Science

Knowledge Building
Processes and Changes
Change happens as a result of different **scientific processes.** Unlike in geography, where processes can be split into two distinct groups (physical and human), scientific processes can be wide-ranging. Some examples of these are: changing states of matter, growth of animals and plants and changing of one type of energy to another, such as using solar energy to product electrical power. These processes can be the subject of experimentation and changes can be observed, measured and recorded. Pupils will see how **processes and changes** work together, but how factors within the processes can affect changes.
Methods
In science, **methods** are a key part of seeking knowledge and answers to scientific problems. **Methods** are a logical way of organising scientific study and experiments so that ideas can be proven, answered and re-tested, if necessary. Most **methods** involve thinking of a hypothesis, testing that hypothesis then concluding and evaluating the results. Pupils will look at what makes a good scientific **method** and learn that using these **methods** makes for safer experimentation and leads to more reliable, accurate results.
Observing and Recording
At the most basic level, **observing and recording** is saying what you see and notice, and noting that down in some form. Being able to do this and decide what is significant is an important part of becoming a **scientist.** Progression involves using more technical equipment, then using observations and recordings to support theories, arguments and findings.
Scientific Vocabulary
The language of science can be broken down into various areas. Initially, basic language covers general science terms such as experiment, record, look, change etc. **Scientific vocabulary** then becomes more specific, depending on the area of science being studied, for example the language of biology could include animal, plant, reproduction, offspring, grow and the language of chemistry may use materials, chemical, change, liquid, gas etc. Finally, vocabulary can be used to link concepts together and be used in different contexts.
Uses and Implications
As with observing and recording, it is important to recognise that science takes place every day. Pupils will see that, even in mundane everyday activities, science is featured. Initially, it may only be the **uses** of science that are recognised but progression means they then explore how these **uses** have **implications.** For example, the use of single-use plastic, however useful to us as humans, has implications in environmental science terms.
Cross-Curricular (STEM)
With links to **uses and implications,** children will see that science has strong ties to other areas of their learning, particularly maths and technology. The use of science within these subjects has strong implications for progression and development in all three.

Science

EXPLORERS

Knowledge Building					
Processes and Changes	**Methods**	**Observing and Recording**	**Scientific Vocabulary**	**Uses and Implications**	**Cross-Curricular (STEM)**
Know that processes and changes occur	Know that methods are necessary when experimenting	Know that saying what you see is an important aspect of science	Understand some simple generic vocabulary linked to science e.g. experiment, record	Know when in everyday activities science is useful	Know that science links to other areas of learning

Learning Progression	
3 – 4 years	**Reception**
• Use all their senses in hands-on exploration of natural materials • Explore collections of materials with similar and/or different properties • Talk about what they see, using a wide vocabulary • Explore how things work • Plant seeds and care for growing plants • Understand the key features of the life cycle of a plant and an animal • Begin to understand the need to respect and care for the natural environment and all living things • Explore and talk about different forces they can feel • Talk about the differences between materials and changes they notice	• Explore the natural world around them, making observations and drawing pictures of animals and plants • Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter • Explore the natural world around them • Describe what they see, hear and feel whilst outside • Understand the effect of changing seasons on the natural world around them

Science

Knowledge Progression

Explorers 1 / Nursery and Explorers 2 / Reception

Happy to Be Me

- To learn about the five senses and why they are important to us
- To name and identify body parts on humans and animals
- To know that animals use their senses in different ways to us
- To know that there are similarities and differences between people

Key Vocabulary

senses, ears, eyes, hands, fingers, toes, mouth, nose, touch, taste, smell, sight, hear, same, difference, different, observe, patterns, food, survive, nose, paws

Tell Us a Story

- To know how to plant a seed and observe changes as it grows either indoors or outdoors
- To identify differences in size between a range of animals, specifically those that are classified as 'giant' species
- To know how and why animals move
- To identify a range of fruit and vegetables
- To know that we use our ears to listen

Key Vocabulary

bean, seed, plant, soil, water, sunlight, indoor, outdoor, grow, harvest, digging, gardening, giant, tall, big, fruit, vegetable, ear, ear drum

No Place Like Home

- To know that animals in the wild need very different kinds of homes from us and from each other
- To know some of the materials used to make houses and other kinds of homes
- To know the difference between natural and man-made light sources
- To know how to make a shadow and change its size

Key Vocabulary

habitat, wild, pet, features, bricks, wood, straw, dog, cat, hamster, fish, animal, look, light, dark, torch, sun, candle, flame, battery, electricity

Under the Sea

- To identify some basic features of a fish including its life cycle and compare with the life cycle of humans
- To know what fish, including sharks, need to survive
- To identify how sea creatures move, including crabs
- To know what teeth are for and why most animals, including humans, need them
- To identify items that float or sink and say why sinking is not a good thing to happen to a boat

Key Vocabulary

fish, head, tail, scales, fin, gills, eyes, aquarium, tank, water, salt water, fresh water, crab, crustacean, sideways, marine, teeth, sharp, shark, whale, dolphin, life cycle, float, sink, boat

What on Earth…?

- To know what a habitat is, compare a range of habitats and identify those suited to specific animals
- To identify some plants, explore how they grow and identify a variety of flowers, comparing them by size, shape and colour
- To identify features of two varieties of the same species and compare them
- To know what the four seasons are and be able to identify the key features of spring specifically
- To know what a reflection is and know that mirrors make reflections

Key Vocabulary

habitat, native, non-native, species, flower, plant, mirror, reflection, environment, creature, alive, season

Science

PATHFINDERS

Knowledge Building					
Processes and Changes	**Methods**	**Observing and Recording**	**Scientific Vocabulary**	**Uses and Implications**	**Cross-Curricular (STEM)**
Identify simple processes and explain in basic terms how they happen	Know the key parts of a simple scientific method	Know how to use simple equipment in observing and recording	Understand some vocabulary linked to specific area of science e.g. animals - species	Know that science is used in a range of everyday situations, both in and outside the classroom	Identify clear connections between science, technology and mathematics for basic experimenting

Skills Progression	
Science Skills Pathfinders 1 / Y1	**Science Skills Pathfinders 2 / Y2**
Sc1 Suggest what might happen and perform simple tests Sc2 Explore using senses and record findings in simple ways Sc3 Collect evidence to try to answer a question Sc4 Make simple comparisons through observation Sc5 Identify and classify based on simple criteria	Sc6 Explore and observe in order to collect data and describe and compare findings Sc7 With help, suggest some ideas and questions and predict what might happen Sc8 Use first-hand observation, own experience and simple information sources to make comparisons and answer questions Sc9 Observe closely using simple equipment Sc10 Recognise ways in which evidence can be collected Sc11 Use simple scientific language Sc12 Perform simple tests Sc13 Record findings in various formats using standard units, drawings, diagrams, photographs, simple prepared formats such as tables and charts, tally charts, and displays Sc14 Say whether what happened was what was expected and draw simple conclusions to help answer questions

Science

Knowledge Progression

Pathfinders 1 / Year 1

Happily Ever After

Pupils will learn, through class discussion, the difference between living and non-living things. They will be introduced to the concept of change and use the story of the 'Ugly Duckling' to explore the changes that occur over the life span of a swan. Pupils will use observation to identify the key characteristics of birds such a feathers, beaks etc. Simple scientific vocabulary relating to living things will be introduced. They will develop their understanding of life cycles and offspring through birds, in comparison to frogs, before looking in more detail at suitable habitats for different animals.

Concepts

A. To know the difference between living things and things that have never been alive (NC)
B. To identify and name a variety of birds
C. To know that humans and other animals can produce offspring and that these offspring can grow into adults (NC)

Come Fly With Me! Arctic Circle

Initially, pupils will embed learning about the main features of each season within the UK. Pupils will also learn that seasons can be very different in other parts of the world, and this will be expanded on in Adventurers.

They will move on to explore the properties of a range of materials used in everyday objects. Pupils will investigate the properties of materials through their senses. The study of materials extends into how malleable certain solid materials can be by squashing, bending, twisting and stretching. Lastly, pupils will learn about the meaning of the term 'waterproof' and experiment using simple tests on a range of materials for waterproofness.

- To 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 / To identify and name a variety of plants and animals in their habitats, including microhabitats

NC Concepts

A. To learn the names of, describe weather associated with and observe changes across the four seasons
B. To identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock, and to know, describe and compare how their simple physical properties vary. Group together a variety of everyday materials on the basis of their simple physical properties
C. To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching
D. To distinguish between an object and the material from which it is made and compare the uses of a variety of everyday materials

Pathfinders 2 / Year 2

Land Ahoy!

To begin with, pupils will look at how objects to move by creating lists and then sorting through observation. They will know what defines a push or pull force and conduct simple experiments on increasing these forces to affect speed. Language such as 'faster' and 'slower' will be used to compare how things move and pupils will recognise the importance of adjusting speed in everyday life. Pupils will be introduced to the term 'sources' when learning about where sounds come from and know that language such as 'quieter' and 'louder' is used when comparing sounds.

Concepts

A. To compare how different things move (LKS2 - NC)
B. To notice and describe how things are moving, using simple comparisons such as faster and slower
C. To understand that there are many kinds of sound and sources of sound
D. To know that sounds get fainter as the distance from the sound source increases (LKS2 - NC)

Going Wild

Pupils will continue to develop their understanding of what it is that defines a living thing through discussions and questioning and have a clear understanding of what the terms 'living' and 'non-living' mean. Further learning on adults and offspring will look at what is needed to care for a human baby and how that baby changes as it grows. Pupils will be introduced to a range of vocabulary relating to gender, age, stage and diet. Pupils will use reasoning and explanation to list things vital for survival and recognise that science can be used outside the classroom to protect habitats and endangered species.

NC Concepts

A. To understand the difference between things that are living and things that have never been alive
B. To learn that animals, as well as humans, have offspring, which grow into adults
C. To learn about the basic needs of animals, as well as humans, for survival (which are food, water and air)
D. To identify and name a variety of common animals that are birds, fish, amphibians, reptiles and mammals
E. To describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)
F. To identify and name a variety of common animals that are carnivores, herbivores and omnivores

Additional Concept

G. To know that some animals are endangered, the reasons why and what is being done to preserve these species

Science

Knowledge Progression	
Pathfinders 1 / Year 1	**Pathfinders 2 / Year 2**
Unity in the Community Pupils will build on their knowledge of plants from the Explorers Learning Pathway to learn about the structure of plants and learn the correct language to describe their parts. Through learning walks, pupils will observe a variety of different plants and trees. Pupils will learn that plants can grow from either seeds or bulbs but all require certain conditions in order to flourish and be healthy. They will conduct a simple experiment for growing their own plants and use STEM skills to record growth. Pupils will expand their knowledge of the relationship between plants and animals by learning about food chains. Pupils will learn the terms 'deciduous' and 'evergreen' in relation to trees. **NC Concepts** A. To know and describe the basic structure of a variety of common flowering plants B. To know and describe how seeds and bulbs grow into mature plants C. To learn that plants need water, light and a suitable temperature to grow and stay healthy D. To name and identify a variety of common wild and garden plants, including deciduous and evergreen trees E. To know 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	**Zero to Hero** Pupils will develop their understanding of light sources and expand this to include those sources that also provide heat energy as well as light. They will recognise that some sources require electricity to work and, therefore, need a circuit and power source in order to function. Pupils will experiment with toys that require electricity and conduct some simple tests from which they can draw conclusions on how these appliances work. Pupils will learn the correct vocabulary for circuit components and will perform some simple tests on putting the components together to make a basic functioning circuit. An introduction to switches will allow for experimenting with how circuits can be broken safely. **Concepts** A. To observe and name a variety of sources of light, including electric lights, flames and the Sun B. To know that fire has been used throughout history for heat and light C. To know about simple circuits involving batteries, wires, bulbs and other components D. To know how a switch can be used to break a circuit
Light Up the World Pupils will learn that, like sound, we use the term 'source' when discussing where light comes from. They will use categorisation to sort light sources and non-light sources, identifying those that require electricity to work. They will learn that the Sun is a light source and they will experiment with using the Sun's energy, recording their findings in a simple way. The concept of sustainable energy will be introduced. Pupils will investigate how shadows are formed and that light levels, as well as shadows, can change. Finally, pupils will look at how light affects animals and identify those animals (nocturnal) that prefer darkness to light. **Concepts** A. To recognise that we need light in order to see things and that dark is the absence of light (LKS2- NC) B. To know, name and observe a variety of sources of light, including electric lights, flames and the Sun C. To recognise that light from the Sun can be dangerous and that there are ways to protect their eyes (LKS2- NC) D. To understand that the Sun provides energy and that solar power is a sustainable energy source E. To be aware of simple ways to save electricity F. To know that shadows are formed when the light from a light source is blocked by a solid object (LKS2 - NC) G. To understand the term 'nocturnal' and learn about nocturnal animals	

Science

Key Vocabulary			
Pathfinders 1 / Year 1		Pathfinders 2 / Year 2	
Happily Ever After		Going Wild	
adult	healthy	adult	herbivore
alive	investigation	air	male
beak	life cycle	amphibian	mammal
birds	life span	baby	needs
eggs	nutrition	bird	offspring
feathers	observation	carnivore	omnivore
habitat	offspring	consumer	producer
	recording	endangered	reptile
	respiration	extinction	scales
	source	female	species
	variety	fins	survival
	young	fish	tails
		food	water
		fur	hair
		gills	
		growth	
		habitat	

Science

Key Vocabulary				
Pathfinders 1 / Year 1			Pathfinders 2 / Year 2	
Come Fly With Me! Arctic Circle			Land Ahoy!	
bending	autumn	adaptations	compare	decrease
flexibility	conditions	arctic fox	decrease	faint
hard	earth	blubber	distance	hearing aid
materials	forecast	camouflage	faster	increase
object	freeze	habitat	force	listening
opaque	hemisphere	micro-habitat	increase	loud / louder
physical properties	rain gauge	polar bear	launch	quiet / quieter
rigid	seasonal change	predator	motion	sound
rough	seasons	prey	movement	
senses	snow	survive	pull	
smooth	spring		push	
soft	summer		slower	
squashing	sun dial		speed	
stretching	tilt		surface	
transparent	winter		transporter	
twisting				
waterproof				

Science

Key Vocabulary				
Pathfinders 1 / Year 1			Pathfinders 2 / Year 2	
Unity in the Community			Light Up the World	
bulb	temperature	food	appliance	shade
deciduous	trees	food chain	darkness	shadow
evergreen	vegetation	food source	day	solar
flower	water	habitat	electricity	solar
food	wild plants	temperature	electricity source	solar panels
fruit		water	energy	sun
garden plants			heat	sun safety
leaves			hydro dam	sustainable
light			light source	wind turbines
planting			measure	
plants			night	
roots			nocturnal	
seed			non-renewable	
stem			renewable	

Science

Key Vocabulary	
Pathfinders 1 / Year 1	Pathfinders 2 / Year 2
	Zero to Hero
	appliance
	battery
	bright
	bulb
	circuit
	component
	dull
	electricity
	heat
	light
	motor
	power
	power source
	switch
	wire

Science

ADVENTURERS

Knowledge Building					
Processes and Changes	**Methods**	**Observing and Recording**	**Scientific Vocabulary**	**Uses and Implications**	**Cross-Curricular (STEM)**
Understand more complex scientific processes and know some factors that can affect change	Understand that methods are a key part of safe experimentation and have secure knowledge of the features	Know that clear observations and recordings support findings and prove theories	Know how scientific language learned relates to new science concepts and ideas	Understand how science affects our lives and the implications its use has on them	Understand that the links between science, technology, engineering and mathematics are key to many industries

Skills Progression	
Science Skills Adventurers 1 / Y3	**Science Skills Adventurers 2 / Y4**
Sc15 Ask relevant questions Sc16 With help, set up and carry out simple practical enquiries, comparative and fair tests Sc17 Suggest what might happen in comparative and fair tests Sc18 Make careful observations and comparisons Sc19 Recognise what constitutes a fair test Sc20 Identify simple patterns, changes, similarities and differences Sc21 Make measurements using standard units Sc22 Discuss and describe findings Sc23 Communicate findings using simple scientific language in written explanations, drawing, labelled diagrams, keys, bar charts or tables Sc24 Use results to draw simple conclusions	Sc25 Set up and carry out simple practical enquiries, comparative and fair tests Sc26 Put forward ideas about testing and make predictions Sc27 Make close observations and comparisons Sc28 Observe patterns and suggest explanations Sc29 Collect data Sc30 Recognise and explain why a test is fair or unfair Sc31 Identify simple trends to answer questions Sc32 Make accurate measurements using standard units and begin to think about why measurements should be repeated Sc33 Use scientific evidence to answer questions Sc34 Use a range of equipment, including data loggers and thermometers Sc35 Gather and record findings through drawings, photographs, labelled diagrams, keys, models, presentations, tables, graphs and displays, using scientific language Sc36 Report on what the evidence shows through written explanations of results and conclusions and reports Sc37 Use results to draw simple conclusions, suggest improvements and raise further questions

Science

Knowledge Progression

Adventurers 1 / Y3

Come Fly With Me! Africa

In this unit, pupils will further develop their understanding and knowledge of classifying living things through the use of classification keys. Pupils will, using research skills, investigate one of the 'Big Five' focusing specifically on their dietary requirements. Through observations and class discussions, pupils will learn about teeth in relation to diet and the digestive system of both humans and animals. Pupils will look at various skulls and skeletal systems using reasoned predictions and conclusions to identify which animal they belong to. Knowledge of food chains will also be advanced by, not only interpreting food chains, but by constructing them.

NC Concepts

A. To recognise that living things can be grouped in a variety of ways
B. To understand and use classification keys to help group, identify and name a variety of living things in their local and wider environment
C. To know 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
D. To know the different types of teeth on humans and their simple functions
E. To know and describe the simple functions of the basic parts of the digestive system
F. To know how to construct and interpret a variety of food chains, identifying producers, predators and prey
G. To know that humans and some other animals have skeletons and muscle for support, protection and movement

May the Force Be With You

Pupils will embed their understanding of movement, revisiting push and pull forces, but extending this further by experimenting with the concept of friction. They will investigate the effects friction has on movement by designing an experiment that includes reasoned predictions, fair testing and conclusions. Pupils will explore the concept of gravity and other 'invisible' forces. They will also investigate magnets in a variety of ways such as through independent experiments, observing magnetic materials in their local environment and discussing how magnetic fields are found on Earth. The vocabulary of attract, repel and poles will be introduced.

NC Concepts

A. To know how things move on different surfaces
B. To know that and observe how some forces need contact between two objects and some forces act at a distance

Adventurers 2 / Y4

Rocky the Findosaur

In this unit, pupils will have the opportunity to devise a range of experiments to test some more complex scientific processes and observe changes, for example, the effects of erosion of various rock types. Pupils will use a range of scientific instruments such as hand lenses to observe rocks, fossils and soils at close range and thermometers to record more detailed results of changing state. They will compare the work of Mary Anning and Lorna Steel as part of this learning. Vocabulary relating to changes in rock, such as erosion and permeability, will be introduced as well as language relating to the water cycle.

NC Concepts

A. To compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
B. To know and describe in simple terms how fossils are formed when things that have lived are trapped within rock
C. 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 (UKS2 NC)
D. To know that soils are made from rocks and organic matter
E. To compare and group materials together, according to whether they are solids, liquids or gases
F. To know and observe how some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
G. To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature

Picture Our Planet

In this unit, pupils will learn about the concept of vibration in relation to how sounds are made, experimenting with tuning forks and observing the vibrations. They will further experiment with changing the volume of sounds by adapting the force used to produce them. Pupils will investigate how sounds travel to the ear and the concept of pitch will be introduced, linking to learning in music.

NC Concepts

A. To identify how sounds are made, associating some of them with something vibrating
B. To know that vibrations from sounds travel through a medium to the ear
C. To recognise patterns between the volume of a sound and the strength of the vibrations that produce it
D. To identify patterns between the pitch of a sound and the feature of the object that produced it

Science

Knowledge Progression

Adventurers 1 / Y3

May the Force Be With You

NC Concepts (cont.)

C. To know that and observe how magnets attract or repel each other and attract some materials and not others
D. To describe magnets as having two poles
E. To predict whether two magnets will attract or repel each other, depending on which poles are facing
F. To 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

Under the Canopy

Pupils will continue to develop their understanding of flowering plants by dissecting and labelling the key parts of a plant. Pupils will be introduced to the processes of photosynthesis and water transportation in plants through experimenting and observing. They will have more in-depth class discussions on what plants need for survival and recognise that plants can vary enormously in how much of these elements they require. The reproduction of plants is explored in more depth through comparing how seeds are produced and then dispersed in different ways.

NC Concepts

A. To identify and describe the functions of different parts of flowering plants: roots, stem / trunk, leaves and flowers
B. To learn about and 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
C. To investigate the way in which water is transported within plants
D. To know and explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Adventurers 2 / Y4

Lightning Speed

In this unit, pupils will learn in more depth about electrical appliances, using classification, and how circuits are essential to their functioning. Pupils are then required to use their previous knowledge of simple circuits to make and draw, using pictorial representations, a range of series circuits and identify the components used. They will need to produce and present an explanation of a circuit they have designed to solve a lighting problem in the local area. An introduction to the concepts of conducting and insulating will be introduced.

NC Concepts

A. To identify common appliances that run on electricity
B. To know how to construct a simple series electrical circuit and demonstrate this, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
C. To 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
D. To recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
E. To know and identify some common conductors and insulators, and associate metals with being good conductors

A World of Difference / Cry Freedom

Pupils will learn through investigation that light can be reflected from a range of surfaces and these reflections are not a light source in themselves. They will also experiment, both independently and as a class, with how shadows can change size and shape depending on how close a light source is to the solid object, and how shadows can change size outside, depending on the location of the sun.

NC Concepts

A. To know that light is reflected from surfaces
B. To find patterns in the way that shadows change

Science

Knowledge Progression	
Adventurers 1 / Y3	**Adventurers 2 / Y4**
Athens v Sparta Pupils will expand their understanding of floating and sinking by initially taking part in a class discussion and then experimenting with a range of objects that may or may not float, making reasoned predictions before their investigations. The concept of displacement of will be introduced and further experiments will take place. Pupils will need to take photographs, record data and draw conclusions from their findings. **Concepts** A. To know that some objects float in water while some others sink B. To understand that displacement occurs when something is placed in liquid	

Science

Key Vocabulary			
Adventurers 1 / Year 3		Adventurers 2 / Year 4	
Come Fly With Me! Africa		Rocky the Findosaur	
biodiversity	nutrition	coarse	permeable
canine	oesophagus	condensation	precipitation
chew	pre-molar	crumbling	rock
classification	predator	erosion	sand
classification keys	prey	evaporation	silt
consumer	producer	evolution	smooth
dental	skeleton	fossil	soil
digestion/	stomach	gas	solid
digestive system	swallow	geology	state of matter
food chain/ food	teeth	global warming	temperature
web		liquid	volume
incisor		loamy	
intestine		metal	
molar		mineral	
muscles		molecule	
		organic matter	
		palaeontology	

Science

Key Vocabulary	
Adventurers 1 / Year 3	Adventurers 2 / Year 4
May the Force Be With You	Picture Our Planet
air resistance	insulate
attract	noise pollution
friction	pitch
gravity	rhythm
magnetic	sound waves
non-magnetic	tuning fork
pole	vibrations
repel	volume
resistance	wireless
water resistance	wires

Science

Key Vocabulary		
Adventurers 1 / Year 3		Adventurers 2 / Year 4
Under the Canopy		Lightning Speed
adaptations	stamen	appliance
carbon dioxide	stem	battery
citrus fruit	stigma	bulbs
dispersal	trunk	buzzer
flowering plants		cells
fungi		component
growth		conductor
oxygen		current
photosynthesis		efficiency
pollination		electric circuit
pollinator		insulator
reproduction		motors
root		series circuit
seed formation		switch
seeds		wires
sepal		
soil nutrients		

Science

Key Vocabulary	
Adventurers 1 / Year 3	Adventurers 2 / Year 4
Athens v Sparta	A World of Difference / Cry Freedom
buoyancy	block
displacement	dark
float	hypothesis
mass	light
materials	opaque
resistance	reflect
sink	shadow
	solid

Science

NAVIGATORS

Knowledge Building					
Processes and Changes	**Methods**	**Observing and Recording**	**Scientific Vocabulary**	**Uses and Implications**	**Cross-Curricular (STEM)**
Understand that numerous factors can affect or prevent change	Know what makes a good methodology and explain how adaptations can lead to improvements	Identify, analyse and explain findings that support or dismiss theories or arguments	Know how to use a range of scientific vocabulary in various contexts	Know that science has implications for world issues and that it can be used for good or bad	Understand how their own STEM skills can benefit future science work in school and beyond

Skills Progression	
Science Skills Navigators 1 / Y5	**Science Skills Navigators 2 / Y6**
Sc38 Plan different types of scientific investigations Sc39 Make predictions based on scientific knowledge Sc40 Carry out a range of scientific investigations Sc41 Begin to recognise and control variable where appropriate during investigations Sc42 Identify trends and patterns and offer explanations for these Sc43 Carry out a fair test explaining why it is fair Sc44 Take measurements using a range of scientific equipment with increasing accuracy and precision Sc45 Understand why observations and measurements need to be repeated Sc46 Select information from provided sources Sc47 Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs Sc48 Produce written explanation of results, causal explanations and conclusions Sc49 Use results to make predictions for further tests	Sc50 Select and plan the most appropriate type of scientific enquiry to answer specific questions Sc51 Make predictions based on scientific knowledge and understanding Sc52 Carry out a range of scientific investigations Sc53 Recognise and control variables where appropriate during investigations Sc54 Identify scientific evidence that has been used to support or refute ideas Sc55 Take measurements using a range of scientific equipment with accuracy and precision Sc56 Decide when observations and measurements need to be checked, by repeating, to give more reliable data Sc57 Select information from a range of sources Sc58 Record data and results of increasing complexity, using scientific diagrams and labels, classification keys, table, bar and line graphs, and models, making appropriate use of ICT Sc59 Reporting findings from investigations, including written explanations of results, explanation involving causal relationships, and conclusions Sc60 Present reports of findings in written form, displays and presentations Sc61 Use test results to make predictions and set up further comparative and fair tests

Science

Knowledge Progression

Navigators 1 / Y5

Full of Beans

In this unit, pupils will further develop their knowledge and understanding of electricity. They will embed and extend their understanding of circuits by experimenting with variations of components, and the concept of voltage will be introduced through changing the number of cells in their circuits. They will also use scientifically correct symbols for components when completing circuit diagrams. They will now learn and use the correct symbols to represent components. Furthermore, pupils will look at energy, identifying its various forms (thermal, light, kinetic), how it is created through renewable and non-renewable sources and the implications this has on real-world use.

Concepts

A. To identify common appliances that run on electricity
B. To compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on / off positions of switches (NC)
C. To be able to associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit (NC)
D. To know how to use recognised symbols when representing a simple circuit in a diagram (NC)
E. To understand the term 'energy' and identify a range of different renewable and non-renewable energy sources

Come Fly With Me! America

Pupils will learn that objects are made from materials which are often combined e.g. a window is made of glass, wood and metal. They will look at objects, identify what they are made from and discuss why the chosen material is suitable for that object. Pupils will also differentiate between man-made and natural materials. With a focus on cotton wool, pupils will devise their own investigations to test either absorbency, flexibility or strength etc. They will be expected to produce a sound methodology and analyse their findings.

Concepts

A. To distinguish between an object and the material from which it is made
B. To understand the difference between man-made and natural materials and identify and sort both

Navigators 2 / Y6

Global Warming

Pupils will explore changing states of matter in more detail. Initially, they will research the numerous factors and processes that are used to recycle glass and paper. Pupils will then have several opportunities to experiment with changing materials by the introduction of processes such as dissolving, filtering and evaporating etc. They will also test whether changes can be reversible. The experiments that the pupils will devise will require a greater focus on fair testing, using comparisons and retesting to ensure the data collected in accurate. Vocabulary such as substance, solution and mixture will be introduced.

NC Concepts

A. To know that some changes result in the formation of new materials, and that this kind of change is not usually reversible
B. To 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
C. To suggest how mixtures might be separated, including through filtering, sieving and evaporating, using their knowledge of solids, liquids and gases
D. To know how to demonstrate that dissolving, mixing and changes of state are often reversible changes
E. To understand how some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution
F. To show understanding by giving reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic

"I Have a Dream…"

Pupils will use their previous knowledge of life cycles to explore the similarities and differences between various animal and plant species. Based on specific criteria and questions, pupils will research the life and reproductive cycles of a variety of animals and plants with opportunity for analysis, discussion and comparison. Pupils will be expected to start to give more scientific reasoning for the groupings of plants and animals by using established classification systems. They will also start to investigate adaptations of various plants and animals to suit particular biomes and how some of these adaptations have led to evolutionary changes.

NC Concepts

A. To know the difference in the life cycles of a mammal, an amphibian, an insect and a bird
B. To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents

Science

Knowledge Progression	
Navigators 1 / Y5	Navigators 2 / Y6
	"I Have A Dream…" **Concepts (cont.)** C. To be able to describe the life process of reproduction in some plants and animals D. To be able to classify plants and animals based on specific characteristics and give reasons E. To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences F. To know and identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

Science

Knowledge Progression

Navigators 1 / Y5

Mission Control

In this unit, pupils will look at the relationship between the Sun, Earth and Moon and how their movements and location in the solar system affect one another. Pupils will produce detailed labelled diagrams and written explanations, including graphs, to support their ideas. Pupils will deepen their knowledge of the Moon's relationship with the Earth, through self-directed research that will be shared with their peers for discussion.

NC Concepts

A. To know that the Sun, Earth and Moon are approximately spherical bodies
B. To know about and explain the movement of the Earth relative to the Sun in the solar system
C. To use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky
D. To know about and explain the movement of the Moon relative to the Earth

Go With the Flow

Pupils will develop their understanding of growth and change in animals and humans by researching, sorting and comparing the gestational periods, life cycles and life spans of humans and animals. Using established research, pupils will investigate how diet, drugs and exercise can affect health and life expectancy in humans. The circulatory system will be introduced and pupils will investigate pulse rate, producing graphs to show their findings. They will investigate how vital water is for survival and compare how long animals can survive without water, discussing their findings with the class.

NC Concepts

A. To know and describe the changes as humans develop to old age
B. To recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
C. To identify and name the main parts of the human circulatory systems, and explain the functions of the heart, blood vessels and blood
D. To describe the ways in which nutrients and water are transported within animals, including humans

Navigators 2 / Y6

A World of Bright Ideas

In this unit, pupils will research and present findings on Sir Isaac Newton and develop their understanding of gravity. Pupils will carry out a number of experiments on the effects of water, air and frictional resistance. The experiments will require reasoned predictions, accurate recording of data and will be shared with the class once complete. Finally, pupils will carry out investigations into mechanisms and use STEM skills to make and test them. Pupils will discuss how these mechanisms are used in everyday life.

NC Concepts

A. To know that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
B. To identify the effect of air resistance and friction, that act between moving surfaces
C. To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect

Wars of the World

Pupils will carry out a range of experiments to test the theory of light travelling in a straight lines, and the concept of refraction when creating rainbows. Pupils will observe what happens and record their findings appropriately. The structure of the human eye will be introduced with the correct vocabulary and pupils will create labelled diagrams. Finally, pupils will embed their knowledge of shadows by creating shadow puppet theatres, which will include the use of transparent, translucent and opaque materials.

NC Concepts

A. To understand that light appears to travel in straight lines
B. To 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
C. To know that we see things because light travels from light sources to our eyes or from light sources to objects and then our eyes see them
D. To use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

Science

Key Vocabulary			
Navigators 1 / Year 5		Navigators 2 / Year 6	
Full of Beans		Global Warning	
brightness	pollution	biodegradable	reuse
bulb	radioactive	conductivity	reversible
buzzer	renewable/	(electrical and	separating sieving
calorie	non-renewable	thermal)	solid
cell	energy sources	dissolve	solubility
circuit diagram	sustainable	dredging	solution
coal	thermal	evaporating	substance
consumption	uranium	filtering	waste
efficiency	voltage	gas	
energy	volume	irreversible	
fuel	wind power	liquid	
gas		magnet	
kinetic		mixing	
nuclear		nurdles	
oil		pollutants	
plutonium		recycle	
		reduce	

Science

Key Vocabulary	
Navigators 1 / Year 5	**Navigators 2 / Year 6**
Come Fly With Me! America	**"I Have A Dream…"**
absorbency	adaptation
classify	amphibian
cotton	appearance
environmentally	biomes
friendly	bird
flexibility	birth rate
man-made	classification
materials	egg
manufacturing	environment
natural	evolution
process	gills
properties	habitat
strength	hereditary
	insect
	invertebrate
	mammal
	reproduction
	sexual
	reproduction
	tendrils
	theories of
	evolution
	vertebrate

Science

Key Vocabulary	
Navigators 1 / Year 5	Navigators 2 / Year 6
A World of Bright Ideas	Mission Control
accelerate	axis
air resistance	constellations
block and tackle	cycle
brake	day and night
decelerate	device
effort	earth
fall	flat earth theory
force	galaxy
friction	moon
fulcrum	orbit
gears	planet
gravity	planetary motion
lever	rotation
load	satellite
newton meter	solar system
pulley	space agencies
resistance	spherical bodies
spring	sun
water resistance	tides

Science

Key Vocabulary			
Navigators 1 / Year 5		Navigators 2 / Year 6	
Go With the Flow		Wars of the World	
additive	life cycle	absorption	translucent
adolescent	lungs	beam	transparent
blood	oxygenated	cornea	
cardiac	plasma	eye	
cell	platelets	iris	
blood pressure	pore	lens	
blood vessel	pregnant	light	
dehydration	pulse	light-emitting	
drug	stethoscope	devices	
function	sweat	opaque	
gestation	urine	periscope	
heart	veins	reflect	
joints	womb	refraction	
		retina	
		shadows	
		shiny	
		torch	

Science

End Goals
Explorers / EYFS
Our aim in teaching science in Explorers is to tap into pupils' curiosity about the world around them. By the end of this phase, pupils should be able to use their senses to investigate a range of materials and should be starting to become familiar with the concept of natural and man-made materials. Pupils should be able to talk in simple terms about how plants and animals change over the course of their life cycles and observe the growth of a plant from seed to full development. Pupils should recognise that humans and animals require a suitable place to live and need food and water to survive. By the end of this phase, they should also be aware of seasonal changes and be able to have conversations about what they see, hear and feel outdoors. Pupils should be able to identify a range of light sources and use light to create reflections and shadows. Pupils should be able to start making comparisons between two or more things e.g. objects, animals, recognising similarities and differences between them.
Pathfinders / KS1
Our aim in teaching science in Pathfinders is to embed and build on learning in Explorers by beginning to develop their ability to work more scientifically. By the end of this phase, pupils should be able to write basic methods for experiments and use some simple equipment to observe and record their findings. They should also be able to make predictions, with reasons for their ideas, before proceeding with an experiment. Pupils should be able to draw on some of their mathematical skills to create charts from data collection and use this data to draw conclusions. Pupils should be able to use a wider range of scientific vocabulary in both their class discussions and written work. We believe that learning in science develops through the experience and development of scientific concepts in incremental steps in each phase. For this reason, we have made the following changes to the Programme of Study within the Science National Curriculum to support children's learning. Exploratory units of Light, Electricity, Sound and Forces have been included in Pathfinders (Key Stage 1) to ensure that children gain initial experience of a range of 'Physical' science before Key Stage 2. They should also have a secure knowledge of what animals and plants need to survive and be able to classify things that are alive and those that are not. Pupils should also be able to explain in more detail the process of growing plants from seeds and bulbs, using a wider scientific vocabulary. When working with materials, pupils should be able to distinguish the difference between an object and material/s it is made from. They should also be able to conduct some simple experiments on the suitability of certain materials for different uses.
Adventurers / LKS2
Our aim in teaching science in Adventurers is to encourage pupils to start to become more scientifically accurate, with the introduction of a range of testing, alongside the questioning and comparing of data when drawing conclusions. In this phase, pupils will have revisited a number of areas of science from Pathfinders, and will be expected to end this phase with a deeper understanding of them through the use of a wider scientific vocabulary and more complex investigative techniques. Pupils should be able to use more technical methods of grouping and classifying, such as classification keys and food chain diagrams. Pupils should also be able to present their findings from experiments in more formal ways and provide evidence for their findings. They should be able to explain the key features of the digestive and skeletal systems in animals and should have a deeper understanding of the reproductive processes of plants and their key parts. Pupils should be able to recognise the difference between volume and pitch when investigating sound and recognise how reflections are formed in the study of light. By the end of the phase, pupils should be able to make and draw diagrams of more complex electrical circuits that include switches. They should also be able to recognise the roles of conductors and insulators in making circuits functional but safe.
Navigators / UKS2
Our aim in teaching science in Navigators is to deepen pupils' knowledge and skills in a wide range of scientific areas. Pupils should now be confident in devising and conducting experiments and presenting their methods and findings with accuracy, using a range of different methods. In this phase, pupils are now expected to, not only ensure fair testing in their experiments, but also conduct comparative tests where appropriate. Pupils should be able to analyse, discuss and argue constructively for and against particular theories or ideas and use evidence to support their own views. They should be able to research and produce explanations or theories that look at scientific concepts beyond the classroom, such as evolutionary theories or the use of renewable energy sources. They should also know about the circulatory and the solar systems, as well as more complex forces such as gravity, water, air and frictional resistance.