

Science



## Intent

At Nerrols Primary School and Nursery we aim to foster a love of science and the natural world. Through the specific disciplines of biology, chemistry and physics, we aim to build our children's curiosity and sense of awe. Our children will develop their questioning, explanation and analysis skills, they will explore patterns, develop an understanding of key knowledge and skills and explain what is occurring in a range of processes.

By the time our children progress to the next stage of their education, we hope they hold a genuine enjoyment and interest in Science, are equipped with the knowledge necessary to apply science in different contexts and appreciate the contribution of Science in all aspects of everyday life.

## Implementation

At Nerrols Primary School and Nursery, we take an inquisitive approach to science. Our children are encouraged to ask questions, make predictions and record their understanding, working scientifically throughout all aspects of their science learning. Our children are encouraged to problem solve, observe, see patterns, make comparisons, carry out fair tests and identify, group and classify.

In the Early Years our children begin their science education under the 'Understanding the World - Natural World' strand of the EYFS. Our children are supported to make sense of the world around them, widen their vocabulary and build the foundations for the scientific concepts that will be built upon throughout the primary stage of their education.

Throughout the primary years, learning takes into account and builds on previous learning and enables children to develop their skills progressively through engaging learning opportunities in which all children can achieve. We recognise the importance of language and vocabulary within our science curriculum in order for children to describe processes as well as use technical terminology accurately. The learning of new vocabulary is explicitly taught in context and referred to throughout children's learning journey as they progress through the school.

## Scope and Sequence

	Autumn Half Term 1	Autumn Half Term 2	Spring Half Term 1	Spring Half Term 2	Summer Half Term 1	Summer Half Term 2
Year 1	Seasonal changes	Everyday materials	Animals, including humans Seasonal Changes	Plants	Everyday materials	Animals, including humans. Seasonal Changes
Year 2	Living things and their habitats	Living things and their habitats	Uses of everyday materials	Animals, including humans	Plants	Uses of everyday materials.
Year 3	Light	Forces and magnets	Rocks	Plants	Animals, including humans	Animals, including humans
Year 4	States of matter	Electricity	Sound	Living things and their habitats	Animals, including humans	Animals, including humans
Year 5	Properties and changes of materials	Properties and changes of materials	Forces	Earth and space	Living things and their habitats	Animals, including humans
Year 6	Electricity	Light	Evolution and inheritance	Evolution and inheritance	Living things and their habitats	Animals, including humans

# Science knowledge builder

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Plants	<ul style="list-style-type: none"> <li>How to identify and name common trees by recognising the shape of their leaves</li> <li>How to identify and name a variety of common wild and garden plants by recognising the colour and shape of their flower.</li> <li>Deciduous trees lose their leaves in the autumn every year</li> <li>Evergreen trees have green leaves all year round</li> <li>The main parts of a tree are: roots, trunk, branch, twig, leaves, bark</li> <li>The main parts of a flowering flower are: roots, stem, leaf, seeds and flower.</li> </ul>	<ul style="list-style-type: none"> <li>Plants can grow from seeds and bulbs</li> <li>Seeds and bulbs germinate and grow into seedlings and they need warmth and light to do so.</li> <li>Seedlings grow into mature plants</li> </ul> <p>Plants need water, light, a suitable temperature and space to grow and stay healthy.</p>	<ul style="list-style-type: none"> <li>The functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers</li> <li>Plants need certain things to grow: air, light, water, nutrients from soil and room to grow. These vary from plant to plant.</li> <li>Water is transported within plants. Roots take up the water and the stem carries the water to leaves.</li> <li>Pollination is when insects, such as bees and wasps, transfer the pollen from the male part of a flower to the female part of other flowers.</li> <li>Seeds can develop after pollination. They can be found in berries or fruits</li> <li>Seeds can be dispersed in different ways for example, wind, animals or water</li> </ul>			
Animals including humans	<ul style="list-style-type: none"> <li>The names of a variety of common animals including fish, amphibians, reptiles, birds and mammals and be able to identify them</li> <li>The names of a variety of common animals that are herbivores, carnivores and omnivores and be able to identify them</li> <li>The key vocabulary used to describe and compare the features of common animals (fish, amphibians, reptiles, birds and mammals including pets)</li> <li>The basic parts of the human body and be able to name, draw and label them</li> <li>The five senses and say which part of the body is associated with each sense</li> </ul>	<ul style="list-style-type: none"> <li>Animals including humans have offspring which grow into adults</li> <li>The young of some animals don't look like their parents e.g. butterfly and frog.</li> <li>The basic needs of animals including humans for survival are: water, food, air and shelter.</li> <li>To grow into healthy adults, animals including humans need exercise, the right amounts of different types of food and good hygiene.</li> </ul>	<ul style="list-style-type: none"> <li>Animals including humans, need the right types and amount of nutrition</li> <li>Animals including humans cannot make their own food; they get nutrition from what they eat</li> <li>The five main food groups and what each group provide the body with</li> <li>The humans and some other animals have skeletons and muscles for support, protection and movement</li> <li>The names of some of the major bones and muscles in the human body</li> </ul>	<ul style="list-style-type: none"> <li>Digestion is the way the body breaks down food so the body can absorb it.</li> <li>The simple functions of the basic parts of the digestive system in humans</li> <li>The different types of teeth in humans and their simple functions</li> <li>Animals including humans can be grouped depending on what they eat: carnivore, herbivore and omnivore</li> <li>How to construct and interpret a variety of food chains, identifying producers, predators and prey.</li> </ul>	<ul style="list-style-type: none"> <li>The life cycle of humans from a foetus to old age</li> <li>Puberty is the time your body begins to develop and change as you become an adult. During puberty the bodies of boys and girls begin to change physically.</li> <li>Menstruation is when a woman has a period and she loses a small amount of blood each month</li> <li>Sexual reproduction is the process where a living thing create another organism like itself. In humans, a sperm cell from a male fertilises an egg from a female to produce a baby.</li> <li>The gestation periods is the length of time a mammal carries her offspring inside her body before giving birth. Larger animals usually have longer gestation periods than smaller animals.</li> <li>Life expectancy is the length of time that an animal is normally likely to live</li> </ul>	<ul style="list-style-type: none"> <li>The human circulatory system circulates blood through the body. It consists of the heart, blood and blood vessels.</li> <li>The function of the heart is to pump blood around the body</li> <li>Blood vessels are the narrow tubes which our blood flows through including arteries, veins and capillaries.</li> <li>Blood is the liquid pumped around the body by the heart. It transports oxygen nutrients and water to all parts of the body</li> <li>Each time the heart beats it can be felt as a pulse in the artery. Typically in the neck and wrist. Our pulse rate quickens when we exercise.</li> <li>Diet, exercise, drugs and other lifestyle choices have an impact on how our bodies function. This can affect how well our heart and lungs work and how fit and well we feel.</li> <li>Some choices such as smoking, drinking alcohol and obesity can be harmful to our health.</li> </ul>

Living things and their habitats		<ul style="list-style-type: none"> <li>The differences between things that are living, dead and things that have never been alive</li> <li>That most living things live in the habitats to which they are suited</li> <li>How different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other.</li> <li>The names of a variety of plants and animals in their habitats including micro habitats</li> <li>How animals obtain their food from plants and other animals using the idea of a simple food chain</li> <li>The names of different sources of food</li> </ul>		<ul style="list-style-type: none"> <li>Living things can be grouped in a variety of ways based on their characteristics</li> <li>How to use classification keys to help group, identify and name a variety of living things in their local and wider environment by answering a series of yes/no questions</li> <li>That environments can change and this can sometimes pose dangers to living things. These changes can be natural such as flooding or cause by humans such as deforestation and plastics in oceans</li> </ul>	<ul style="list-style-type: none"> <li>A life cycle shows how things are born, how they grow and reproduce</li> <li>The differences between a life cycle of a mammal, an amphibian, insect and a bird</li> <li>There is sexual reproduction and asexual reproduction. Most animals reproduce sexually</li> <li>Plants reproduce both sexually and asexually. Sexual reproduction occurs through pollination usually involving wind or insects. Asexual reproduction involves only one parent using bulbs, runners or cuttings.</li> </ul>	<ul style="list-style-type: none"> <li>Living things are classified into broad groups according to common observable characteristics and based on similarities and differences including micro-organisms, plants and animals.</li> <li>Micro organisms are tiny living creatures . most can only be seen through a microscope.</li> <li>They can be sub-divided into smaller groups including bacteria, fungi and viruses.</li> <li>Plants can be divided into two main groups: flowering plants and non-flowering plants.</li> <li>Vertebrate animals (animals with a backbone) can be divided into 5 groups: fish amphibians, reptiles, birds and mammals.</li> <li>Invertebrate animals (without a backbone) can be divided in to several smaller groups including insects, spiders, snails and worms</li> </ul>
Materials	<ul style="list-style-type: none"> <li>That all objects are made from one or more materials</li> <li>The names of a variety of everyday materials including wood, plastic, glass, metal, water and rock</li> <li>The simple physical properties of a variety of everyday materials</li> <li>How to compare and group together a variety of everyday materials on the basis of their simple physical properties.</li> </ul>	<ul style="list-style-type: none"> <li>A variety of everyday material including wood plastic, glass, brick, rock, paper and cardboard are suitable for particular uses because of their properties</li> <li>You can change the shape of solid objects made from some materials by squashing, bending, twisting and stretching</li> <li>An object that is flexible bends easily without breaking whereas a rigid object is unable to bend or be forced out of shape</li> <li>Materials can be either transparent, translucent or opaque depending on how much light they let through.</li> <li>Materials can be reflective (reflect light easily) or non-reflective (does not reflect light)</li> <li>Some materials are absorbent and can soak up liquid easily.</li> </ul>	<ul style="list-style-type: none"> <li>How to compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</li> <li>The property of soils is affected by the L types of rock, size of rock pieces and amount of organic matter in it.</li> <li>There are three types of rocks: sedimentary, metamorphic and igneous</li> <li>Fossils were formed millions of years ago</li> <li>In simple terms how fossils are formed when things that have lived are trapped within rock</li> <li>That soils are made from ground up rocks and plants and animal remains.</li> </ul>	<ul style="list-style-type: none"> <li>The difference in structure between solids, liquids and gases</li> <li>Melting is a change of state from solid to liquid</li> <li>Freezing is a state of change from liquid to solid. The freezing point of water is 0°C</li> <li>Boiling is a change of state from liquid to gas, water boils when it is heated to 100°C</li> <li>Evaporation is the change from a liquid to a gas at the surface of the liquid.</li> <li>Condensation is the change from a gas to a liquid caused by cooling</li> <li>The water cycle is the never ending process of water moving from the oceans into the atmosphere and back to the earth and oceans. It involves evaporation and condensation.</li> </ul>	<ul style="list-style-type: none"> <li>How to compare and group together everyday materials on the basis of their properties, including hardness, solubility, conductivity, (electrical and thermal) and response to magnets</li> <li>Some material will dissolve in liquid to form a solution and describe how to receive a substance from a solution</li> <li>How mixtures might be separated, including through filtering, sieving and evaporating, using knowledge of solids, liquids and gases.</li> <li>That dissolving, mixing, melting and freezing are reversible changes</li> <li>Some changes result in the formation of new materials, and this kind of change is not usually reversible, including change associated with burning, rusting and the action of acid on bicarbonate of soda</li> </ul>	<ul style="list-style-type: none"> <li>Fossils give us evidence of what lived on earth millions of years ago</li> <li>By studying fossils, scientists can put together how a plant or animal looked. They can identify what an animal ate, where it lived and how it died.</li> <li>Plants and animals have characteristics that make them suited to their environment e.g. cactus or polar bear</li> <li>Adaptation can lead to evolution if the environment changes i.e. tawny owls.</li> <li>Animals and plants with variations that are best suited to survive in greater numbers to reproduce and pass their characteristics on to their young. This is natural selection.</li> <li>Living things produce offspring of the same kind. The offspring are not normally identical to their parents and vary from each other.</li> </ul>

Light and sound	<ul style="list-style-type: none"> <li>The names of the four seasons and the months that each season takes place in</li> <li>The changes that happen across the four seasons</li> <li>The weather associated with the seasons and how day length varies including the date of the longest / shortest day</li> <li>The weather symbols and use them to record the weather where they live</li> <li>That sunrise is the time in the morning when the sun first appears and sunset is the time in the evening when the sun disappears out of sight in the sky.</li> </ul>		<ul style="list-style-type: none"> <li>You need light in order to see things and that dark is the absence of light</li> <li>Light is reflected (bounces off) from surfaces, shiny surfaces reflect light and matt surfaces don't reflect light very well</li> <li>Light from the sun can be dangerous and damage your eyes. You must never look directly at the sun and can wear sunglasses to protect your eyes</li> <li>Shadows are formed where the light from a light source is blocked by a solid object</li> <li>The size of a shadow can be changed by changing the position of the light sources / object or surface where the shadow is being made.</li> </ul>	<ul style="list-style-type: none"> <li>A sound is something you can hear or that can be heard. We hear sound with our ears.</li> <li>Sounds are made when a part of a sound source is vibrating</li> <li>That vibrations from a sound travel through a medium to the ear. As well as travelling through air (gas), sound can travel through solids and liquids</li> <li>The pitch of a sound, how low or high the sound is, depends on the features of the objects that produced it</li> <li>The volume of a sound depends on the strength of the vibrations producing it.</li> <li>That sounds get fainter as the distance from the sound source increases.</li> <li>You can insulate sound using a material which blocks sound effectively.</li> </ul>	<ul style="list-style-type: none"> <li>The sun is a star at the centre of our solar system</li> <li>There are 8 planets in our solar system that all orbit around the sun</li> <li>The earth orbits the sun. It takes 365 ¼ days to complete its orbit around the sun. this is a year.</li> <li>The movement of the Earth, and other planets, relative to the sun in the solar system.</li> <li>The moon orbits the Earth. It takes about 28 days to complete it's orbit.</li> <li>The sun, earth and moon are approximately spherical bodies</li> <li>The Earth rotates (spins) on its axis once every 24 hours and this gives us day and night.</li> </ul>	<ul style="list-style-type: none"> <li>Light travels in straight lines</li> <li>We see things because light travels from light sources to our eyes</li> <li>From objects that are not a light sources, light must be reflected from the object into our eye for us to see the object.</li> <li>Shadows have the same shape as the objects that cast them.</li> </ul>
Force and electricity			<ul style="list-style-type: none"> <li>Objects move differently on different surfaces</li> <li>Some forces need contact between two objects, a pull or a push</li> <li>Magnets have two poles (north and south) and opposite poles attract (pull towards) whereas same poles repel (push away)</li> <li>A magnet attracts magnetic materials. It does not need to touch the object to attract it as magnetic forces can act at a distance.</li> </ul>	<ul style="list-style-type: none"> <li>That electricity is a form of energy used for lighting, heating, making sound and making machines work</li> <li>The names of common appliances that run on electricity Some plug into the mains and others run on batteries</li> <li>How to construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</li> <li>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 the battery.</li> <li>That a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.</li> <li>Some common conductors and insulators, and associate materials with being good conductors</li> </ul>	<ul style="list-style-type: none"> <li>A force is a push or a pull. Forces make objects start moving, stop moving, speed up, slow down or change direction.</li> <li>The unit for measuring force is Newtons and they are measured using a force meter</li> <li>That unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</li> <li>The effects that air resistance and friction have between moving surfaces</li> <li>That some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li> </ul>	<ul style="list-style-type: none"> <li>A circuit is a complete path that an electric current can flow around. It flows from the battery, through wire and devices before returning to the battery.</li> <li>Adding more cells to a circuit makes a bulb brighter or a buzzer louder</li> <li>If you use a battery with a higher voltage, the bulb would also be brighter or the buzzer louder.</li> <li>Adding more bulbs or a motor into a circuit with a single bulb or buzzer will make the bulb less bright or buzzer quieter.</li> <li>If we add more motors to the circuit, each motor will spin more slowly.</li> <li>A switch breaks the circuit so it is not complete and electricity cannot flow. The bulb, buzzer or motor will turn off.</li> <li>Recognised symbols can be used when representing a simple circuit as a diagram</li> <li>Volts are a measure of the energy flow of electricity.</li> </ul>

# Working Scientifically Progression of skills

Topic	Nursery	Reception
<b>Animals, excluding humans</b>	<ul style="list-style-type: none"> <li>I understand about the life cycles of animals</li> <li>I can compare adult animals to their babies</li> <li>I can observe and talk about how baby animals change over time</li> </ul>	<ul style="list-style-type: none"> <li>I can name and describe animals that live in different habitats</li> <li>I can describe different habitats</li> <li>I can name some familiar animals</li> </ul>
<b>Humans</b>	<ul style="list-style-type: none"> <li>I understand about the life cycles of humans</li> <li>I know how to take care of myself</li> <li>I can understand my senses</li> </ul>	<ul style="list-style-type: none"> <li>I can describe people who are familiar to them</li> <li>I know how to take care of myself</li> </ul>
<b>Living things and their habitats</b>	<ul style="list-style-type: none"> <li>I can explore the surrounding natural environment</li> <li>I can explore natural objects from the surrounding environment</li> </ul>	<ul style="list-style-type: none"> <li>I can explore plants in the surrounding natural environment</li> <li>I can explore the animals in the surrounding environment</li> <li>I can explore plants and animals in a contrasting natural environment.</li> </ul>
<b>Plants</b>	<ul style="list-style-type: none"> <li>I can grow plants</li> </ul>	
<b>Seasonal changes</b>		<ul style="list-style-type: none"> <li>I play and explore outside in all seasons and in different weathers</li> <li>I observe living things throughout the year</li> </ul>
<b>Materials, including changing materials</b>	<ul style="list-style-type: none"> <li>I can explore a range of materials</li> <li>I can shape and join materials together</li> <li>I can combine and mix ingredients together</li> <li>I can change materials by heating and cooling, including cooking</li> </ul>	<ul style="list-style-type: none"> <li>I can explore a range of materials, including natural materials</li> <li>I can make objects from different materials, including natural materials</li> <li>I can observe, measure and record how materials can change when heated or cooled.</li> <li>I can compare how materials change over time and in different conditions.</li> </ul>
<b>Electricity</b>	<ul style="list-style-type: none"> <li>I can identify electrical devices</li> <li>I can use battery-powered devices</li> </ul>	
<b>Light</b>	<ul style="list-style-type: none"> <li>I can explore light sources</li> <li>I can shine light on or through different materials</li> </ul>	<ul style="list-style-type: none"> <li>Explore shadows</li> <li>Explore rainbows</li> </ul>
<b>Forces</b>	<ul style="list-style-type: none"> <li>I can feel and talk about different forces</li> <li>I can explore how things work</li> <li>I can explore how objects/ materials are affected by forces</li> </ul>	<ul style="list-style-type: none"> <li>Explore how to change how things work</li> <li>Explore how wind can move objects</li> <li>Explore how objects can move in water</li> </ul>
<b>Sound</b>	<ul style="list-style-type: none"> <li>I can listen to sounds</li> <li>I can make sounds</li> </ul>	<ul style="list-style-type: none"> <li>I can listen to sounds outside and identify the source</li> <li>I can make sounds</li> </ul>
<b>Earth and Space</b>		<ul style="list-style-type: none"> <li>I can learn about the Solar System and stars</li> <li>I can learn about space travel</li> </ul>

Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
I can explore the world around me and raise my own simple questions.	I can raise my own relevant questions about the world around me.	I can use my science experiences to explore ideas and raise different kinds of questions.
I can experience different types of science enquiries, including practical activities.	I can be given a range of scientific experiences including different types of science enquiries to answer questions.	I can talk about how scientific ideas have developed over time.
I can begin to recognise different ways in which I might answer scientific questions.	I can start to make my own decisions about the most appropriate type of scientific enquiry I might use to answer questions.	I can select and plan the most appropriate type of scientific enquiry to use to answer scientific questions.
I can carry out simple tests.	I can set up simple practical enquiries, comparative and fair tests I can recognise when a simple fair test is necessary and help to decide how to set it up.	I can recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why.
I can use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (identifying and classifying).	I can talk about criteria for grouping, sorting and classifying; and use simple keys.	I can use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment.
I can ask people questions and use simple secondary sources to find answers.	I can recognise when and how secondary sources might help me to answer questions that cannot be answered through practical investigations.	I can recognise which secondary sources will be most useful to research my ideas and begin to separate opinion from fact.
I can observe closely, using simple equipment I can, with help, observe changes over time.	I can make systematic and careful observations I can help to make decisions about what observations to make, how long to make them for and the type of simple equipment might be used.	I can make my own decisions about what observations to make, what measurements to use and how long to make them for.
I can, with guidance, begin to notice patterns and relationships.	I can begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them.	I can look for different causal relationships in data and identify evidence that refutes or supports my own ideas.
I can use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data.	I can take accurate measurements using standard units and learn how to use a range of (new) equipment, such as data loggers / thermometers appropriately.	I can choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. I can take repeat measurements where appropriate.
I can record simple data.	I can collect and record data from my observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys and make decisions about how to analyse this data.	I can decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
I can use my observations and ideas to suggest answers to questions. I can talk about what I have found out and how I found it out.	I can, with help, look for changes, patterns, similarities and differences in my data in order to draw simple conclusions and answer questions.	I can identify scientific evidence that has been used to support or refute ideas or arguments.
I can, with help, record and communicate findings in a range of ways and begin to use simple scientific language.	I can use relevant simple scientific language to discuss ideas and communicate findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions.	I can use relevant scientific language and illustrations to discuss, communicate and justify scientific ideas, use oral and written forms such as displays and other presentations to report conclusions, causal relationships and explanations of degree of trust in results.
	I can, with support, identify new questions arising from the data, making predictions for new values within or beyond the data they have collected and finding ways of improving what they have already done.	I can use my results to make predictions and identify when further observations, comparative and fair tests might be needed.

# Impact

Teachers use a range of formative assessment strategies to understand children's knowledge, address misconceptions and adapt teaching. Children are engaged in learning which provides students with the foundations for understanding the world. We develop their understanding of their local environment as well as wider issues affecting them and the planet.

Children have the knowledge and skills to investigate their own questions, carry out investigations, record results and draw conclusions from their results. Children develop their resilience and understanding that sometimes results aren't what they expected and are able to suggest improvements or alternatives to their investigations.