

## Key stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

### 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"><li>• asking simple questions and recognising that they can be answered in different ways</li><li>• observing closely, using simple equipment</li><li>• performing simple tests</li><li>• identifying and classifying</li><li>• using their observations and ideas to suggest answers to questions</li><li>• gathering and recording data to help in answering questions.</li></ul> | <p>Pupils in years 1 and 2 should explore the world around them and raise their own questions.</p> <p>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</p> |

they have found out and how they found it out.

With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language.

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.

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"> <li>• identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen</li> <li>• identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers.</li> </ul>  | <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. 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 and wild plants: flower, petals, stem, leaves, roots, fruit, bulb and seed).</p> | <ul style="list-style-type: none"> <li>▪ Where do the most plants grow in the school grounds?</li> <li>▪ Do all plants have roots, stem/trunk, leaves and flowers.</li> <li>▪ What type of plants/trees are there in the school/park?</li> <li>▪ What grows first the root or the stem?</li> </ul> <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. 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.</p> |
| <p>Other teaching ideas</p> <ol style="list-style-type: none"> <li>1. Discuss and describe a particular plant in detail. Take a photograph of it. Ask children what it will be like in a few weeks time. Make a list of what they say. Return to the plant in a few weeks.</li> <li>2. Grow carrot tops, mustard and cress, pulses etc.</li> <li>3. Sort and group large seeds.</li> <li>4. Cut open fruits to look at seeds, break open seeds.</li> </ol> |  |   |

5. Grow bulbs in water so that you can see the roots system.
6. Make rubbings of different leaves.
7. Make a labels or map of the different trees/plants found in the school grounds

#### Key information

- The shape of the leaves relates to the species.
- Leaves can be simple or compound.
- Single leaves, e.g. oak and sycamore, are called simple leaves.
- Leaves which are made up of leaflets, e.g. horse chestnut and ash are called 'compound' leaves.
- Trees can be identified by their leaves.
  
- All flowering plants have roots, stems, leaves and flowers.
- Roots, stems, leaves and flowers are similar on plants that are alike e.g. all dandelions. There are differences between roots, stems, leaves and flowers on different kinds of plants e.g. buttercup and dandelion.
- The flower grows first as a bud and then opens up into a flower.
- When the petals fall the seed pod is left. The pod will continue to grow and the seeds will ripen.
- Some plants grow flowers to attract insects.
- The insects take the pollen to another flower of the same type so the plant can make seeds.
- Seeds can be different shapes and sizes.
- Parts of the flower become a fruit.
- The fruits contain the seeds.
- Plants usually grow in soil - they also need light and water.

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"> <li>• identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates</li> <li>• identify and name a variety of common animals that are carnivores, herbivores and omnivores</li> <li>• describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles, mammals and invertebrates, and including pets)</li> <li>• identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.</li> </ul>   | <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"> <li>• What differences are there between the skeletons of different animals?</li> <li>• Can we taste when we can't smell?</li> <li>•</li> </ul> <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> |
| <p>Other teaching ideas</p> <ol style="list-style-type: none"> <li>1) Sort things in school grounds into plants and animals.</li> <li>2) Sort animals further into birds, fish, amphibians, reptiles, mammals and invertebrates.</li> <li>3) Songs naming parts of the body, eg. Head, shoulders, knees and toes.</li> <li>4) Draw round a child and label body parts.</li> <li>5) Match food to different animals</li> <li>6) Go on a sound walk</li> <li>7) Consider how to treat living things with care and sensitivity.</li> <li>8) Explore websites for more information such as <a href="http://www.animalsworlds.com/">http://www.animalsworlds.com/</a></li> <li>9) Find out more about canivores, omnivores and herbivores at websites such as <a href="http://animals.pppst.com/what-animals-eat.html">http://animals.pppst.com/what-animals-eat.html</a></li> </ol> |   |   |
| <p>Key information</p> <p><b>Humans</b></p> <p>Living things need light, air and water to stay alive. Living things grow and change as they get older. Our favourite toys let us play games of make-believe, but they have never been alive.</p>  |   |   |

Living things can be divided into two main categories - plants and animals. (Bacteria and fungi can be referred to, if necessary, as 'other living things')

### **Fish**

Fishes are cold blooded animals in the world that are covered with scales and equipped with a pair of fins to swim in the water. Unlike other animals in the world fishes do not have lungs as their breathing organ. Fishes are provided with a special organ called gills which are used for respiration. With the help of gills they draw oxygen from the water and into the blood stream. Fishes reproduce by laying eggs.

Depending upon the habitats and characteristics there are a variety of fish available on the world. Fresh water, tropical, marine, cold water and aquarium fish are the major types of fishes.

### **Amphibians**

The amphibians belong to the class amphibian. Ectothermoc or cold blooded animals like **frogs, toads, salamanders, newts, and caecilians** metamorphose from a juvenile, water breathing form to an adult, air breathing form. Amphibians are four limbed animals. As by their ancestors "the fish" the amphibians lay eggs in the water. Amphibians are similar to the reptiles.

### **Reptiles**

Animals that have scales and the ability to creep are called Reptiles. Since the animals have the ability to creep they got the name Reptiles (meaning to creep). Reptiles are cold blooded animals that live on the world since the Dinosaurs period. The Dinosaurs is the biggest and the extinct species of the reptiles. Reptiles include snake, turtles, alligator and lizards.

### **Birds**

Birds are the only creatures in the world that have the capacity to walk, fly, sing, dance and swim. Birds are warm blooded animals with high body temperature that is necessary for their flights. The most highlighted characteristic of birds are its feathers. No other living organism in the world has wings (feathers). They are the light weight organisms and they have the capacity to grow feathers each year.

### **Mammals**

Mammals are warm blooded animals. Of all the class in the animal world the mammals are considered to be the most advanced. Mammals belong to the class mammalia and are the only class that has hair and feed their young ones with the milk produced by the mammary glands.

Dogs and cats that we house are mammals; horse, sheep, baboons, giraffes and elephants are also mammals. We the human beings also belong to the class mammals.

### **Invertebrate**

An **invertebrate** is an animal without a vertebral column. The group includes 95% of all animal species — all animals except those in the Chordate subphylum Vertebrata (fish, reptiles, amphibians, birds, and mammals).

### **Herbivores**

A herbivore is an animal that gets its energy from eating plants, and only plants. Omnivores can also eat parts of plants, but generally only the fruits and vegetables produced by fruit-bearing plants. Many herbivores have special digestive systems that let them digest all kinds of plants, including grasses.

Herbivores need a lot of energy to stay alive. Many of them, like cows and sheep, eat all day long. There should be a lot of plants in your ecosystem to support your herbivores. If you put carnivores or some omnivores in your ecosystem, they'll eat your herbivores, so make sure you have enough herbivores to support them.

### **Carnivores**

A carnivore is an animal that gets food from killing and eating other animals.

Carnivores generally eat herbivores, but can eat omnivores, and occasionally other carnivores. Animals that eat other animals, like carnivores and omnivores are important to any ecosystem, because they keep other species from getting overpopulated.

Since carnivores have to hunt down and kill other animals they require a large amount of calories. This means that they have to eat many other animals over the course of the year. The bigger the carnivore, the more it has to eat. You should make sure that you have many more herbivores and omnivores than carnivores.

You have several kinds of carnivores to choose from in this simulation, of different sizes:

### **Omnivores**

An omnivore is a kind of animal that eats either other animals or plants. Some omnivores will hunt and eat their food, like carnivores, eating herbivores and other omnivores. Some others are scavengers and will eat dead matter. Many will eat eggs from other animals.

Omnivores eat plants, but not all kinds of plants. Unlike herbivores, omnivores can't digest some of the substances in grains or other plants that do not produce fruit. They can eat fruits and vegetables, though. Some of the insect omnivores in this simulation are pollinators, which are very important to the life cycle of some kinds of plants.

### **Senses**

We use all our senses to understand the world around us.

Sight is one of our **five** senses.

Our two eyes work together to help us see how far away things are.

When we cannot use our eyes we use some of our other senses.

We use all our senses to understand the world around us.

Smell is one of our **five** senses.

We use our nose to smell.

It is difficult to smell things when you have a cold.

We use all our senses to understand the world around us.

Touch is one of our five senses.

We usually use our hands to touch.

Our fingers are very sensitive; we can feel differences in texture, shape and temperature.

Our tongue is the most sensitive part of the body that is why babies put things in their mouths.

Hearing is one of our five senses. We use all of our senses to understand the world around US.

Sounds are heard when they enter the ear.

Two ears help us detect the direction of the sound.

There are lots of different animals.



## 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"> <li>• distinguish between an object and the material from which it is made</li> <li>• identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock</li> <li>• describe the simple physical properties of a variety of everyday materials</li> <li>• compare and group together a variety of everyday materials on the basis of their simple physical properties</li> </ul>   | <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 only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil.</p> | <ul style="list-style-type: none"> <li>▪ Which bag is most waterproof or strongest?</li> <li>▪ What material is the most hard/soft; stretchy/stiff; shiny/dull; rough/smooth or bendy?</li> </ul> <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> |
| <p>Other teaching ideas</p> <ul style="list-style-type: none"> <li>▪ Use senses to describe objects as shiny or dull, light or heavy, soft or hard, bendy or stiff etc.</li> <li>▪ Grade a range of materials from shiniest to dullest or lightest to heaviest etc.</li> <li>▪ Compile a class list or dictionary of words that describe materials.</li> <li>▪ Sort and group materials into groups like rough/smooth or colours or transparent, opaque, shiny, magnetic/non magnetic.</li> <li>▪ Three of a kind. One person picks three things that have the same property, eg. they are all rough. The rest of the group/class have to figure out what the property is.</li> <li>▪ Odd one out. As 'Three of a kind' but one thing has a different property eg. two transparent and one opaque.</li> <li>▪ Test hardness by finding out which material will scratch which others.</li> <li>▪ Explore ways in which we could send an Easter egg through the post safely?</li> <li>▪ Make rubbings of surfaces.</li> </ul> |   |   |
| <p>Key information</p> <p>There are lots of different materials. The 'material' is the substance from which something is made. Materials can be natural or made. They have different properties - this means they look and feel different and behave in different ways.</p> <p>Materials are chosen for different purposes because of their properties e.g. a window is made of glass because glass is transparent.</p>   |   |   |

Materials can be natural or made.

Things that are made by people may be manufactured from natural or made materials.

When we describe what the material feels like, looks like and what it can do we are describing the properties of the material.

Different materials are used to make different things because of their particular properties e.g. strength, hardness.

Some will decompose e.g. vegetable peelings can be used to make compost for the garden. Some will re-cycle and can be put into special containers for re-cycling e.g. aluminium cans, glass etc. These materials are collected and used a to make new cans, bottles etc. Some rubbish can be used again e.g. plastic carrier bags to line bins, coffee or cocoa tins for storage.

Some rubbish can only be thrown away e.g. plastic\_wrappings.

Our rubbish is made up of many different materials

Magnets attract metals that contain iron.

Sometimes magnets seem to stick to paint or plastic - don't be fooled, there is iron underneath!

Some magnets have a plastic covering.

Magnets can attract through thin materials.

*Only iron can be made into a magnet but magnets will attract three metals: iron, nickel and cobalt.*

Magnets attract some metals.

Strong magnets can:

pick up heavy magnetic objects; pick up lots of paper clips; make a paper clip jump up; attract through thin materials.

Rocks are made of different materials.

Some rocks are harder than others. Hard rocks can scratch softer rocks. Your fingernail will only scratch very soft rocks.

A copper coin will scratch harder rocks and a steel nail, even harder ones. Some rocks are too hard for the steel nail to scratch. Softer rocks will grate into fine particles or grains.

Some materials float, others sink.

Some materials or objects float because they have air trapped inside them.

Think about buoyancy aids in the swimming pool, submarines and lifeboats.

Materials will float if they are less dense than water.

## Year 1: Seasonal changes

| 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"> <li>observe changes across the four seasons</li> <li>observe and describe weather associated with the seasons and how day length varies.</li> </ul>   | <p>Pupils should observe and talk about changes in the weather and the seasons.</p> <p><b>Note:</b> Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.</p> | <ul style="list-style-type: none"> <li>How does the temperature change during a week, month, term?</li> </ul> <p>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.</p> |
| <p>Other teaching ideas</p> <ul style="list-style-type: none"> <li>Keep a diary of weather and temperature over a long period.</li> <li>Take the temperature at different points during a day.</li> <li>Paint a picture of a tree at different times of the year.</li> <li>Match clothing to season in which it will be needed.</li> <li>Film a weather report.</li> </ul>  |  |  |
| <p>Key information</p> <p>Seasons are created by two very important events - the rotation of the Earth that gives us day and night, and the rotation of the Earth around the sun that gives us our year. Because the sun never changes, only the movement of the Earth creates changes in light and darkness, and in temperature.</p> <p>Because seasons are based on the rotation of the planet around the sun, the seasons change at the same time every year, even though the two halves of the planet experience opposite seasons!</p> <p>Some regions do not experience seasons the same way as others, but all parts of the Earth have seasonal changes. For the Polar Regions (the areas at the top and bottom of the Earth) and the temperate zones (the area around the middle), seasons change the amount of daylight and darkness they experience more than the temperature.</p> |  |  |

## Optional Unit

### Year 1 : Light

| 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"> <li>• observe and name a variety of sources of light, including electric lights, flames and the Sun</li> <li>• associate shadows with a light source being blocked by something.</li> </ul>  | <p>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.</p> <p>Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.</p> | <ul style="list-style-type: none"> <li>▪ Which is the most reflective material?</li> <li>▪ Which materials let light through?</li> <li>▪ Which torch is the brightest?</li> <li>▪ How can we make our shadows bigger?</li> <li>▪ Which is the brightest light source in the class/school?</li> </ul> <p>Pupils might work scientifically by exploring shiny things and grouping them according to whether they shine in the dark or not.</p> <p>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).</p> |
| <p>Other teaching ideas</p> <ol style="list-style-type: none"> <li>1) Going into a room which is pitch black and describing what it is like.</li> <li>2) Brainstorming session of how many different sources of light the children can think of.</li> <li>3) Go on a 'light' walk around local area to find different types of light eg. Traffic lights, stop lights, car lights, street lights, sunlight etc.</li> <li>4) Make day and night pictures. How will they be different?</li> <li>5) Make a display of objects/clothes used during the day/at night.</li> <li>6) Go on a 'shadows' walk to observe light sources, direction of shadows.</li> <li>7) Observing and describing something in subdued light then in bright light</li> </ol> |   |   |

### Key information

- Light comes from a variety of sources.
- The greatest source of light is the Sun.
- Light can be bright or dim.
- Light can be different colours.
- Light will shine through some materials.
- Dark is the absence of light.
- We see things because light bounces off them.
- In a dark room we can usually see the outlines of shapes but colours are difficult to recognise.
- It is only really dark when there is no light at all.
- We can see reflections in mirrors and shiny objects.
- Mirrors reflect everything in front of them
- If we use two mirrors we can reflect the reflection several times
- We can see lots of reflections like this
- Kaleidoscope patterns are formed by mirrors making lots of reflections.

### Transparent, translucent and opaque materials

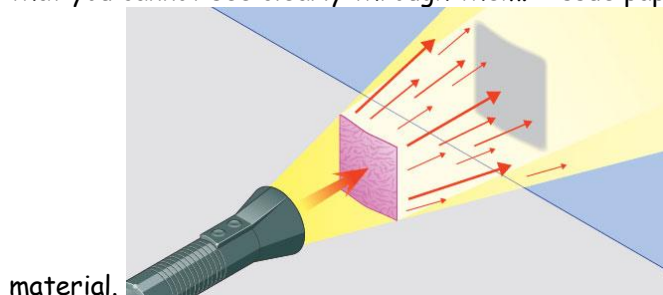
#### Transparent

Transparent materials let light pass through them in straight lines, so that you can see clearly through them. Glass is an example of a transparent material.



#### Translucent

Translucent materials let some light through, but they scatter the light in all directions, so that you cannot see clearly through them. Tissue paper is an example of a translucent material.



#### Opaque

Opaque materials do not let any light pass through them. They block the light. Wood is an example of an opaque material

