Science Curriculum Statement

How is Science a Sacred Subject?

Science enables us to plummet the mysteries of the mind of the Creator of the universe and inform our world view through a deeper understanding of the inter-connectedness of all levels of creation. Scientific exploration and discovery help students to recognise their potential and responsibility through the development of humility and the dependence on their ability to discern how to make the right choices. Science encourages students to respond to the big questions of the purpose and meaning of life as it works in collaboration with other disciplines within the curriculum.

Intent

St. Mary's Catholic Primary School understands the need for all pupils to develop their Scientific ability as an essential component of all subjects and as a subject in its own right. A good understanding of scientific knowledge and conceptual understanding helps to support pupils work across the curriculum.

At St. Mary's Catholic Primary School, we promote the use of a knowledge-rich curriculum to serve key principles of cognitive science. Scientific research has shown that knowledge is essential to the development of reading comprehension and critical thinking. Research has also shown that those who are rich in knowledge gain new knowledge quicker and more effectively. We therefore place the acquisition of knowledge at the heart of the learning process.

We believe that 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.

Science in our school is about developing children's ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills. The staff at St. Mary's ensure that all children are exposed to high quality teaching and learning experiences, which allow children to explore their outdoor environment and locality, thus developing their scientific enquiry and investigative skills. They are immersed in scientific vocabulary, which aids children's knowledge and understanding not only of the topic they are studying, but of the world around them. We intend to provide all children regardless of ethnic origin, gender, class, aptitude or disability, with a broad and balanced science curriculum.

Implementation

In ensuring high standards of teaching and learning in science, we implement a curriculum that is progressive throughout the whole school.

Planning for science is a process in which all teachers are involved to ensure that the school gives full coverage of, 'The National Curriculum programmes of study for Science 2014' and, 'Understanding of the World' in the Early Years Foundation Stage. Science teaching at St. Mary's Catholic Primary School involves adapting and extending the curriculum to match all pupils' needs. Where possible, Science is linked to class topics, but is taught as discrete units and lessons, once a week for up to two hours. We ensure progression and the thorough coverage of the objectives by using a scheme of work (Plan Bee) that we have tailored to suit the needs of the school.

We ensure that all children are provided with rich learning experiences that aim to:

- Prepare our children for life in an increasingly scientific and technological world today and in the future.
- Help our children acquire a growing understanding of the nature, processes and methods of scientific ideas.
- Help develop and extend our children's scientific concept of their world.
- Build on our children's natural curiosity and developing a scientific approach to problems.
- Encouraging open-mindedness, self-assessment, perseverance and developing the skills of investigation: observing, measuring, predicting, hypothesising, experimenting, communicating, interpreting, explaining and evaluating.
- Develop the use of scientific language, recording and techniques.
- Develop the use of computing in investigating and recording.
- Make links between science and other subjects.
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At. St. Mary's we have also developed scientific vocabulary tasks, which are completed both at the beginning (pre-learning task) and end (post-learning task) of a topic in order to show clear progression and children's new found knowledge and understanding. These tasks also enable the children to articulate scientific concepts clearly and precisely, assisting them in making their thinking clear, both to themselves and others. Where appropriate school trips and visits from experts will also enhance the children's learning experiences.

Science Overview

Year 1	My Body	Identifying animals	Everyday materials	Identifying Plants	Seasonal changes
Year 2	Exploring Everyday Materials	Growth and survival	Super Scientists	Living in Habitats	Growing Plants
Year 3	Rocks, Fossils and Soils	Light and Shadow	How Plants Grow	Forces and Magnets	Health and Movement
Year 4	Circuits and Conductors	Changing Sound	States of Matter	Eating and Digestion	Living in Environments
Year 5	Life Cycles	Classifying Organisms	Properties and Changes of Materials	Earth and Space	Forces in Action
Year 6	Changing Circuits	Seeing Light	Healthy Bodies	Evolution and Inheritance	Changes and Reproduction

EYFS

The teaching of Science is practical, playful and inclusive with support and challenge from adults in class sessions, small groups and through working with individuals. There is a combination of adult-led, teacher taught sessions as well as a wealth of stimulating continuous provision opportunities when adults scaffold learning through skillful interactions and questioning. The links to science are made through the texts shared with the children with the focus being on gaining knowledge and understanding of the world around them.

Career Professional Development

We develop strong subject knowledge amongst all staff which is achieved through: comprehensive middle leadership development, a focus on developing all teachers' subject knowledge, science pedagogy and the provision of high-quality planning resources. Links are made with Christ the King Catholic Collegiate to share resources and knowledge.

Teaching Style

Excellent teaching, within St. Mary's Catholic Primary School, is based upon two key principles: research on the classroom practices of master teachers and research on cognitive supports to help pupils learn complex tasks. The child is encouraged to engage head, heart and hand, the 3 domains to learning are the emotional, the social and the cognitive. In addition to this, staff use an enquiry based approach with the use of a 'hook' to draw children into the lesson. We consider these enquiries/questions and allow the children to discuss them in depth. This allows them to challenge their own ideology and build greater recognition. Through such discussions, St. Mary's enhances the children's thinking and communication skills, boosts their self-esteem, and improves their academic attainment; focusing on the enquiries with lenses of critical, caring, collaborative and creative thinking. The children are comfortable with epistemic uncertainty because they understand that the dilemma is more important than being right.

Quizzing

At the start and end of each unit, the children will be asked to define key vocabulary for that area. This is to help to embed the terminology a well as develop a better understanding. There will also be a quiz about the unit that the children answer before they begin learning about that unit and then again at the end of the unit to monitor progress. The benefit of retrieval practice is one of the most robust findings in cognitive psychology (Roediger & Karpicke, 2006; Storm, Bjork & Storm, 2010). Low-stakes multiple choice quizzes are efficient, effective and motivating for pupils, whilst providing teachers with vital information about what pupils have misunderstood, and/or what they are struggling to remember. These questions can be easily recycled, utilising the spacing effect to ensure content is retained for the long term instead of being forgotten soon after the lesson or unit has ended. We believe that regular low stakes testing/quizzing helps and it is better if that testing is spaced or looped. We know that interleaving information - interrupting it with unrelated information but then coming back to its original focus of study – seems to be effective. It is more effective when it is interleaved with material that is in some way conceptually or thematically connected. Therefore, the children will be given a 'cold' quiz at the start of the unit and the same quiz will be repeated at the end of the unit to show progress made.

Lesson Plans

Each unit consists of five to seven, carefully sequenced 'knowledge lessons', which can be contrasted with popular but ultimately less effective 'discovery-based' lessons described by Kirschner, Sweller and Clark (2006) as 'minimally guided instruction'. In line with findings from cognitive load theory (Baddeley & Hitch, 1974; Baddeley 1986; Rosenshine 2012; Sweller, 1988) lessons are chunked into small sessions of explicit teaching followed by regular opportunities for all children to think, apply and practice key skills and knowledge.

Flipcharts

Each lesson includes a slide show to support the teacher in delivering the content of the lessons clearly and precisely. The slides aid pupil memory by making effect of 'dual coding' (Paivio 1986; Mayer & Moreno, 2003). Dual coding can improve the absorption of new knowledge without increasing pupils' cognitive load, with the benefits of receiving explanations through both visual and auditory channels being well established in research literature.

Cross Curricular

Wherever possible, the Science Curriculum will be enhanced by interweaving content through other subjects. To understand the world in which we live in, pupils will have a secure understanding of how different scientific processes happen and why.

SEND/ Disadvantaged

At St Mary's, it is our firm intention for all our pupils to access the full Science curriculum. All teaching staff will support and facilitate access to the curriculum by adaptive teaching, adult support, and appropriate choice of equipment as necessary. There is a wide range of capability and confidence across the school; tasks and activities are designed to allow pupils to engage at their own level and make appropriate progress

Assessment

- At the start of each unit, a vocabulary sheet will be stuck into the children's science books. The vocabulary will be the key words for each topic that the children should learn. As a form of assessment, the children write down what they think the meaning of the word is and then return back to this sheet at the end of the unit to write down what the word actually means.
- There will be a quiz about the unit that the children answer before the unit is taught and then again at the end of the unit to monitor progress (scores to be recorded on a class sheet on Staffshare under science assessment).
- Due to the nature of Science, it is important to be practical where ever possible and for the children to be hands on, therefore there is not the expectation that work will be recorded formally each week. Instead, where practical work takes place, photographs will be taken and a class pic collage with annotations will be kept as evidence. Children will be expected from year 2 upwards to write about their findings from investigations and will be assessed against the National Curriculum objectives. The children's knowledge is to be assessed at the end of each unit with an end of unit quiz and also an investigation to show their working scientifically skills. The assessment activity will be based on a key question arising out of the topic and will be assessed based on TAPS. This will be recorded on the class record sheet which will be kept in the class science folder. The sheet is to be highlighted as follows: green exceeding the year group objectives, yellow in line with the year group objectives and red working towards the year group objectives.

To further show the children's understanding at the end of each unit, there will be a 'Big Question' for the children to answer to show their knowledge of the subject and also how they have linked in the working scientifically skills. An electronic copy of assessments will be stored on the Staff Share under 'SCIENCE ASSESSMENT'.

Oracy within Science

Through our Science curriculum, pupils have opportunities to develop their oracy skills by:

- Asking questions in Science.
- Using key words.
- Promoting small group discussion.
- Generating discussions and argument through use of Concept Cartoons.
- Engaging in structured debates.
- Relating new learning to relevant real-world contexts.
- Formulating and refining questions and lines of enquiry.

Impact

The impact and measure of this is to ensure children not only acquire the appropriate age related knowledge linked to the science curriculum, but also skills which equip them to progress from their starting points, and within their everyday lives.

All children will have:

- A wider variety of skills linked to both scientific knowledge and understanding, and scientific enquiry/investigative skills.
- A richer vocabulary which will enable to articulate their understanding of taught concepts.
- High aspirations, which will see them through to further study, work and a successful adult life.