



Science at St Mary's:

Intent

At St Mary's we aim to provide a high-quality science curriculum which provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and it is vital to the world's future prosperity. All pupils should be taught essential scientific knowledge and conceptual understanding which can be demonstrated in written and verbal explanation, solving challenging problems and reporting scientific findings. We develop the ability for pupils to think independently and ask questions about working scientifically and the knowledge and skills it brings. Pupils will gain confidence and competence in the full range of practical skills, planning and carrying out scientific investigations. We endeavour to create a passion for science and its application in past, present and future technologies.

"Science and everyday life cannot and should not be separated."

Rosalind Franklin

Implementation

Classes in KS1 and KS2 at St. Mary's cover 5 or 6 Science units every year. All units of work are planned to build upon children's prior learning. Children of all abilities are able to develop their knowledge and skill through careful planning of exciting and engaging activities by teachers. Children are challenged to apply the skills and knowledge they have gained more frequently as they move up through the school. Teachers carefully plan lessons to address common misconceptions and any gaps in understanding from previous topics or year groups.

Children at St. Mary's can develop their 'working scientifically' skills as teachers plan activities that encourage children to ask and answer their own scientific questions, plan and prepare their own investigations, conduct and review their own fair tests, and draw conclusions from and evaluate these experiments. These practical skills serve to develop and build upon the key knowledge children gain from their rich and varied Science learning. Children can develop these key skills throughout their learning journey at St. Mary's and these skills progress through the school, with children being challenged to



Children at St. Mary's can develop and build on their key scientific knowledge. We believe there are key pieces of scientific knowledge and vocabulary that children must learn and remember. Children gain opportunities to do just this, as teachers regularly use and refer back to knowledge organisers in lessons. Teachers plan activities within a science lesson around the key knowledge or vocabulary in a particular topic. Teachers will also use assessment tasks towards the end of a topic, to ensure that children have learned these key pieces of information. This assessment informs future planning and is passed up to a child's future teacher, to ensure that any gaps are addressed, even in a different year group.

Impact

Our approach to teaching Science will lead to children who are able to: remember key scientific knowledge; use challenging scientific vocabulary in their writing and when speaking about their learning; and can plan, prepare, conduct, draw conclusions from and evaluate a fair, scientific investigation. Children at St. Mary's will demonstrate an interest in Science and the natural world and be able to ask and investigate their own questions about the world around them.

The impact of our curriculum can be demonstrated: through the quality lessons that teachers plan, prepare and teach; through speaking with our pupils about their Science learning; through the quality work and investigations that children have completed. Children's learning in Science is assessed regularly and these assessments serve to inform future planning.



Threshold Concepts for Science:

Working Scientifically

Work scientifically

This concept involves learning the methodologies of the discipline of science.

Biology

Understand plants

This concept involves becoming familiar with different types of plants, their structure and reproduction.

Understand animals and humans

This concept involves becoming familiar with different types of animals, humans and the life processes they share.

Investigate living things

This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.

Understand evolution and inheritance

This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.

Chemistry

Investigate materials

This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.

Physics

Understand movement, forces and magnets

This concept involves understanding what causes motion.

Understand the Earth's movement in space

This concept involves understanding what causes seasonal changes, day and night.

Investigate light and seeing

This concept involves understanding how light and reflection affect sight.

Investigate sound and hearing

This concept involves understanding how sound is produced, how it travels and how it is heard.

Understand electrical circuits

This concept involves understanding circuits and their role in electrical applications.

Science Vocabulary linked to 400-words project

Milestone 1 / Year 1 and 2	Analyse, approximate, capacity, clarify, couple, data, energy, environment, estimate, evaluate, flexible, identify, investigate, method, minimum, outcome, plus, portion, predict, rigid, statistics, survey, symbol, transform, stem, fin, scales, senses, object, material, stretchy, bendy, floppy, flexible, absorbent, waterproof, rough, smooth, transparent, opaque, translucent, reflective, weather, seasons, monsoon, diurnal, nocturnal, , food chain, shelter, habitat, micro habitat, germinate, healthy, offspring, reproduction, growth, exercise, heartbeat, breathing, hygiene, germs, disease, food types, squashing. twisting, evaluate, predict, explore, test, fair test, experiment, alter, improve, results, observe, identify, classify, record, data, accurate, chart, conclusion, table, graph, partition, camouflage, climate
Milestone 2 / Year 3 and 4	Pollination, dispersal, transparent, translucent, opaque, matt, repel, grain, absorb, sedimentary, igneous, metamorphic, nutrition, nutrients, carbohydrates, protein, classification, habitat, migrate, digestion, herbivore, omnivore, producer, predator, prey, appliance, mains, circuit, component, positive, negative, conductor, insulator, insulation, vibration, pitch, evaporation, series, aural, sepal, stigma, ovary, stamen, attracts, ultra-violet, vertebrate, invertebrate, carnivore, omnivore, herbivore
Milestone 3 / Year 5 and 6	Vertebrates, invertebrates, offspring, suited, adapted, environment, inherited, species, pulse, blood vessels, transported, carbon dioxide, nutrients, circulatory system, rotation, orbit, spherical, thermal, solution, filter, reversible, irreversible, mechanism, vibration, texture, source, fertilisation, asexual, sexual, reproduction, metamorphosis, inseminate, prediction, proof, disprove, atom, particle reliable, anomaly, resistance, observation, evidence, average, adaption, tilt, variables, evolve, evolution, evaporation, condensation.

Subject specific vocabulary is taught using the follow strategy:

- Define it
- Capture the essence
- Apply it

Subject specific vocabulary will be visible on classroom displays and used by pupils in discussions and written work.



Science Lenses

Each topic must address all of the year group relevant milestone, for example, identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers.

Working scientifically must be planned and taught within **every** topic.

KS1, seasonal change including understanding the Earth's movement in space must be taught throughout year 1 and year 2.

Key website for scientist study: <https://www.dkfindout.com/uk/science/famous-scientists/>

Science	Autumn	Spring	Summer	
Reception	Understand the effect of changing seasons on the world around them. Explore the natural world around them. Describe what they see, hear and feel whilst outside.			
Year 1	Materials Chemistry	Animals and humans Biology Scientist study: Jane Goodall	Forces Physics Sound and hearing Physics Scientist study: Alexander Grahame Bell Light and seeing Physics	Plants Biology Investigate living things Biology
Year 2	Materials Chemistry	Animals and humans Biology	Forces Physics Sound and hearing Physics Scientist study: Alexander Grahame Bell	Plants Biology Investigate living things Biology



		Scientist study: Jane Goodall			Light and seeing Physics			
Year 3	Rocks and Soils Chemistry Scientist study: Mary Anning	Light and seeing Physics Scientist study: Ibn Al-haytham	Living things including evolution with a plant focus. Biology	Plants Biology	Movement Physics	Forces and magnets Scientist study: Isaac Newton Space Scientist study: Galileo Galilei Physics		
Year 4	States of Matter Chemistry Scientist study: Daniel Fahrenheit, Andres Celsius and	Sound and hearing Physics	Living things including evolution and inheritance with an animal focus. Biology Scientist study: Carl Linnaeus	Animals and humans including evolution and inheritance. Biology	Electricity Physics Scientist study: Michael Faraday	Electricity Physics Space Physics Scientist study: Nicklaus Copernicus		
Year 5	Magnets and Forces Physics Scientist study: Albert Einstein (building on the work of Isaac Newton)		Materials Chemistry Scientist study: Linus Pauling and Richard Feynman		Space Physics Scientist study: Zhang Heng and Stephen Hawkins	Light and seeing Physics		
Year 6	Sound and hearing Physics	Electrical circuits Physics Scientist study: Nikola Tessler	Animals and humans Living things Biology		Evolution and inheritance including plants Biology Scientist study: Watson and Crick, Rosalind Franklin, Darwin and Gregor Mendel			

**Breadth of Study: Working scientifically**

Across all year groups scientific knowledge and skills should be learned by working scientifically

Note: Items marked * are not statutory.

Key Stage 1	Key Stage 2
Biology Plants • Identify, classify and describe their basic structure. • Observe and describe growth and conditions for growth. Habitats • Look at the suitability of environments and at food chains. Animals and humans • Identify, classify and observe. • Look at growth, basic needs, exercise, food and hygiene. All living things* • Investigate differences.	Plants • Look at the function of parts of flowering plants, requirements of growth, water transportation in plants, life cycles and seed dispersal. Evolution and inheritance • Look at resemblance in offspring. • Look at changes in animals over time. • Look at adaptation to environments. • Look at differences in offspring. • Look at adaptation and evolution. • Look at changes to the human skeleton over time. Animals and humans • Look at nutrition, transportation of water and nutrients in the body, and the muscle and skeleton system of humans and animals. • Look at the digestive system in humans. • Look at teeth. • Look at the human circulatory system. All living things • Identify and name plants and animals • Look at classification keys. • Look at the life cycle of animals and plants. • Look at classification of plants, animals and micro-organisms. • Look at reproduction in plants and animals, and human growth and changes. • Look at the effect of diet, exercise and drugs.
Chemistry	



Materials • Identify, name, describe, classify, compare properties and changes. • Look at the practical uses of everyday materials.	Rocks and fossils • Compare and group rocks and describe the formation of fossils. States of matter • Look at solids, liquids and gases, changes of state, evaporation, condensation and the water cycle. Materials • Examine the properties of materials using various tests. • Look at solubility and recovering dissolved substances. • Separate mixtures. • Examine changes to materials that create new materials that are usually not reversible.
Physics Light* • Look at sources and reflections. Sound* • Look at sources. Electricity* • Look at appliances and circuits. Forces • Describe basic movements. Earth and space • Observe seasonal changes.	Light • Look at sources, seeing, reflections and shadows. • Explain how light appears to travel in straight lines and how this affects seeing and shadows. Sound • Look at sources, vibration, volume and pitch. Electricity • Look at appliances, circuits, lamps, switches, insulators and conductors. • Look at circuits, the effect of the voltage in cells and the resistance and conductivity of materials. Forces and magnets • Look at contact and distant forces, attraction and repulsion, comparing and grouping materials. • Look at poles, attraction and repulsion. • Look at the effect of gravity and drag forces. • Look at transference of forces in gears, pulleys, levers and springs. Earth and space • Look at the movement of the Earth and the Moon Explain day and night

Science Milestones

Taught in both years

Taught in first year of milestone

Taught in second year of milestone

Threshold Concepts	Milestone 1 (KS1) Year 1 and 2	Milestone 2 (LKS2) Year 3 and 4	Milestone 3 (UKS2) Year 5 and 6
Work scientifically This concept involves learning the methodologies of the discipline of science. <u>In every topic</u>	• Ask simple questions. • Observe closely, using simple equipment. • Perform simple tests. • Identify and classify. • Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions.	• Ask relevant questions. • Set up simple, practical enquiries and comparative and fair tests. • Make accurate measurements using standard units, using a range of equipment, e.g. 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, bar charts and tables.	• Plan enquiries, including recognising and controlling variables where necessary. • Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work. • 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, bar and line graphs, and models. • Report findings from enquiries, including oral and written explanations of results, explanations involving

BIOLOGY Understand plants This concept involves becoming familiar with different types of plants, their structure and reproduction.	- Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen. - Identify and describe the basic structure of a variety of common flowering plants, including roots,	- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. - Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests. - Identify differences, similarities or changes related to simple, scientific ideas and processes. - Use straightforward, scientific evidence to answer questions or to support their findings. - Identify and describe the functions of different parts of flowering plants: roots, stem, 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.	causal relationships, and conclusions. - Present findings in written form, displays and other presentations. - Use test results to make predictions to set up further comparative and fair tests. - Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.	- Relate knowledge of plants to studies of evolution and inheritance. - Relate knowledge of plants to studies of all living things.
---	--	---	--	--



Understand animals and humans This concept involves becoming familiar with different types of animals, humans and the life processes they share.	stem/trunk, leaves and flowers. • 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.	• Investigate the way in which water is transported within plants. • Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	
Understand animals and humans This concept involves becoming familiar with different types of animals, humans and the life processes they share.	• Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates. • 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 (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets). • Identify name, draw and label the basic parts of the	• Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat. • Construct and interpret a variety of food chains, identifying producers, predators and prey. • Identify that humans and some animals have skeletons and muscles for support, protection and movement. • Describe the simple functions of the basic parts	• 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 importance of diet, exercise, drugs and lifestyle on the way the human body functions. • Describe the ways in which nutrients and water are transported within animals, including humans.



Investigate living things This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.	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. • Investigate 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.	of the digestive system in humans. • Identify the different types of teeth in humans and their simple functions.	
	• Explore and compare the differences between things that are living, that are dead and 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	• Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys. • Recognise that environments can change and that this can sometimes pose dangers to specific 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. • Describe how living things are classified into broad groups



	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 micro-habitats. • 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.		according to common observable characteristics. • Give reasons for classifying plants and animals based on specific characteristics.
Understand evolution and inheritance This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.		• Identify how plants and animals, including humans, resemble their parents in many features. • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Identify how animals and plants are suited to and adapt to their environment in different ways.	• 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.



CHEMISTRY –

Investigate materials

This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.

- 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.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
- Identify and compare the suitability of a variety of everyday materials, including wood, metal,

Rocks and Soils

- Compare and group together different kinds of rocks on the basis of their simple, physical properties.
- Relate the simple physical properties of some rocks to their formation (igneous or sedimentary).
- Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary 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

- Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets.
- Understand how 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



	plastic, glass, brick/rock, and paper/cardboard for particular uses. Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock and paper/cardboard for particular uses.	the temperature at which this happens in degrees Celsius (°C), building on their teaching in mathematics. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	materials, and that this kind of change is not usually reversible, including changes associated with burning, oxidation and the action of acid on bicarbonate of soda.
PHYSICS Understand movement, forces and magnets This concept involves understanding what causes motion.	- Notice and describe how things move, using simple comparisons such as faster and slower. - Compare how different things move.	- 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 on the basis of whether they are attracted to a magnet, and	Magnets - Describe magnets as having two poles. - Predict whether two magnets will attract or repel each other, depending on which poles are facing. Forces - Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. - Identify the effect of drag forces, such as air resistance,

		Identify some magnetic materials. - Describe magnets as having two poles. - Predict whether two magnets will attract or repel each other, depending on which poles are facing.	water resistance and friction that act between moving surfaces. - Describe, in terms of drag forces, why moving objects that are not driven tend to slow down. - Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs. - Understand that some mechanisms including levers, pulleys and gears, allow a smaller force to have a greater effect.
Understand light and seeing This concept involves understanding how light and reflection affect sight.	Observe and name a variety of sources of light, including electric lights, flames and the Sun, explaining that we see things because light travels from them to our eyes.	- 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.	- Understand 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 eyes. - Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast



		• 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.	• 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.
Investigate sound and hearing This concept involves understanding how sound is produced, how it travels and how it is heard.	• Observe and name a variety of sources of sound, noticing that we hear with our ears.	• 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.
Understand electrical circuits This concept involves understanding circuits and their role in electrical applications.		• 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	• 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



Understand the Earth's movement in space This concept involves understanding what causes seasonal changes, day and night.	• <i>Observe the apparent movement of the Sun during the day.</i> • <i>Observe changes across the four seasons.</i> • <i>Observe and describe weather associated with the seasons and how day length varies.</i>	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.	loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	• 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.
---	--	---	---	---



Cultural capital in science:

	Autumn	Spring	Summer
Whole school events		Science week	
Reception	Forest schools visit	Forest schools visit Pond – observe frog spawn	Forest schools visit Living eggs Farm visit
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			

Cross curricular in science:

	Autumn	Spring	Summer
Reception			
Year 1			
Year 2			
Year 3			
Year 4			DT - torches
Year 5			
Year 6			