



Science

Curriculum Rationale

Science is a subject that enables pupils to understand, enjoy and marvel at the natural world. It consists of observing the world by watching, listening, observing, and recording. It is curiosity in thoughtful action about the world and how it behaves.

At Our Lady of Lourdes, our bespoke curriculum aims to develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. We develop understanding of the nature, processes and methods of science through science enquiries helping the children to answer scientific questions about the world around them. We work to ensure that our pupils are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. As Scientists, we embody our school motto “I can do great things with God’s love” in our appreciation, love and care of all our world has to offer.

Curriculum Intent

Teachers present the curriculum content clearly through composites and component parts supported by unit plans which break the unit knowledge, concepts and skills down for each lesson in each year group.

The curriculum is delivered through a subject specific approach which supports pupils to develop the key concepts and knowledge of the science curriculum. Each lesson within a unit of work is carefully crafted and builds upon what has been previously taught from one year to the next. Children’s ideas and misconceptions are built on, ensuring that the curriculum is full and relevant.

Unit of Work	Prior learning	What I will learn now.	What I don't need to know yet.	Misconceptions
Animals including Humans Key vocabulary: Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, <u>fibre</u> , fat, water, skeleton, bones, muscles, support, protect, skull, ribs, spine, muscles, joints	Pupils should know about / be taught to: - recognise a variety of common animals that are carnivores, herbivores and omnivores (Y1) - label the basic parts of the human body and say which part of the body is associated with each sense. (Y1) - notice that animals, including humans, have offspring which grow into adults (Y2) - recognise basic needs of animals, including humans, for survival (water, food and air) (Y2) - describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene (Y2)	Pupils should be taught to: - 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 https://www.ase.org.uk/resources/y3-animals-including-humans-max	Pupils in Year 4 will be taught to: - describe the simple functions of the basic parts of the digestive system in humans (<u>4-Animals, including Humans</u>) - identify the different types of teeth in humans and their simple functions (<u>4-Animals, including Humans</u>) construct and interpret a variety of food chains, identifying producers, predators and prey (<u>4-Animals, including Humans</u>) Pupils in Year 6 will be taught to: - identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood (<u>6-Animals, including Humans</u>) - recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function (<u>6-Animals, including Humans</u>) - describe the ways in which nutrients and water are transported within animals, including humans (<u>6-Animals, including Humans</u>)	Some children may think; - certain whole food groups like fats are 'bad' for you - certain specific foods, like cheese are also 'bad' for you - diet and fruit drinks are 'good' for you - snakes are similar to worms, so they must also be invertebrates <u>invertebrates</u> have no form of skeleton.

The science curriculum is adapted to build upon the learning opportunities and assessment end points for each year group and ensures progression and repetition in terms of embedding key learning, knowledge and skills.

TAPS ASSESSMENT ACTIVITIES https://pstt.org.uk/unique-resources/taps/				
Investigating skeletons	Magnet test Shoe grip forces Wind power vehicle Balloon rockets	Rock Reports Cars down ramps(skate ramp)	Making Shadows	Measuring plants Plants close observation Function of a stem
USEFUL BOOKS				
Charlie and the Chocolate Factory- Roald Dahl. Bone by Bone – Sara Levine	The Iron Man- Ted Hughes Magnets push, magnets pull – David A Adler	The Pebble in my Pocket- Meredith Hooper Stone girl, Bone Girl	The Firework Maker's Daughter- Philip Pullman The Gruffalo's Child- Julia Donaldson The Black Rabbit (Philippa Leathers)	The Story of Frog Belly Rat Bone - Timothy Basil Ering Seeds Move – Robin Page
BIG QUESTIONS				
Imagine if a skeleton was made of a flexible material. (PMI) Which breakfast is best?	Imagine a world with no friction. (PMI) What are the best shoes for running? What's the best surface to run on?	Which rock would be best for a skate ramp? Why don't all rocks look the same? Do rocks stay the same forever?	What can you see when there is absolutely no light?	I planted a tree in my garden 4 years ago. It now weighs 250kg more. Where did this 250kg come from? How can you tell if something is a plant?
Working Scientifically Focus				
Ask relevant questions and using different types of scientific enquiries to answer them. Record findings using simple scientific language, drawings, labelled diagrams.	Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.	Set up simple practical enquiries, comparative and fair tests.	Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units. Use a range of equipment, including data loggers.	Report on findings from enquiries, including oral and written, displays or presentations of results and conclusions. Use straightforward scientific evidence to answer questions or to support their findings.

Children explore and practice the knowledge, skills and disciplines involved in the unit and use their books to record their observations and use evidence to justify their ideas and use their scientific knowledge and understanding to explain their findings. Each scientific discipline and knowledge taught is revisited in each phase, at a progressively deeper level. All classes study subject unit specific vocabulary and this develops year on year.

Science subject specific characteristics, which we expect the pupils to demonstrate, have been developed and shared with all stakeholders. These characteristics underpin all work in science and form a focal point for display areas and provide a common subject specific vocabulary for staff and pupils. These characteristics are to:

- develop a sense of excitement and curiosity about natural phenomena
- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- understand the nature, processes and methods of science through different types of scientific enquiries that helps them answer scientific questions
- be familiar with and use technical terminology accurately & precisely
- apply their knowledge of maths to collecting, presenting and analysing data
- plan different types of scientific enquiry questions and control variables
- take measurements using a range of scientific equipment with increasing accuracy
- record data of results with increasing complexity, using diagrams, charts & tables
- use test results to make predictions to set up further comparative and fair tests
- report and present findings from enquiries, including conclusions
- identify scientific evidence that has been used to support or refute ideas or arguments

The teaching of the science curriculum is planned and delivered to support pupils to transfer key knowledge into their long-term memory and therefore improve the progress they make. Essential

vocabulary is identified within each lesson and unit of work to ensure that our pupils can discuss and evaluate the science content effectively.

Whilst delivering the curriculum, teachers are constantly checking to ensure that pupils are learning the necessary knowledge and identifying and addressing misunderstandings. Assessment is used as a tool to support pupil learning. We use the TAPS planning guide to support this and to inform next steps.

The science curriculum is research evidence informed in relation to the content, delivery and process of learning.

Science Impact

We use both formative and summative assessment information in science. Assessment informs learning to ensure that all pupils including disadvantage and those with SEND achieve highly and acquire the knowledge, skills and concepts they need to succeed in life. Staff use assessment information to inform their short-term planning and address misconceptions. This helps us provide the best possible support for all of our pupils. The end points for each phase have been carefully mapped out and further broken down. This means that the essential knowledge, skills and concepts in science are progressive and build year on year.

Purpose of study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Aims

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

Scientific knowledge and conceptual understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Insecure, superficial understanding will not allow genuine progression: pupils may struggle at key points of transition (such as between primary and secondary school), build up serious misconceptions, and/or have significant difficulties in understanding higher-order content.

Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider school curriculum: teachers will wish to use different contexts to maximise their pupils' engagement with and motivation to study science.

The nature, processes and methods of science

'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance give examples of how 'working scientifically' might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils should seek answers to questions through collecting, analysing and presenting data. 'Working scientifically' will be developed further at key stages 3 and 4, once pupils have built up sufficient understanding of science to engage meaningfully in more sophisticated discussion of experimental design and control.

Spoken language

The national curriculum for science reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their scientific vocabulary and articulating scientific concepts clearly and precisely. They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

School curriculum

The programmes of study for science are set out year-by-year for key stages 1 and 2. Schools are, however, only required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study.

Subject content

Early Years Foundation Stage

Understanding of the World involves guiding children to make sense of their physical world and their community, through opportunities to explore, observe and find out about people, places, technology and the environment.

Understanding of the World includes the following areas:

Past and Present

Children at the expected level of development will:

- Talk about the lives of the people around them and their roles in society;

People, Culture and Communities

Children at the expected level of development will:

- Describe their immediate environment using knowledge from observation, discussion, stories, non-fiction texts and maps;

The Natural World

Children at the expected level of development will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;
- Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class;
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter

When teaching Understanding of the World in EYFS, enabling environments should be well planned and paramount to the lesson.

Each area of learning and development must be implemented through planned, purposeful play and through a mix of adult-led and child-initiated activity. There should be elements of:

- **playing and exploring** - children investigate and experience things, and 'have a go'
- **active learning** - children concentrate and keep on trying if they encounter difficulties, and enjoy achievements
- **creating and thinking critically** - children have and develop their own ideas, make links between ideas, and develop strategies for doing things.

Key Stage One

The principal focus of science teaching in Key Stage One is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word-reading and spelling knowledge at key stage 1.

Lower key stage 2 – Years 3 and 4

The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

‘Working scientifically’ is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word-reading and spelling knowledge.

Upper key stage 2 – Years 5 and 6

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

‘Working and thinking scientifically’ is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell and pronounce scientific vocabulary correctly.