



Science at St Michael's

At St Michael's, we strive to promote the love of learning science and for children to understand and be curious about the science within their everyday lives. In our rapidly evolving world science is a vital part of our curriculum intention. Science stimulates and excites pupils' curiosity about phenomena and events in the world around them. It also satisfies their curiosity with knowledge. Because science links direct practical experience with ideas, it can engage learners at many levels. Scientific method is about developing and evaluating explanations through experimental evidence and modelling. Pupils learn to question and discuss science-based issues that may affect their own lives, the direction of society and the future of the world'

Intention

It is our intention that by the end of each Key Stage, each child will have an understanding of a variety of scientific concepts and be able to confidently discuss them. We aim for all children to work scientifically during lessons and work collaboratively investigating different concepts and ideas.

At Key Stage 1 pupils observe, explore and ask questions about living things, materials and physical phenomena. They begin to work together to collect evidence to help them answer questions and to link this to simple scientific ideas. They begin to evaluate evidence and consider whether tests or comparisons are fair. They use reference materials to find out more about scientific ideas. They share ideas and communicate them using scientific language, drawings, charts and tables with the help of ICT if it is appropriate.

At Key Stage 2 pupils learn about a wider range of living things, materials and physical phenomena. They make links between ideas and explain things using simple models and theories. They apply their knowledge and understanding of scientific ideas to familiar phenomena, everyday things and their personal health. They think about the effects of scientific and technological developments on the environment and in other contexts. They carry out more systematic investigations, working on their own and with others. They use a range of reference sources in their work. They talk about their work and its significance, using a wide range of scientific language, conventional diagrams, charts, graphs and ICT to communicate their ideas

Implementation

In order to allow children to reach their full potential, we cover the objectives set out in the Programmes of Study in the National Curriculum. We mix the content knowledge and investigation skills needed to solve science problems and make decisions and predictions based on what they have learned. Our lessons also allow the children to practise their maths and English whilst developing their reasoning and problem-solving skills.

In Key Stage 1 and 2 content is delivered in each year group in accordance with the National Curriculum. Teachers are able to plan units drawing upon a number of resources such as Explorify and our progressive skills, misconceptions and practical documents, which are all used and amended to meet the needs of the children. To ensure children make the necessary progress and are challenged appropriately, teachers plan enjoyable, engaging and inspiring practical activities that mean the children are working hands-on; these lessons link science concepts to everyday life so the children can understand the world around them in a scientific way. Our lessons aim to develop a child's social skills by working in teams and encourage resilience, determination, perseverance, communication, collaboration, questioning and problem-solving. We encourage children to talk like and write like a scientist by promoting vocabulary and teaching specific skills.

Impact

Through the consistent use of the progressive skills document, staff are able to assess children during lessons and at the end of a unit.

Working Scientifically:

At St Michael's we are always looking to provide the children with hands on experiments and encouraging them to think and work scientifically. This includes: making predictions, observing closely using simple equipment, answering questions and asking simple questions, recording and gathering data and carrying out a fair test.

Misconception

Animals including humans: Misconceptions		
	Misconception	Fact
Digestion	Digestion starts in the stomach	Digestion starts in the mouth – saliva (a digestive enzyme) acts on starch in food
	Digestion ends in the stomach	Digestion ends in the small intestine (carbs, proteins & fats digested)
Respiration	We breathe in only Oxygen and breathe out only carbon dioxide	We breathe in air, and this air contains more oxygen than the air we breathe out. We breathe out air and this air has more carbon dioxide than the air that we breathe in.
	Air is inhaled into lungs, then exhaled, without links to heart and circulatory system	Air in – circulated to heart then to rest of body through circulatory system
	The inability to link the need for oxygen with the use of food.	Oxygen is needed for aerobic respiration, to release energy from food in the cells
	Air tubes link the lungs and the heart	Blood vessels link the lungs and the heart
The Brain	Respiration is the same as breathing	Respiration is the release of energy from food – takes place in cells. Breathing is exchange of respiratory gases between body and surroundings.
	The brain is responsible for thinking, but not for physical actions	Different parts of the brain are responsible for cognition, emotion, personality, sensation, voluntary and involuntary movements
	Muscles and brain are not involved in digestive, circulatory or respiratory systems	The brain controls the workings of these systems. Many organs in these systems are made up of muscular tissues
The Body	Bones are not living things	Bones are living tissue which have their own blood vessels and are made of various cells, proteins, minerals and vitamins. This structure enables them to grow, transform and repair themselves throughout life.

There are certain barriers to learning science and one of them is the interference between misconceptions and scientific notions. Misconceptions are explanations about natural phenomena that we develop mainly based on our daily experiences and observations, such as the “fact” that the earth is flat. These misconceptions are generally little rigorous and, in many cases, technically wrong.

Misconceptions are remarkably persistent, because they are deeply rooted in the mental framework of the student, and a simple explanation given by the teacher, is not normally enough to carry out the conceptual change. Identifying and addressing students’ misconceptions is a key part of effective classroom practice. In order to combat this we have developed a misconception document that is used to inform planning and given to staff in order to tackle misconceptions before, during and after lessons.

Practical documents

Practical lessons give science its identity. To ensure every class in every subject has the opportunity to learn practically we have created practical documents to map out all practical lessons. Every subject for every age group has at least three practical lessons planned into its curriculum. The practical document also ensures that there is progression between year groups and they are all at age-expected standards. Within these lessons we aim to teach the main enquiry skills in order for children to become successful scientists.

YEAR 4

Enquiry skills



- 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.

Digestion

[How to model digestion using tights - BBC Bitesize](#)
[Dazzling digestion | STEM](#)

What is digestion?

Digestion is an important process in the human body. It helps us get the nutrients our body needs to stay healthy.

Digestion happens in the **digestive system**, which begins at the mouth and ends at the anus.

What nutrients does our body need?

A balanced diet provides our body with the correct amount of each food group, so that our body can function at its best.

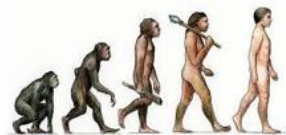




Science slam

At St Michael's we start every lesson with a science slam. The science slam allows children the opportunity to learn new vocabulary, explore, discuss new learning and tackle misconceptions.

It also incorporates a Bright ideas section which allows children time to think about new learning and link work to previous knowledge. The Bright Ideas Time is a key strategy to encourage pupils to develop their thinking through talking. It is a dedicated discussion slot –time set aside to talk about science in each primary science lesson.

Bright ideas include:

Science slam	
New vocabulary	Taxonomy <hr/> <hr/> <hr/> <hr/>
	Adaptation <hr/> <hr/> <hr/> <hr/>
	Share DNA <hr/> <hr/> <hr/> <hr/>
Bright ideas	Agree or disagree  Agree or disagree Humans descended from monkeys.
	<div>  Big question </div> <div> How have humans evolved?  </div>

Odd one out

- ▶ The pupils are shown three or four different pictures, or better if possible the actual objects, and are asked to say which one is the odd one out and why. The 'why' is key - the pupils justify their reasoning and so reveal their thinking.
- ▶ The Odd One Out is used to encourage pupils' thinking in science. The pupils are shown three or four different pictures, or better if possible the actual objects, and are asked to say which one is the odd one out and why. The 'why' is key - the pupils justify their reasoning and so reveal their thinking. The example below is from one of the project schools, Freeland Primary School, and includes a sample of the pupils' responses. There is no right or wrong answer and the children can be as creative as they wish (as long as they provide an appropriate reason). From these responses we can identify a common mis-understanding - the idea that a human is not an animal.



P M I

THE SCENARIO:

PEOPLE HAVE THEIR OWN PLANT-LIKE GREEN SKIN, SO THEY CAN CREATE THEIR OWN FOOD IN SUNLIGHT

Minus: You might not be able to lie still to sunbathe – you'd get a sugar rush and have to run around!

Positive: Poor people wouldn't starve.

Interesting: Would diabetes be a problem or not?

Interesting: Would you not need sleep?

These are obviously interesting and thoughtful responses, which show the pupils' existing understanding and also their ability to apply their understanding in a way that provokes further discussion. The teacher can decide whether these questions are pursued in this lesson or should be left for personal research. Science is a creative subject and giving the pupils time to consider different aspects of a scenario, including the 'interesting' ideas brings this to the fore – it allows their imagination to play a full part in science lessons.



De Bono (1973) and Fisher (2000) are amongst the many who have developed methods to encourage pupils' thinking. The PMI is one of these. The pupils are given a scenario - a statement - and then consider, in turn with a few minutes on each:

P: the Positives

M: the Minuses

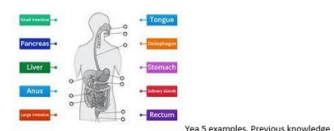
I: the Interesting associated ideas

Previous knowledge

- ▶ Preconceptions: build on the ideas that pupils bring to lessons
- ▶ Science is about how the world works and long before children start a formal education in science they build their own understanding about the phenomena that they meet on a daily basis. These preconceptions are built through sensory experiences and social interactions.



Year 6 example. Previous knowledge



Year 5 example. Previous knowledge



Year 2 example.

Tackle misconceptions

Agree or disagree-



Leaves are mainly to catch and take in water

Agree or disagree-



People need to help plants grow

Overview of the maths process at St Michael's

At St Michael's pupils have structured maths lessons

Science Slam- Vocabulary

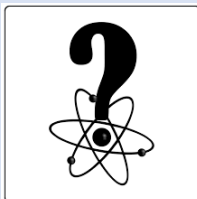
Children complete a vocabulary question associated with a previous topic.

Science Slam- Bright idea

Ten to fifteen-minute starter at the start of the lesson in order to re-visit previous knowledge, tackle misconceptions and think outside the box.



Science Slam- Big question



Provide opportunities to ask important questions and work with others to find answers.

This question provides the overview of the main teach of the day.

Main teach and Practical learning

Teachers teach the main principles of the science skill and children are given the opportunity to work practically.

Write like a scientist

'Write like a scientist' has the aim of developing subject specific writing, teaching children



Assessment

Children are assessed.

Marking and feedback

Children are given time to make corrections and are challenged through marking stickers.