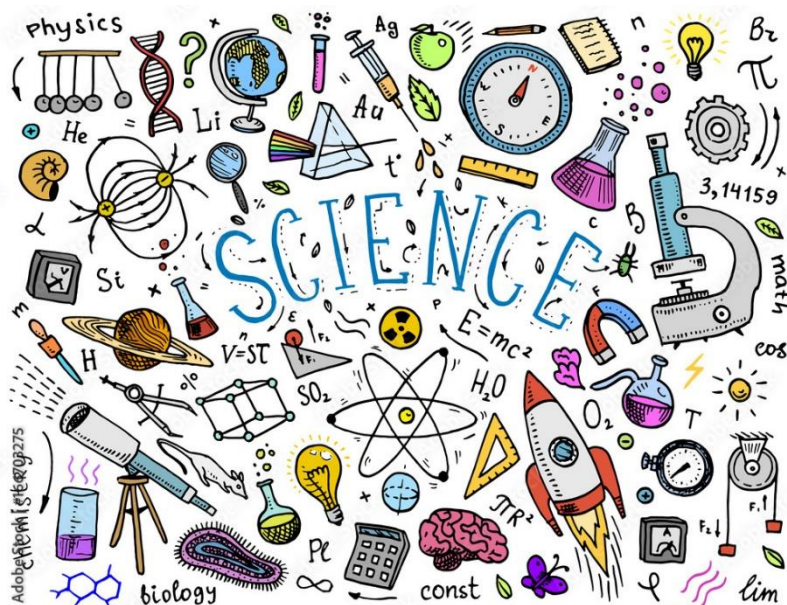




Science Handbook



Our Rational and Ethos

All children at Perryfields Primary school are entitled to a broad, balanced, relevant education suited to their individual needs. The study of Science at Perryfields Primary School follows the guidelines of the National Curriculum and provides children with knowledge and an understanding of the world around them.

Aims and Objectives

The teaching of Science aims to enable children to:

- Develop scientific knowledge and conceptual understanding through biology, chemistry and physics
- Ask and answer scientific questions about the world around them
- Develop understanding of nature, processes and methods of science through different types of science enquiries
- Understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes

Science Expectations

Science is a core subject, which is taught weekly in Year 1 up to Year 6. In EYFS, Science is not a separate subject, however it is regularly taught through 'Understanding the World'. Scientific vocabulary is used by teachers and children should also be encouraged to use it where appropriate. The vocabulary and definitions are displayed in each classroom and referred to during teaching. Science learning not only covers knowledge of science topics but also covers skills that children need to become successful 'scientists'. These are outline in the working scientifically objectives. Where appropriate, there are opportunities to make cross-curricular links with science to other areas of the curriculum, e.g. history, geography, maths and english.

Science in Early Years

In the Early Years Foundation Stage, children learn about the world around them through first-hand experiences both independently and facilitated by adults. The teaching and learning of Science is mainly through the objective 'Understanding the World' and the development of the children set out in the Early Learning Goals, which underpin the curriculum planning for children aged three to five.

The children's learning includes being exposed to new vocabulary and hands on activities that promotes exploring simple questions. The range of experience encourages children to make connections between one area of learning and another and so extends their understanding. We provide a rich environment in which we encourage and value creativity. Children experience a wide range of activities that they respond to, using the various senses.

Science in KS1

In Key Stage 1, Science learning focuses on developing children's understanding of the world around them and helping them to develop their scientific skills.

In Year 1, children learn about plants, animals, everyday materials and seasonal changes. They begin to carry out scientific enquiries by asking simple questions and investigations.

In Year 2, Children learn about living things and their habitats, plants, animals and everyday materials. They continue to apply this knowledge to carry out scientific investigations involving the KS1 requirements.

Working Scientifically in Year 1 and 2:

- 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

Science in KS2

In Lower Key Stage 2, the science curriculum focuses on broadening pupils' scientific views of the world around them.

In Year 3, children learn about plants, animals including humans, rocks, light, forces and magnets. Children also begin to use more complex practical scientific methods and skills.

In Year 4, children learn about animals including humans, sound and electricity. Children continue to carry out practical scientific enquiries.

Working Scientifically in Year 3 and 4:

- 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.

In Upper Key Stage 2, the science curriculum enables children to develop a deeper understanding of a wide range of scientific ideas.

In Year 5, children learn about living things and habitats, properties and changes of materials, Earth and space and forces. Children carry out practical scientific enquiries.

In Year 6, children learn about living things and habitats, animals, evolution and inheritance, light, and electricity. Children carry out practical scientific enquiries.

Working Scientifically in Year 5 and 6:

- 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

Progression of Skills

The progression of skills from EYFS (Early Years Foundation Stage) to Year 6 can be found in the Science Progression document. This outlines progression of scientific knowledge and working scientifically skills to ensure continuity and progression for all pupils from EYFS to Y6.

Planning

Planning starts with the objectives stated in the National Curriculum. The progression of skills (as above) ensures that children build upon each scientific skill or area throughout the school. KRC folders are used to ensure that objectives have been covered and can identify any areas which children may need to revisit before moving on to new learning. More detailed lesson planning for each year group is created by teachers, using PowerPoints or Smart Notebooks. These are accessed in the year group folders in Teams.

Assessment, Retrieval Practise and Knowledge Organisers

Teachers assess attainment when marking Science books and can use this assessment for future learning. The National Curriculum Science objectives are included in the Knowledge Rich Curriculum (KRC) Assessment folders. Teachers complete the assessment sheets each term in the KRC folder and also highlight the progression of skills document. Displays around classrooms and school celebrate work and further evidence the subject.

The children's understanding of Science knowledge and skills is continuously assessed through a variety of ways; by observing pupils, discussing topics with pupils, marking written work, Retrieval Practice tasks and the completion of Knowledge Organisers. At the end of each science topic, the children complete a Kahoot quiz, which assesses and demonstrates the progress made in that topic.

Teachers provide children with regular opportunities to revisit prior learning. One of the ways this is achieved is by children completing a Knowledge Organiser. Children work together as a group to write down what they have learnt across that topic. Not only does this help to embed learning in Science it also provides children with the regular opportunity to use their Building Learning Power (BLP) and Oracy Skills. This enables the teacher to assess the knowledge gained and also any knowledge or skills that are not yet secure and that may need to be revisited.

Resources and Links

All classes have access to a range of Science resources to support with practical investigations and to help children visualise their learning and to be hands on to encourage their curiosity in Science.

Useful links to online resources:

White Rose Science [Primary science curriculum and resources](#) | [White Rose Education](#)

PSTT <https://pstt.org.uk/>

Explorify <https://explorify.uk/>

BBC bitesize <https://www.bbc.co.uk/bitesize/subjects/z7nygk7>

Early Years Foundation Stage (Reception)	Key Stage One		Lower Key Stage Two		Upper Key Stage Two	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

Pupils should be taught to:

<i>Working Scientifically</i>						
EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> Answer 'how' and 'why' questions about their experiences. 	<ul style="list-style-type: none"> Asking simple questions and recognising that they can be answered in different ways 		<ul style="list-style-type: none"> Asking relevant questions and using different types of scientific enquiries to answer them 	<ul style="list-style-type: none"> Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. 		
		<ul style="list-style-type: none"> Asking simple questions when investigating something new. 	<ul style="list-style-type: none"> Recognise that questions can be answered in different ways. 	<ul style="list-style-type: none"> Questions are relevant to the unit being studied and are answered using enquiries suggested by adults or others. 	<ul style="list-style-type: none"> Children begin to suggest the type of Scientific Enquiry most suitable for answering questions 	<ul style="list-style-type: none"> Plan different types of enquiry to answer questions, with support recognising variables.
<ul style="list-style-type: none"> Handle equipment and tools appropriately. 	<ul style="list-style-type: none"> Observing closely, using simple equipment 		<ul style="list-style-type: none"> Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. 		<ul style="list-style-type: none"> Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. 	
	<ul style="list-style-type: none"> Handle and use simple equipment such as magnifying glasses. 	<ul style="list-style-type: none"> Describe the effect/difference of using the equipment. For example – describe how magnifying glass improves view. 	<ul style="list-style-type: none"> Take measurements over intervals, using measurements learned – links with maths. 	<ul style="list-style-type: none"> Take accurate measurements, suggesting suitable timeframes for enquiries and use equipment independently. 	<ul style="list-style-type: none"> Record complex data, using more detailed scientific diagrams and labels, tables, bar and line graphs. 	<ul style="list-style-type: none"> Use classification keys and scatter graphs.
	<ul style="list-style-type: none"> Performing simple tests 		<ul style="list-style-type: none"> Setting up simple practical enquiries, comparative and fair tests. 		<ul style="list-style-type: none"> Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. 	
	<ul style="list-style-type: none"> Using equipment and methods guided by an adult. 	<ul style="list-style-type: none"> Begin to suggest ideas for equipment to be used. 	<ul style="list-style-type: none"> Set up simple enquiries when provided with equipment. 	<ul style="list-style-type: none"> Choose appropriate and relevant equipment from a given variety to create comparative and fair tests. 	<ul style="list-style-type: none"> Take measurements using a range of equipment. Begin to take repeat readings for the purpose of 'fair test' when necessary. 	<ul style="list-style-type: none"> Identify when a repeat reading is appropriate/necessary.
<ul style="list-style-type: none"> Make observations of animals and plants and explain why some things occur (Understanding the world). 	<ul style="list-style-type: none"> Identifying and classifying 		<ul style="list-style-type: none"> Gathering, recording, classifying and presenting data in a variety of ways to help in answering the question 		<ul style="list-style-type: none"> Using test results to make predictions to set up further comparative and fair tests 	
	<ul style="list-style-type: none"> Classify using simple models based on one different characteristic. 	<ul style="list-style-type: none"> Use more detailed models e.g. 3 circle Venn diagrams, Carroll diagrams etc. 	<ul style="list-style-type: none"> Suggest the best ways of gathering, recording and classifying data. 	<ul style="list-style-type: none"> Present in a variety of ways and begin to notice patterns in data and suggest possible reasons for this. Record data with increasing accuracy. 	<ul style="list-style-type: none"> Use others' test results to set up further comparative and fair tests. 	<ul style="list-style-type: none"> Use their own test results to set up further comparative and fair tests. Consider adapting original hypothesis.
	<ul style="list-style-type: none"> Gathering and recording data to help in answering questions 		<ul style="list-style-type: none"> Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Identifying differences, similarities or changes related to simple scientific ideas and processes 		<ul style="list-style-type: none"> Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations 	

	<ul style="list-style-type: none"> Use raw data to answer simple questions. 	<ul style="list-style-type: none"> Use raw data to answer more complex questions (how many more etc). 	<ul style="list-style-type: none"> Be able to orally discuss findings, using basic scientific language and provide written explanations with support. Identify differences or similarities between scientific ideas. 	<ul style="list-style-type: none"> Be able to present results and conclusions of what they have found to others, using detailed scientific vocabulary. Compare differences and changes between scientific ideas and processes. 	<ul style="list-style-type: none"> Report and present findings from enquiries, including conclusions in oral and written forms such as displays and other presentations. 	<ul style="list-style-type: none"> Report and present on causal relationships, discussing degrees of trust.
<ul style="list-style-type: none"> Talk about changes related to observations. (Understanding the world). 	<ul style="list-style-type: none"> Using their observations and ideas to suggest answers to questions. 		<ul style="list-style-type: none"> Recording findings using simple scientific language, drawings, labelled diagrams, bar charts, and tables. Using straightforward scientific evidence to answer questions or to support their findings. Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. 		<ul style="list-style-type: none"> Identifying scientific evidence that has been used to support or refute ideas or arguments. 	
	<ul style="list-style-type: none"> Answer simple questions which have been given by a teacher. 	<ul style="list-style-type: none"> Suggest answers to questions of their own and those of classmates based on their own ideas and observations. 	<ul style="list-style-type: none"> Use simple, scientific language, drawings and bar charts. Use scientific evidence to answer simple questions with support. Use results to draw simple conclusions and make predictions for new values. 	<ul style="list-style-type: none"> Use labelled diagrams, keys and tables. Use evidence to support findings. Suggest improvements and raise further questions. 	<ul style="list-style-type: none"> Identify evidence that has been used to support ideas or arguments. 	<ul style="list-style-type: none"> Identify evidence that has been used to support or refute ideas or arguments.

Plants/All Living Things

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> Can talk about the features and areas around them and how environments can be different. 	<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. 	<ul style="list-style-type: none"> 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. 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 micro-habitats. 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. 	<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. 	<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. 	<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. 	<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. <p><u>Evolution and 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.

Animals Including Humans

<ul style="list-style-type: none"> Know about the similarities and differences between themselves and others. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. 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. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Describe the changes as humans develop to old age. 	<ul style="list-style-type: none"> 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.
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Light and Sound

			<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 a solid object. Find patterns in the way that the size of shadows change 	<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. 		<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.
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Forces and Electricity

			<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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 associate metals with being good conductors. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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 simple circuit in a diagram.
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Earth and Space

	<ul style="list-style-type: none"> Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies. 				<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. 	
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Materials, States of Matter and Rocks

<ul style="list-style-type: none"> Know about similarities and differences in relation to places, objects and materials. 	<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. 	<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. 	<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. 	<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. 	<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 particular uses of everyday materials. Demonstrate that dissolving, mixing and changes of state are reversible changes. 	
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					<ul style="list-style-type: none">• 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.	
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