



Buckingham Primary Academy

BELIEVE PERSEVERE ACHIEVE

part of the **enquire**
learning trust

Science Learning Challenges

Whole school challenges



Learning Challenges – The Principles

How do we ensure that pupils are improving their knowledge and understanding and developing appropriate skills?

- Continuity and Progression in the curriculum will be built around a set of matrices known as essential ‘knowledge, skills and understanding’ within subject disciplines. These are broken into Year group expectations and have additional challenges for able learners. The Knowledge, Skills and Understanding’ matrices within the Learning Challenge Curriculum (Weaving Knowledge, Skills and Understanding into the new National Curriculum) will allow school to guarantee that the learners’ essential skills are being developed, alongside National Curriculum requirements (where appropriate), whilst allowing individual schools to have a great deal of autonomy with their methodology.
- In addition, there is an expectation that teachers apply English, mathematics and ICT skills where it is appropriate to do so.



Learning Challenges – The Principles

How are learners presented with opportunities to reflect on their learning?

- Time for learners to reflect or review their learning is central to the whole process. This is in keeping with the 'Learning to Learn' principles where reflection is seen as a very important part of individuals' learning programme.
- Within the Learning Challenge Curriculum it is suggested that the final subsidiary learning challenge is handed over for learners to reflect on their learning. The idea is that learners present their learning back to the rest of the class or another appropriate audience - making the most of their oracy and ICT skills to do so. Initially, learners may require a great deal of direction so the reflection time may need to be presented in the form of a question which helps them to review their work.
- Although reflection is seen as a concluding part of the prime learning challenge it is hoped that there will be continual opportunities for learners to reflect frequently, especially as each subsidiary learning challenge comes to an end. Ideally, there should be a good deal of learner autonomy evident during reflection time.



Science Programme of Study: 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.



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Science Learning Challenges

Year 1



Year 1 Statutory Requirements

Working Scientifically (Y1 & 2)	Plants	Animals, including humans	Everyday materials	Seasonal Changes
<ul style="list-style-type: none">• Ask simple questions and recognise that they can be answered in different ways;• Observe carefully, using simple equipment;• Identifying and classifying• Using their observations and ideas to suggest answers to their questions;• Gathering and recording data to help in answering questions.	<ul style="list-style-type: none">• Identify and name a variety of common, wild and green plants, including deciduous and evergreen trees;• Identify and describe the basic structure of a variety of common flowering plants, including trees.	<ul style="list-style-type: none">• 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 human body is associated with each sense.	<ul style="list-style-type: none">• Distinguish between an object and the materials from which it is made;• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock;• Describe the simple physical properties of a variety of everyday materials;• Compare and group together a variety of everyday materials on the basis of their simple physical properties.	<ul style="list-style-type: none">• Observe changes across the four seasons;• Observe and describe weather associated with the seasons and how day length varies.



Science: Year 1 Overview

Key Features

	PLANTS	ANIMALS (including Humans)	EVERYDAY MATERIALS	SEASONAL CHANGES
YEAR 1	<ul style="list-style-type: none"> • Identification and labelling, including trees • Structure of plants, including roots, stem, flower, etc. 	<ul style="list-style-type: none"> • Identification and labelling a variety of common animals (fish, amphibians, reptiles, birds and mammals) • Know carnivores, herbivores and omnivores • How to care for pets • Name parts of the human body 	<ul style="list-style-type: none"> • Identify and name a range of materials (wood, plastic, glass, metal, water and rock; • Classifying and grouping according to a range of physical properties 	<ul style="list-style-type: none"> • Features of day and night including temperature • Weather, associated with seasons
Possible Learning Challenges	<ul style="list-style-type: none"> • Which birds and plants would Little Red Riding Hood find in our park? 	<ul style="list-style-type: none"> • Why are humans not like tigers? 	<ul style="list-style-type: none"> • Which materials should the Three Little Pigs have used to build their house? or • What do Aliens think of life on planet Earth? 	<ul style="list-style-type: none"> • Why does it get dark earlier in winter? or • How do the seasons impact on what we do?



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Science Learning Challenges

Year 2



Year 2 Statutory Requirements

Working Scientifically (Y1 & 2)	Living things and their habitats	Plants	Animals, including humans	Uses of everyday materials
<ul style="list-style-type: none">• Ask simple questions and recognise that they can be answered in different ways;• Observe carefully, using simple equipment;• Identifying and classifying;• Using their observations and ideas to suggest answers to their questions;• Gathering and recording data to help in answering questions.	<ul style="list-style-type: none">• Explore and compare differences between things that are living, dead and things that have never been alive;• Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other;• Identify and name a variety of plants and animals in their habitats, including micro-habitats;• Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	<ul style="list-style-type: none">• Observe and describe how seeds and bulbs grow into mature plants;• Find out and describe how plants need water, light and suitable temperature to grow and stay healthy.	<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 amount of different types of food, and hygiene.	<ul style="list-style-type: none">• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, rock, brick, 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.

Science: Year 2 Overview

Key Features				
	PLANTS	LIVING THINGS and their HABITATS	ANIMALS (including Humans)	Uses of Everyday Materials
YEAR 2	<ul style="list-style-type: none"> • What plants and seeds need to grow • Growing from seeds and bulbs 	<ul style="list-style-type: none"> • Habitats • Living and non living things • Early Food Chains 	<ul style="list-style-type: none"> • Exercise and healthy living • What animals and humans need to survive • Animals have offspring, which grow to be adults 	<ul style="list-style-type: none"> • Use of different everyday materials • Classifying and grouping • Changing materials by bending, etc.
Possible Learning Challenges	<ul style="list-style-type: none"> • How can we grow our own salad? or • How can you be the next master chef? 	<ul style="list-style-type: none"> • Why would a dinosaur not make a good pet? 	<ul style="list-style-type: none"> • How will 5 a day help me to be healthy? or • How could you be the next Jessica Ennis or Steven Gerrard ? 	<ul style="list-style-type: none"> • What is our school made of? or • Which materials did they use to build the Trafford Centre?

Science

Lower Key Stage 2

Lower Key Stage 2

Science Programme of Study: Lower Key Stage 2

- The principal focus of science teaching in **lower key stage 2** is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.
- 'Working scientifically' is described separately at the beginning of the programme of study, but must **always** be taught through and clearly related to 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 correctly and with confidence, using their growing word reading and spelling knowledge.

Science Learning Challenges

Year 3

Year 3 Statutory Requirements

Working Scientifically (Y3 & Y4)	Plants	Animals, including humans
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. 	<ul style="list-style-type: none"> • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Year 3 Statutory Requirements (continued)

Rocks	Light	Forces and Magnets
<ul style="list-style-type: none"> compare and group together different kinds of rocks on the basis of their appearance and simple physical properties describe in simple terms how fossils are formed when things that have lived are trapped within rock recognise that soils are made from rocks and organic matter. 	<ul style="list-style-type: none"> recognise that they need light in order to see things and that dark is the absence of light notice that light is reflected from surfaces recognise that light from the sun can be dangerous and that there are ways to protect their eyes recognise that shadows are formed when the light from a light source is blocked by a solid object find patterns in the way that the size of shadows change. 	<ul style="list-style-type: none"> 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.

Science: Year 3 Overview

	ANIMALS (including Humans)	PLANTS	LIGHT	FORCES and MAGNETS	ROCKS
YEAR 3	<ul style="list-style-type: none"> • Nutrition, linked to what we eat • Skeletons and muscles 	<ul style="list-style-type: none"> • Function of different parts of plants • What different plants need to flourish • Journey of water through a plant • Life cycle of a plant 	<ul style="list-style-type: none"> • Sources, including the Sun • Protecting eyes from the Sun • Shadows • Reflection /mirrors 	<ul style="list-style-type: none"> • How magnets attract/repel some materials • Magnetic poles • Friction 	<ul style="list-style-type: none"> • How rocks are formed • Different kinds of rocks • Fossils • Soil
Possible Learning Challenges	<ul style="list-style-type: none"> • How can Usain Bolt move so quickly? 	<ul style="list-style-type: none"> • How did that blossom become an apple? 	<ul style="list-style-type: none"> • How far can you throw your shadow? 	<ul style="list-style-type: none"> • Are you attractive enough? 	<ul style="list-style-type: none"> • What do rocks tell us about the way the Earth was formed?

Science Learning Challenges

Year 4 Science

Year 4 Statutory Requirements

Working Scientifically (Y3 & Y4)	Living Things and their Habitats	Animals, including humans
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • recognise that environments can change and that this can sometimes pose dangers to living things. 	<ul style="list-style-type: none"> • describe the 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.

Year 4 Statutory Requirements (continued)

States of Matter	Sound	Electricity
<ul style="list-style-type: none"> compare and group materials together, according to whether they are solids, liquids or gases observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. 	<ul style="list-style-type: none"> identify how sounds are made, associating some of them with something vibrating recognise that vibrations from sounds travel through a medium to the ear find patterns between the pitch of a sound and features of the object that produced it find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that sounds get fainter as the distance from the sound source increases. 	<ul style="list-style-type: none"> 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.

Science: Year 4 Overview

	ANIMALS, including Humans	LIVING THINGS and their Habitats	STATES OF MATTER	ELECTRICITY	SOUND
YEAR 4	<ul style="list-style-type: none"> • Digestive System • Teeth • Food chains • Predators and prey 	<ul style="list-style-type: none"> • Identify and name a variety of living things (plants and animals) in the local and wider environment and group them • Recognise that environments can change and can pose dangers 	<ul style="list-style-type: none"> • Solids, Liquids and Gases • Heating and cooling (no baking, etc.) • Evaporation and condensation 	<ul style="list-style-type: none"> • Identify common appliances • Construct simple circuits including switches • Common conductors and insulators • Alternative sources of energy 	<ul style="list-style-type: none"> • Sources • Vibration • Loud and faint • Pitch • Volume • Sound travelling
Possible Learning Challenges	<ul style="list-style-type: none"> • What happens to the food we eat? 	<ul style="list-style-type: none"> • Which wild animals and plants thrive in your locality? 	<ul style="list-style-type: none"> • How would we survive without water? 	<ul style="list-style-type: none"> • How could we cope without electricity for one day? 	<ul style="list-style-type: none"> • Why is the sound that 'One Direction' makes enjoyed by so many?

Science

Upper Key Stage 2

Upper Key Stage 2

Science Programme of Study: Upper Key Stage 2

- The principal focus of science teaching in **upper key stage 2** is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.
- 'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must **always** be taught through and clearly related to 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, spell and pronounce scientific vocabulary correctly.

Science Learning Challenges

Year 5

Year 5 Statutory Requirements

Working Scientifically (Y5 & Y6)	Living Things and their habitats	Animals, including humans
<ul style="list-style-type: none"> • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments. 	<ul style="list-style-type: none"> • describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • describe the life process of reproduction in some plants and animals. 	<ul style="list-style-type: none"> • describe the changes as humans develop to old age.

Year 5 Statutory Requirements (continued)

Properties and changes of materials	Earth and Space	Forces
<ul style="list-style-type: none"> compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic demonstrate that dissolving, mixing and changes of state are reversible changes 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. 	<ul style="list-style-type: none"> describe the movement of the Earth, and other planets, relative to the Sun in the solar system describe the movement of the Moon relative to the Earth describe the Sun, Earth and Moon as approximately spherical bodies use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. 	<ul style="list-style-type: none"> explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object identify the effects of air resistance, water resistance and friction, that act between moving surfaces recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Science: Year 5 Overview

	Living things and their habitats	Animals, including humans	Properties & changes of materials	Earth and space	Forces
YEAR 5	<ul style="list-style-type: none"> • Life cycles of plants and animals • Birth, growth, development and reproduction 	<ul style="list-style-type: none"> • Changes as humans develop from birth to old age 	<ul style="list-style-type: none"> • Dissolving • Evaporating • Filtering • Reversible and Irreversible changes 	<ul style="list-style-type: none"> • Earth relative to the Sun • Moon relative to the Earth • Relationship between Sun, Earth and Moon • Earth's rotation • Day and night 	<ul style="list-style-type: none"> • Gravity • Air Resistance • Water Resistance • Friction • Gears, Pulleys, Leavers and Springs
Possible Learning Challenges	<ul style="list-style-type: none"> • Do all animals and plants start life as an egg? 	<ul style="list-style-type: none"> • How different will you be when you are as old as your grandparents? 	<ul style="list-style-type: none"> • Could you be the next CSI investigator? 	<ul style="list-style-type: none"> • Will we ever send another human to the moon? 	<ul style="list-style-type: none"> • Can you feel the force?

Science Learning Challenges

Year 6 Science

Year 6 Statutory Requirements

Working Scientifically (Y5 & Y6)	Living things and their habitats	Animals, including humans
<ul style="list-style-type: none"> • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments. 	<ul style="list-style-type: none"> • describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • give reasons for classifying plants and animals based on specific characteristics. 	<ul style="list-style-type: none"> • identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • describe the ways in which nutrients and water are transported within animals, including humans.

Year 6 Statutory Requirements (continued)

Evolution and inheritance	Light	Electricity
<ul style="list-style-type: none">• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago• recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents• identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	<ul style="list-style-type: none">• recognise that light appears to travel in straight lines• use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye• explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes• use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	<ul style="list-style-type: none">• associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit• compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches• use recognised symbols when representing a simple circuit in a diagram.

Science: Year 6 Overview

	LIVING THINGS and their Habitats	ANIMALS, including Humans	EVOLUTION and INHERITANCE	LIGHT	ELECTRICITY
YEAR 6	<ul style="list-style-type: none"> • Classification of living things • Vertebrates and invertebrates • Classifying reptiles, amphibians, mammals, insects, etc. 	<ul style="list-style-type: none"> • Circulatory system • Heart, blood vessels • Diet, exercise and drugs • Transport of nutrients through the body 	<ul style="list-style-type: none"> • Fossils tell us about the past • Off spring • Changes to the human skeleton over time • Darwin 	<ul style="list-style-type: none"> • How light travels • The eye • Shadows 	<ul style="list-style-type: none"> • Electrical circuits (series) • Designing traffic lights
Possible Learning Challenge	<ul style="list-style-type: none"> • Could Spiderman really exist? 	<ul style="list-style-type: none"> • What would a journey through your body be like? 	<ul style="list-style-type: none"> • Have we always looked like this? 	<ul style="list-style-type: none"> • How can you light up your life? 	<ul style="list-style-type: none"> • Could you be the next Nintendo apprentice?