BSP Science Framework

Curriculum Context

Our curriculum is designed around local themes that the children explore in EYFS and KS1 which begin the pupils on their journey to understand our curriculum themes and this narrative is expanded on throughout KS2.

Our curriculum our progression model. It is designed around themes which we return to again and again, at different levels, so that the children are constantly revising the knowledge that they have and synthesising it alongside their greater knowledge and understanding of the concepts that we are learning. We have two main ways of doing this. The first is our BSP curriculum theme threads (see box at the right) which are referred to constantly, both in planned curriculum learning and in incidental conversations. The children explore these themes in different times, places and contexts and over time build a deep conceptual understanding of the themes. The second way in which we demonstrate learning and progression is through the use of Big Ideas or Key concepts. We are using these in Maths, Science, History and Geography already and will be developing them in some other subject areas. These Big Ideas are linked with the essence of the discipline of each subject, examining in depth what it is to be a scientist or a geographer. Again, we revisit these Big Ideas in different contexts, times and places through our teaching so that the children build a secure understanding of these subject concepts, and understand the ways in which learning in different units of a subject is linked.
For each unit of work there is a comprehensive medium term planning document which lists the knowledge to be taught in the unit, alongside links to schemes, to the school's curriculum themes and vision and which includes key vocabulary. These planners also list the key texts, both fiction and non fiction, that the learning will be based on. These plans also include a progression of learning plan, showing the order in which the children will be taught the key knowledge. In many cases the steps of progression within a unit of work are identified by key questions, which are answered in the things the children will learn. These medium term plans are shared with support staff as well, and subject leaders can also use them to monitor learning. From these medium term planners, teachers plan and resource day to day learning as they see fit. Most units of work are supported with Knowledge Organisers which the children refer to for information and use later on for retrieval. The children also complete in/out quizzes at the beginning and end of most units of work and in some units of work they complete a written essay describing what they have learned. Assessment is a mixture of formative and summative assessment, as required by the subject and in line with the Learn AT assessment policies.

These are the themes which are woven through many of our lessons.

Trade

Reasons to **travel**

The importance of **place**: people and resources

Migration

Population changes

Discovery

Innovations leading to **change**: People, places, commodities, communication, future

Power and **democracy**

Human rights

Science at BSP

Our ambition is that our children become educated and informed about scientific concepts and knowledge, and are curious about the world they live in. We want our children to develop their scientific knowledge so that they have a greater understanding of the world around them. Our curriculum is designed to provide stimulating and challenging experiences to help the children develop their curiosity and to be able to answer scientific questions about the ever-changing world in which they live. We want them to engage with and enjoy science and understand its relevance to them and life in the modern world. We aim to build cultural capital in order for pupils to take advantage of opportunities, responsibilities and experiences of later life. Science allows every pupil to develop a deeper understanding of the world in which they live. Through a stimulating curriculum provide memorable learning experiences allowing all pupils to discover, question and develop their curiosity thus evolving their knowledge and bank of core skills which will equip them for an ever-changing world.

Science in action at BSP

We follow the national curriculum and our aim is for children to achieve the endpoints at the end of each topic and each key stage. Our science curriculum is mapped out against the Association for Science Education's fourteen Big Ideas of and about science, so that whichever order science units are taught in children revisit, review and reflect upon these key concepts and big ideas, augmenting their understanding of them by revisiting them in different contexts and units of work.
Teachers take account of the big ideas and related threshold concepts in their science planning to secure mastery of subject knowledge year on year and over time. Within the science curriculum domain specific skills such as setting up practical enquiries, making systematic and careful observations are taught alongside key knowledge.

Science is taught where possible within topics which take account of links between concepts and address the way science contributes to our curriculum themes ag GBA. Throughout the school knowledge is built on prior knowledge.

For each science topic there is a knowledge organiser with key information which is used for retrieval practice to enable children to know and remember more. In and out quizzes show progress over a topic of work and identify gaps and misconceptions.

The science coordinator attends regular science network meetings for CPD and is currently engaging in the PSQM.

At the end of a unit of work children produce an assessment /report or presentation.

At Blaby Stokes C of E Primary Schoool, we have planned our science curriculum using enquiry questions. These are listed in the left hand column of the document. As the topic is taught, teachers use the Big Ideas concepts for that topic to address the enquiry question, reading horizontally across the 14 big ideas for each topic.

Big Ideas of science

1 All matter in the Universe is made of very small particles
Atoms are the building blocks of all matter, living and non-living. The behaviour and arrangement of the atoms explains the properties of different materials. In chemical reactions atoms are rearranged to form new substances. Each atom has a nucleus containing neutrons and protons, surrounded by electrons. The opposite electric charges of protons and electrons attract each other, keeping atoms together and accounting for the formation of some compounds.
2 Objects can affect other objects at a distance
All objects have an effect on other objects without being in contact with them. In some cases the effect travels out from the source to the receiver in the form of radiation (e.g. visible light). In other cases action at a distance is explained in terms of the existence of a field of influence between objects, such as a magnetic, electric or gravitational field. Gravity is a universal force of attraction between all objects however large or small, keeping the planets in orbit round the Sun and causing terrestrial objects to fall towards the centre of the Earth.
3 Changing the movement of an object requires a net force to be acting on it
A force acting on an object is not seen directly but is detected by its effect on the object's motion or shape. If an object is not moving the forces acting on it are equal in size and opposite in direction, balancing each other. Since gravity affects all objects on Earth there is always another force opposing gravity when an object is at rest. Unbalanced forces cause change in movement in the direction of the net force. When opposing forces acting on an object are not in the same line they cause the object to turn or twist. This effect is used in some simple machines.
4 The total amount of energy in the Universe is always the same but can be transferred from one energy store to another during an event
Many processes or events involve changes and require an energy source to make them happen. Energy can be transferred from one body or group of bodies to another in various ways. In these processes some energy becomes less easy to use. Energy cannot be created or destroyed. Once energy has been released by burning a fossil fuel with oxygen, some of it is no longer available in a form that is as convenient to use.
5 The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate
Radiation from the Sun heats the Earth's surface and causes convection currents in the air and oceans, creating climates. Below the surface heat from the Earth's interior causes movement in the molten rock. This in turn leads to movement of the plates which form the Earth's crust, creating volcanoes and earthquakes. The solid surface is constantly changing through the formation and weathering of rock.
6 Our solar system is a very small part of one of billions of galaxies in the Universe
Our Sun and eight planets and other smaller objects orbiting it comprise the solar system. Day and night and the seasons are explained by the orientation and rotation of the Earth as it moves round the Sun. The solar system is part of a galaxy of stars, gas and dust, one of many billions in the Universe, enormous distances apart. Many stars appear to have planets.
7 Organisms are organised on a cellular basis and have a finite life span
All organisms are constituted of one or more cells. Multi-cellular organisms have cells that are differentiated according to their function. All the basic functions of life are the result of what happens inside the cells which make up an organism. Growth is the result of multiple cell divisions.
8 Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms
Food provides materials and energy for organisms to carry out the basic functions of life and to grow. Green plants and some bacteria are able to use energy from the Sun to generate complex food molecules. Animals obtain energy by breaking down complex food molecules and are ultimately dependent on green plants as their source of energy. In any ecosystem there is competition among species for the energy resources and materials they need to live and reproduce.
9 Genetic information is passed down from one generation of organisms to another
Genetic information in a cell is held in the chemical DNA. Genes determine the development and structure of organisms. In asexual reproduction all the genes in the offspring come from one parent. In sexual reproduction half of the genes come from each parent.
10 The diversity of organisms, living and extinct, is the result of evolution
All life today is directly descended from a universal common ancestor that was a simple one-celled organism. Over countless generations changes resulting from natural diversity within a species lead to the selection of those individuals best suited to survive under certain conditions. Species not able to respond sufficiently to changes in their environment become extinct.

Big Ideas about science
11 Science is about finding the cause or cause of phenomena in the natural world
Science is a search to explain and understand phenomena in the natural world. There is no single scientific method for doing this; the diversity of natural phenomena requires a diversity of methods and instruments to generate and test scientific explanations. Often an explanation is in terms of the factors that have to be present for an event to take place as shown by evidence from observations and experiments. In other cases, supporting evidence is based on correlations revealed by patterns in systematic observation.
12 Scientific explanations, theories and models are those that best fit the evidence available at a particular time
A scientific theory or model representing relationships between variables of a natural phenomenon must fit the observations available at the time and lead to predictions that can be tested. Any theory or model is provisional and subject to revision in the light of new data even though it may have led to predictions in accord with data in the past.
13 The knowledge produced by science is used in engineering and technologies to create products to serve human ends
The use of scientific ideas in engineering and technologies has made considerable changes in many aspects of human activity. Advances in technologies enable further scientific activity; in turn this increases understanding of the natural world. In some areas of human activity technology is ahead of scientific ideas, but in others scientific ideas precede technology.
14 Applications of science often have ethical, social, economic and political implications
The use of scientific knowledge in technologies makes many innovations possible. Whether or not particular applications of science are desirable is a matter that cannot be addressed using scientific knowledge alone. Ethical and moral judgments may be needed, based on such considerations as justice or equity, human safety, and impacts on people and the environment.
Reference
Harlen, W. (2010) Principles and Big Ideas of Science Education. Association for Science Education. Herts

		Scientific Big Ideas *('motorways' of conceptual understanding)*													
		Big Ideas of Science											Big Ideas about Science		
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	Year 6 **Electricity** How can I control what happens in a circuit? (link with DT) Focus: varying effects of voltage in circuits, circuit diagrams.	Electrical currents flow when small parts of atoms called electrons pass between them.			Electrical energy can be stored in batteries. Voltage is the amount of force available to drive an electric current. When there is more electrical energy in a circuit it has a bigger impact on the actions that take place in the circuit.										
	Year 6 **Light** What is light and shadow? How do we see things? Focus: Light waves, reflection, refraction, function of the eye.		Light energy travels in straight lines. We can see things that we cannot touch. We can only see things because light travels from light sources to our eyes.	Light can be reflected off most surfaces. As light waves travel through some objects, the objects' composition or shape can change the way the light waves travel (refraction).				The cells in our bodies which absorb light are in our eyes. We see things when light waves enter our eyes. Strong light can cause the cells in our eyes to break down.							
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					another during an event.										
	Year 6 **Evolution and inheritance** How do Darwin's ideas help us to understand evolution? (link with Victorians topic) Focus: changes over time. Inheritance and variation. Adaptation.					Fossils are made when soft tissues decay and are compressed. They are compressed when they are buried by successive layers of soil (which may become rock over time).		When some living things die they are preserved in the earth as fossils.		Living things produce offspring of the same kind but the offspring are not always identical to their parents.	Living things have changed over time. Plants and animals adapt to their environment in different ways. Over time these adaptations lead to the evolution of different species.	Observations of fossils enables scientists to describe ways in which living things have changed over time.	Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out. As scientists are able to use DNA to link species together they understand more about how species have diversified over time.		

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	Y6 **Animals including humans** What keeps us alive? How important is it to be fit and healthy? (Link with Polar Region topic) Focus: circulatory system. Lifestyle. Revision of digestive system esp transportation of water and nutrients.	Cells in our bodies are made of water and other nutrients.						All body parts are made of cells which do different things. Cells in our bodies are made of water and other microscopic structures. The cells need to be fed by particular nutrients to enable them to work properly. Blood carries nutrients and air around the body.	The circulatory system contains parts that work together to transport nutrients, air and water around the body. Health and lifespan is affected by the things animals eat and drink.	Our ability to make the right choices about being healthy have to be learned, they are not inherited.			Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.		

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	Year 6 **Living things and their habitats** Focus: Classification.							Life spans are similar within family groups of living things but can vary widely.	Ways of getting energy and materials for life are similar within different classes of living things.	Living things have physical characteristic that make them similar or different to each other. These characteristics are the same within families. Living things can be classified into groups according to their characteristics.	External factors can affect the life span of different living things.		Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.		

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	Year 5 **Forces** Do all forces need contact between two objects? How can we affect the way things move? Focus: effects of gravitational force. Friction including air and water resistance. Pulleys and levers.	The tiny molecules in air can have an effect on the way big things move.	Gravitational force pulls things towards the earth.	An object's motion is changed by forces acting on it. The amount of change of motion depends on the object's mass and the amount of force applied. The greater the mass of an object, the longer it takes to speed up or slow down. Friction is caused when a moving object is in contact with a surface: the surface resists the movement of the object. Friction can be caused by large particles like stones or small particles like air molecules.	When something is moving is has kinetic energy. It slows because its kinetic energy is converted to heat and light energy caused by friction (this can be air and water resistance as well as surface friction). Pulleys and levers allow a small force to have a greater effect.	Gravitational force helps keep our earth's atmosphere stable.	Every star and every planet has its own gravitational force. The larger the mass of the planet, the greater the gravitational force is.						Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out. Theories about how the planets move and affect each other have changed over time as ways technology has improved to help scientists observe what is happening better.		

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	Y5 **Earth and Space**		The objects in the solar system	The movement of the moon	Wind energy is a renewable	The angle of the earth to the sun	The sun is the only star in our						Scientists work out answers to		

	What causes day and night? What does the sun have to do with the years and seasons? What is the solar system? What is the moon? Focus: Solar System.		affect each other because they all have gravitational forces which interact with each other. The temperature of the planets in our solar system is affected by the sun.	around the earth is affected by the gravitational force of the earth.	energy source. Waves can also be used to provide energy.	affects the temperature, climate and weather in different parts of the earth. There is air all around our planet but less and less further away from its surface.	solar system. It is the primary source of heat and light in our solar system. Our earth is one of several planets in the solar system. We can see the other planets in our solar system at night when the sun's light is reflected off them. We can also see stars and planets from other solar systems. The earth moves around the sun. The earth spins on its axis as it rotates which causes day and night. The moon orbits the earth and reflects light from the sun onto the earth.						questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.		

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	Y5 Properties and changes of materials What is a solution? How can mixtures be separated? Why is a change reversible? What is an irreversible change? Focus: Observe, describe, sort, classify. States of matter. Dissolving. Reversible and irreversible changes.	There are three states of matter: solid, liquid and gas. The things substances are made from mean they look different and have different characteristics. Some substances combine with others. Sometimes these mixtures can be separated out to obtain the original substances that were mixed together. Sometimes their structure changes permanently to become a new and different substance.											Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	As scientists find different ways of combining substances they create new substances that we can use in different ways. For example, 100 years ago there were few plastics in the world.	Irreversible changes to substances mean it's hard to recycle materials and re-use their component parts.
	Y5 Animals including humans What changes happen to humans as they grow from birth to old age? How can we describe different stages of growth in humans and animals? Focus: changes as humans develop to old age.	The cells in our bodies are made of different things.						Animals body parts are made of cells which are constantly being renewed by their bodies.	Cells need to obtain the correct nutrients to survive properly.	Animals families reproduce in the same way from generation to generation.	Reproduction cycles differ in time and in manner between different species even within animal classes.		Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.		
	Y5 Living things and their habitats What are the differences in the life cycles of a mammal an				All living things get energy from the sun directly or indirectly. When organisms die the energy stored in their cells can be	The bacteria in the earth's soil help to break down living things as they decay. These decayed organisms introduce chemicals into	The earth's angle relative to the sun affects the climate of a place.	All living things die. Some living things have longer life spans than others.	Most living things rely on other organisms, dead or alive, to get energy and survive.	Living things live in different ways. Plants and animals have specific parts that are for reproduction. Different classes of animals and plants reproduce in different ways.	Different types of living things are born and grow in different ways. The places where things live affects the ways they can survive.	Careful observations over time enable scientists to understand and describe the different ways that living things live and survive.			Habitats can change more quickly than the species that live in them. Changing habitats can cause animal and plant

	amphibian, an insect and a bird? Do all plants and animals reproduce in the same way? Focus: life cycles of mammal, amphibian, bird. Reproduction in plants and animals.				used by other organisms.	the soil which plants need to grow.									species to die out.

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	Y4 Electricity Where does electricity come from? How does a circuit work? What are electrical conductors and insulators? Which appliances run on electricity? Focus: simple series circuits, conductors and insulators. Link to DT - torches	Some substances have atoms that can pass electrical charge from one atom to another.			Electrical energy can be made by converting the sun's energy. The sun's energy is stored in plants. Plants and decayed plants (peat, coal) can be burned to produce electrical energy. Electrical energy can be converted to heat or light or sound energy.								Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	Electricity has transformed the way we live today because we can have light and heat whenever and wherever we need it.	We are using up many non renewable resources to make electrical energy and this is using up our planet's resources.
	Y4 **Sound** What is a sound? How is a sound made? How do sounds travel? How do we hear sounds? How do sounds change? Focus: sound waves, pitch, changes in sound	When sound waves travel through the air, the air molecules move.	Sound is made when things vibrate. The sound energy travels in waves through the air, making the air vibrate as it carries the sound. The further away a sound is, the fainter the sound will be.	Sound is a form of energy which makes air molecules vibrate.	When you hit a drum the energy is transferred from your arm onto the skin of the drum where it forms sound waves.					Our ears convert sound waves reaching them into nerve signals that our brain interprets as sound.			Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	Scientists have helped develop hearing aids which can pick up sound waves and amplify them for people who cannot hear well naturally.	Objects can block sound waves – earplugs.
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	Y4 States of matter What is a solution? How can mixtures be separated? Why is a change reversible? What is an irreversible change? Focus: States of matter, water cycle, heating and cooling.	All substances are made of small parts called atoms. When atoms join together they form molecules. At room temperature, some substances are in the solid state, some the liquid state and some are in a gaseous state. The state of many substances can be changed by heating or cooling them. The amount of matter does not change when it is heated or cooled.	The sun's heat energy travels in invisible waves. The sun doesn't need to be touching something to warm it up.	When things are heated up they are given more energy. When molecules have more energy they warm up. When they are warm enough to be a gas they can move around much faster.	When something is warmed up energy is transferred to it from the heat source. Some of the heat energy can also become light energy.	The different states of matter of water are all vital for our survival on the earth. 2/3 of the earth is covered by liquid water which is essential to life. Water is constantly recycled through processes involving evaporation from oceans and other surfaces, condensation in clouds and precipitation as rain, snow or ice. The temperature and movement of water vapour in the air affects our weather. Measuring the patterns of water vapour movement enables us to predict the weather. Long term patterns in the weather are referred to as climate.	Animals need water to survive. Water at the temperature we need it to survive is only found in any quantity on earth.				Ice can float in water so when it's cold creatures can still survive in water at the bottom of oceans and lakes where the water is not frozen.	Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	Some thermostats work when parts inside them expand as they get warmer and shrink as they get colder to open and close switches inside circuits.	Many industries require water for heating, cooling, hydrating and cleaning products. In some parts of the world there is competition for water between people and industries. Our changing climate means that weather patterns are more erratic so some people have too much water and some people not enough.
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	Y4 animals, including humans. What are the main parts of the digestive systemin humans and what do they do? Producers predators and prey what are they? Why do humans have different types of teeth?				Energy for life comes from the sun. Animals get that energy through eating plants which have harvested the sun's energy.		The sun's position relative to the earth affects the climate of a place.		Most animals have some sort of digestive system which enables them to process food into energy. Animals need food that they can break down to release energy. This	Humans all have the same digestive system. Some animals have particular physical characteristics (eg teeth) enable them to eat particular things.	Animals have developed particular body shapes (eg teeth) to enable them to survive in different environments.		Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the	Scientists have supported doctors by developing ways of seeing and monitoring what happens inside our bodies, to keep us healthy. We can wear devices that help	Changing diets mean our bodies have easier access to more energy but some forms of energy eg sugar are bad for us (tooth decay).

	Focus: digestive system including teeth, food chains.								food comes from plants directly (herbivores) or by eating animals (carnivores) which have eaten plants or other animals. These can be described as food chains.					us monitor the amount we move and keep healthy.	
	Y4 **Living things and their habitats** How can living things be grouped? How can a classification key help us to identify and name living things? What dangers can a change of environment pose to living things? Focus: Classification, changing environments.						The sun's position relative to the earth affects the climate of a place.	Organisms have particular physical characteristics that enable them to survive and thrive.	Organisms need others to survive. If one organism can't survive, its demise can affect the survival of other organisms. If one organism dominates an environment it can use up resources that other organisms need to thrive.	Living things can be classified into family groups. These groups often have similar identifiable features. The mature offspring of organisms is the same as its parent but juveniles can be very different to their parents.	Sometimes features of organisms change to enable them to survive. If the organisms cannot adapt to new environments they may die out.				We can help or hinder the way organisms thrive by creating or destroying the habitats they live in.

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	Year 3 Forces and magnets Can we compare and group everyday objects into magnetic and non magnetic? Focus: movement of objects on surfaces, friction, magnetism.	Everything is made of small particles call atoms. The internal structure of an atom determines whether it is a metal or a non metal. Some metals have magnetic properties. Iron is the most frequently found magnetic metal, though there are others. A magnetic material will have magnetic poles. Surfaces are different because of the things they are made from.	Some metals are magnetic. Magnets attract metals that are magnetic. Magnets don't need to be touching an object to exert a force. When an object is dropped it falls to the floor because it is being influenced by gravitational force.	Things move when a force is directly applied. The movement of an object can change when external forces act on it. When surfaces touch they exert forces on each other. When one force is bigger than another they are not balanced. The speed (motion) of a moving object is changed depending on the forces acting on it and the object's mass. Magnets make some things move because they have a magnetic force that you can't see and doesn't have to be touching an object.	When an object moves, energy is transferred from somewhere else into the object. When an object slows down, the moving (kinetic) energy it has is transferred into other sorts of energy (heat, light etc). When friction occurs surfaces get hot because some of the moving energy becomes heat energy.	The earth's core produces magnetism, the effects of which can be detected everywhere (compasses).	Gravitational force is affected by the mass of a planet. The larger the mass of the planet, the greater the gravitational force is.				We measure forces in units called newtons.	Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	We use magnets to induce currents in generators. We use electricity and magnetism to produce motion in motors. We also use magnets to help with sorting rubbish and recycling. Our knowledge of forces and friction helps us to make things safer (tyre treads, shoe sole treads, brakes). Sometimes, removing friction makes things more energy efficnent (racing skick tyres).	
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	Year 3 Plants	Each part of a plant (eg leaf) is made of cells.	Plants' growth is affected by their proximity to		The sun's light gives energy to plants. Plants	The earth's soil contains air, water, chemicals	The earth's angle relative to the sun	Plants have specialised parts that	Plants need water, air and light to survive.	Plants can be grouped together into plant families	Plants have evolved to live in different habitats	Scientists help us to understand the function of	Scientists work out answers to questions	We have been able to develop new varieties of	Sometimes when plant species have

	What do plants need to live and grow? How is water transported within plants? What role do flowers play in the life cycle of flowering plants? Do all plants and animals reproduce in the same way? Focus: Functions of different parts, reproduction, transportation of water.	There are different sorts of cells within parts of plants.	light and heat sources.		store the energy from the sun inside their cells. Plant energy is renewable energy.	from the decay of living things and living bacteria. All of these contribute towards healthy plant growth.	affects the climate of a place.	provide different functions. Within leaves and cells, they have cells whose function is to use light to convert water and carbon dioxide into food. There are also cells whose function is to transport water, and some cells whose function is to convert gasses. Plants have an internal circulation system which allows the transfer of water and nutrients within parts of a plant. Plants also have specific parts that are designed to help the plant reproduce.	Some plants depend on other organisms to enable them to be pollinated properly or for seed dispersal.	that have similar characteristics. Plants with similar characteristics often live in similar habitats and have similar features.	by adapting some of the ways they survive. Some of their features or the way they interact with other organisms are specialised to help them adapt to particular environments.	different parts of plants and this helps us to understand their diversity.	through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in the correct way and this is usually guided by having a theory about an answer that they want to test out.	food plants to maximise their food they can produce or to help them be cultivated in different places.	been introduced to new locations they become invasive and have no predators (Japanese knot weed, Himalayan balsam)
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	Year 3 Rocks What are the features of different types of rock? How are fossils formed? How are soils produced? Focus: observe, compare, describe. Simple fossils.	Soils are formed from broken down rocks and other things.			Some organisms decay to produce other materials which can be used as energy sources (short term: compst. Long term: coal, oil).	Most of our earth is covered with a layer of soil with rock underneath. Some rocks are formed through volcanic action. Wind and rain break down rocks into small		Some rocks are made from things that were once alive. Creatures' bodies that lived long ago can be found fossilised in rocks.				Science can explain how fossilised creatures can be found in rocks.	Scientists work out answers to questions through careful collection of data, observation and measuring. Scientists can only get the right answers if they have collected the correct data in	Scientists have helped us to use fossil fuels in different ways with increasing efficiency.	Sources of fossilised energy are finite and using them affects our world's environment. When we burn fossil fuels for energy it

	Composition of soil.				Fossil fuels are non renewable energy sources.	particles which become soil.								creates pollution.
	Y3 **Animals inc humans** How do animals get the nutrients they need? What types and amounts of nutrition do different animals need? What is the purpose of skeletons and muscles? Focus: skeleton and muscles; nutrition.				The sun supplies energy to plants which is transferred to animals.			The sun's energy is key to providing many of the things animals need to grow. Animals have different body parts and structures that enable them to perform functions that they need to survive.	Animals have nutritional needs to sustain life, which are supplied by other organisms.	Many animals have structures that provide the ability for them to obtain what they need. These structures are very similar within species.	Different animals have adapted to live in their habitats and environments. Animal families have similar body structures and are likely to live in similar places.	Science can explain through observation how animals' body structures are adapted to different environments.			

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	Y3 **Light** Why do we need light? How are shadows formed? Why is it important to protect your eyes from bright lights? Focus: light vs dark, reflection, shadows.		Light illuminates objects at a distance. Light travels in straight lines. Objects in the light's path can affect its behaviour (reflection, shadows, colours). Shadows are modifications to the patterns of light reaching something.		Light is a type of energy. It is known as a renewable energy source because it does not run out.		The sun is a star which is the main source of light in our solar system.		We have cells that react to light in our eyes.		We measure light in units called lumens.		Sunglasses and sunscreen protect us from the damaging effects of sunlight by changing the way the light reaches our skin or eyes.	

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	Y2 **Plants and animals including humans** What lives in a woodland habitat and why is it a great place for them to live? Why is location important for animals? Focus: changes in growth over lifetime of plants and animals. Conditions needed for growth and life.					The earth is covered with soil which is where most plants grow. The soil contains bacteria which helps things decay. Some places cannot sustain life because their climate is too extreme. Not all things can survive in the same place.	The sun's position relative to the earth affects the climate of a place. Plants grow better in the summer when there is more sun and the days are longer.	Plants and animals have different parts that perform different functions to enable them to thrive. Each living organism has its own life cycle.	Living things have requirements to enable them to live and thrive. Plants with green leaves can make food from the sun and store it to use later. Animals are dependant on plants and sometimes on other animals for survival – either for food or for shelter.	Living things inherit the characteristics of their species.	Living things die if their environment does not provide them with the essentials they require. We can group types of animals and plants together because they have similar characteristics.	Science can explain diversity. Science helps us to understand factors affecting healthy living and existence.	We can all ask questions about what is happening in our world and we can do something to find answers to the questions to explain what is happening.	We use wearable health montitors to help us know how healthy we are and whether we are doing enough exercise.	
	Y2 Life cycles and living things. Why can't Meerkats and Penguins live together? Why is location important for animals? What happens to food when it's stored for a long time? What is decay? Where do we get our energy from? How do plants and animals help each other to live? Focus: habitats, simple food chains, life cycles.					Long term weather patterns are called climate. Climate and weather affect the way things can live.		Living things die. Dead things decay and nourish new life.	The sun gives living things energy. Different living things get energy and nourishment in different ways. Dead and decaying organisms provide energy and nourishment for living things.		Some living things have adapted to obtain nourishment in special ways because of where they live. Some species could not survive in the places they lived and have become extinct.	Scientists can explain why habitats and their occupants are diverse,	Today we know we have to look after habitats and ecosystems but 100 years ago people did not. We use seed banks and animal sanctuaries to stop some species dying out.	We can create artificial habitats (farms) so that things grow more abundantly than they would in the wild and we can use them for our food.	Conservation helps us to keep habitats safe so things can live there.

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	Y2 **Materials** Is it easier to move a boat along water or the ground? How can we change the shape of something? Focus: properties of materials making them suitable for particular use, changing shapes of solid objects.	Everything is made of something else. Some things join together to make something different. Everything takes up space on the earth. Everything has a mass.	Every substance has a mass. The mass of the earth pulls things towards it. Objects can be changed when forces are applied.	Force, speed and friction affect the way things move. A force can change the direction of something or twist it or make its shape change. If two things push against each other with the same force they cancel each other out because they are in balance.	When we push something to make it move we are transferring energy from one thing to another. We use heat energy to make things change when we cook them.							Scientists can use what they know about forces and materials to describe how things move.	We can all ask questions about what is happening in our world and we can do something to find answers to the questions to explain what is happening.	Transportation is affected by what scientists know about moving things efficiently. We can alter the way things move to make them safer.	

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	Y1 **Plants** How can I identify Oak trees in my local area? What's the same and different about oak trees and other trees? What do plants need to grow? Focus: describe, identify and name.		The sun's light causes things to grow even though the sun isn't touching them.					Inside plants there are different parts that have jobs to do to help the plant survive.	Plants need food, air, water and certain temperature conditions to grow. Plants can make food from the sun.	Plants from a particular family of plants have similar features. Plants reproduce and their offspring have many things in common with the parent.	Not all plants are the same.		We can all ask questions about what is happening in our world and we can do something to find answers to the questions to explain what is happening.		
	Y1 seasonal changes Ongoing throughout the year Focus: observe and describe weather, day length, seasons.		Weather patterns are caused by things happening all around the world.		Wind energy can make things move.	Weather patterns are caused by things happening in other places. Our weather changes because of the earth's angle relative to the sun. We can measure what is happening with the weather and notice seasonal patterns. Long term weather patterns are called climate. Climate and weather affect the way things can live.	There are patterns of the sun seen at different times of the day and patterns of the shape of the moon from one night to another. Some parts of the year have different weather patterns to other parts of the year.		Sunny seasons are when things grow best in our country.				Meterologists have computers that measure weather patterns. This helps them to make weather forecasts.	
	Y1 **Everyday materials** What are boats made from? What's the best material to use to keep something dry? Focus: Identify, describe, name, compare.	Everything is made from something else.			Recycling is a good way to conserve energy and resources.							Some materials are better than others to do a particular job.		Scientists have invented ways of making materials from other materials eg glass, plastic	Learning to identify and separate materials is important so that they can be recycled and reused.

	Y1 **Animals including humans** What do animals need to survive? What's the same and different about my life cycle and a bee's life cycle? Focus: describe, identify and compare. Animal groups, carnivore/ herbivore/omnivore. Human body parts.				All food starts off being plants. Some animals eat plants. Some animals eat plants as well as other animals. Some animals eat other animals.	Animals need to live at a particular temperature so not all places are OK for them to live in.		Animals can move and have babies and can react to things. Animals need light, air, nutrition and water to survive.	Animals need food, air, water and certain temperature conditions to thrive.	Offspring are similar to their parents.	Different things live in different places. Some plants and animals are extinct.	Scientists can explain ways in which humans have changed habitats.			Sometimes the things humans do change the ways other living things can live.
	EYFS														

Key Skills: procedural knowledge/domain specific skills Know how to:	
Ask simple questions and recognise that they can be answered in different ways Observe closely, using simple equipment Perform simple tests	Identify and classify Use their observations and ideas to suggest answers to questions Gather and record data to help in answering questions
Y1	**Y2**
Key Knowledge - know about:	**Key Knowledge – know about:**
Plants • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • Identify and describe the basic structure of a variety of common flowering plants, including trees	**Living things and their habitats** • Explore and compare the differences between things that are living, dead, and things that have never been alive • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • Identify and name a variety of plants and animals in their habitats, including microhabitats • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.
Animals including humans • Identify and name a variety of common animals including, fish, amphibians, reptiles, birds and mammals • Identify and name a variety of common animals that are carnivores, herbivores and omnivores • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	**Plants** • Observe and describe how seeds and bulbs grow into mature plants • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.
Everyday materials • Distinguish between an object and the material from which it is made • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • Describe the simple physical properties of a variety of everyday materials • Compare and group together a variety of everyday materials on the basis of their simple physical properties	**Animals including humans** • Notice that animals, including humans, have offspring which grow into adults • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.
Uses of everyday materials • Observe changes across the 4 seasons • Observe and describe weather associated with the seasons and how day length varies.	**Uses of Everyday Materials** • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses; • Compare how things move on different surfaces. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching
KS2	
Science Big Ideas and Threshold Concepts	
Curriculum designers take account of big ideas and pertinent threshold concepts to plan a coherent, 'spiral' curriculum for Science which secures mastery and progression in conceptual understanding and builds knowledge from 'novice' to 'expert'. **Teachers** take account of big ideas and related threshold concepts in their Science planning for Science lessons to secure mastery of subject knowledge, year on year and over time.	

Key Skills: procedural knowledge/domain specific skill: know how to:	
Ask relevant questions and using different types of scientific enquiries to answer them. Set up simple practical enquiries, comparative and fair tests. Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. Gather, record, classify and present data in a variety of ways to help in answering questions. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.	Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. Identify differences, similarities or changes related to simple scientific ideas and processes. Use straightforward scientific evidence to answer questions or to support their findings.
Y3	**Y4**
Key Knowledge - know about:	**Key Knowledge – know about:**
Plants Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant Investigate the way in which water is transported within plants Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	**All Living Things** Recognise that living things can be grouped in a variety of ways Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment Recognise that environments can change and that this can sometimes pose dangers to living things.
Animals including humans Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	**Animals including humans** Describe the simple functions of the basic parts of the digestive system in humans Identify the different types of teeth in humans and their simple functions Construct and interpret a variety of food chains, identifying producers, predators and prey.
Rocks Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties Describe in simple terms how fossils are formed when things that have lived are trapped within rock Recognise that soils are made from rocks and organic matter.	**States of Matter** Compare and group materials together, according to whether they are solids, liquids or gases Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
Light Recognise that they need light in order to see things and that dark is the absence of light Notice that light is reflected from surfaces Recognise that light from the sun can be dangerous and that there are ways to protect their eyes Recognise that shadows are formed when the light from a light source is blocked by a solid object Find patterns in the way that the size of shadows change.	**Sound** Identify how sounds are made, associating some of them with something vibrating Recognise that vibrations from sounds travel through a medium to the ear Find patterns between the pitch of a sound and features of the object that produced it Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sound source increases
Forces and Magnets Compare how things move on different surfaces Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance Observe how magnets attract or repel each other and attract some materials and not others Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials Describe magnets as having 2 poles Predict whether 2 magnets will attract or repel each other, depending on which poles are facing.	**Electricity** Identify common appliances that run on electricity Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit Recognise some common conductors and insulators, and associate metals with being good conductors.

KS2

Science Big Ideas and Threshold Concepts

Curriculum designers take account of big ideas and pertinent threshold concepts to plan a coherent, 'spiral' curriculum for Science which secures mastery and progression in conceptual understanding and builds knowledge from 'novice' to 'expert'.

Teachers take account of big ideas and related threshold concepts in their Science planning for Science lessons to secure mastery of subject knowledge, year on year and over time.

Key Skills: Know how to:

- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision.
- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs
- Use test results to make predictions to set up further comparative and fair tests.
- Report and present findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations.
- Identify scientific evidence that has been used to support or refute ideas or arguments.

Y5	Y6
Key Knowledge - know about:	**Key Knowledge – know about:**
Living things and their habitats • 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.	**Living Things and Their Habitats** • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • Give reasons for classifying plants and animals based on specific characteristics
Animals, including humans • Describe the changes as humans develop to old age.	**Animals Including Humans** • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • Describe the ways in which nutrients and water are transported within animals, including humans
Properties and changes of materials • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic Demonstrate that dissolving, mixing and changes of state are reversible changes • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	**Properties and Changes of Materials** • compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • demonstrate that dissolving, mixing and changes of state are reversible changes • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.
	Evolution • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
Earth and Space • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Use the idea of the Earth's rotation to explain day and night, and the apparent movement of the sun across the sky.	**Light** • Recognise that light appears to travel in straight lines • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them
Forces • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object	**Electricity** • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit

• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces • Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	• Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • Use recognised symbols when representing a simple circuit in a diagram.