

Science Long Term Plan

Science

How is the curriculum organised?

Science teaching at Green Lane is based on the 2014 Primary National Curriculum in England and aims to give all children a strong scientific understanding and to develop within them a curiosity of the world around them. We give our pupils the knowledge and skills to think scientifically, to gain an understanding of scientific processes and to develop an understanding of the uses of science today and for the future. This begins in the Early Years setting where The Early Years Foundation Stage Curriculum lays the foundations for scientific knowledge through the planning and teaching of 'Understanding the World'. Children find out about objects, materials and living things using their senses and looking at similarities, differences, patterns and change. In all year groups, scientific enquiry is clearly planned, knowledge is broken down in to small steps and is revisited and built upon throughout each year group and key stage.

Our school definition-

Science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments.

Key Concepts

These key concepts repeat throughout the curriculum.

Physics

P1: The universe follows unbreakable rules that are all about forces, matter and energy.

P2: Forces are different kinds of pushes and pulls that act on all the matter that is in the universe. Matter is all the stuff, or mass, in the universe.

P3: Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it.

Chemistry

C1: All matter (stuff) in the universe is made up of tiny building blocks.

C2: The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy, etc).

C3: Matter can change if the arrangement of these building blocks changes.

Biology

B1: Living things are special collections of matter that make copies of themselves, use energy and grow.

B2: Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.

B3: The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.

Earth Science

E1: The Earth is one of eight planets that orbit the sun.

E2: The Earth is tilted and spins on its axis leading to day and night, the seasons and the climate.

E3: The Earth is made up of several layers, including a relatively thin rocky surface which is divided into tectonic plates, and the movement of these plates leads to many geologic events (such as earthquakes and volcanoes) and geographical features (such as mountains.)

Working Scientifically – relate to the disciplinary knowledge of science

KS1

Sc1/1.1 (Sc2/1.1) asking simple questions and recognising that they can be answered in different ways

Sc1/1.2 (Sc2/1.2) observing closely, using simple equipment

Sc1/1.3 (Sc2/1.3) performing simple tests

Sc1/1.4 (Sc2/1.4) identifying and classifying

Sc1/1.5 (Sc2/1.5) using their observations and ideas to suggest answers to questions

Sc1/1.6 (Sc2/1.6) gathering and recording data to help in answering questions.

LKS2

Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them

Sc4/1.2 setting up simple practical enquiries, comparative and fair tests

Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes

Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.

UKS2

Sc5/1.1 (Sc6/1.1) planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

Sc5/1.2 (Sc6/1.2) taking measurements, using a range of scientific equipment, with increasing accuracy and precision

Sc5/1.3 (Sc6/1.3) recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs

Sc5/1.4 (Sc6/1.4) using test results to make predictions to set up further comparative and fair tests

Sc5/1.5 (Sc6/1.5) reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations

Sc5/1.6 (Sc6/1.6) identifying scientific evidence that has been used to support or refute ideas or arguments.

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Year Group	Autumn Block 1	Spring Block 2	Summer Block 3
Little Buds 2 Yr	<p>Endpoints</p> <p>Explore materials with different properties. Explore natural materials, indoors and outside.</p> <p>Notices detailed features of objects in their environment.</p> <p>Can talk about some of the things they have observed such as plants, animals, natural and found objects.</p> <p>Enjoys playing with small world reconstructions, building on first-hand experiences, e.g. visiting farms, garages, train tracks, walking by river or lake.</p>	<p>New Vocabulary</p>	
Nursery 3-4yr	<p>Endpoints (taken from EYFS checkpoint document)</p> <p>Explore materials with different properties. Explore natural materials, indoors and outside.</p> <p>Can talk about things they have observed such as plants, animals, natural and found objects.</p> <p>Talks about why things happen and how things work.</p> <p>Begins to understand growth, decay and changes over time.</p> <p>Shows care and concern for living things and the environment.</p>	<p>Endpoints (taken from EYFS checkpoint document)</p> <p>Use all their senses in hands on exploration of natural materials. Comments and asks questions about aspects of their familiar world such as the place where they live or the natural world.</p> <p>Developing an understanding of growth, decay and changes over time.</p> <p>Begin to understand the effect their behaviour can have on the environment</p>	<p>Endpoints (taken from EYFS checkpoint document)</p> <p>Use all their senses in hands on exploration of natural materials. Explore collections of materials with similar and/or different properties. Talk about what they see, using a wide vocabulary. Plant seeds and care for growing plants. Understand the simple 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 the different forces they can feel. Talk about the differences between materials and changes they notice.</p>
REC	Endpoints/ topics taken from EYFS checkpoint document. Some topics will reoccur in different terms.		
REC	<p>Earth Science: Seasonal Changes Knowledge endpoints</p> <p>Pupils can use their knowledge of plants to identify similarities and differences between them.</p>	<p>Earth Science: Seasonal Changes (NEW OBSERVATIONS)</p> <p>Chemistry: Everyday Materials (Change)</p>	<p>Earth Science: Seasonal Changes (NEW OBSERVATIONS)</p> <p>Biology: Animals including Humans (Living things)</p>

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	<p>Pupils can describe changes to the natural world around them and describe similarities and differences in living things and over time.</p> <p>Scientific endpoints</p> <p>Pupils can make close observations, describe the similarities, differences and changes which they see over time and use appropriate vocabulary to offer explanations for what has occurred</p>	<p>Knowledge endpoints</p> <p>Pupils can identify a variety of materials in the natural and built environment.</p> <p>Pupils can identify simple properties of materials and why they have been used for a given purpose.</p> <p>Pupils can identify and use a variety of materials for a given purpose and justify their choices based on form, colour, function, texture and design.</p> <p>Scientific endpoints</p> <p>Pupils can make close observations, describe the similarities, differences and changes which they see over time and use appropriate vocabulary to offer explanations for what has occurred</p>	<p>Knowledge endpoints</p> <p>Pupils show an interest in their natural environment by describing what they see and asking simple questions.</p> <p>Pupils can describe similarities and differences in living things and over time</p> <p>Scientific endpoints</p> <p>Pupils can observe and describe living things using appropriate vocabulary. They notice similarities and differences, ask simple questions and offer explanations, based on their experiences, for why some changes occur.</p>
Year 1	<p>Earth Science: Seasonal Changes</p> <p>Knowledge endpoints</p> <p>Pupils learn about the different seasons and understand that there are changes associated with each season. They can identify weather, changes in plants, appropriate clothing for each season. They know that the Earth goes around the Sun to make these seasons happen.</p> <p>Scientific endpoints</p> <p>Pupils can make close observations, describe the similarities, differences and changes which they see over time and use appropriate vocabulary to offer explanations for what has occurred. They can use their observations to suggest answers to questions.</p> <p>Chemistry: Everyday Materials</p> <p>Knowledge endpoints</p> <p>Pupils can identify and name a variety of everyday materials and distinguish between an object and what it is made from. They can group materials based on their properties.</p>	<p>Earth Science: Seasonal Changes (NEW OBSERVATIONS)</p> <p>Biology: Plants</p> <p>Knowledge endpoints</p> <p>Pupils can identify and name a variety of common wild and garden plants (including deciduous and evergreen trees) and describe their basic structure.</p> <p>Scientific endpoints</p> <p>Pupils can make careful scientific observations over time, identifying natural features, similarities and differences and patterns of change.</p>	<p>Earth Science: Seasonal Changes (NEW OBSERVATIONS)</p> <p>Biology: Animals including Humans</p> <p>Knowledge endpoints</p> <p>Pupils can identify, name, describe and compare a variety of common animals including, fish, amphibians, reptiles, birds and mammals. They can describe whether these animals are carnivores, herbivores or omnivores. They can link human body parts to the associated sense.</p> <p>Scientific endpoints</p> <p>Pupils can ask simple questions, observe closely in order to identify and classify different animals.</p>

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	<p>Scientific endpoints Pupils can ask simple questions and carry out simple tests. They can observe and gather data to help them answer the questions raised.</p>		
Year 2	<p>Chemistry: Everyday Materials Knowledge endpoints Pupils can identify and classify materials based on their properties and say what material would be best suited for a particular task, justifying their choices using first hand experiences and scientific vocabulary. They can compare how objects move on different surfaces and describe the effects of external forces on different solids. Scientific endpoints Pupils can ask simple questions and carry out simple tests. They can observe and gather data to help them answer the questions raised.</p>	<p>Biology: Living things and lifecycles Knowledge endpoints Pupils can describe differences between living, dead, and things that have never been alive. They can describe what a habitat is and link plants and animals to their habitats. They can produce simple food chains. Pupils can describe growth of a plant from seed/bulb to maturity and explain what plants need to grow and stay healthy. Scientific endpoints Pupils can ask simple questions and observe closely using their observations and ideas to suggest answers to questions</p>	<p>Biology: Plants and Animals including Humans Knowledge endpoints Pupils know the basics needs for animals' survival and that animals have offspring that grow into adults. Pupils understand the importance of a healthy diet and exercise Scientific endpoints Pupils can ask simple questions, observe closely in order to identify and changes in animals.</p>
Year 3	<p>Chemistry and Earth Science: Rocks and Fossils Knowledge endpoints Compare and group different kinds of rocks based on properties. Relate properties to formation. (igneous or sedimentary). Describe how fossils and soil are formed. Scientific Endpoints Pupils can use careful observation to compare, noticing patterns and making predictions. Pupils can identify when to use secondary sources of scientific information to answer simple questions. Pupils can use careful observations to compare, group and identify, explaining their criteria and justifying their choices.</p>	<p>Physics: Forces and Magnets Pupils understand that some forces need contact between two objects, but magnetic forces can act at a distance. They can observe how magnets attract or repel each other and attract some materials and not others. Pupils can 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 and predict whether two magnets will attract or repel each other, depending on which poles are facing.</p>	<p>Physics: Light Knowledge Endpoints Pupils 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. Pupils recognise that shadows are formed when the light from a light source is blocked by a solid object and can find patterns in the way that the size of shadows change.</p>

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They can raise questions and research answers using secondary sources, presenting their findings using simple scientific language.

Biology: Animals including Humans

Skeletons and muscles

Pupils can identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat. They can identify that humans and some animals have skeletons and muscles for support, protection and movement.

Scientific Endpoints

Pupils can make systematic and careful observations, using patterns, similarities and differences to compare and group, justifying their choices.

Pupils can use careful observation to raise relevant scientific questions about the world around them.

Scientific Endpoints

Pupils can set up simple practical enquiries, comparative and fair tests, recognising when a simple fair test is necessary and help to decide how to set it up.

Pupils can select what data to record, collecting and representing it accurately using a variety of instruments and methods.

Biology: Plants

Knowledge Endpoints

Pupils can identify and describe the functions of different parts of flowering plants and describe water transportation in plants. They can describe how the requirements of plants for life and growth vary from plant to plant. They can describe the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Scientific endpoints

Pupils can perform close observation of living things in the local environment, and can describe, group, sort and classify.

Pupils can identify and group living things in their local environment and choose how to present this in different ways, explaining their choices

They can concisely and accurately explain the function of different parts of a plant, suggesting scientific explanations for differences in these features between plants.

Scientific endpoints

Pupils can use careful observation to compare, noticing patterns and making predictions.

Pupils can identify when to use secondary sources of scientific information to answer simple questions.

Pupils can use careful observations to compare, group and identify, explaining their criteria and justifying their choices. They can raise questions and research answers using secondary sources, presenting their findings using simple scientific language.

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Year 4

Chemistry: Solids, Liquids and Gases

Knowledge Endpoints

Pupils are taught that materials can be solids, liquids or gases and some can change their state: solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container. Pupils are taught that some materials change state when they are heated or cooled. Pupils are taught how materials change state in the water cycle; evaporation and condensation.

Scientific Endpoints

Pupils can plan and set up a practical enquiry for everyday materials, make systematic and careful observations, they look for patterns, similarities and differences in their data and communicate their findings for different audiences in a variety of ways.

Physics: Sound

Knowledge Endpoints

Pupils will be taught that sound is caused by vibrations and travels through a medium to the ear.

Pupils will be taught that pitch and volume can be changed.

Scientific Endpoints

Pupils can plan and set up a practical enquiry for sound, make systematic and careful observations, they look for patterns, similarities and differences in their data and communicate their findings for different audiences in a variety of ways, using scientific evidence to support their findings.

Biology: Living Things and Their Habitats

Knowledge Endpoints

Pupils are taught that life can be grouped in different ways (flowering plants and non-flowering) and into different categories. Pupils are taught that a habitat will change throughout the year, including the plants and animals within them.

Scientific Endpoints

Pupils can perform close observation of living things in the local environment, and can group, sort and classify using their own criteria. Pupils can identify and group living things in their local environment and choose how to present this in different ways, explaining their choices.

Biology: Living Things and Their Habitats

Knowledge Endpoints

Pupils are taught that changes to the environment can make it more difficult for living things to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies. Pupils are taught that human activity – such as climate change caused by pollution - can change the environment for many living things, endangering their existence.

Pupils are taught that many species of living things have already been made extinct as a result of human activity.

Pupils are taught that the polar bear is a famous example of climate change endangering the existence of a species; as the climate changes and gets warmer, the sea ice on which polar bears live reduces in amount making it harder for them to survive and reproduce.

Biology: Animals including Humans

Knowledge Endpoints

Pupils are taught to identify and describe the basic parts of the digestive system in humans including mouth, tongue, teeth, oesophagus, stomach, small/large intestine. Pupils are taught to identify the different types of teeth in humans and know their simple functions.

Scientific Endpoints

Pupils can describe the function of different parts of the digestive system (including teeth) and explain similarities and differences in different animals.

Physics: Electricity

Knowledge Endpoints

Pupils will be taught that some appliances run on electricity.

Pupils will be taught the basic parts of a simple series electrical circuit (cells, wires, bulbs, switches & buzzers).

Pupils will be taught that materials can be conductors and insulators.

N.B. pupils should be taught about the precautions for working safely with electricity.

Scientific Endpoints

Pupils can use their scientific knowledge of electricity to undertake scientific investigations to explain key scientific concepts in these areas.

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		<p>Scientific Endpoints Pupils can identify scientific evidence that has been used to support or refute ideas or arguments.</p>	
<p>Year 5</p>	<p>Physics: Forces Knowledge Endpoints Pupils know that all objects will fall due to gravity but at varying speeds dependent on the other forces acting on the object e.g. air resistance / water resistance. They understand that different materials cause different amounts of friction which slow down or stop moving objects. Scientific Endpoints Pupils undertake scientific investigations, making their own decisions about how to undertake the investigation, identify causal relationships and using these to explain scientific concepts.</p> <p>Earth Science: Earth and Space Knowledge Endpoints Pupils know; the sun is a star at the centre of the solar system which has 8 planets, the moon orbits the Earth and the Earth orbits the sun and the position of these are what causes day and night and the moon phases and that the Earth rotates on an axis which affects climate & creates biomes (links to geography).</p>	<p>Biology: Living Things and Their Habitats Knowledge Endpoints Pupils understand that every living thing has to have the means of reproducing itself in order to have a life cycle and to continue the species. Pupils can accurately explain the similarities and differences between the gestation and growth of different species Scientific Endpoints Pupils can select and present appropriate scientific evidence. Pupils can use scientific evidence to identify similarities, difference and patterns and offer well-reasoned explanations for these. Pupils can research independently and recognise useful secondary sources. They can synthesising these into concise explanations or scientific diagrams.</p> <p>Biology: Plants and Animals including Humans Pupils are taught to describe the changes as humans develop from birth to old age, the changes experienced in puberty. Pupils are taught the gestation periods of animals, including humans Pupils are taught the process of reproduction in some plants including sexual and asexual reproduction including which parts of the plants could be used to try and re-grow new plants.</p>	<p>Chemistry: Everyday Materials Knowledge Endpoints Materials can be changed using different processes some of which are reversible others are irreversible. Sometimes new materials can be made because an existing material has been altered and this is not usually reversible Understand some materials are used for more than one thing e.g. metal can be used for coins, cans, cars - Different materials have different properties which determine their use Scientific Endpoints Pupils can plan and set up a practical enquiry, make systematic and careful observations; they look for patterns, similarities and differences in their data and communicate their findings for different audiences in a variety of ways. Finally, they can evaluate the accuracy and efficacy of their methods, suggesting improvements.</p>

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	<p>Scientific Endpoints Pupils can plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. They can use test results to make predictions to set up further comparative and fair tests. They can report and present findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations.</p>	<p>Scientific Endpoints Pupils can select and present appropriate scientific evidence. Pupils can use scientific evidence to identify similarities, difference and patterns and offer well-reasoned explanations for these. Pupils can research independently and recognise useful secondary sources. They can synthesising these into concise explanations or scientific diagrams.</p>	
<p>Year 6</p>	<p>Physics: Light Knowledge Endpoints Pupils know that light appears to travel in straight lines and that objects are seen because they give out or reflect light into the eye. They know shadows have the same shape as the object that cast them and can make predictions about the behaviour of light (light sources, reflection, shadows) and create investigations to test the theory.</p> <p>Scientific Endpoints Pupils can plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. They can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs. They can use test results to make predictions to set up further comparative and fair tests.</p>	<p>Biology: Living Things and Their Habitats Knowledge Endpoints Pupils can describe how living things are classified into broad groups including micro-organisms, plants and animals. They can give reasons for classifying plants and animals based on specific characteristics.</p> <p>Scientific Endpoints Pupils can identify scientific evidence that has been used to support or refute ideas or arguments. They can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs.</p> <p>Biology: Animals Including Humans Knowledge Endpoints Pupils can describe the process of digestion, name the major organs involved and their function in the process. Pupils can identify and name the main parts of the skeletal system, describing the functions of the rib cage, skull and whole skeleton.</p>	<p>Biology: Animals Including Humans Knowledge Endpoints Pupils can identify and name the main parts of the human circulatory system, describing the functions of the heart, blood vessels and blood. They know that diet, exercise, drugs and lifestyles impact on the way their body functions and can analyse and make links on the relationship between diet, exercise, drugs, lifestyle, health.</p> <p>Scientific Endpoints Pupils can recognise which secondary sources will be the most useful in researching their ideas, including data (presented in a range of different forms).</p> <p>Biology: Evolution and Adaptation Knowledge Endpoints Pupils know that characteristics are passed from parents to their offspring and variation in offspring over time can make animals more or less able to survive in particular environments. They know how Charles Darwin developed his ideas on evolution.</p>

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Physics: Electricity

Knowledge Endpoints

Pupils know how to construct a simple circuit, know and use conventional symbols when drawing a simple circuit and that there is electrical output from a cell.

Lemon and potato experiments electromagnets

Explain reasons for their findings, using appropriate scientific vocabulary

Record findings accurately in a variety of ways and present with accuracy using scientific evidence to support findings, using appropriate, conventional circuit symbols.

Scientific Endpoints

Pupils can use their scientific knowledge of electricity to undertake scientific investigations to explain key scientific concepts in these areas.

They are able to apply scientific knowledge to solve a practical problem and can evaluate their findings to identify where further observations, comparative or fair tests might be needed.

Scientific Endpoints

Pupils can recognise which secondary sources will be the most useful in researching their ideas, including data (presented in a range of different forms).

Scientific Endpoints

Pupils can raise appropriate questions and use research evidence/secondary sources to identify specific adaptations in given animals and plants over time and explain their occurrences, benefits and disadvantages.