



- The ability to think independently and raise questions about working scientifically and the knowledge and skills that it brings.
- Confidence and competence in the full range of practical skills, taking the initiative in, for example, planning and carrying out scientific investigations.
- Excellent scientific knowledge and understanding which is demonstrated in written and verbal explanations, solving challenging problems and reporting scientific findings.
- High levels of originality, imagination or innovation in the application of skills.
- The ability to undertake practical work in a variety of contexts, including fieldwork.
- A passion for science and its application in past, present and future technologies.



To work scientifically

Biology

To understand plants

To understand animals and humans

To investigate living things

To understand evolution and inheritance

Chemistry

To investigate materials

Physics

To understand movement, forces and magnets

To understand the Earth's movement in space

To investigate light and seeing

To investigate sound and hearing

To understand electrical circuits

**Working scientifically**

Key stage 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)
<p>During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:</p> <ul style="list-style-type: none"> • 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. 	<p>Pupils in years 1 and 2 should explore the world around them and raise their own questions. They should experience different types of scientific enquiries, including practical activities, and begin to recognise ways in which they might answer scientific questions.</p> <p>They should use simple features to compare objects, materials and living things and, with help, decide how to sort and group them, observe changes over time, and, with guidance, they should begin to notice patterns and relationships.</p> <p>They should ask people questions and use simple secondary sources to find answers.</p> <p>They should use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data, carry out simple tests, record simple data, and talk about what they have found out and how they found it out.</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>These opportunities for working scientifically should be provided across years 1 and 2 so that the expectations in the programme of study can be met by the end of year 2. Pupils are not expected to cover each aspect for every area of study.</p>

Year 1: Plants

Year 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> • identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen • identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers. 	<p>Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they should observe the growth of flowers and vegetables that they have planted.</p> <p>They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (trees: trunk, roots, branches, leaves, flowers (blossom), fruit; garden</p>	<ul style="list-style-type: none"> ▪ Where do the most plants grow in the school grounds? ▪ Do all plants have roots, stem/trunk, leaves and flowers. ▪ What type of plants/trees are there in the school/park? ▪ What grows first the root or the stem? <p>Pupils might work scientifically by: observing closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants; describing how they were able to identify and group them, and drawing diagrams showing the parts of different plants and trees.</p>

	and wild plants: flower, petals, stem, leaves, roots, fruit, bulb and seed).	Pupils might keep records of how plants have changed over time, for example the leaves falling off trees and buds opening; and compare and contrast how different plants change over time.
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Year 1: Animals, including humans

Year 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates 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 (birds, fish, amphibians, reptiles, mammals and invertebrates, and 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. 	<p>Pupils should use the local environment throughout the year to explore and answer questions about animals in their habitat. They should understand how to take care of animals taken from their local environment and the need to return them safely after study. Pupils should become familiar with the common names of birds, fish, amphibians, reptiles, mammals and invertebrates, including pets.</p> <p>Pupils should have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes.</p>	<ul style="list-style-type: none"> What differences are there between the skeletons of different animals? Can we taste when we can't smell? <p>Pupils might work scientifically by: using their observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them; grouping animals according to what they eat; and using their senses to compare different textures, sounds and smells.</p>

Year 1: Everyday materials

Year 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <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 	<p>Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Pupils should explore and experiment with a wide variety of materials, not</p>	<ul style="list-style-type: none"> Which bag is most waterproof or strongest? What material is the most hard/soft; stretchy/stiff; shiny/dull; rough/smooth or bendy? <p>Pupils might work scientifically by: performing simple tests to explore questions such as: 'What is the best material for an umbrella? ... for lining a dog basket? ... for curtains? ... for a bookshelf? ... for a gymnast's leotard?'</p>

physical properties	only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil.	
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Year 1: Seasonal changes

Year 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
Pupils should be taught to: <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. 	Pupils should observe and talk about changes in the weather and the seasons. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.	<ul style="list-style-type: none"> How does the temperature change during a week, month, term? Pupils might work scientifically by: making tables and charts about the weather; and making displays of what happens in the world around them, including day length, as the seasons change.

Optional Unit Year 1 : Light

Year 1 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
Pupils should be taught to: <ul style="list-style-type: none"> observe and name a variety of sources of light, including electric lights, flames and the Sun associate shadows with a light source being blocked by something. 	Pupils should explore materials to raise questions that will help them to understand the differences between materials that are transparent, translucent and opaque (though these words do not need to be used at this stage). They should observe shadows being formed in everyday contexts, such as when they play outside or shine torches indoors. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.	<ul style="list-style-type: none"> Which is the most reflective material? Which materials let light through? Which torch is the brightest? How can we make our shadows bigger? Which is the brightest light source in the class/school? Pupils might work scientifically by exploring shiny things and grouping them according to whether they shine in the dark or not. They can go on a shadow hunt and think about what is similar about the places where shadows are found (that is, that there is a light source and something is blocking it).

Year 2: All living things and their habitats

Year 2 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
Pupils should be taught to: <ul style="list-style-type: none"> explore and compare the differences between things that are living, dead, and things that have never been alive identify that most living 	Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They should raise and answer	<ul style="list-style-type: none"> Do a greater variety of minibeasts live on the ground or in the trees? Do wood lice prefer the light or the dark, dry or damp conditions? Which tree has most birds

<p>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</p> <ul style="list-style-type: none"> • 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>questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example plants serving as a source of food and shelter for animals. Pupils should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.</p>	<p>on it?</p> <ul style="list-style-type: none"> • Which type of bird visits our playground most? <p>Pupils might work scientifically by: sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts. They should describe how they decided where to place things, exploring questions such as: 'Is a flame alive? Is a deciduous tree dead in winter?' and talk about ways of answering their questions. They could construct a simple food chain that includes humans (e.g. grass, cow, human); describing the conditions in different habitats and micro-habitats (under log, on stony path, under bushes); finding out how the conditions affect the number and type(s) of plants and animals that live there.</p>
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Year 2: Plants

Year 2 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <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. 	<p>Pupils should use the local environment throughout the year to observe how plants grow (including seeds, bulbs, fruit and vegetables, deciduous and evergreen bushes and trees). Pupils should be introduced to the requirements of plants for growth and survival, as well as the process of reproduction and growth in plants.</p> <p>Note: Seeds and bulbs need water to grow but do not need light; seeds and bulbs have a store of food inside them.</p> <p>Note: Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them.</p>	<ul style="list-style-type: none"> • Do shoots always grow up and roots always grow down? • Do plants need light in order to grow? • Will seeds grow in anything other than soil? <p>Pupils might work scientifically by: observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb, or observing similar plants at different stages of growth; setting up a comparative test to show that plants need light and water to stay healthy.</p>

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Year 2: Animals, including humans

Year 2 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <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. 	<p>Pupils should be introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans. They should also be introduced to the processes of reproduction and growth in animals. The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs. The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Growing into adults can include reference to baby, toddler, child, teenager, adult.</p>	<ul style="list-style-type: none"> How clean are your hands? Do people grow at the same rate? How many times can you jump up and down in a fixed time? <p>Pupils might work scientifically by: observing, through video or first-hand observation and measurement, how different animals, including humans, grow; asking questions about what things animals need for survival and what humans need to stay healthy; and suggesting ways to find answers to their questions.</p>

Year 2: Uses of everyday materials

Year 2 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <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. 	<p>Pupils should identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They should think about the properties of materials that make them suitable or unsuitable for particular purposes and they should be encouraged to think about unusual and creative uses for everyday</p>	<ul style="list-style-type: none"> Which sponge is the best for mopping up spills? When squashed, which materials return to their original shape? What happens to materials when they are heated or cooled? Which surface does a car roll down quickest? <p>Pupils might work scientifically by: comparing the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs); observing closely, identifying and classifying the uses of different materials, and recording their observations.</p>

	materials. Pupils might find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.	
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Optional Unit Year 2: Sound

Year 2 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> observe and name a variety of sources of sound, noticing that we hear with our ears recognise that sounds get fainter as the distance from the sound source increases. 	<p>Linked with work in music, pupils should explore various ways of making sounds, for example using a range of musical instruments to make louder and softer and higher and lower sounds.</p>	<ul style="list-style-type: none"> What size/shape makes the best ears? What makes the best string telephones? Which ear protector is best? Which sounds can be heard furthest away? How can you make the sounds louder/softer? How many ways can you play these instruments? How far do you need to walk before you stop hearing eg. a clock tick? <p>Pupils might work scientifically by: comparing different sound sources and looking for patterns; carrying out tests to find the best places to locate fire bells in school.</p>