of Living	The Art of Being Human
Summer 2	What's growing in our gardens?	Gardens and allotments	Artful flowers, fruits and seeds	Help our habitats!	Life Explorers	The Science of Sport

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Split year groups:

Year 1 / 2

Cycle A: Amazing Me, Wild Weather, Brilliant builders! Growing Things, Wild and Wonderful Creatures, Growing Things

Cycle B: People and their Pets, Weather Art, Brilliant builders! Art and Nature, Exploring Changes, Habitats and Homes