

Science Approach



Science raises aspirations for children who lack confidence. Practical investigations help children to develop valuable skills including resilience and self-belief. Children learn that if something does not work first time it does not matter. They can talk about why it did not work and find a solution. They become less hung-up on getting everything right. Science builds practical real-life, transferable skills.

We value science as a core subject and want our pupils to learn key scientific vocabulary and knowledge as well as the skills linked to scientific working. We want the pupils at Berkeley Primary to develop the ability to think independently and raise scientific questions, developing an enthusiasm and enjoyment of scientific learning and discovery so that they have an excitement and passion to pursue science at secondary school and know what career options it could lead to.

Intent

We aim for all pupils to have:

- 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.

Implementation

- Science is taught weekly in termly units. This is a strategy to enable the achievement of a greater depth of knowledge.
- Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom.
- Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge.
- Teachers use precise questioning in class to test conceptual knowledge and skills and assess children regularly to identify those children with gaps in learning, so that all children keep up.
- We build upon the learning and skill development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence.
- Children learn from our KEY CONCEPTS in science, helping them to make links to prior learning and build new knowledge as they progress through each year.
- In addition to weekly lessons, we also have Sparky weeks with a science focus and take part in STEM projects with local businesses and secondary school.

Impact

Children at Berkeley Primary School will:

- Be able to retain knowledge that is pertinent to Science with a real life context.
- Be able to question ideas and reflect on knowledge.
- Work collaboratively and practically to investigate and experiment.
- Be able to articulate their understanding of scientific concepts and be able to reason scientifically using rich language linked to science.
- Demonstrate a high love of mathematical skills through their work, organising, recording and interpreting results.
- Achieve age related expectations in Science at the end of their cohort year.
- Be ready for their next phase of education in science learning at secondary school by the time they leave Berkeley primary school.

Science

CURRICULUM DRIVERS

SCIENCE

DIVERSITY

We will build a culture in science lessons where differences are valued & part of what makes science inspiring. We will learn about scientists from all backgrounds & cultures, linking to themes where possible.

ASPIRATIONS

Create engaging experiences for children to allow hands on awe & wonder in science. We use links to a local science college and also a grammar school who provide ambitious experiences where possible.

VOCABULARY

A glossary of new words will be compiled at the start of each unit. These words will be added to, referred to & revisited throughout learning.

KEY CONCEPTS SCIENCE

WORKING SCIENTIFICALLY
As scientists, we learn to observe, predict, experiment, analyse & evaluate

BIOLOGY
As biologists, we study all living things, evolution & extinction in our natural world

CHEMISTRY
As chemists, we study various substances & materials & look at their properties

PHYSICS
As physicists, we study energy, forces, space & time & look at how they relate

Essentials



Science

Our intent is to spark children's curiosity as scientists, developing a thirst for learning and finding out why things happen in the way that they do. The teaching of science at Berkeley Primary School, follows the objectives laid out in the National Curriculum.

We value science as a core subject and want our pupils to learn key scientific vocabulary and knowledge as well as the skills linked to scientific working. We want our pupils to develop the ability to think independently and raise scientific questions, developing an enthusiasm and enjoyment of scientific learning and discovery so that they have an excitement and passion to pursue science at secondary school and know what career options it could lead to.

Science raises aspirations for children who lack confidence. Practical investigations help children to develop valuable skills including resilience and self-belief. Children learn that if something does not work first time it doesn't matter. They can talk about why it didn't work and find a solution. They become less hung-up on getting everything right. Science builds practical real-life, transferable skills

Overview

- 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.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS	Explore the natural world around them		Describe what they can see, feel and hear outside		Understand the effect of changing seasons on the natural world around them	
Year 1	Identifying materials	Comparing materials	Parts of animals	Types of animals	Observe seasonal changes	Plants
Year 2	Uses of materials	Changing shape	Living things	Habitats	Plants	Food and exercise
Year 3	Force and magnets	Movement and Feeding	Rocks and soils	Light	Parts of plants	What plants need
Year 4	Changes of state	Electricity	Living things and their habitats	Dangers to living things	Human nutrition	Sound
Year 5	Earth and Space	Forces	Properties and changes in materials	Living Things and their Habitats	Life cycle and changes	Animals including humans
Year 6	Classifying living things	Circulatory system	Diet and exercise	Light	Electricity	Evolution and Inheritance

Progression of skills

Threshold Concept		Milestone 1	Milestone 2	Milestone 3
	<p>Work scientifically This concept involves learning the methodologies of the discipline of science.</p>	<ul style="list-style-type: none"> • Ask simple questions. • Observe closely, using simple equipment. • Perform simple tests. • Identify and classify. • Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions. 	<ul style="list-style-type: none"> • Ask relevant questions. • Set up simple, practical enquiries and comparative and fair tests. • Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers. • Gather, record, classify and present data in a variety of ways to help in answering questions. • Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables. • Report on findings 	<ul style="list-style-type: none"> • Plan enquiries, including recognising and controlling variables where necessary. • Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work. • Take measurements, using a range of scientific equipment, with increasing accuracy and precision. • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models. • Report findings from enquiries, including oral and written explanations of

			<p>from enquiries, including oral and written explanations, displays or presentations of results and conclusions.</p> <ul style="list-style-type: none"> • Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests. • Identify differences, similarities or changes related to simple, scientific ideas and processes. • Use straightforward, scientific evidence to answer questions or to support their findings. 	<p>results, explanations involving causal relationships, and conclusions.</p> <ul style="list-style-type: none"> • Present findings in written form, displays and other presentations. • Use test results to make predictions to set up further comparative and fair tests. • Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.
Biology	<p>Understand plants This concept involves becoming familiar with different types of plants, their structure and reproduction.</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 	<ul style="list-style-type: none"> • Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers. • Explore the requirements of plants for life and growth 	<ul style="list-style-type: none"> • Relate knowledge of plants to studies of evolution and inheritance. • Relate knowledge of plants to studies of all living things.

the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers.

- 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.

(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 role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Understand animals and humans

This concept involves becoming familiar with different types of animals, humans and the life processes they share.

• 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

• Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat.

• Construct and interpret a variety of food chains, identifying producers, predators and prey.

• Identify that humans

• 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 importance of diet, exercise, drugs and lifestyle on the way the human body functions.

common animals (birds, fish, amphibians, reptiles, mammals and invertebrates, 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.
- Investigate 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.

and some 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.

• Describe the ways in which nutrients and water are transported within animals, including humans.

Investigate living

• Explore and compare

• Recognise that living

• Describe the differences

things

This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.

the differences between things that are living, that are dead and 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.

things can be grouped in a variety of ways.

- Explore and use classification keys.

- Recognise that environments can change and that this can sometimes pose dangers to specific habitats.

in the life cycles of a mammal, an amphibian, an insect and a bird.

- Describe the life process of reproduction in some plants and animals.

- Describe how living things are classified into broad groups according to common observable characteristics.

- Give reasons for classifying plants and animals based on specific characteristics.

Understand evolution and inheritance

- Identify how humans resemble their parents

- Identify how plants and animals, including

- Recognise that living things have changed over

This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.

in many features.

humans, resemble their parents in many features.

time and that fossils provide information about living things that inhabited the Earth millions of years ago.

- 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 suited to and adapt to their environment in different ways.

- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Chemistry

Investigate materials
This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.

- 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

Rocks and Soils

- Compare and group together different kinds of rocks on the basis of their simple, physical properties.

- Relate the simple physical properties of some rocks to their formation (igneous or sedimentary).

- Describe in simple

- Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets.

- Understand how some materials will dissolve in liquid to form a solution and describe how

materials.

- Compare and group together a variety of everyday materials on the basis of their simple physical properties.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock, and paper/cardboard for particular uses.

terms how fossils are formed when things that have lived are trapped within sedimentary rock.

- Recognise that soils are made from rocks and organic matter.

States of Matter

- 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 the temperature at which this happens in degrees Celsius ($^{\circ}\text{C}$), building on their teaching in mathematics.
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of

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, oxidation and the action of acid on bicarbonate of soda.

			evaporation with temperature.	
Physics	<p>Understand movement, forces and magnets This concept involves understanding what causes motion.</p>	<ul style="list-style-type: none"> • Notice and describe how things move, using simple comparisons such as faster and slower. • Compare how different things move. 	<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 	<p>Magnets</p> <ul style="list-style-type: none"> • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing. <p>Forces</p> <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 effect of drag forces, such as air resistance, water resistance and friction that act between moving surfaces. • Describe, in terms of drag forces, why moving objects that are not driven tend to slow down.

poles are facing.

- Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs.

- Understand that some mechanisms including levers, pulleys and gears, allow a smaller force to have a greater effect.

Understand light and seeing

This concept involves understanding how light and reflection affect sight.

- Observe and name a variety of sources of light, including electric lights, flames and the Sun, explaining that we see things because light travels from them to our eyes.

- 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

- Understand 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 eyes.

- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes.

			<p>by a solid object.</p> <ul style="list-style-type: none"> • Find patterns in the way that the size of shadows change. 	<ul style="list-style-type: none"> • 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.
	<p>Investigate sound and hearing This concept involves understanding how sound is produced, how it travels and how it is heard.</p>	<ul style="list-style-type: none"> • Observe and name a variety of sources of sound, noticing that we hear with our ears. 	<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. 	<ul style="list-style-type: none"> • 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.
	<p>Understand electrical circuits This concept involves understanding circuits and their role in electrical applications.</p>	<ul style="list-style-type: none"> • Identify common appliances that run on electricity. • Construct a simple series electrical circuit. 	<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 	<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

			<p>buzzers.</p> <ul style="list-style-type: none"> • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is <p>part of a complete loop with a battery.</p> <ul style="list-style-type: none"> • 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. 	<p>of buzzers and the on/off position of switches.</p> <ul style="list-style-type: none"> • Use recognised symbols when representing a simple circuit in a diagram.
	<p>Understand the Earth's movement in spaceThis concept involves understanding what causes seasonal changes, day and night.</p>	<ul style="list-style-type: none"> • Observe the apparent movement of the Sun during the day. • Observe changes across the four seasons. • Observe and describe weather associated 	<ul style="list-style-type: none"> • Describe the movement of the Earth relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. 	<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

with the seasons
and how day length
varies.

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.

Note:

Items in italics are not
statutory in the English
National Curriculum.