

#### Science at

### **Exwick Heights Primary School**

#### Overview

We aspire to give our children an understanding of the world around them from the moment they join our community. Children are natural scientists and so we have adopted a curriculum (PLAN and TAPS) which ensures that scientific enquiry skills are embedded in each unit. This helps children to ask and answer questions about the world around them and recognise how and why Science plays an important part in our world.

### **Curriculum Principles**

### By the end of their primary education, a pupil of Exwick Heights Primary School will:

- Develop scientific knowledge (substantive knowledge) and conceptual understanding through the specific disciplines of biology, chemistry and physics that will provide a foundation for understanding the world.
- Develop understanding of the nature, processes and methods of science through different types of scientific enquiries (disciplinary knowledge) that help them to answer scientific questions about the world around them.
- Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future, providing each child with science capital.

### By the end of Early Years, pupils can...

- Talk about the lives of the people around them and their roles in society;
- Understand the past through settings, characters and events in books read in class and storytelling.
- Describe their immediate environment using knowledge from observation, discussion, stories, non-fiction texts and maps;
- Explain some similarities and differences between life in this country and life in other countries, drawing on knowledge from stories, non-fiction texts and when appropriate maps.
- Explore the natural world, making observations and drawing pictures of animals and plants;
- Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class;
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

### By the end of KS1, pupils can...

- observe and experience phenomena
- be curious and ask questions
- use simple scientific language
- communicate their ideas in different ways
- have practical first-hand experiences

Pupils will also develop the following scientific process, methods and skills:

- 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

### By the end of lower KS2, pupils can...

- broaden their scientific view of the world around them through talking about, testing and developing ideas
- ask their own questions about what they observe
- make some decisions about which type of scientific enquires are best to answer them
- draw simple conclusions
- use some scientific language to talk and write about what they found out

Pupils will also develop the following scientific process, methods and skills:

- 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.

#### By the end of upper KS2, pupils can...

- explore and talk about their ideas; ask their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically.
- encounter more abstract ideas and begin to recognise how these help them to understand and predict how the world operates
- recognise that scientific ideas change and develop over time
- select the most appropriate ways to answer scientific questions using different types of scientific enquiry
- draw their own conclusions based on data and observations
- use evidence to justify their ideas and use their scientific knowledge and understanding to explain their findings

Pupils will also develop the following scientific process, methods and skills:

- plan 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 argument

# In order to achieve a true understanding of Science, topics are sequenced based on the following rationale:

- Science is taught weekly in carefully planned and arranged topic blocks by the class teacher. This
  is a strategy to enable the achievement of a greater depth of knowledge, which supports longterm memory through regular looping and building on prior knowledge. Topics are revisited and
  knowledge developed across each phase.
- Existing knowledge is checked at the beginning of each topic. This ensures that teaching is informed by the children's starting points and that it takes account of pupil voice, incorporating children's interests.
- Through our planning, we involve problem-solving opportunities that allow children to apply their knowledge, and find out answers for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess pupils regularly to identify those children with gaps in learning, so that all pupils keep up. Tasks are selected and designed to provide appropriate challenge to all learners, in line with the school's commitment to inclusion.
- We build upon the knowledge and skill development of the previous years. As the children's knowledge and understanding increases, they become more proficient in selecting and using scientific equipment as well as collating and interpreting results. The children become increasingly confident in their growing ability to come to conclusions based on real evidence.
- Working Scientifically skills (disciplinary knowledge) are embedded into lessons to ensure that skills are systematically developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.
- Teachers demonstrate how to use scientific equipment in order to embed scientific understanding. Teachers find opportunities to develop children's understanding of their surroundings by accessing outdoor learning and workshops with experts.
- Children are offered a wide range of extra-curricular activities, visits, trips and visitors to complement and broaden the curriculum. These are purposeful and link with the knowledge being taught in class.
- At the end of each topic, key knowledge is reviewed by the children and rigorously checked by the teacher and consolidated as necessary.
- Teachers create a positive attitude to science learning within their classrooms and reinforce an
  expectation that all pupils are capable of achieving high standards in science.



# The Science curriculum will address social disadvantage by addressing gaps in students' knowledge and skills:

- At Exwick, we provide relevant CPD to ensure that <u>all</u> staff are able to give the students the best quality first teaching.
- Staff have access to Reach Out CPD online.
- Students are tracked against core assessment standards and expectations three times per year using DCPRO. Students who are identified as needing additional support to meet objectives will be given support through adult led small group work, feedback and other appropriate support e.g. widget to support scientific vocabulary.
- Special educational needs/disabilities are given extra support. E.g. EAL students receive preteaching of vocabulary, support for writing in the form of a scaffolded structure (pictures/questions), the use of widget maps and differentiated tasks.
- The Education Endowment Foundation published a major report in 2017 examining the disadvantaged attainment gap in science. The strongest factor affecting pupils' learning in science is their literacy skills. We encourage and model sentence starters verbally, give thinking time and allow partner talk time. We support children with sentence starters, keywords and lessons use Explorify to promote discussion and higher order thinking skills.
- Following the publication of 'The 10 Key Issues with Children's Learning in Primary Science in England' (March 2021), in staff meetings, we will regularly promote to staff the potential to use pre-teaching in science and for home learning links in science to be made. We need to ensure that assumptions are not made about the science capital that children bring to lessons as this can lead to the needs to disadvantaged children not being met.

# We fully believe Science can contribute to the personal development of students at Exwick Heights:

- Children will learn how to develop their social competence, learn how to work with others and articulate ideas to justify their opinions.
- Develop an understanding of how different scientific discoveries have had an impact on their lives.
- Science lessons provide opportunities to explore personal development relating to physical and mental health. For example, learning about what humans need to stay healthy, learning about teeth, the digestive system and sex and relationship education.

In each phase of learning, our belief is that homework should be a revision of powerful knowledge previously modelled and taught in lessons. This knowledge is recalled and applied through a range of quizzing and practice.



### **Curriculum Overview including Enrichment Opportunities**

Year	Term 1	Term 2	Term 3		Term 4	Term 5	Term 6
Nursery	In Nursery, children will h	ave scientific opportuniti	es of learning through Und	erstan	nding of the World.		
Reception	In Reception, children wil	continue to have scienti	fic opportunities of learning	g thro	ugh Understanding of the	e World. Drakes Farm	
Year 1	Seasonal Changes	Trees Killerton	Seasonal Changes		Everyday Materials	Animals Including Humans	Plants Paignton Zoo
Year 2	Materials	Animals including Humans Animals2u	Uses of Everyday Materials		Plants	Living Things and their Habitats	Plants
Year 3	Animals including Humans - Skeleton	Rocks and Soils	Plants	Week	Animals including Humans – Nutrition	Forces and Magnets	Light
Year 4	Animals including Humans - Digestion	Electricity	Sound	British Science W	States of Matter	Living Things and their Habitats Plymouth Aquarium	Living Things and their Habitats
Year 5	Properties and Changes of Materials	Properties and Changes of Materials	Forces	Brit	Earth and Space Space Dome Ted Wragg: Innovation Project	Living Things and their Habitats	Animals Including Humans – Changing Bodies
Year 6	Living Things and their Habitats – Classification	Evolution and Inheritance We the Curious	Light		Electricity	Animals Including Humans - The Heart Paramedic Visit	Animals Including Humans – Changing Bodies

# Wragowall Wragowall

### **Our Spiral Curriculum**

All children are entitled to a curriculum and to the powerful knowledge, which will open doors and maximise their life chances. Below is a high-level overview of the critical knowledge children will learn in Science at each stage of their primary education, from Nursery through to Year 6. The curriculum is planned vertically and horizontally giving thought to the optimum knowledge sequence for building secure schema. This curriculum overview shows the knowledge, skills and understanding at each stage of a child's Science journey at Exwick Heights.

### **Nursery and Reception**

Alongside the Early Years Foundation Stage Statutory Framework and the Development Matters guidance, PLAN primary science resources are integrated into EHPS's Specific planning for teaching and learning in Understanding of the World. The overview of learning throughout the year is as follows:

		Autumn	Spring	Summer
u	Area of learning	Understanding of the World	Understanding of the World	Understanding of the World
Nursery and Reception	Opportunities for science	<ul> <li>Humans</li> <li>Sound</li> <li>Living things and their habitats</li> <li>Materials</li> <li>Light</li> <li>Electricity</li> <li>Earth and Space</li> <li>Seasonal changes</li> </ul>	<ul> <li>Forces</li> <li>Materials</li> <li>Plants</li> <li>Animals</li> <li>Living things and their habitats</li> <li>Seasonal changes</li> </ul>	<ul> <li>Materials</li> <li>Living things and their habitats</li> <li>Forces</li> <li>Seasonal changes</li> </ul>

### Year 1



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	<u>Topic</u>	Seasonal Changes	Trees	Seasonal Changes	Everyday Materials	Animals Including Humans	<u>Plants</u>
Year 1	Knowledge introduced	Observe changes across the four seasons.  Observe and describe weather associated with the seasons and how day length varies	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	Observe changes across the four seasons  Observe and describe weather associated with the seasons and how day length varies	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	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.	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

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Skills introduced	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							
Knowledge	The Natural World	The Natural World	The Natural World	The Natural World	The Natural World	The Natural World		
revisited	(EYFS)	(EYFS)	(EYFS)	(EYFS)	(EYFS)	(EYFS)		
Skills	See Nursery and Recep	otion						
revisited								



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	<u>Topic</u>	<u>Materials</u>	Animals including Humans	Uses of Everyday Materials	<u>Plants</u>	<u>Living Things and their</u> <u>Habitats</u>	<u>Plants</u>
Year 2	Knowledge	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.	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.	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.	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 living, dead, and things never alive.  Identify that most living things live in habitats to which they are suited and describe how different habitats provide for different kinds of animals and plants, and  Identify and name plants and animals in their habitats & microhabitats.  Describe how animals obtain food from plants and animals, using the idea of a simple food chain, and identify and name 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.

		Tool Tool
Skills introduced	Asking simple questions and recognising that they can be answered in different ways; Observing close tests; Identifying and classifying; Using their observations and ideas to suggest answers to questions; Canswering questions	
Knowledge revisited	Everyday Materials (Y1) The Natural World (EYFS)	
Skills revisited	See Nursery, Reception and Year 1	·



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	<u>Topic</u>	Animals including Humans – Skeleton	Rocks and Soils	<u>Plants</u>	Animals including Humans – Nutrition	Forces and Magnets	<u>Light</u>
Year 3	Knowledge	Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	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.	Identify and describe the functions of different parts of flowering plants. 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.	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 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.	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.



Skills introduced	tests Making systematic and including thermometer Recording findings usin including oral and writt for new values, suggest	careful observations and, s and data loggers; Gathe g simple scientific langua en explanations, displays improvements and raise	where appropriate, taking ring, recording, classifying ge, drawings, labelled diag or presentations of results further questions; Identifying	accurate measurements u and presenting data in a rams, keys, bar charts, and and conclusions; Using re ng differences, similarities	using standard units, using variety of ways to help in a d tables; Reporting on find sults to draw simple concles or changes related to sim	a range of equipment, nswering questions; lings from enquiries, usions, make predictions
	<u> </u>	The Natural World	Plants (Y2) The Natural	Animals Including		The Natural World
Knowledge		(EYFS) Everyday	World (EYFS)	Humans (Y2)		(EYFS)
revisited		Materials (Y1 & Y2)	Seasonal Changes (Y1)			
Skills revisited	See Nursery, Reception, Year 1 and Year 2					

### Year 4



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1 Summer 2
	<u>Topic</u>	Animals Including Humans - Digestion	<u>Electricity</u>	<u>Sound</u>	States of Matter	Living Things and their Habitats
Year 4	Knowledge introduced	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	Identify common electrical appliances. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.  Identify whether or not a lamp will light in a simple series circuit. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors.	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.	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.	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.



Skills introduced	tests Making systematic and car including thermometers ar Recording findings using s including oral and written for new values, suggest im	reful observations and, wher nd data loggers; Gathering, r imple scientific language, dr explanations, displays or pre	e appropriate, taking accura recording, classifying and pro awings, labelled diagrams, k resentations of results and co er questions; Identifying diffe	te measurements using stand esenting data in a variety of v ceys, bar charts, and tables; Re nclusions; Using results to dra erences, similarities or change	lard units, using a range of equipment, vays to help in answering questions; eporting on findings from enquiries, aw simple conclusions, make predictions as related to simple scientific ideas and				
Knowledge revisited	Animals Including Humans (Y2 and Y3)		The Natural World (EYFS)	Everyday Materials (Y1 & Y2) The Natural World (EYFS)	The Natural World (EYFS) Living Things and their Habitats (Y2)				
Skills revisited	See Nursery, Reception,	See Nursery, Reception, Year 1, Year 2 and Year 3							



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	<u>Topic</u>	Properties and Changes of	<u>Materials</u>	<u>Forces</u>	Earth and Space	Living Things and their Habitats	Animals Including Humans – Changing Bodies
Year 5	Knowledge	Compare and group everyday m basis of their properties (hardness transparency, conductivity, responsance).  Know that some materials will disto form a solution, and describe a substance from a solution.  Use knowledge of solids, liquids decide how mixtures might be solutioned including through filtering, sieving evaporating.  Give reasons, based on evidence comparative and fair tests, for the uses of everyday materials, inclusive wood and plastic.  Demonstrate that dissolving, mixthanges of state are reversible of the comparation of new materials, and change is not usually reversible, changes associated with burning of acid on bicarbonate of soda.	ss, solubility, onse to ssolve in liquid how to recover and gases to eparated, ng and from e particular ding metals, sing and nanges.	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.	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	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.

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Skills introduced	Planning different types of scientific enquiries t measurements, using a range of scientific equip and results of increasing complexity using scien results to make predictions to set up further co relationships and explanations of and a degree scientific evidence that has been used to suppo	ment, with increasing acculutific diagrams and labels, of mparative and fair tests; Resoft trust in results, in oral a	uracy and precision, taking classification keys, tables, eporting and presenting f and written forms such as	g repeat readings when app scatter graphs, bar and line indings from enquiries, inclu	ropriate; Recording data graphs; Using test uding conclusions, causal
Knowledge revisited	States of Matter (Y4) Everyday Materials (Y2) Everyday Materials (Y1) The Natural World (EYFS)	Forces and Magnets (Y3)	The Natural World (EYFS) Seasonal Changes (Y1)	Living Things and their Habitats (EYFS-Y4)	Animals including Humans (Y2)
Skills revisited	See Nursery, Reception, Year 1, Year 2, Year 3	and Year 4			



		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	<u>Topic</u>	Living Things and their Habitats – Classification	Evolution and Inheritance	<u>Light</u>	Electricity	Animals Including Humans – The Heart	Animals Including Humans – The Heart
Year 6	Knowledge introduced	Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals.  Give reasons for classifying plants and animals based on specific characteristics.	Recognise that living things have changed over time and that fossils provide information about living things that lived millennia 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 and that adaptation may lead to evolution.	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.  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 simple circuit in a diagram	Identify and name the modification circulatory system, and of the heart, blood vessels.  Recognise the impact of and lifestyle on the way.  Describe the ways in which are transported within an humans.	describe the functions of and blood.  diet, exercise, drugs their bodies function.  ich nutrients and water



Skills	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 and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs; Using test									
introduced	results to make predi	ts; Reporting and presenting	presenting findings from enquiries, including conclusions, causal ms such as displays and other presentations; Identifying							
	scientific evidence that has been used to support or refute ideas or arguments.									
Knowledge revisited	Living Things and Habitats (Y4)	Rocks (Y3)	Light (Y3)	Electricity (Y4)	Animals including Humans (Y1) Nutrition (Y3) Digestion (Y4)	Animals including Humans (Y2) Animals including Humans:				
Skills revisited	See Nursery, Reception, Year 1, Year 2, Year 3, Year 4 and Year 5									

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