



# Science Curriculum

2020-21

Northbourne CE Primary School  
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## Science Curriculum

At Northbourne Primary School, our vision is for the science curriculum to engage children in a deeper understanding of the world around them and enable them to explore and discover through practical investigations and thoughtful questioning.

Teaching should inspire curiosity, excitement and encourage this process of discovery. Activities should present children with the skills to ask questions, develop independence in their learning and to progress their knowledge and understanding.

### 1. The structure of our Science curriculum

Our class structure (phases of 3 mixed age classes of children in two year groups each) means topics in Science are taught on a two-year cycle. Phases (KS1, LKS2 and UKS2) have taken their respective year groups' science topics from the National Curriculum and arranged them so as best to support progression and to support embedding close links with other subjects where possible.

In Key Stage One, the focus of pupils' learning is to develop pupil's experience and observations of the natural and humanly constructed world around them. They are encouraged to be curious and ask questions while developing their understanding of scientific ideas by using different types of scientific enquiry to explore their questions. In lower Key Stage two, pupils will continue to ask questions to broaden their views about the world around them and will develop their ideas about their observations, drawing conclusions using scientific language. In Upper Key Stage two pupils will begin to draw conclusions from data they have collected justify their ideas using their scientific knowledge and understanding to explain things.

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Biology	Living things and their Habitats Animals, including humans Plants	Living things and their Habitats Animals, including humans Plants	Living things and their Habitats Animals, including humans Evolution and inheritance
Chemistry	Everyday materials	Rocks States of matter	Properties of everyday materials
Physics	Seasonal Changes	Electricity Forces and magnets Light Sound	Electricity Forces Light Earth and Space
Working Scientifically	Pattern seeking, research, fair testing, observation over time, identifying and classifying		

### 2. Teaching of Science

Science topics are organized as far as possible to be taught in a cross-curricular way. Science knowledge is deepened through the use of science as a context for learning in other subjects, especially, where links are appropriate and meaningful, in Reading and Writing; however, this does not weaken the focus on the development of scientific skills and knowledge which remain the focus of teaching within a 'Science' lesson.

Science is taught weekly in blocked sessions. When appropriate, these can be blocked together for longer sessions in order to allow for more time (such as when setting up and performing an investigation).

New topics in science are introduced with a Big Question which pupils will be able to discuss with greater understanding as the topic progresses. These are clearly displayed in classes and referred to in lessons. Most science sessions begin with a 'Bright Ideas' activity, which prompts discussion about a range of different questions unrelated to the current science topic. Teachers can use these to recap and reinforce previously taught science topics, or to develop vocabulary and thinking skills beyond the scope of the current topic. New topics taught will always be preceded by an initial assessment which will be used to guide the planning to ensure progression on prior knowledge. Termly working scientifically assessments will help secure a teacher's judgment on attainment and progress.

### 3. Working scientifically

The following five types of enquiry are used by children from year 1 to year 6 across the different subject areas as appropriate (biology, physics and chemistry). These are:

- Observing changes over time
- Pattern-Seeking
- Grouping and classifying things (noticing similarities and differences)
- Comparative and fair testing
- Finding things out using secondary sources of information (researching)

Children will also have opportunities to model their science learning. Investigative work is interwoven throughout the science topics taught to help children develop their working scientifically skills and understanding.

### 4. Knowledge of Science as a discipline

In Key Stage One, children will begin to look at how science is used in various jobs and how the skills and knowledge we learn in school are used occupations such as vets, paleontologists, meteorologists, gardeners and naturalists. These will be linked with their respective topics and, where possible, shared through first-hand practical experiences or secondary sources (such as books, videos or images).

In Key Stage 2, children will develop their knowledge of science as a discipline and the impact a range of scientists have had on our understanding of the world. Each phase in Key Stage 2 will learn about two dedicated scientists linked with topics being taught. These will help children draw parallels with historical understanding and incorporate scientists from a range of backgrounds and ethnicities.

#### Year 5/6

Mary Anning	A self-taught British paleontologist who among other achievements, discovered fossilized remains of Ichthyosaur and Pterodactyl on the Dorset 'Jurassic Coast'
Carl Linnaeus	Carl Linnaeus is the father of the classification system as we know it today and is famous for his work in taxonomy, the science of identifying, naming and classifying organisms (plants, animals, bacteria, fungi, etc.)
Professor Brian Cox	An English physicist who continues to inspire people by communicating an interest in the stars, our galaxy and the wonders of the universe.
Charles Darwin	The 'father' of the theory of evolution, Darwin's ideas were gathered from his voyages in the HMS Beagle and helped form the concept of natural selection.

#### Year 3/4

Thomas Edison	Described as America's greatest inventor, Edison is famed for inventing the light bulb and electric power generation.
Marie Curie	As an influential female Physicist and Chemist, Curie conducted pioneering research into radioactivity. She is the name-sake of a cancer charity.

Alexander Graham Bell	Despite his mother and wife being deaf, Bell worked tirelessly to perfect the invention of the telephone, being the first scientist to patent it.
Agnes Arber	A British plant morphologist and anatomist. Arber studied the physical form, internal and external structure of plants.

## 5. Progression in knowledge and understanding

### a) Physics

<b>KS1</b>				<b>Seasonal changes</b> -observe changes across the four seasons -observe and describe weather associated with the seasons and how day length varies.
<b>LKS2</b>	<b>Electricity</b> -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	<b>Forces and magnets</b> -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	<b>Light</b> -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 a light source is blocked by a solid object -find patterns in the way that the size of shadows change	<b>Sound</b> -identify how sounds are made, associating some of them with something vibrating -recognise that vibrations from sound 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.
<b>UKS2</b>	<b>Electricity</b> -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	<b>Forces</b> -explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object -identify the effect 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	<b>Light</b> -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	<b>Earth and space</b> -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

## b) Chemistry

<b>KS1</b>	<b>Everyday materials</b> -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 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.	
<b>LKS2</b>	<b>Rocks</b> -compare and group together different kinds of rocks on the basis of their simple physical properties -recognise that soils are made from rocks and organic matter -describe in simple terms how fossils are formed when things that have lived are trapped within rock. <a href="#">(link UKS2 Evolution and Inheritance)</a>	<b>States of matter</b> -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.
<b>UKS2</b>	<b>Properties of everyday materials</b> -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, including metals, wood and plastic Reversible change -demonstrate that dissolving, mixing and changes of state are reversible changes. Changes that form new materials -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.	

**c) Biology**

<p><b>KS1</b></p>	<p><b>Living things and their habitats</b>                  -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.</p>	<p><b>Animals, including humans</b>                  -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.                  -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</p>	<p><b>Plants</b>                  -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 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.</p>
<p><b>LKS2</b></p>	<p><b>Living things and their habitats</b>                  -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</p>	<p><b>Animals, including human</b>                  -identify that animals, including hu-mans, 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.                  -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</p>	<p><b>Plants</b>                  -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 of flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</p>
<p><b>UKS2</b></p>	<p><b>Living things and their habitats</b>                  -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                  -describe the life process of reproduction in some plants and animals                  -describe the differences in the life cycle of a mammal, an amphibian, an insect and a bird                  -recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.</p>	<p><b>Animals, including humans</b>                  -describe the changes as humans develop to old age                  -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</p>	<p><b>Evolution and inheritance</b>                  -recognise that living things produce off-spring of the same kind, but normally off-spring vary and are not identical to their parents                  -recognise that living things have changed over time and that fossils provide the information about living things that inhabited the Earth millions of years ago (<a href="#">link LKS2 Rocks</a>)                  -identify how animals and plants are adapted to suit their environment in different ways and that adaption leads to evolution</p>

## 4. Progression in working scientifically

KS1	LKS2	UKS2
Explore the world around them and raise their own simple questions	Raise their own relevant questions about the world around them	Use their science experiences to explore ideas and raise different kinds of questions
Experience different types of science enquiries, including practical activities	Should be given a range of scientific experiences including different types of science enquiries to answer questions	Talk about how scientific ideas have developed over time
Begin to recognise different ways in which they might answer scientific questions	Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions	Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions
Carry out simple tests	Set up simple practical enquiries, comparative and fair tests Recognise when a simple fair test is necessary and help to decide how to set it up	Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why
Use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (identifying and classifying)	Talk about criteria for grouping, sorting and classifying; and use simple keys	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
Ask people questions and use simple secondary sources to find answers	Recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations	Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact
Observe closely using simple equipment with help, observe changes over time	Make systematic and careful observations Help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used	Make their own decisions about what observations to make, what measurements to use and how long to make them for
With guidance, they should begin to notice patterns and relationships	Begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them	Look for different causal relationships in their data and identify evidence that refutes or supports their ideas
Use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data	Take accurate measurements using standard units learn how to use a range of (new) equipment, such as data loggers / thermometers appropriately	Choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. Take repeat measurements where appropriate.
Record simple data	Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys and help to make decisions about how to analyse this data	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

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<p>Use their observations and ideas to suggest answers to questions Talk about what they have found out and how they found it out</p>	<p>With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions</p>	<p>Identify scientific evidence that has been used to support or refute ideas or arguments</p>
<p>With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language</p>	<p>Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions</p>	<p>Use relevant scientific language and illustrations to discuss, communicate and justify their 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</p>
	<p>With support, they should 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.</p>	<p>Use their results to make predictions and identify when further observations, comparative and fair tests might be needed</p>

## 5. Our Curriculum Plan

2021-22	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Nursery						
Reception <i>(Focused teaching)</i>	Natural Environment and Living Things		Life Cycles	Plants		Materials
Key Stage One	Seasonal Changes Uses of Everyday Materials	Seasonal Changes Uses of Everyday Materials	Plants	Everyday Materials	Animals incl Humans <i>Animals focus</i>	Animals incl Humans <i>Humans focus</i>
Lower Key Stage Two	Rocks and Soils	States of Matter	Electricity	Forces and Magnets	Scientists and inventors	Animals incl Humans
Upper Key Stage Two	Animals incl Humans	Living Things and Their Habitats	Earth and Space	Forces	Forces	Electricity

2022-23	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Nursery						
Reception <i>(Focused teaching)</i>	Natural Environment and Living Things		Life Cycles	Plants		Materials
Key Stage One	Seasonal Changes Animals incl Humans	Seasonal Changes Living Things and Their Habitats	Animals incl Humans	Seasonal Changes Plants	Seasonal Changes Everyday Materials	Seasonal Changes Living Things and Their Habitats
Lower Key Stage Two	Working Scientifically: <i>Chemistry focus</i>	Plants	Living Things and Their Habitats	Animals incl Humans	Light	Sound
Upper Key Stage Two	Living Things and Their Habitats	Evolution and Inheritance (incl Adaptation)	Materials and Their Properties	Scientists and inventors	Light	Animals incl Humans

<b>Physics</b>	<b>Chemistry</b>	<b>Biology</b>
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