

CURRICULUM DESIGN for SCIENCE

Science INTENT

At Mosaic, our intent is to deliver a high-quality and broad and balanced science curriculum which enables children to confidently explore and discover what is around them, so that they have a deeper understanding of the world we live in and develop a respect for living organisms and the physical environment. We aim to promote positive attitudes to science as an interesting and enjoyable subject, and to develop pupils' awareness of how science is relevant in our daily lives and plays a pivotal role in shaping the future. The world we live in is constantly changing and pupils need to be equipped with the necessary skills to thrive and be successful in that future.

We aim to instil a passion for science through investigative learning, allowing students to ask questions, explore problems and search for solutions using their creativity. We want them to have no limits to their ambitions and to grow up wanting to be anything from astronauts, forensic scientists, vets or marine biologists.

To achieve this, we will include exciting, practical hands-on experiences that encourage curiosity and questioning. Our aim is that these stimulating and challenging experiences help every child secure and extend their scientific knowledge and vocabulary, as well as promoting a love and thirst for science.

Science IMPLEMENTATION

Science follows the National Curriculum; objectives are delivered through weekly lessons. The curriculum makes use of prior substantive knowledge and provides clear references on how learning will be used in future enquiries.

Science learning is structured around the repeated themes of chemistry, biology, physics and earth sciences. These unit studies are assigned key knowledge and vocabulary to be learnt and understood.

For those children that show a particular enthusiasm for the subject, they can become a Science Star. Our Science Star initiative gives children the chance to explore learning beyond the National curriculum, support with Science Week and deliver assemblies to the rest of the school.

Science IMPACT

The successful approach to the teaching of science at Mosaic Primary School will result in a fun, engaging, high quality science education, that provides children with the foundations for understanding the world that they can take with them once they complete their primary education.

Children at Mosaic Primary School will:

- demonstrate a love of science work and an interest in further study and work in this field
- retain knowledge that is pertinent to Science with a real-life context.
- be able to question ideas and reflect on knowledge.
- be able to articulate their understanding of scientific concepts and be able to reason scientifically using rich language linked to science.
- demonstrate a high love of mathematical skills through their work, organising, recording and interpreting results.
- work collaboratively and practically to investigate and experiment.
- achieve age related expectations in Science at the end of their cohort year.

Impact of teaching and learning will be determined through SLT and subject leader reviews and observations as well as assessment carried out through pre and post tasks. We will know we have been successful if children have met their 'end points' which are specified in the planning document.

Whole school Overview

	Earth sciences			Chemistry	Biology	Physics	
	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Aut 1	Floating and sinking Body Parts	Animals including Humans (Human Body)	Living things and their Habitats	Forces and Magnets	Living things and their habitat	Earth and Space	Living Things and Habitats
Aut 2	Light	Everyday Materials	Everyday Materials	Light		Forces	Animals including Humans (Evolution)
Sp 1	Natural World (seasons)	Seasons	Animals including Humans (nutrition)	Plants	States of Matter	Plants	Electricity
Sp 2	Materials (Man Made and natural)	Plants	Sound	Animals including Humans (nutrition)	Sound	Changes in Materials	Light
Sum 1	Animals including Humans	Materials	Plants	Rocks	Electricity	Living things and their habitats	Animals including Humans (reproduction)
Sum 2	Changes of Matter	Animals including Humans	Animals including Humans (offspring)	Animals including humans (skeletons and muscles)	Animals including Humans (digestion and food chains)	Animals including Humans (Human life cycle)	

<p>End points:</p>		<p>By the end of Key Stage 1, children will have been taught:</p> <ul style="list-style-type: none"> □ Plants: identify some common plants and describe basic plant and tree structure. □ Animals: identify common animals including fish and reptiles, and use the terms carnivore, herbivore and omnivore. Notice how offspring grow into adults. □ Humans: Label a human diagram and investigate senses. Understand basic human needs and how to sustain healthy life. □ Materials: name and describe features of a range of common materials and compare their suitability for different uses. Find out how to change shapes of basic materials. □ Seasons: observe and record changes in seasons and weather. □ Living things: study habitats and how animals are suited to them and discuss simple food chains. □ Plants: observe how seeds grow and the conditions that they need. 	<p>By the end of Key Stage 2, children will build on their prior knowledge of Science and extend this further. Children will have been taught:</p> <ul style="list-style-type: none"> □ Plants: understand the functions of plant parts, their life cycles and how they sustain life. □ Animals: understand nutrition, and the purpose of skeletons, muscles and major organs. □ Rocks: compare types of rocks and describe fossils. □ Light: recognised how shadows are formed and change, notice reflections and understand how light travels and how we see objects. □ Forces and magnets: investigate friction and magnetism, and used the terms repel and attract. Experiment with other forces including air resistance and water resistance and see how pulleys and levers can increase the impact of a force. □ Living things: group and classify living things, and study how their environment shapes how they behave. Give specific reasons for classifications. Describe basic life cycles and the process of reproduction in some plants and animals. □ Humans: describe the basic parts of human digestion, including teeth, and create simple food chains. Describe the human life cycle. Identify the main parts of the circulatory system and recognise impacts on it (diet/ exercise) □ States of matter: understand solids, liquids and gases as states of matter and observe changes in the states, including the water cycle. □ Sound: understand sound is created by vibration and experiment with pitch and volume. □ Electricity: construct and draw simple circuits, including with lamps motors and switches. Recognise how the objects perform is related to the number of cells used. □ Materials: describe changes such as melting, evaporating and making a solution. Understand materials can change in reversible and irreversible ways. □ Earth and Space: describe the movement of the Earth, moon and other planets relative to the sun in the solar system. □ Evolution and inheritance: recognise how living things change over time and that offspring usually vary from their parent.
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Progression of Knowledge

Our Science curriculum for KS1-KS2 follows four main themes: Earth sciences, Chemistry, Biology and Physics.

There is an expectation that children will use their prior learning to build on as they journey through Mosaic. Children will reach an **end point** where their understanding of science has been strengthened and deepened through this purposefully mapped out curriculum.

In **Early Years**, children will encounter Science through Understanding the World. Here children will look at people and communities and are helped to make sense of their physical world. They will leave Early Years having been encouraged to explore and problem solve. Children are well prepared for their Y1 learning on the weather through their daily discussions and observations of whether conditions and seasons. Year 1 build on this prior learning and extend it through their fieldwork studies. The EYFS curriculum is mindful of how their curriculum can be used to create the foundations of prior knowledge which we build upon as children journey through Year 1 and KS1.

Scientific Enquiry

Ideas and Questions			
EYFS	Year 1 and 2	Year 3 and 4	Year 5 and 6
<p>-Talk confidently to adults and peers about their family and local community.</p> <p>-Can talk about people who are familiar to them e.g. police, doctors, teachers etc.</p>	<ul style="list-style-type: none"> ask simple questions and recognising that they can be answered in different ways recognise scientific and technical developments that help us 	<ul style="list-style-type: none"> ask relevant questions and using different types of scientific enquiries to answer them explain the purposes of a variety of scientific and technological developments 	<ul style="list-style-type: none"> Use their scientific experiences to explore ideas and raise different types of questions talk about how scientific ideas have developed over time recognise the applications of specific scientific ideas
Planning			
<p>-Explore the natural world around them, making observations and drawing pictures of animals and plants.</p>	<ul style="list-style-type: none"> perform simple tests or follows teachers' instructions with guidance, suggest what they will do with guidance, identify things to measure or observe that are relevant to the question use resources provided or chosen from a limited range use simple measurements and equipment to gather data suggest why a test is unfair 	<ul style="list-style-type: none"> set up simple practical enquiries, comparative and fair tests begin to make decisions about what observations to make and how long to make them for begin to choose the type of simple equipment that might be used from a reasonable range use appropriate equipment and measurements with reasonable accuracy recognises when a simple fair test is needed with help, decide how to set up a fair test and control variables 	<ul style="list-style-type: none"> select and plan different types of scientific enquiries to answer questions make decisions about what observations to make, what measurements to use, how long to make them for and whether to repeat them choose the most appropriate equipment to make measurements explain how to use the equipment accurately recognise when and how to set up comparative and fair tests recognise and controls variables where necessary (eg. explains which variables need to be controlled and why)
Observing and Presenting			

<p>-Explore the natural world around them, making observations and drawing pictures of animals and plants.</p>	<ul style="list-style-type: none"> • observe closely (including changes over time), using simple equipment • make measurements using non-standard units • use simple secondary sources to find answers • gather simple data to help answer questions • record findings in a range of ways, eg. simple tables, diagrams, pictograms, sorting circles, bar charts and templates • talk about their findings using everyday terms, text scaffolds or simple scientific language 	<ul style="list-style-type: none"> • make systematic and careful observations • make accurate measurements using standard units, using a range of equipment • recognise when and how secondary sources might help answer questions that cannot be answered through practical investigations • gather and record data in a variety of ways • make decisions about how to record and analyse the data and prepare own formats for recording • record and presents findings using drawings, labelled diagrams, keys, tally charts, Carroll diagrams, Venn diagrams, bar charts and tables • report on findings from enquiries, in simple scientific language 	<ul style="list-style-type: none"> • take measurements, in standard units, using a range of scientific equipment, with increasing accuracy and precision • take repeat readings when appropriate • recognise which secondary sources will be most useful to research their ideas • begin to separate opinion from fact • record data and results of increasing complexity, making own decisions about how to record • calculate mean value where appropriate • record and present findings using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • report on findings from enquiries, using relevant scientific language, in oral and written explanations such as displays and other presentations
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Looking For Patterns

<p>-Explores the natural world around them, making observations and drawing pictures of animals and plants.</p>	<ul style="list-style-type: none"> • use simple observable features to compare objects, materials and living things • identify and classify (decides how to sort and group objects) • with guidance, begin to notice changes (ie. cause and effect), patterns and relationships (ie. how one variable affects another) 	<ul style="list-style-type: none"> • use observable and other criteria to group, sort and classify in different ways (including simple keys and branching databases) • identify differences, similarities or changes related to simple scientific ideas and processes • with help, look for changes, patterns, and relationships in their data 	<ul style="list-style-type: none"> • use and develops keys and other information records to identify, classify and describe living things and materials • identify conclusions, causal relationships and patterns
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Explaining Results

<p>-Can talk about people who are familiar to them e.g. police, doctors, teachers etc. - Can talk about people who are familiar to them e.g. police, doctors, teachers etc.</p>	<ul style="list-style-type: none"> • talk about what they have found out and how they found it out • use their observations and ideas to suggest answers to questions • use comparative language to describe changes, patterns and relationships 	<ul style="list-style-type: none"> • with help, use results to draw simple conclusions and answers questions using appropriate level of knowledge • use straightforward scientific evidence to answer questions or to support their findings • use relevant scientific language to discuss their ideas and communicate their findings 	<ul style="list-style-type: none"> • draw valid conclusions, explains and interprets the results (including the degree of trust) using scientific knowledge and understanding (eg. recognises limitations of data) • identify scientific evidence that has been used to support or refute ideas or arguments • use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas
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Evaluating

<p>-Daily weather conversations and comparisons from yesterday and predictions for tomorrow's weather.</p>	<ul style="list-style-type: none"> • with support, suggest whether or not what happened was what they expected • with support, suggest different ways they could have done things 	<ul style="list-style-type: none"> • with support, use results to suggest improvements to what they have done • with support, raise further questions (eg. arising from the data) • with support, make predictions for new values within or beyond the data collected 	<ul style="list-style-type: none"> • make practical suggestions about how their working method could be improved (eg. the effect of sample size on reliability) • use results to identify when further tests and observations might be needed • use test results to make predictions and to set up further comparative and fair tests
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	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Develop Biology knowledge		<ul style="list-style-type: none"> 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. 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. Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. 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 		<ul style="list-style-type: none"> 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. 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. 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. Describe the simple functions of the basic parts of the digestive system in humans Identify different types of teeth in humans and their simple functions Construct and interpret a variety of food chains, identifying producers, predators and prey. 	<ul style="list-style-type: none"> 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. Year 6 Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. Give reasons for classifying plants and animals based on specific characteristics. Describe the changes as humans develop to old age. Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Recognise the impact of diet, exercise, drugs and lifestyle on the way their body's function. <ul style="list-style-type: none"> Describe the ways in which nutrients and water are transported within animals, including humans. 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. <ul style="list-style-type: none"> Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. Key Stage 3 Heredity as the process by which genetic information is transmitted from one generation to the next. <ul style="list-style-type: none"> A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. 		

Develop Chemistry knowledge		<ul style="list-style-type: none"> • 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 • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. 	<ul style="list-style-type: none"> • 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. • Recognise some common conductors and insulators, and associated metals with being good conductors. 	<ul style="list-style-type: none"> • 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 acid on bicarbonate of soda.
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Develop Physics knowledge

(Non-statutory)

- What sources of light are features of day and night, including temperature.
- Electricity as a source of light
- Observe and describe shadows
- Identify sources of sound
- Identify louder and softer sounds

- 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 an opaque object.
- Find patterns in the way that the size of a shadow changes.
- Compare how things move on different surfaces.
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Observe how magnets attract or repel each other and attract some materials and not others.
- Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials.
- Describe magnets as having two poles.
- Predict whether two magnets attract or repel each other, depending on which way the poles are facing
- 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.
- 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 associated metals with being good conductors.

- 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.
- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- 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.
- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
- Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.
- Use recognised symbols when representing a simple circuit in a diagram.

<p>Develop Earth Sciences knowledge.</p>		<ul style="list-style-type: none"> • Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. • Describe the Sun, Earth 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.
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