

Year 5/6
Science
Autumn 1 & 2
Physics - Forces and Mechanisms

Previous learning

In Year 3, children learnt an object will not move unless a pushing or pulling force is applied and that magnetic forces do not require contact.

This project teaches children about the forces of gravity, air resistance, water resistance and friction, with children exploring their effects. They learn about mechanisms, their uses and how they allow a smaller effort to have a greater effect.

Substantive Knowledge in Science

Gravity is a non-contact, pulling force which attracts two objects that have mass.

A force meter can be used to measure an object's mass in grams (g) or kilograms (kg) and its weight in newtons (N).

Friction, air resistance and water resistance are forces that oppose motion and slow down moving objects.

Mechanisms, such as levers, pulleys and gears, give us a mechanical advantage.

Disciplinary knowledge in Science

Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.

Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

Use test results to make predictions to set up further comparative and fair tests.

Report and present 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.

Identify scientific evidence that has been used to support or refute ideas or arguments.

Lesson 1

Contact and non-contact forces

- To identify scientific evidence that has been used to support or refute ideas or arguments.

Lesson 2

Gravity

- To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.

Lesson 3

Mass and weight

- To take increasingly accurate measurements in standard units, using a range of chosen equipment (force meters).

Lesson 4

Friction

- To identify the effects of friction that act between moving surfaces.

Lesson 5	Air resistance and water resistance
	To identify the effects of air resistance and water resistance.
Lesson 6	Levers, pulleys and gears
	To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
Vocabulary	
gravity, gravitational pull, machine, levers, pulley, gears, air resistance, water resistance, friction	

Year 5/6
Science:
Spring 1
Physics - Electrical Circuits and Components

Previous learning

In Year 4, children learnt that a series circuit is a simple loop with only one path for the electricity to flow. They learnt that a series circuit must be a complete loop to work and have a source of power from a battery or cell. In Year 3, children learnt that switches open and close a circuit and provide control.

This project teaches children about electrical circuits, their components and how they function. They recognise how the voltage of cells affects the output of a circuit and record circuits using standard symbols. It also teaches children about programmable devices, sensors and monitoring. They combine their learning to design and make programmable home devices.

Substantive Knowledge in Science	Disciplinary knowledge in Science
An electric current is the flow of electric charge around a circuit. The electric current flows from the cell through all the components and back to the cell. Electric current is measured using an ammeter. The force that pushes electric charge around a circuit, called the voltage, is measured using a voltmeter.	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Use test results to make predictions to set up further comparative and fair tests. Report and present 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. Identify scientific evidence that has been used to support or refute ideas or arguments.
Lesson 1	Recognised circuit symbols
	To use recognised symbols when representing a simple circuit in a diagram.

Lesson 2	Recording circuits
	To create circuits using a range of components and record diagrammatically using the recognised symbols for electrical components.
Lesson 3	Exploring circuit components
	To investigate how circuit components function and what happens when components in series circuits are changed and added to.
Lesson 4	Voltage and cells
	To use a voltmeter or multimeter to measure the actual voltage of the cells, recording the data in the table and then completing the tasks and questions.
Lesson 5	Investigating voltage
	To explain how the brightness of a lamp or volume of a buzzer is affected by the number and voltage of cells used in a circuit.
Lesson 6	Programming tasks
	To demonstrate how programs run in an exact order by following a sequence of instructions, and test and debug programs.
Vocabulary	
voltage, volts, electrons, lamp, buzzer, motor	

Year 5/6 Science: Spring 2 Biology - Classification	
Previous learning	
In Year 5, children group and sort plants by how they reproduce. In Year 2, children identified and named a variety of plants and animals in a range of habitats and Microhabitats. In Year 1, children identified, compared, grouped and sorted a variety of common wild and garden plants, including deciduous and evergreen trees, based on observable features. This project teaches the children that classification is the grouping of living and non-living things with similar characteristics. They learn how to sort and group using existing classification keys and observe how a key can be produced.	
Substantive Knowledge in Science	Disciplinary knowledge in Science
Classification keys help us identify living things based on their physical characteristics. An adaptation is a physical or behavioural trait that allows a living thing to survive and fill an ecological niche.	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Take measurements, using a range of scientific equipment, with increasing accuracy and precision,

Adaptations evolve by natural selection. Favourable traits help an organism survive and pass on their genes to subsequent generations.		taking repeat readings when appropriate. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Use test results to make predictions to set up further comparative and fair tests. Report and present 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. Identify scientific evidence that has been used to support or refute ideas or arguments.
Lesson 1	Classification - plants and animals and micro-organisms	
	To describe how living things are classified into broad groups according to common observable characteristics.	
Lesson 2	Classification - micro-organisms	
	To describe how living things are classified into broad groups according to common observable characteristics (micro-organisms).	
Lesson 3	Classification keys - plants	
	To use and construct classification systems to identify plants from a range of habitats.	
Lesson 4	Classification keys - animals	
	To use and construct classification systems to identify animals from a range of habitats.	
Lesson 5	Adaptations	
	To identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	
Lesson 6	Polar adaptations	
	To ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.	
Vocabulary		
microorganism, germ, microbe, ancestry, genetic comparison		

Year 5/6
Science:
Summer 1
Biology - Evolution and Inheritance

Previous learning

In Year 5, children learnt that Humans reproduce sexually, which involves two parents (one female and one male) and produces offspring that are different from the parents. In Year 4, children learnt that fossils form over millions of years and are the remains of a once-living organism, preserved as rock. In Year 2, children learnt that human offspring go through different stages as they grow to become adults.

This project teaches children how living things on Earth have changed over time and how fossils provide evidence for this. They learn how characteristics are passed from parents to their offspring and how variation in offspring can affect their survival, with changes (adaptations) possibly leading to the evolution of a species.

Substantive Knowledge in Science

There are five kingdoms: animals, plants, fungi, protists and monerans.

Scientists compare fossilised remains from the past to living species that exist today to hypothesise how living things have evolved over time.

The theory of evolution was developed in the 19th century by the naturalists Charles Darwin and Alfred Russel Wallace. It states that: all life on Earth has evolved from simple life forms to more complex ones over time.

Inheritance is when living things pass on characteristics following sexual reproduction, such as height, skin colour and eye colour.

Disciplinary knowledge in Science

Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.

Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

Use test results to make predictions to set up further comparative and fair tests.

Report and present 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.

Identify scientific evidence that has been used to support or refute ideas or arguments.

Lesson 1

Classification and reasoning

- To classify living things, including microorganisms, animals and plants, into groups according to common observable characteristics and based on similarities and differences.

Lesson 2

Classifying fossils

- To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Lesson 3

Theory of evolution

- To explain that living things have changed over time, using specific examples and evidence.

Lesson 4	Inheritance
	To identify that living things produce offspring of the same kind, although the offspring are not identical to either parent.
Lesson 5	Natural selection and survival of the fittest
	To identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
Lesson 6	Artificial selection
	To describe how animals and plants can be bred to produce offspring with specific and desired characteristics (selective breeding).
Vocabulary	
natural selection, identical, genes, Charles Darwin, ancestor, common ancestor, deoxyribonucleic acid (DNA), evolutionary tree diagram, evolve	

Year 5/6 Science: Summer 2 Physics - Light Theory	
Previous learning	
In Year 3, children learnt that light from the Sun is damaging for vision and the skin. Shadows change shape and size when the light source moves. Children noticed that light is reflected from surfaces and that we need light in order to see things and that dark is the absence of light. Children recognised that shadows are formed when the light from a light source is blocked by an opaque object and find patterns in the way that the size of shadows change. In Year 2, children learnt that plants need water, light and a suitable temperature to grow and stay healthy. This project teaches children about the way that light behaves, travelling in straight lines from a source or reflector, into the eye. They explore how we see light and colours, and phenomena associated with light, including shadows, reflections and refraction.	
Substantive Knowledge in Science	Disciplinary knowledge in Science
Light travels in waves in straight lines. Light sources give out light. They can be natural or artificial. The angle at which light hits a reflective surface is the same angle at which it is reflected. Refraction is the bending of light as it passes from one transparent material to another.	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Use test results to make predictions to set up further comparative and fair tests. Report and present 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. Identify scientific evidence that has been used to support or refute ideas

		or arguments.
Lesson 1	How does light travel?	
	To identify that light travels in straight lines.	
Lesson 2	How do we see?	
	To explain how we can see things (give out or reflecting light into the eye).	
Lesson 3	Shadows	
	To explain (using words, diagrams or a model) why shadows have the same shape as the objects that cast them and how shadows can be changed.	
Lesson 4	Reflections	
	To describe how light behaves when reflected off a mirror (plane, convex or concave) and when passing through a lens (concave or convex).	
Lesson 5	Measuring light	
	To use data loggers to take accurate measurements of light.	
Lesson 6	Refraction	
	To describe, using scientific language, phenomena associated with refraction of light (prisms).	
Vocabulary		
natural, artificial, absorbed, scattered, reflected, optic nerve, retina, transmitted, fossilised remain, prism		