Finlay Community School

Science

Our Whole School Curriculum Intent

At Finlay, we aim to teach a broad and balanced curriculum that enables children to enjoy, achieve and succeed in line with the National Curriculum. We provide opportunities to develop the children's cultural capital and ensure they are life-long learners, who are ready for the next step of the education and to thrive in Society. In addition to teaching the National Curriculum, we also aim for our children to leave school with a SMILE! Our SMILE values are: social awareness, mental health and wellbeing, independence, life skills and excellent aspirations. We provide opportunities to develop these values in all curriculum areas.

Our Science Intent

At Finlay, we teach the National Curriculum. As outlined in the National Curriculum, "a high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics". Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Science is a core subject and is taught weekly at Finlay, in its own subject discipline. Staff at Finlay use our planning matrix to ensure coverage of their science objectives, but also assess the pupil's learning using Insight: our whole-school assessment system for core subjects. Our intent for science is closely aligned to our school SMILE values and our school motto: *Aspire, Belong, Achieve* as pupils learn more about the reasons for the world being the way that it is, and are equipped with the knowledge, skills and understanding to foster excellent future aspirations.

Whole School Curriculum Overview: Science Overview

Reception

Autumn 1 and 2: Animals including humans (senses walks, looking at ourselves, baby animals)
Spring 1: Everyday materials
Summer 1: Living things and their habitats.
Summer 2: Understanding plants

Year 1

Autumn 1 and 2: Types of materials and their properties (making a toy)
Spring 1: Seasonal changes
Spring 2: Wonder
Summer 1: Understanding plants, trees, structure of a plant/tree
Summer 2: Animals including humans - common animals: fish, amphibians etc and omnivores, carnivores and herbivores.

Year 2

Autumn 1: Everyday materials: Identify and compare suitability of materials:
Autumn 2: Animals and their habitats.
Spring 1: Animals including humans - how offspring grow - children to adults.
Spring 2: Wonder
Summer 1: Observe how plants grow
Summer 2: Animals including humans - how humans stay alive, healthy lifestyle and exercise.

Year 3

Autumn 1: Rocks and fossils
Autumn 2: Light and shadow
Spring 1: Forces and magnets
Spring 2: Wonder
Summer 1: Plants - features, how they grow, water transportation, seed dispersal. Plants in hot places compared to the UK.
Summer 2:
Animals including humans

Year 4

Autumn 1: The digestive system
Autumn 2: Electricity: circuits and how they work (Making a chariot)
Spring 1: Materials: changing state, reversible and irreversible changes solid, liquid, gas. The Water Cycle.
Spring 2: Wonder
Summer 1: Classification, living things, environmental change. Food chains
Summer 2: Sound and how it travels

Year 5

Autumn 1: Science: states of matter and reversible and irreversible changes, dissolving and filtering.
Autumn 2: Space
Spring 1: Living things and their habitats, plants, life cycles of animals, reproduction in plants (green eyed tree frog)
Spring 2: Wonder - Oxford Building Bridges
Summer 1: Forces, Materials and magnets
Summer 2: Changes in humans as they age: adolescence and puberty.

Year 6

Autumn 1: Animals including humans: exercise and the Circulatory system.
Autumn 2: Electricity
Spring 1: Living things and animals: classification of animals and plants
Spring 2: Wonder
Summer 1: Evolution and inheritance
Summer 2: Light

Coverage Term by Term (EYFS – Year 6)

	Autumn Term		Spring Term		Summer Term	
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Reception	It's Good to be Me	Let's Celebrate	Once Upon a Time		Are we nearly there yet?	Moving on up!
Science Content	Animals including humans Senses walks – looking at ourselves Baby animals – who is my Mummy?		Everyday materials/states of matter		Living things and their habitats	Understanding plants
Year 1	Finlay Toy Factory		Where oh Where is Finlay Bear		The Great Space Race	
Science content	Types of materials and their properties – make a toy		Seasonal changes	Wonder	Understanding plants, trees, structure of a plant/tree	Animals including humans – common animals: fish, amphibians etc and carnivores, omnivores, herbivores
Year 2	The Great Fire of London & The Tudors		Around the World in … Days Passport theme		Heroes in History Florence Nightingale and Mary Seacole	
Science Content	Everyday materials Identify and compare suitability of materials – making a lamp	Animals and their habitats	Animals including humans – how offspring grow – children to adults	Wonder	Observe how plants grow	Animals including humans – how humans stay alive Healthy lifestyle and exercise
Year 3	Rock and Roll! Stone Age and Iron Age		Deadly Disasters		Navigating the Nile/ Ancient Egyptians	
Science content	Rocks and Fossils	Light and shadow	Forces and magnets	Wonder	Plants – features, how they grow, water transportation Plants in hot places compared to the UK	Animals including humans

Year 4	Rotten Romans Glorious Glevum		Journey to the River Sea! Come Sail with Me!		Ancient Greeks Olympics	
Science content	Animals including humans - Digestive system	Electricity - circuits and how they work (Chariot)	Materials changing state - solid, liquid, gases The Water Cycle Reversible and irreversible changes	Wonder	Classification Living things Environment change Food chains	Sound and how it travels
Year 5	**Invaders and Settlers - Saxons, Vikings and Mayans**		**Deforestation The Rainforest - North and South America**		**Chocolate! Ancient Maya and Aztec Civilisation**	
Science Content	Science - states of matter and reversible and irreversible changes, dissolving, filtering	Space	Science - Living things and their habitats/ plants: life cycles of animals, reproduction in plants (green eyed tree frog)	Wonder (Oxford University Building Bridges project)	Forces and magnets	Changes in humans as they age (adolescence and puberty)
Year 6	**We'll Meet Again! World War 2**		**Ice Explorer Arctic and Antarctica**		**Let Me Entertain You! History of Entertainment**	
Science Content	Animals including humans: Exercise and the Circulatory System	Electricity	Living things and animals: classification of animals and plants	Wonder (Oxford University Building Bridges project)	Evolution and inheritance (link to RSHE)	Light

Progression of Knowledge, Skills and Understanding in the National Curriculum

Working Scientifically

	Birth to Three	Three to Four Years	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Planning Scientifically									
Asking questions		Comment and ask questions about the natural world. Notice and ask questions about differences	Comment and ask questions to learn more about the world that they live in. Ask questions to find out more and to check they understand what has been said to them. ELG: listen attentively and respond to what they hear with relevant	Ask simple questions and recognising that they can be answered in different ways.	Ask simple questions and recognise that they can be answered in different ways including the use of scientific language from the National Curriculum.	Begin asking relevant questions and experiment with different types of scientific enquiries to answer them,	Ask relevant questions and use different types of scientific enquiries to answer them.	Ask relevant questions to explore scientific contexts further, choosing which type of scientific enquiries to answer them.	Ask relevant questions to futher their own scientific understanding in a range of contexts, choosing and justifying which type of scientific enquiry is best to answer them.

			questions, comments and actions.							
Planning a scientific investigation		Choose the right resources to carry out their plan. Choose a spade to enlarge a small hole they dug with a trowel. Explore different tools.	Develop their small motor skills so that they can use a range of tools competently, safely and confidently ELG: use a range of small tools, including scissors	Perform simple tests.	Perform simple and comparative tests.	Begin to set up simple practical enquiries, comparative and fair tests.	Set up simple practical enquiries, comparative and fair tests, understanding this is important to draw accurate conclusions.		Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling independent and dependent variables.
Observing scientifically										
Observation	Notices detailed features of objects in their environment.	Can talk about some of the things that he/she has observed Make comments and share their own ideas	Describe events in some detail.	Make observations using appropriate senses and simple equipment (magnifying glasses and timers).		Use simple equipment to observe closely, including changes over time.	Make systematic and careful observations.	Make systematic and careful observations and comparisons of relevant features in a variety of contexts.	Decide what to observe/compare, how long to observe for and whether to repeat observations.	Decide what to observe/compare, the duration of observation and whether repeated observations are needed, justifying my reasons why using my scientific understanding.
Using measurement	Use one-handed tools and equipment, for	Use vocabulary 'more than'	Use vocabulary 'more	Use non-standard units of measure to collect data.		Use non-standard units of	Take measurements using	Take accurate measurement	Take accurate measurements using a range	Take accurate measurements, choosing

	example making snips in paper with scissors Compare amounts saying 'lot's, 'more' or 'same' Compare sizes, weights etc. using gesture and language - bigger/little/smaller, high/low, tall, heavy Compare quantities using language 'more than' 'fewer than' Make comparisons between objects relating to size, length, weight, and capacity	less than' 'fewer' 'the same as' 'equal to'	than' less than' 'fewer' 'the same as' 'equal to' to compare quantities such as length, weight and capacity.		measure and begin to experiment using standard units of measure to collect data.	standard units using a range of equipment including: data loggers and thermometers	s using standard units using a range of equipment including: data loggers and thermometers	of scientific equipment with increasing accuracy and precision, taking repeated readings where necessary.	which scientific equipment to use, with increasing accuracy and precision, taking repeated readings where necessary to identify anomalies.
Gather and record scientifically									
Gathering and recording data	Notice patterns and arrange things in patterns	Show an interest in technology - want to have a go on an Ipad or white board	Interact and explore their environment using a range of multimedia equipment, including	Gather and record data using pictures, block graphs or tally charts to help in answering questions as a class.	Gather and record observations using tables, drawings, block graphs and some written	Gather and record findings using simple scientific language, drawing, labelled diagrams,	Gather and record findings using simple scientific language, drawing, labelled diagrams, charts and	Gather and record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables,	Select the most appropriate method of gathering and recording data and results of increasing complexity: scientific diagrams and

		Use a shortcut such as an icon on the computer/iPad to navigate to a specific website. Can use all age appropriate apps.	digital cameras, microscopes etc. Collect information, e.g. by taking photographs		data to help in answering questions, including from secondary sources of information as a group.	charts and tables with increasing independence.	tables independently ensuring they are accurate.	scatter graphs, bar and line graphs.	labels, classification keys, tables, scatter graphs, bar and line graphs.
Concluding scientifically									
Reporting on findings		Talk about why things happen and how things work.	Use talk to help work out problems, organise thinking to explain how things work and why they might happen.	Use his/her observations and ideas to suggest answers to questions and whether this was what they expected.	Use his/her observations and ideas to suggest answers to questions.	Use his/her own results and scientific evidence to draw simple conclusions, and answer questions.	Draw scientific conclusions and answer questions using their own results and evidence to support this.	Use scientific enquiries, own subject knowledge and experiences to draw their own conclusions, which can be fully supported with data and evidence.	Use scientific enquiries, detailed subject knowledge and a range of experiences to draw their own detailed conclusion, which can be fully supported and justified through the use of data and gathered evidence, ruling out anomalies.
Finding similarities, differences and relationships between.		Begin to describe a sequence of events, real or fictional using words such	Connect one idea to another using a range of connectives.	Begin to notice some similarities and differences	Notice similarities, differences and patterns.	Identify differences, similarities or changes related to simple scientific	Identify simple trends and patterns related to simple scientific	Begin to identify causal relationships and explanations of the degree	Confidently identify causal relationships and explanations of the degree of trust in

		as 'first', 'then'	When directed, looks closely at similarities, differences, patterns and change.			ideas and processes.	ideas and processes.	of trust in results.	results, explaining the impact that this has.
Presenting findings			Articulate their ideas and thoughts into well-formed sentences	Begin to present some findings orally, in simple tables and block graphs using ICT where relevant.	Present findings from collaborative data orally, using tables, drawings or block graphs. Continue to use ICT where relevant.	Begin to present findings from enquiries using age-appropriate scientific language, drawings, labelled diagrams, keys, bar charts, tables and ICT where appropriate.	Present findings from enquiries using age-appropriate scientific language, drawings, labelled diagrams, keys, bar charts, tables and ICT where appropriate.	Begin to present findings from scientific enquiries of increasing complexity using scientific diagrams and labels, classification keys, tables, scattergraphs, bar and line graphs, written explanations and presentations. Continue to use ICT where it enhances the presentation of findings.	Confidently present findings from scientific enquiries of increasing complexity using scientific diagrams and labels, classification keys, tables, scattergraphs, bar and line graphs, written explanations and presentations. Continue to use ICT where it enhances the presentation of findings.
Evaluating Scientifically									
Evaluating		Estimate and guess how many there might be before counting	ELG: hold conversation when engaged in back-and-forth	Begin to identify some successes of my investigation	Identify what was successful in my investigation and	Make predictions for new values using recording	Make predictions for new values using recording	Use test results to make predictions to set up further	Confidently use test results to make predictions for new values,

		Understand 'why' questions like 'Why do you think the caterpillar got so fat?' Answer simple 'why' questions Be able to express a point of view to debate when they disagree with an adult or friend, using words as well as actions	exchange with their teacher and peers. ELG: participate in small group discussions, offering their own ideas, using recently introduced vocabulary		suggest changes for the future.	data, suggest some improvements for future investigations and potentially raise further questions.	data, suggest well thought-out improvements for future investigations, which can be explained fully and raise further Questions.	comparative and fair tests.	justifying these fully. Use this information to independently set up further comparative and fair tests to find out more.
Refuting or supporting scientific claims		Be able to express a point of view to debate when they disagree with an adult or friend, using words as well as actions						Identify scientific evidence that has been used to support or refute ideas and arguments.	Identify scientific evidence from their own enquiries or other people's scientific ideas (including those that have changed over time) and use these to support or refute ideas

									and arguments.

Progression of Knowledge, Skills and Understanding in the National Curriculum

Biology: Understanding Plants

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Types of plants and flowers. Specific parts of plants and flowers	Explore natural materials indoors and outdoors	Use all their senses in hands on exploration of natural materials	Explore the natural world around them and draw pictures of plants Describe what they see, hear and feel whilst outside looking at plants Talk about similarities and difference between plants	Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.	Observe and describe how seeds and bulbs grow into mature plants.	Identify, locate and describe the functions of different parts of flowering plants (roots, stem/trunk, leaves and flowers).			

Types of plants and flowers	Watch a plant grow and talk about changes	Plant seeds and care for growing plants		Identify and describe the basic structure (at least: flower, leaf, root, stem, trunk, seed, branch and petal) of a variety of common flowering plants, including deciduous and evergreen trees .	Find out and describe how plants need water, light and a suitable temperature to stay and grow healthily and how changing these effect the plant.	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.			
Seed dispersal and reproduction		Understand the key features of the life cycle of a plant Begin to understand the need to respect and care for plants				Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.		Name, locate and describe the main parts of the reproductive system of plants: stigma, stamen, petal, sepal, pollen and ovary, (covered in living things and their habitats)	
		Observe decay over time			Know that plants are living and eventually die.	Investigate the way in which water is transported			

						within plants			

Progression of Knowledge, Skills and Understanding in the National Curriculum

Biology: Animals including humans

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Identifying and naming animals. Recognising that animals and humans change.				Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.	Understand that animals, including humans, have offspring which grow into adults.			Describe the changes as humans develop to old age.	
	Make connections between the features of their family and other families Notice differences	Sequence family members by size and name (baby, child, adult) Begin to	Name and describe people who are familiar with them Talk about members of their immediate family	Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and			Construct and interpret a variety of food chains, identifying producers, predators and prey.		

	between people	develop complex stories using small world equipment like animal sets.	Makes observations of animals and draw pictures of animals	mammals, including pets)					
Nutrition		Make healthy choices about food and drink with adult support	Independently make healthy food and drink choices Know and talk about healthy eating	Identify and name a variety of common animals that are carnivores, herbivores and omnivores.	Describe the basic needs of animals including humans for survival (water, food and air)	Identify that animals, including humans, need the right types of nutrition, and that they cannot make their own food. They get nutrition from what they eat.			Describe the ways in which nutrients and water are transported within animals, including humans.
Healthy lifestyle and exercise		Observe the effects of activity on their bodies. Make healthy choices about	Show some understanding that good practices with regard to exercise (eating, sleeping and hygiene) can contribute to good health.		Describe the importance for humans of exercise, eating the right amounts of different types of		Identify the different types of teeth in humans and their simple functions.		Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.

		food, drink, activity and tooth brushing	Independently meet their own care need (brushing teeth, using the toilet, washing and drying their hands thoroughly) Know and talk about regular physical exercise, tooth brushing, sensible amounts of screen time, good sleep routine and being a safe pedestrian		food and hygiene.				
The Human Body	Notice and ask questions about differences such as skin colour, types of hair, gender, special needs and disabilities etc.			Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.		Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	Describe that simple functions of the basic parts of the digestive system in humans.		Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.

	Explore paint using fingers and other parts of their bodies.								

Progression of Knowledge, Skills and Understanding in the National Curriculum

Biology: Living things and their habitats

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Explore, compare, describe and classify living things.	Notices detailed features of objects in their environment.	Begin to develop complex stories using small world equipment like animal sets. Comments and asks questions about aspects of his/her familiar world such as the place where	Explore the natural world around them and draw pictures of animals Describe what they see, hear and feel whilst outside looking at animals Talk about similarities and		Explore and compare differences between things that are living, dead, and things that have never been alive.		Recognise that living things can be grouped in a variety of ways.	Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.	Describe how things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.

		he/she lives or the natural world. 	difference between animals Recognise some environments that are different to the one they live in Talk about similarities and differences between the natural world around them and contrasting environments						
Life Cycles		Care for an animal that goes through a life cycle Talk about similarities and differences when observing life cycles						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. Name, locate and describe the main parts of the reproductive	

								system of plants: stigma, stamen, petal, sepal, pollen and ovary	
Food Chains					Describe how animals obtain their food from plants and other animals, using the ideas of a simple food chain, and identify and name different sources of food.				
Changing Habitats		Shows care and concern for living things and the environment.	Talk about how to care about the environment				Recognise that environments can change and that this can sometimes pose dangers to living things.		

Progression of Knowledge, Skills and Understanding in the National Curriculum

Biology: Evolution and Inheritance

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Understand that living things have changed over time									Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.
Understand that living things produce offspring.									Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
Understand how animals and plants are adapted									Identify how animals and plants are adapted to suit their

and that this can lead to evolution									environment in different ways and that adaptation may lead to evolution.

Progression of Knowledge, Skills and Understanding in the National Curriculum

Chemistry: Everyday Materials, Rocks and States of Matters

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Everyday Materials									
Compare, group and classify materials	Start to develop pretend play, pretending that one object represents another Explore different materials, using all their senses to investigate them. Explore materials with different	Take part in simple pretend paly using an object to represent something else even if not similar. Explore different materials freely, in order to develop their ideas about how to use them and what	Describe what they see, hear and feel when investigating different materials.	Distinguish between an object and the material from which it is made.					

	properties including materials indoors and outdoors. Explore materials with different properties including natural materials,	to make. Explore collections of materials with similar and/or different properties. Talk about what they see. Use all their senses in hands on exploration of natural materials. Talk about the difference between materials and the changes they notice.							
	Manipulate and play with different materials. Use their imagination as they consider	Create closed shapes with continuous lines, and begin to use these shapes to represent		Identify and name a variety of everyday materials, including wood, plastic, glass,	Identify and compare the suitability of a variety of everyday materials, including			Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency,	

	what they can do with different materials.	objects. Join different materials and explore different textures. Combine shapes to make bigger ones - an arch, a bigger triangle - etc. Develop their own ideas and then decide which materials to use to express them.		metal, water and rock.	woods, metal, plastic, glass etc. for particular uses.			conductivity (electrical and thermal) and response to magnets	
	Explore materials with different properties Explore natural materials indoors and outdoors			Compare and group together a variety of everyday materials on the basis of their simple physical properties.					

Describe the properties and uses of materials				Describe the simple physical properties of a variety of everyday materials.	Find out how shapes of solid objects made from materials can be changed by squashing, bending, twisting and stretching.			Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, woods and plastics.	
Rocks									
Compare and group rocks	Explore materials with different properties Explore natural materials indoors and outdoors					Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.			
Describe how fossils were formed						Describe in simple terms how fossils are formed when things that have lived are trapped within rocks.			

Understand how soil is made.						Recognise that soils are made from rocks and organic matter.			
States of matters/ reversible and irreversible changes									
Compare and group materials							Compare and group materials together, according to whether they are solid, liquid or gas.		
Changing state and sorting materials							Observe that some materials change state when they heated or cooled and measure or research the temperature at which this happens in degrees Celsius.	Use a knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.	
							Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.		
Reversible and irreversible changes								Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.	

								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 reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Light

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
How light travels and how we see	Switch on electric toys such as a torch	Explore light and dark Talk about the difference in materials and changes they notice.	Describe what they see, hear and feel is the same and different between light and dark Observe and interact with natural process such as light travelling through transparent materials			Recognise that he/she need light in order to see things and that dark is the absence of light.			Use the idea that light travels in straight lines to explain that ideas that objects are seen because they reflect light to the eye.
						Notice that light is reflected			Recognise that light appears to travel in straight lines.

						from surfaces.			
						Recognise that light from the sun can be dangerous and there are ways to protect their eyes.			Explain that we see things because light travels from light sources to our eyes or from light sources to objects to eyes.
Shadows			Observe and interact with natural process such as an object casting a shadow			Recognise that shadows are formed when the light from a light source is blocked by a solid object.			Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
						Find patterns in the way that the size of shadows change.			

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Sound

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Understand that sounds are made by vibrations.	Show attention to sounds and music Turn towards familiar sounds Reach or point to something they want while making sounds	Listen with increased attention to sounds Use drawing to represent ideas like loud noises	Observe and interact with natural process such as a sound causing a vibration				Identify how sounds are made, associating some of them with something vibrating.		
Understand that sound travels in vibrations.							Recognise that vibrations from sounds travel through a medium to the ear.		
Identify patterns in sound	Explore voices and enjoy making sounds	Sing the pitch of a tone sung by another person	Experiment making different sounds and look at ways				Find patterns between the pitch of a sound and the features of the object that produced it.		

	Make sounds to get attention in different ways Join in with songs and rhymes making some sounds Explore a range of sound makers and different instruments and play them in different ways	(pitch match) Understand that sounds can be loud or quiet. Sing the melodic shape (moving melody, such as up and down, down and up to familiar songs Play instruments with increasing control.	these can be changed Listen carefully to rhymes and songs and talk about how they sound						
						.	Find patterns between the volume of the sound and the strength of the vibrations that produced it.		
							Recognise that sounds get fainter as the distance from the sound source increases.		

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Force and Magnets

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Understand and compare how things move.	Operates mechanical toys, e.g. turns the knob on a wind-up toy or pulls back on a friction car. Sit on a push along wheeled toy, use a scooter or ride a tricycle Be interested in pulley toys	Shows an interest in technological toys with knobs or pulleys. Play and explore how toys move Explore and talk about different forces they can feel.	Observe and interact with natural process such as floating and sinking			Compare how things move on different surfaces.			
Forces		Use a variety of electronic toys in play situations using basic	Observe and interact with natural process			Notice that some forces need contact between two objects		Explain that unsupported objects fall towards the Earth because of the force of	

		directional language (forward, backward, stop)	such as a magnet attracting an object			but magnetic forces can act at a distance.		gravity acting between the Earth and the falling object.	
						Observe how magnets attract or repel each other and attract some materials but not others.		Identify the effects of air resistance, water resistance, and friction that act between moving surfaces.	
						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.		Recognise that some mechanisms, including levers, pulleys and gears, allow a small force to have a greater force.	
						Describe magnets as having two poles.			
						Predict whether two magnets will attract			

						or repel each other depending on which poles are facing.			

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Electricity

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Identify appliances that use electricity.	Explore electrical technology by pressing the on and off buttons, and experiment with other buttons to see what they do.		Recognise and explore everyday technology that is electrical				Identify common appliances that run on electricity.		
Construct and draw simple circuits.							Construct a simple series electrical circuit identifying and naming its basic parts, including cells,		Use recognised symbols when representing a simple circuit in a diagram.

							wires, bulbs, switches and buzzer.		
Understand how different components impact on others within a circuit.							Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.		Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
							Identify whether or not a lamp will light in a simple series circuit, based on if the bulb is part of a complete loop.		Compare and give reasons for variations in how components function, including the brightness of the bulbs, loudness of buzzers and the on/off position of switches.
Recognise and understand conductors and insulators.							Recognise some common conductors and insulators, and associate metals with being good conductors.		

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Seasonal Changes

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Observe changes in seasons	Experience different weather conditions		Describe what they see, hear and feel while outside Note and record the weather across the four seasons Observe what happens to plants a the seasons change Observe how animals behave differently	Observe changes across the four seasons					

			as the seasons change Observe and describe the weather associated with the seasons and how day length varies.						
Observe and describe weather and day length				Observe and describe the weather associated with the seasons and how day length varies.					

Progression of Knowledge, Skills and Understanding in the National Curriculum

Physics: Earth and Space

	Birth to Three	Three to Four Year Olds	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Describe the movement of planets related to the sun								Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.	
Describe the movement of the moon								Describe the movement of the Moon relative to the Earth.	
Describe the sun, earth and moon								Describe the sun, Earth and Moon as approximately spherical bodies.	
Explain day and night								Use the ideas of the Earths rotation to explain day and night and the apparent movement of the sun across the sky.	

Progression of Vocabulary

	Autumn Term		Spring Term		Summer Term	
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Reception	It's Good to be Me	Let's Celebrate	I wonder...		Once upon a time	Moving on up!
Science Vocabulary	Head, body, eyes, ears, mouth, teeth, leg, Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue	tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves	Plants : Leaf, flower, petal, fruit, berry, root, seed, stem, stalk, bud Places: hot/ cold, environment, beach, seaside, forest, house, cottage, woods, forest Links to fairy tales and home environments		Hard, soft, plastic, wood, push, pull. Float, sink, turn, loud, quiet, on, off,	See Autumn Term
Year 1	Finlay Toy Factory		Where oh Where is Finlay Bear		The Great Space Race	
Science Vocabulary	Types of materials and their properties – make a toy Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through		Seasonal changes Weather (sunny, rainy, windy, snowy etc) Seasons (Winter, Summer, Spring, Autumn) Sun, sunrise, sunset, day length	Wonder question, answer, observe, observing, equipment, identify, sort, group, compare, differences, similarities	Understanding plants, trees, structure of a plant/tree Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud	Animals including humans – common animals: fish, amphibians etc and carnivores, omnivores, herbivores Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves

						Senses- touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue, names of animals experienced first hand
Year 2	**The Great Fire of London & The Tudors**		**Around the World in ... Days Passport theme**		**Heroes in History Florence Nightingale and Mary Seacole**	
Science Vocabulary	Everyday materials Identify and compare suitability of materials Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard. Properties of Materials From Y1: object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card, cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy,	Animals and their habitats Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats: pond, woodland Names of microhabitats: under logs, in bushes	Animals including humans – how offspring grow – children to adults Stages (e.g. chick, hen, baby, child, adult, caterpillar, butterfly)	Wonder From Year 1: question, answer, observe, observing, equipment, identify, sort, group, compare, differences, similarities New vocabulary: describe, measurements, test, results, secondary sources record – diagram, chart	Observe how plants grow Y1: Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud New vocabulary: light, shade, sun, warm, cool, water, grow, healthy,	Animals including humans – how humans stay alive Healthy lifestyle and exercise Exercise, heartbeat, breathing, hygiene, germs, disease, good types (meat, fish, vegetables, bread, rice, pasta)

	waterproof, absorbent, breaks, tears, rough, smooth, shiny, dull, see-through, not see-through New vocabulary: opaque, transparent, translucent, reflective, non-reflective, flexible, rigid, shape, push, pushing, pull, pulling, twist, twisting, squash, squashing, no bend, bending, stretch, stretching					
Year 3	Rock and Roll! Stone Age and Iron Age		Deadly Disasters		Navigating the Nile/ Ancient Egyptians	
Science Vocabulary	Rocks and Fossils Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb, water, soil, fossil, marble, chalk, granite, sandstone, slate,	Light and shadow Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	Forces and magnets Force, pull, push Twist, contact force, non-contact force, magnetic force, magnet, strength, bar magent, ring magnet, button magnet, horseshoe magnet, attract,	Wonder written explanations, conclusion, predictions, criteria, classify, changes, data, contrast, evidence, improve, secondary sources, guides, keys, construct, interpret research	Plants - features, how they grow, water transportation Plants in hot places compared to the UK Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)	Animals including humans Nutrients Nutrition Carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs

	soil, peat, sandy, chalk, clay		repel, magnetic material, metal, iron, steel, poles, north pole, south pole	- relevant question equipment - thermometer, data - gather, standard units, record, classify, present record - drawings, labelled diagrams, keys, bar charts, tables		
Year 4	**Rotten Romans Glorious Glevum**		**Journey to the River Sea! Come Sail with Me!**		**Ancient Greeks Olympics**	
Science Vocabulary	Animals including humans - Digestive system Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, intestine, large intestine, teeth, molar, premolars, incisors,	Electricity - circuits and how they work (Chariot) Electricity, electrical, appliance, device, mains, plug, electrical circuit, complete circuit, circuit, component, cell, battery, positive, negative, connect, connections, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal,	Materials changing state - solid, liquid, gases The Water Cycle Reversible and irreversible changes	Wonder oral and written explanations, conclusion, predictions, criteria, classify, changes, data, contrast, evidence, improve, secondary sources, New vocabulary: guides, keys, construct, interpret research - relevant question equipment - thermometer, data - gather, standard units,	Classification Living things Environment change Food chains Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, herbivore, carnivore, omnivore, producer, predator, prey, food chain	Sound and how it travels Sound, source, vibrate, vibration, travel, pitch, high, low, volume, faint, loud, insulation.

		non-metal, symbol		record, classify, present record – drawings, labelled diagrams, keys, bar charts, tables		
Year 5	Invaders and Settlers – Saxons, Vikings and Mayans		Deforestation The Rainforest – North and South America		Chocolate! Ancient Maya and Aztec Civilisation	
Science Content	Science – states of matter and reversible and irreversible changes, dissolving, filtering Insulator, conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible, irreversible, change, burning, rusting, new material	Space Earth, sun, moon, Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune, spherical, solar system, rotates, star, orbit, axis, planets	Science – Living things and their habitats/ plants: life cycles of animals, reproduction in plants (green eyed tree frog) Life cycle, reproduce, sexual, sperm, fertilizes, egg, live, young, metamorphis, asexual, plantlets, runners, bulbs, cuttings.	Wonder plan, variables, measurements, accuracy, precision, repeat readings, predictions, further comparative and fair test, identify, classify and describe, patterns, scientific diagrams, labels, classification keys, tables, bar graph and line graphs, conclusions, explanations, degree of trust, support, ideas or arguments, biology, physics, chemistry	Forces and magnets air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears,	Changes in humans as they age (adolescence and puberty) Puberty – the Vocabulary to describe sexual characteristics
Year 6	We'll Meet Again! World War 2		Ice Explorer Arctic and Antarctica		Let Me Entertain You! History of Entertainment	

Science Content	Animals including humans: Exercise and the Circulatory System Heart, heart rate, pulse, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle	Electricity Year 4 vocabulary plus: straight lines, light rays Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage	Living things and animals: classification of animals and plants Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering	Wonder plan, variables, measurements, accuracy, precision, repeat readings, predictions, further comparative and fair test, identify, classify and describe, patterns, systematic, quantitative measurements, scientific diagrams, labels, classification keys, tables, scatter graphs, bar graph and line graphs, conclusions, casual relationships, explanations, degree of trust, oral and written display and presentation, support, refute, ideas or arguments biology, physics, chemistry	Evolution and inheritance (link to RSHE) Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils	Light Y3 - Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous,

Example Unit of Work

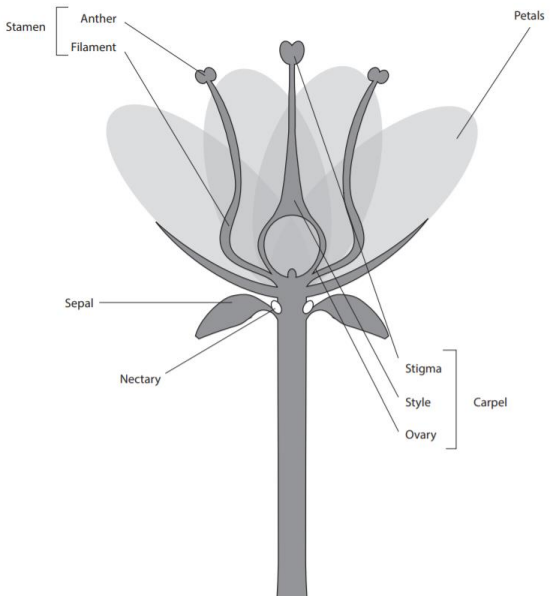
Science Unit of Work Plan

<table>
<tr><td colspan="2">Year group: 3</td><td colspan="2">Area of focus:
Biology: Understanding plants</td></tr>
<tr><td>Prior objectives (Taken from Planning Matrix)</td><td>Year 2:
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 stay and grow healthily and how changing these effect the plant.
Know that plants are living and eventually die.

Year 1:
Identify and describe the basic structure (at least: flower, leaf, root, stem, trunk, seed, branch and petal) of a variety of common flowering plants, including deciduous and evergreen trees.</td><td>Current year group objectives (Taken from Planning Matrix)</td><td>Year 3:
Identify, locate 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.
Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
Investigate the way in which water is transported within plants</td></tr>
<tr><td>Key vocabulary</td><td colspan="3">Root: helps anchor the plant into the soil. Takes up water and nutrients.
Stem: holds the plant upright and supports the leaves. Contains tubes that allow water to travel from the roots to the rest of the plant.
Flower: the part of the plant where seeds are made.
Leaves: catch sunlight and use this to make food.
Veins: tubes in the leaf that carry water and food.
Germinate: when a seed starts to grow and produce a root and shoot.
Pollen: dust-like powder made in the stamen of a flower.</td></tr>
</table>

	Pollination: moving the pollen from the stamen of one flower to the stigma of another. Ovary: the part of the flower that contains the ovules. Sepals: protect the rest of the flower as it grows. Stamen: the male part of the flower produces pollen. Carpel: female part of the flower – made of stigma, style and ovary. Stigma: part of the carpel that pollen grains attach to during pollination. Style: the middle part of the carpel, connecting the ovary to the stigma. Ovule: these are like eggs – they develop into seeds. Petal: part of the flower which attracts insects – often brightly coloured.
Lesson 1: Elicitation and recap	TBAT: Elicitation: Share a concept cartoon about plants and discuss as a class Post it notes as a class – what do you know about plants? Can you name any? What do plants need to grow?
Lesson 2: Teach new knowledge **Parts of a plant and their functions**	TBAT: Identify, locate and describe the functions of different parts of a flowering plant (roots, stem, trunk, leaves and flowers) **Quick challenge:** Explain why tall trees don't fall over. What's keeping them up? Think about the different plants that we eat. For each one – do we eat the leaf, root, stem or flower? (N.B. fruits grow from the flower) **Main activities** Get into groups: Bring in examples of plants for the children to look at, such as geraniums in pots. Ask groups to identify the different parts of the plants that they can remember from Year 1. Get groups to discuss what job they think each part of the plant does. Write their ideas on sticky notes. Carefully lift one plant out of the pot to show the roots. Then discuss their ideas as a class. The children can label the parts of a plant on 'Plant parts' activity sheet (Activity resource book, page 31).

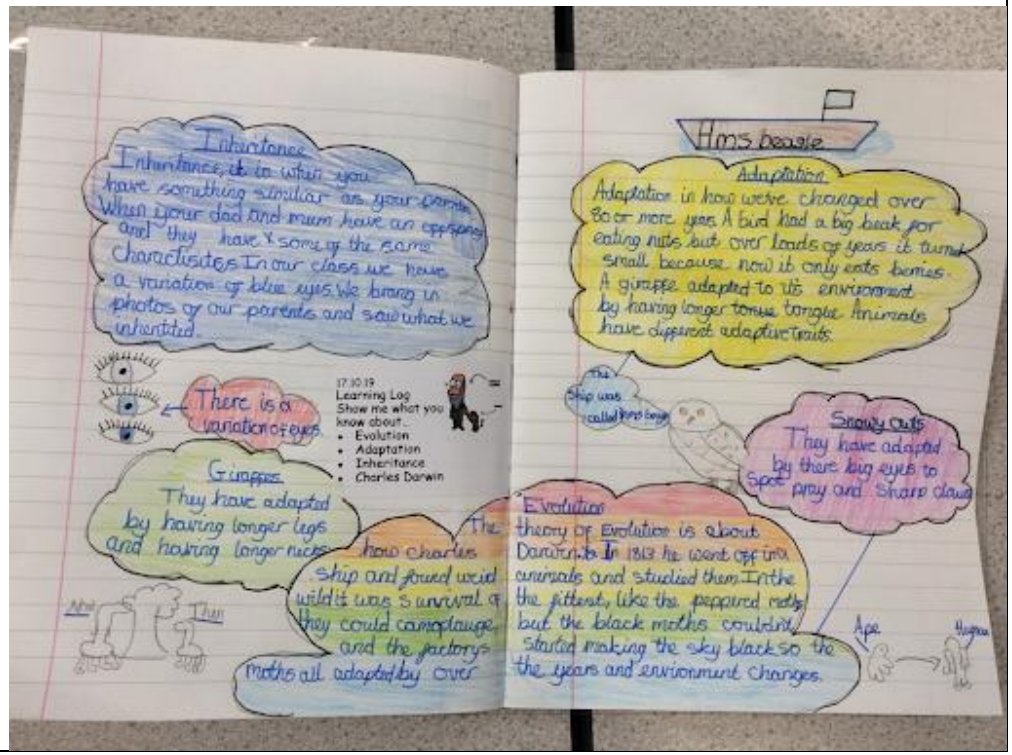
	Class activity: Ask the children to think of a pose or an action that they can perform for each part of the plant. For example, they could stand up straight to mimic a stem; and leaves catch sunlight, so they could mime catching something. Then show them the 'Plant parts song' and ask them to do their actions as each part of the plant is mentioned. Check out www.schooltube.com/video/8b5cd92efbe9708a4a5a. Get into groups: Take the children outside to examine a tree. How is it the same as the plants they were looking at in the classroom? How is it different? Can they identify the leaves, roots and stem? Can they see any flowers? **Independent activity:** Make a collage of a plant from different materials such as silver paper, scrunched-up crepe paper, string and sequins. Add labels for each part and a caption explaining the function Differentiation: word bank, cut and stick labels, gap fill for function
Lesson 3 Teach new knowledge **What is pollen?**	TBAT: Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. **Recap** Quick game in pairs matching the parts of a flower to a diagram with the functions – see who can do it in the quickest time? **Quick challenges** Discuss hay fever – how many children in your class have it? Do they know what causes it? Show some different flowers on the whiteboard. Can the children name them? Do some research to find the correct answer **Main activities**

	Get into groups: Take a close look at a lily or a tulip. Identify the different parts of the flower. Point out where the pollen is made. Gently remove the petals and sepals, placing them on a large sheet of paper. Then carefully remove the stamen and carpels. Stick all the parts down onto a big sheet of paper using a large strip of sticky tape and label each part. Count the number of sepals, petals, stamens and carpels in the flower. Be careful: pollen can stain clothes. Children can use the activity sheet, 'Flower power' to label the parts of a flower (Activity resource book, page 32). Photograph dissecting of flower for science books. Get interactive: Children can label the parts of a flower on the interactive activity, 'Flower power' (My Rising Stars). Class activity: What could be more fun than a role playing activity to demonstrate how pollination works? Start by discussing the process of pollination. Then, in a large space, have the children act out the process of pollination. Get some children to act as the stamen and stigma inside flowers and some to be insects. The insects can collect pollen (pingpong balls or beads) from the stamen of one flower and deliver it to the stigma of another. Top tip: Film the role playing activity with a digital camera so your class remember the fun they had taking part. Try it: Discuss other ways for plants to spread their pollen. For example, some plants pollinate without the help of insects. They just dump pollen into the air and it floats away to other plants. 
Lesson 4 Teach new knowledge Seed spreading	TBAT: Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. **Recap** Label parts of a flower on the interactive activity 'Flower Power' (My Rising Stars) **Quick Challenge** What do the children think happens to a flower once it has been pollinated? Have they ever seen rosehips? What are they? Where did the rose go?

	Main activity Get into groups: Show the children real examples of seeds from packets. You could also show images taken from the Internet of conkers, acorns, etc. Discuss what seeds are and why plants might make them. (Take care: wash hands after handling packet seeds.) The children can record their observations on the 'Type of seed' sheet (Activity resource book, page 33). Pair up: Discuss what fruit is, looking at some real examples. You could start by cutting a sweet pepper in half. Ask the children to draw what they see inside and label the seeds. Then repeat the process with other fruit such as a tomato and an apple. Discuss why plants make fruit like this for the seeds. And how does it help the seeds spread? Get into groups: Ask the children to harvest some of the seeds from the fruits they are looking at. Dry these out for a few days and then plant them in small pots of compost. See 'It's harvest time!' practical, page 67. Get interactive: Discuss the different ways a seed can be dispersed. For example, how does a sycamore seed or dandelion seed travel to somewhere else? You could liven up the lesson by using the following resource on your interactive whiteboard: www2.bgfl.org/bgfl2/custom/resources_ftp/client_ftp/ks2/science/ plants_pt2/dispersal.htm
Lesson 5 and 6: Teach new knowledge Scientific investigation **Water transportation**	TBAT: Investigate the way in which water is transported within plants. **Recap** 5 minute quiz with 5 questions from block of learning so far. **Quick challenge** Show the children a photograph of a really tall tree. Ask them for their ideas about how we could get water to a person sitting at the top of a tree using different methods. From buckets on a rope to a really long hosepipe, there are lots of ways to choose from. How many can the children think of? **Main activities:** https://www.bbc.co.uk/teach/class-clips-video/science-ks1-ks2-ivys-plant-workshop-how-does-water-get-from-the-roots-to-the-leaves/zdtfjhv **Scientific question: How does water transport through a plant?**

	"I'm going to put these white carnations into pots of food colouring. What do you think will happen?" Children share thoughts on post it notes. - Create prediction: what will happen to the flowers? Which colour do you think will cause the most change? - Method - How are you going to make it a fair test? Keep the flower heights the same, volume of water, amount of food colouring. Get into groups: Stand white carnations in pots of water with food colouring. Leave them for a few hours, observing every half an hour or so and keeping post it notes observations and see what happens to the colour of the flowers. Take photographs before and after to help the children see just how much the carnations have changed. **Next lesson:** Let's recap – what did we look at in our investigation? What do you notice has happened to the flowers? Look at your observations that you have recorded as a class. - Write up results Pair up: Explain that the stem of a plant is full of many long, thin tubes that draw water up from the roots right to the top of the plant. When water disappears from the leaves, the tubes helps them suck up the water. - Write conclusion using scientific understanding. Plenary: Give each group a pile of drinking straws. Show them how to poke one inside another to create a longer straw. Challenge the groups to see if someone standing on a chair could drink water from a cup on the floor. (You could also look at novelty, looped drinking straws or Strawz connectable drinking straws kits.)
Lesson 7: Assessment	TBAT: Explain what I know about plants, the parts of a plant and water transportation Give children 3 post it notes to record 3 new learnt bits of knowledge

	Children to complete double page spreads showing their knowledge. They can write or draw or a combination of both. Expectation children cover: - Parts of a plant including flower - Pollination and seed dispersal - Water transportation **Example:**



Common Misconceptions

Year 1:

Plants • plants are flowering plants grown in pots with coloured petals and leaves and a stem • trees are not plants • all leaves are green • all stems are green • a trunk is not a stem • blossom is not a flower	Animals including humans • only four-legged mammals, such as pets, are animals humans are not animals • insects are not animals • all 'bugs' or 'creepy crawlies', such as spiders, are part of the insect group • Amphibians and reptiles are the same.
Seasonal changes • it always snows in winter • it is always sunny in the summer • there are only flowers in spring and summer • It rains most in the winter.	Everyday materials • only fabrics are materials • only building materials are materials • only writing materials are materials • the word 'rock' describes an object rather than a • material • 'Solid' is another word for hard.

Year 2:

Living things and their habitats • an animal's habitat is like its 'home' • plants and seeds are not alive as they cannot be • seen to move • fire is living • Arrows in a food chain mean 'eats'.	Plants • plants are not alive as they cannot be seen to • move • seeds are not alive • all plants start out as seeds • seeds and bulbs need sunlight to germinate
Animals including humans • an animal's habitat is like its 'home' • all animals that live in the sea are fish • respiration is breathing • Breathing is respiration.	Everyday materials • only fabrics are materials • only building materials are materials • only writing materials are materials • the word rock describes an object rather than a • material • Solid is another word for hard.

Year 3:

Light • we can still see even where there is an absence of any light • our eyes 'get used to' the dark • the moon and reflective surfaces are light sources • a transparent object is a light source • shadows contain details of the object, such as facial features on their own shadow • shadows result from objects giving off darkness	Plants • plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem.
Animals including humans • certain whole food groups like fats are 'bad' for you • certain specific foods, like cheese are also 'bad' for you • diet and fruit drinks are 'good' for you • snakes are similar to worms, so they must also be invertebrates • Invertebrates have no form of skeleton.	Rocks • rocks are all hard in nature • rock-like, man-made substances such as concrete or brick are rocks • materials which have been polished or shaped for use, such as a granite worktop, are not • rocks as they are no longer 'natural' certain found artefacts, like old bits of pottery or coins, are fossils • a fossil is an actual piece of the extinct animal or plant

	• soil and compost are the same thing
Forces and Magnets • the bigger the magnet the stronger it is • all metals are magnetic	

Year 4:

Living things and their Habitats • the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative	Animals including humans • arrows in a food chains mean 'eats' • the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain • there is always plenty of food for wild animals • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another • the food you eat becomes "poo" and the drink becomes "wee"

States of matter	Sound
• 'solid' is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms - steam, water, ice - are all different substances • all liquids boil at the same temperature as water • (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen) • clouds are made of water vapour or steam • the substance on windows etc. is condensation rather than water • the changing states of water (illustrated by the water cycle) are irreversible evaporating or • boiling water makes it vanish	• Pitch and volume are frequently confused, as both can be described as high or low. • sound is only heard by the listener • sound only travels in one direction from the source • sound can't travel through solids and liquids • high sounds are load and low sounds are quiet

• evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material	
Electricity • electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • Electricity works by simply coming out of one end of a battery into the component.	

Year 5:

Living things and their Habitats • all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds • Only birds lay eggs.	Animals including Humans • a baby grows in a mother's tummy • A baby is "made".

States of matter • Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. • Chemical changes result in a new material being formed. These are mostly irreversible. • Physical changes are often reversible but may be permanent. These do not result in new materials e.g. Cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.	Earth and Space • the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth
Forces • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction	

• objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float	

Year 6:

Living things and their habitats • all micro-organisms are harmful • mushrooms are plants	Animals including Humans • your heart is on the left side of your chest • the heart makes blood • the blood travels in one loop from the heart to the lungs and around the body • when we exercise, our heart beats faster to work the muscles more • some blood in our bodies is blue and some blood is red • we just eat food for energy • all fat is bad for you • all dairy is good for you

	• protein is good for you, so you can eat as much as you want • foods only contain fat if you can see it • All drugs are bad for you.
Evolution and Inheritance • adaptation occurs during an animal's lifetime: • giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life • offspring mostly resemble their parents of the same sex, so that sons look like fathers • all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited • cavemen and dinosaurs were alive at the same time.	Light • we see objects because light travels from our eyes to the object.
Electricity • larger-sized batteries make bulbs brighter • a complete circuit uses up electricity • Components in a circuit that are closer to the battery get more electricity.	

Knowledge Organisers

Knowledge organisers should be shared with the children at the beginning of each block of work.

In Science, this tends to be at the beginning of each half term. The children should have on average 5-6 knowledge organisers per year.

The children should take a copy of this home.

The children should have quizzes based on the information on their knowledge organisers on a regular basis and use this as a tool for learning.

Knowledge Organisers should show:

- Diagrams as required
- Vocabulary
- Sticky knowledge and Rapid Recall facts
- How learning may link to previous learning

Everyday Materials

Focus: Material Manipulation

Year: 2	Term: Autumn 1	Subject: Science

Rapid Retrieval (Can I still recall)

- Weather can change
- There are lots of different types of weather: Rain, Sun, Cloud, Wind, Snow etc
- Days are longer and hotter in the Summer
- Days are shorter and colder in the Winter
- There are four seasons: Spring, Summer, Autumn, Winter

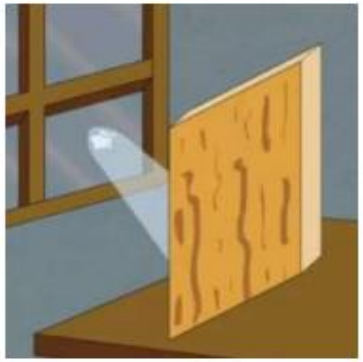
Clever Connections: (Links to the previous learning)

- There are many different materials that have different describable and measureable properties
- Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic, and ceramics (including glass)
- The properties of a material determine whether they are suitable for a purpose.

Key Question	Sticky Knowledge
Elicitation	• Recap different types of material -metals -rocks -fabrics -wood -plastic • Rock is a material, not an object
What are everyday items made from?	• Materials can be grouped by their properties: colour, texture, shape, size, firmness • Some materials in same group may have slightly different properties
What makes materials suitable or unsuitable?	• The properties of a material determine whether they are suitable for a purpose • People choose which materials to use after 'best fit' investigations
How can the shape of solid objects be changed?	• Materials can be manipulated/changed for different purposes • a push/pull force can change the shape of a material • some materials cannot be changed by bending or twisting
Investigation	SHAPE SHIFTING INVESTIGATION
Results	SHAPE SHIFTING INVESTIGATION RESULTS
Assessment	• I can recall the above information and retrieve this information in an appropriate manner

Vital Vocabulary:

Opaque
A material that is not clear enough to see through or allow light through.



Strength
The ability that a material has to hold heavy weights without breaking or being damaged

Transparent
A material that you can see through or allows light to pass through it.

Flexible
Able to bend easily without breaking.

Rigid
An object which stiff and difficult to move or bend.

Squash
Push an object into a space that is too small.

Twist
To turn something into a shape that is not normal.

Record
To keep a written account of your findings.

Choice
An act of choosing between two or more possibilities.

Everyday Materials

Focus: Rocks and Fossils

Year: 3	**Term:** Autumn 1	**Subject:** Science

Rapid Retrieval (Can I still recall)

- Living things are adapted to survive in different habitats
- Different materials can sometimes been described by their colour, texture, firmness, shape
- Plants have requirements to survive- light, water and warmth

Clever Connections: (Links to the previous learning)

- There are many different materials that have different describable and measureable properties
- Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic, and ceramics (including glass)
- The properties of a material determine whether they are suitable for a purpose.
- The word 'rock' describes an object rather than a material
- Some materials are naturally occurring and some are man-made

Key Question	Sticky Knowledge
Elicitation	• Rocks are not all hard in nature • Concrete and bricks are not rocks • rocks have multiple purposes in everyday life • soil and compost are different
What are the different types of rocks?	• There are different types of rock • Sedimentary (deposited particles such as sandstone) • Metamorphic (rocks exposed to high temperatures/pressure e.g. marble) • Igneous (hot molten rock e.g. granite) • Rocks are eroded over time
How can we tell the difference between different rocks?	• Hard types of rocks are usually resistant to erosion • Some soft rocks hold lots of water
How is soil made?	• There are different types of soil • Soils change over time • Different plants grow in different soils • Soil is a mixture of tiny rock particles, dead plants and animals, water and air
Investigation	SOIL INVESTIGATION
How are fossils formed?	• Fossils tell us what has happened before • Fossils provide evidence • Paleontologists use fossils to find out about the past • Fossils provide evidence that living things have changed over time • Preserved remains of organism
Assessment	• I can recall the above information and retrieve this information in an appropriate manner

Vital Vocabulary:

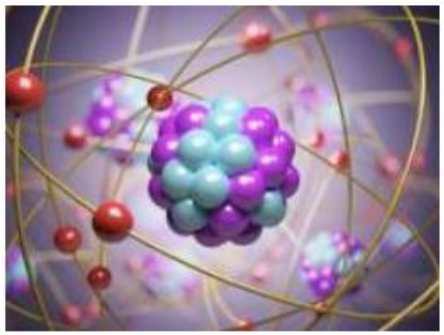
Ammonite
An extinct creature found as a fossil.

Chalk
A soft limestone made from the skeletal remains of sea creatures.

Fossil
The remains or traces of creatures that lived long ago.

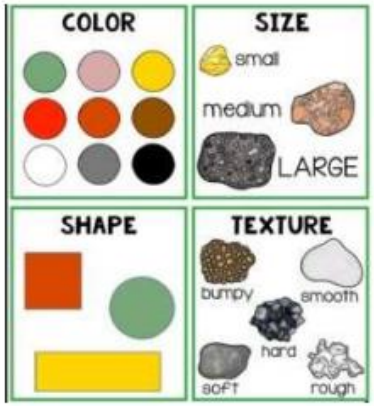
Organic Material
Matter that contains a large amount of carbon-based compounds.

Particle
Any of the smallest pieces of matter that make up atoms or the parts of atoms.



Peat
A dark brown substance like soil formed by plants dying and being buried.

Properties
A quality in a material, especially one that means that it can be used in a particular way



Metamorphic
Rock that has undergone transformation by heat or pressure.

Igneous
Having solidified from lava or magma.

Animals including Humans

Focus: The Digestive System

Year: 4	**Term:** Autumn 1	**Subject:** Science

Rapid Retrieval (Can I still recall)

- The five senses used in human survival
- We need light to see shiny items
- All animals eventually die
- Breathing is the process of taking air into the lungs and expelling it from the lungs
- Humans are categorised as animals as they are mammals

Clever Connections: (Links to the previous learning)

- Different animals are adapted to eat different foods- some have sharper/more incisors depending on their diet.
- Many animals have skeletons to support their bodies and protect their vital organs- including the organs involved in digesting food.
- Animals need food in order to survive.
- Animals need a variety of food to help them grow, repair their bodies, be active and stay healthy.

Key Question	Sticky Knowledge
Elicitation	• Animals have teeth to help them eat • Your stomach is not where your belly button is located • There are not set 'tubes' for eating and drinking • Food is not just digested in the stomach
What are the different types of teeth and what are their jobs?	• Different types of teeth do different jobs • incisors (bite and chew) • molars (crush) • canines (tear)
Where does our food go when we eat?	• Different types of teeth do different jobs- incisors (bite and chew), molars (crush), canines (tear) • Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood • It takes your mouth, oesophagus, stomach, small intestine, large intestine, gallbladder, pancreas and liver just to digest food • Nutrients produced by plants move to primary consumers then to secondary consumers through food chains
How do we look after our teeth?	• Acids and bacteria in foods can lead to the decay of teeth • Tooth decay relates to the permanent damage of teeth, it does not been the tooth is dead • Regular visits to a dentist can help prevent tooth decay • Brushing twice a day with fluoride toothpaste is recommended
Investigation	DECAY INVESTIGATION
Results	DECAY INVESTIGATION WRITE UP
Assessment	• I can recall the above information and retrieve this information in an appropriate manner

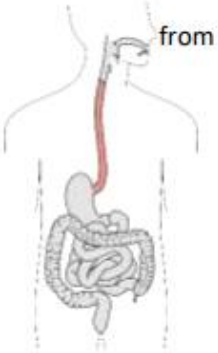
Vital Vocabulary:

Intestine
A long tube through which food travels while it is being digested.

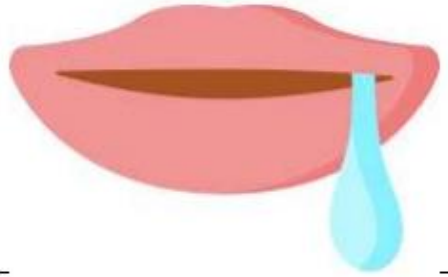
Mineral
A chemical that your body needs to stay healthy.

Nutrients
Any substance that plants or animals need in order to live and grow.

Oesophagus
The tube in the body that takes food from the mouth to the stomach.



Saliva
The liquid produced in your mouth to keep the mouth wet and to help to prepare food to be digested.



Stomach
An organ in the body where food is digested, or the soft front part of your body just below the chest.

Dental Hygiene
Cleaning teeth in order to keep your mouth healthy

Roughage
A substance in certain foods, such as fruit, that travels through the body as waste

Digest
Break down food into substances that can be absorbed and used by the body.

States of Matter

Focus: Reversible and Irreversible changes

Year: 5	**Term**: Autumn 1	**Subject**: Science

Rapid Retrieval (Can I still recall)

- There are different types of rock and soil- these change over time.
- Sound travels from its source in all directions and we hear it when it travels to our ears.
- Solids are tightly packed particles with a lack of movement
- Liquids are free-flowing particles that tale the shape of any container
- Gases have no fixed shape and the particles are much looser than solids or liquids.

Clever Connections: (Links to the previous learning)

- Solids, liquids and gases are described by observable properties.
- Materials can be divided into solids, liquids and gases.
- Heating causes solids to melt into liquids and liquids evaporate into gases
- Cooling causes gases to condense into liquids and liquids to freeze into solids.
- The temperature at which given substances change state are always the same.

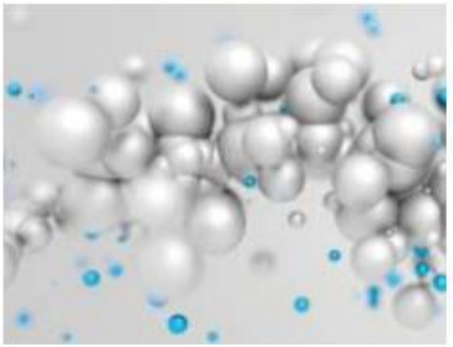
Key Question	Sticky Knowledge
Elicitation	• All matter has mass • Thermal insulators prevent heat from transferring from one place to another • Solids dissolved in liquids may be able to be recovered, they have not just disappeared • Lit candles do not just melt, this is an irreversible change that cannot be recovered by freezing the candle
How can materials be grouped?	• Materials change shape by heating and cooling • Sometimes mixed substances react to make a new substance. These changes are usually irreversible • Heating can sometimes causes materials to change permanently. When this happens, a new substance is made. These changes are not reversible. • Indicators that something new has been made: different colour, state, texture, hardness, smell, temperature
Can substances be recovered from a solution?	• When two or more substances are mixed and remain present, the mixture can be separated. • Some changes can be reversed and some cannot. • If it is not possible to get the material back easily, it is likely that it is not there anymore and something new has been made (irreversible change) • Dissolving does not make the particles disappear, it breaks the particles down so small that they cannot be seen
How are mixtures separated?	• A mixture is formed when two or more substances are mixed physically (e.g. sugar into tea) • Mixtures can be separated dependent on their properties • Filtering is when tiny solid particles are removed from a liquid • Magnets can be used to separate magnetic particles in a mixture of magnetic particles and non-magnetic particles
Investigation	SPEED OF DISSOLVING SUGAR INVESTIGATION
Why are specific materials used for different purposes?	• Materials have different properties such as conductivity and transparency which make them suitable or unsuitable for a purpose.
Assessment	• I can recall the above information and retrieve this information in an appropriate manner

Vital Vocabulary:

Dissolve
A solid, which is absorbed by a liquid, especially when mixed.

Mixture
A substance made from a combination of different substances, or any combination of different things.

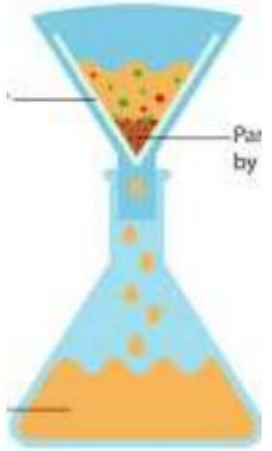
Particle
An extremely small piece of matter.



Reversible
If something is reversible, it can be changed back to what it was before.

Saturate
To fill a thing completely so that no more can be added.

Separate
To cause two or more things to stop being with or near each other.



Soluable
Able to dissolve in another substance, usually a solid dissolves in a liquid.

Solution
A liquid in which other substances have been mixed and dissolved.

Evaporate
Turn from liquid into vapour.

Animals including Humans

Focus: The Circulatory System

Year: 6	**Term**: Autumn 1	**Subject**: Science

Rapid Retrieval (Can I still recall)

- Animals cannot make their own food but need the right nutrition
- Food chains consist of producers, predators and preys
- Puberty is something we all go through, a process which prepare out bodies for being adults, and reproduction
- The moon moves rotates around the Earth (24 hours), which rotates around the sun (365 days)
- Unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.

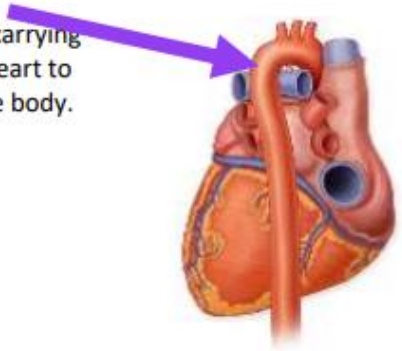
Clever Connections: (Links to the previous learning)

- Exercise keeps animal's bodies in good condition and increases survival chances- this is also why humans need to exercise.
- Many animals have skeletons to support their bodies and protect vital organs- these skeletons protect the heart.
- Muscles are connected to bones and move them when they contract- the heart is a muscle in itself and supports the delivery of oxygen when muscles are contracting.
- Nutrients are taken around the body by blood.

Key Question	Sticky Knowledge
Elicitation	• The heart is a muscle • The heart is located at the front of the chest, slightly behind the left sternum • The heart pumps blood around the body and to vital organs • The circulatory system is made up of three parts; the heart, the blood vessels and the blood itself
What is the function of the heart?	• The heart pumps blood around the body • Blood can be oxygenated or deoxygenated • The valves are 'gates' that control the flow of blood and make sure it doesn't go the wrong way • Deoxygenated blood is pumped to the lungs • Oxygenated blood is pumped around the body
How are nutrients transported around the body?	• Oxygen is breathed into the lungs where it is absorbed by the blood • Blood carries nutrients around the body and removes waste products e.g. carbon dioxide
How do our muscles work?	• Muscles need oxygen to release energy from food to do work. • Oxygen is taken into the blood in the lungs • The heart pumps the blood through the blood vessels to the muscles • The muscles take oxygen and nutrients from the blood
Investigation	EFFECT OF EXERCISE ON HEART RATE INVESTIGATION
Are all drugs bad for you?	• Some unsaturated fats are good for you • Balanced portions (not all protein/dairy is good for you)
Assessment	• I can recall the above information and retrieve this information in an appropriate manner

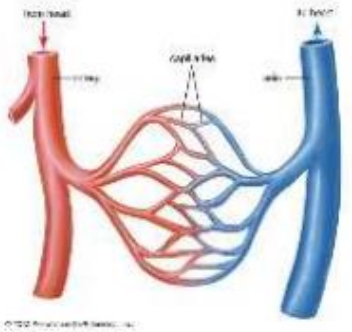
Vital Vocabulary:

Aorta
The main artery carrying blood from the heart to other parts of the body.

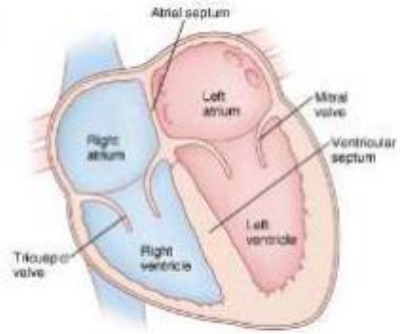


Arteries
The thick tubes that carry blood from the heart to other parts of the body.

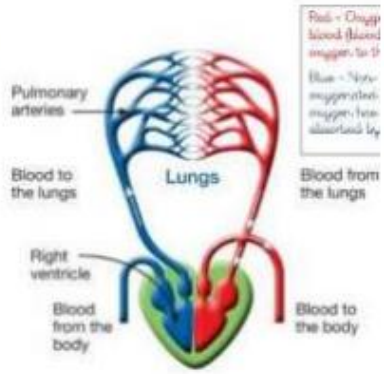
Blood vessels
The tubes through which the blood flows.



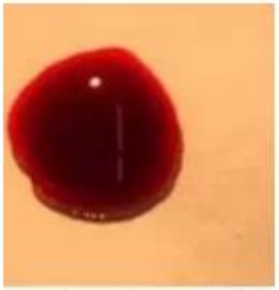
Chambers
A space in the heart which is separated from the rest.



Circulatory system
The system that moves blood through the body. It includes heart, arteries and veins.



Deoxygenated blood
When oxygen has been removed from the blood – it is carrying more carbon dioxide.



Deoxygenated blood:
Deep red-purple

Oxygenated blood
Blood that contains more oxygen – straight from the lungs.

Oxygenated blood: Bright red

Veins
The tubes that carry blood from all parts of the body back towards the heart.

Heart rate
the speed at which the heart beats.

Characteristics of Effective Science Teaching

What would I see in a unit of Science? What would I see in a Lesson?

Elicitation of prior knowledge about a topic through: Concept cartoons Quizzes Post it notes Card sorting – explore reasons Discussion	Developing competency in Science skills and understanding: elicit / revisit prior knowledge; teach new knowledge; investigate, assess. Teaching in a sequential manner therefore learning is progressive. (See planning format example)	Opportunity to develop Scientific skills: Planning Observing Gathering and Recording Information Concluding Evaluating
Practical, hands on investigations to include: Comparative / fair testing. Research Observation over time. Pattern seeking. Identifying, grouping and classifying. Problem solving.	5 minute recap at the beginning of each lesson to encourage retention of key Knowledge and vocabulary.	Opportunities to use and develop Science vocabulary Use of knowledge organiser to aid this
Assessment of learning Embedded oracy strategies	Exploration of common misconceptions. Learning relevant to everyday situations through a hook	Development of knowledge, skills and Understanding in line with the National Curriculum.