

Bitterne C of E Primary School



Policy for Science

Headteacher: Andy Peterson

At Bitterne CE Primary, we encourage children to be inquisitive throughout their time at the school and beyond. The Science curriculum fosters a healthy curiosity in children about our universe and promotes respect for the living and non-living. We believe science encompasses the acquisition of knowledge, concepts, skills and positive attitudes. Throughout the programmes of study, the children will acquire and develop the key knowledge that has been identified within each unit and across each year group, as well as the application of scientific skills. We ensure that the Working Scientifically skills are built-on and developed throughout children's time at the school so that they can apply their knowledge of science when using equipment, conducting experiments, building arguments and explaining concepts confidently and continue to ask questions and be curious about their surroundings.

Reviewed by	Leadership Team and Full Governing Board	Authorised by	Leadership Team
Last Review	October 2021	Subject Lead	Emma Braggins
Next Review	October 2024	Review Cycle	Every 2-3 years (or sooner if required)
Signed for Governors:			Amanda Humby, Chair of Governors

The Nature of Science in Primary Schools

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.

(An extract taken from the new primary National Curriculum, 2014)

The Nature of Science in Bitterne CE Primary

At Bitterne CE Primary School, we facilitate the children's enquiry of Science through the school's Christian values of Love, Trust and Forgiveness. Our vision is to distil a lifelong love of science within our pupils, we want them to be inquisitive, explore and question the world around them. Science has changed our lives and is vital to the world's future prosperity.

We foster a love of science by building upon the learning and skill development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence. Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.

Trust, is embedded when we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning, so that all children make good progress.

Through forgiveness, children learn that practice and mistakes are part of the learning process and that no matter the result, this learning and any errors can be used to build upon or develop new ideas for their own scientific enquiry.

The National Curriculum

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

Key Stage 1

The principal focus of science teaching in key stage 1 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. Additionally, pupils 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.

Lower Key Stage 2

The principal teaching 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 way 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. Pupils at this stage should also draw simple conclusions and use some scientific language, first, to talk about and, later, to discuss what they have discovered.

Upper Key Stage 2

The principal focus of teaching science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, pupils should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should additionally 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. Moreover, pupils should draw conclusions based on their data and observations, use evidence to justify ideas, and use their scientific knowledge and understanding to explain their findings.

The key principle of science in the Early Years Curriculum – ‘Understanding of the world’

Science at this stage of primary education is based on children’s *understanding of the world*. Pupils in Reception year learn about similarities and differences in relation to places, objects, materials and living things. In addition, they talk about the features of their own immediate environment and how environments might vary from one another. Pupils at this stage of the curriculum also make observations of animals and plants. What is more, they begin to explain why phenomena occurs, and talk about changes which they experience.

What science looks like in the Early Years Curriculum?

The learning of science in Early Years is hugely practical and interactive. Teachers in Early Years facilitate the learning via the use of an investigation area. This area is updated regularly throughout the year. The topic of learning can be based on the season of the year. For example, in autumn, there might be a woodland tray full of fir cones, sycamore leaves and conkers for pupils to explore. The learning of science in the investigation area is wholly pupil-led. Assessment is captured by teachers making observations of children using and applying scientific knowledge and understanding to describe occurrences, explain why these occurrences have happened and be able to discuss any physical changes that they may have noticed.

Working Scientifically

'Working scientifically' is essentially the methods and processes of scientific enquiry. It must **always** be taught and clearly related to the teaching of **every** science unit in the programme of study. These core skills should be threaded through the learning of **every** lesson so that children are "working as scientists" in all lessons. The "working scientifically" strand equates to 50% of the weighting of science assessment in the new curriculum so this component of the curriculum is vitally important in the progress of pupils in primary science.

Links Across the Curriculum

Science has many strong links with other subjects as well as constantly reinforcing children's basic skills. It develops many of the skills used in literacy such as reading, writing, speaking and listening. Children enhance their mathematics skills by developing their ability to problem solve, measure, and represent and analyse information. Children use ICT whenever appropriate in science lessons. This includes using computers, tablets, cameras and movie creators. Science makes a significant contribution to CPSHE. It raises matters of citizenship, welfare and provides opportunities for debates and discussions.

Links to Personal Development

- **Spiritual development:** Science supports spiritual development by providing many opportunities for children to think and spend time reflecting on the amazing wonders which occur in our natural world.
- **Moral development:** Science supports moral development by showing children that different opinions need to be respected and valued. There are many moral and ethical issues that we cover in science including discussions about environmental and human issues.
- **Social development:** Science supports social development by exposing children to the power of collaborative working in the science community which has led to some amazing and life changing breakthroughs in medicine. When undertaking experiments and research children work collaboratively.
- **Cultural development:** Science supports cultural development by looking at how scientists from a range of cultures have had a significant impact globally. It also helps children to understand how important science is to the economy and culture of the UK.

Links to English

Science contributes significantly to the teaching of English at Gresham by actively promoting the skills of thinking, reading, writing, speaking and listening. The children develop oral skills in science lessons through discussions and through recounting their observations of scientific experiments. They develop their writing skills through writing reports and projects and by recording information. Children should be introduced to new words and phrases in a progressive way across the school. same standard as the writing in English books. Please refer to the English Policy for further information.

Links to maths

Science contributes to the teaching of mathematics in a number of ways. The children use weights and measures and learn to use and apply number skills. Through working on investigations, they learn to estimate and predict. They develop the skills of accurate observation and recording of events. They use numbers in many of their answers and conclusions.

Links to Computing

Children use computing in science lessons where appropriate. They use it to support their work in science by learning how to find, select, and analyse information on the internet. Children use computers to record, present and interpret data and to review, modify and evaluate their work and improve its presentation.

Links to Personal, social and health education (PSHE) and citizenship

Science makes a significant contribution to the teaching of personal, social and health education. This is mainly in two areas. Firstly, the subject matter lends itself to raising matters of citizenship and social welfare and healthy eating and exercise. Secondly, children benefit from the nature of the subject in that it gives them opportunities to take part in debates and discussions. Science promotes the concept of positive citizenship.

Inclusion in Science

The school uses a variety of teaching and learning styles in science lessons. Our principal aim is to develop the children's knowledge, skills and understanding. We do this through a mixture of whole-class teaching and individual / group activities. Teachers encourage the children to ask as well as answer scientific questions. The children have the opportunity to use a variety of secondary sources of information, where it will enhance learning as well as gaining first hand experiences, for example, the use of books, photographs, graphs, diagrams, models and ICT.

We recognise the fact that we have children of differing scientific ability in all our classes and so we provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child. We achieve this in a variety of way by:

- Setting common tasks that are open-ended and can have a variety of responses
- Setting tasks of increasing difficulty (we do not expect all children to complete all tasks)
- Grouping children by ability and setting different tasks for each group
- Providing a range of challenges with different resources
- Using additional adults to support the work of individual children or small groups
- Incorporating high order questions that apply to scientific thinking to extend the most able children in science

Inclusion of SEND in Science

At Bitterne CE Primary all children have an entitlement to a broad and balanced curriculum, which is differentiated to enable our children to:

- Understand the relevance and purpose of all learning activities; ·
- Experience levels of understanding and rates of progress that bring feelings of success and achievement; · maximise achievement for all pupils, including pupils with Special Educational Needs and Disabilities (SEND) and children whose first language is not English, by addressing barriers to learning.
- Staff at Bitterne CE Primary consider that pupils have different educational and behavioural needs and aspirations; require different strategies for learning; acquire, assimilate and communicate information at different rates; and need a range of different teaching approaches and experiences.

In science, staff make appropriate curricular provision to respond to children's needs by: -
planning for all children's full participation in learning. This includes making sure that practical lessons are accessible by all children including those with physical disabilities; -

- differentiating teaching and learning to recognise individual needs;
- Providing support for children who require it to access the curriculum through pre-teaching key scientific vocabulary or concepts prior to lessons or through targeted adult support with lessons; -
- Considering the specific needs of pupils with SEND and the targets set for them as identified in their Pupil Profile, Individual Education Plans or Education, Health and Care Plans. Work towards key targets set for children on their Independent Education Plans, such as letter formation/punctuation targets or turn taking/communication targets, can be addressed through the context of science. This may be through written elements for example, investigation write ups, or through practical investigations and partner work where the skills of communication and co-operation are vital;
- Using resources effectively to support all learners, including those with SEND. This may include using writing frames to support children with SEND to complete write ups for investigations, using alternative methods of recording children's responses e.g. recording on an iPad or using specifically adapted resources
- Seeking advice from the subject leader and the SENDCOs to meet the needs of all pupils.

For children in the Shooting Stars group, the curriculum overview provides opportunities for children to develop their Scientific knowledge and vocabulary at a level appropriate to their development. Teachers liaise with the Shooting Stars Lead to ensure learning can be reinforced back in the classroom.

For children in the Woodlands nurture group, the curriculum is adapted to teach children the knowledge of Science that they require in the context of the setting. Phrases and vocabulary is modified according to the topics covered within Woodlands and appropriate for their development. Teachers continue to liaise with the Woodlands Lead to ensure skills are transferred and reinforced back in to the classroom.

Inclusion of Greater Depth in Science

All children in Science should have the opportunity to be challenged and extended regardless of their ability. Those working at a more able or a 'Greater Depth' level should be catered for and provided with extra opportunities to extend their learning whilst learning new skills and techniques. We set high expectations from the outset which challenges pupils to think 'is this my best work?' Then teach children how to reflect, explain, justify and question are key to lesson design. Children must be able to explain how they know they are right. They may need guiding to get there with careful questioning, but they must always be using a correct scientific vocabulary. Having opportunities to collaborate. When children are in groups they have opportunities to generate endless lines of enquiry. They are able to question each other effectively and challenge ideas. Finally, we plan to give children an opportunity to show their learning in a variety of ways, different types of tasks may be created that prove to the teacher that pupils are gaining a deeper understanding of the same content.

Planning for Science

Planning begins from a thorough understanding of children's needs gathered through effective and rigorous assessment and tracking, combined with high expectations and ambition for all children to achieve. Medium term planning will outline the areas of science that will be taught during the term to ensure coverage of the National Curriculum.

Within short term planning, clear success criteria for each learning objective taught should be created – demonstrating the progression needed to reach and exceed the objective. This will

enable the class teacher to follow a clear and systematic teaching sequence, where input and activities are differentiated by considering which parts of the success criteria individual children are ready for.

Where children are working significantly above or below the objective the majority of the class need to work towards, and where extending this by expanding the success criteria seems inappropriate, objectives should be adapted in order to meet the individual's needs, including providing scaffolding to allow children to achieve objectives or by allowing children to research challenging key questions or enquiries independently to allow them to develop mastery of the objective.

Planning should involve real life contexts for science, where children are investigating scientific question with a real purpose in mind, appropriately linked to the creative curriculum topic.

Enquiry-based learning should permeate the scientific knowledge and understanding being developed by the teacher, as it gives life and sustenance to learning new knowledge and developing understanding in every area of the primary science curriculum. It should be the driving force of scientific learning, teaching and assessment, enabling children to be far more independent and scientific in their thinking and approach to science and ultimately leading to the development of in-depth scientific understanding in all areas of the subject.

Class teachers should regularly plan for opportunities for children to apply their scientific skills to different areas within science lessons and across the curriculum. This will also allow children to revisit, practice and consolidate different areas of science and apply them within different contexts.

Pre and post assessment

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.

Teacher assessments should take place at the beginning and end of each unit of work. The pre-assessment **could** take the form of a blank concept mind-map bubble, where children specify what they already know in one colour and add what they have learnt over the course of the unit in another colour. Or alternatively, it **could** take the form of a scientific diagram which can be completed at the beginning and then the end of the unit to demonstrate progress in scientific understanding. The post-assessment should consider the children's investigative skills and their knowledge and understanding of the subject matter through what they have learnt in each lesson.

Teachers should use the information in the pre-assessment to analyse strengths and weaknesses of the pupils so that planning can be adapted and learning is made appropriate and challenging to meet the needs of all children. The post assessments should be recorded and kept as evidence to track the progress of children throughout the year and used as information for reports to parents at the end of each school year.

Regarding attainment, teachers are expected to use Target Tracker to assess children as either: well below expected/below expected/at expected or above expected for both the knowledge and skill strands of the curriculum. For the 'skills' half of the curriculum, children are assessed against one of three bands based on their age. Children who are in years 1 and 2 are assessed against the KS1 working scientifically skills; children who are in years 3 and 4 are assessed against the lower KS2 skills; and, children who are in years 5 and 6 are assessed against the upper KS2 skills.

In between the pre- and post-assessment stages of the learning journey for each unit of work, all teachers should apply the school's marking policy of – Tick and Tip – to ensure that all children receive the necessary feedback they need in order to make progress.

Marking and feedback

Science work should always be marked in accordance with the Feedback Policy. There should be evidence of verbal feedback, self/peer marking or a tick, tip and time given for talkback activities to respond to the marking. The tip should be the next step to improve the Science work and should be linked to the learning intention and success criteria. Please refer to the Feedback Policy for further information.

Leadership of Science

[Please see the Curriculum Leadership Overview for full details of the Subject Leader's role and how this relates to the wider Leadership structure].

The Science subject leader should:

- Monitor the effectiveness of Science teaching and learning by means of lesson observation, pupil interviews, learning walks, sampling children's work and overseeing assessment
- Provide feedback to teaching staff and the headteacher
- Periodically update the whole school planning overview (in consultation with all teaching staff) to ensure it remains relevant and appropriate.
- Attend subject leader network meetings and disseminate new information
- Support teachers in planning and delivering the curriculum
- Manage the resources for teaching Science
- Report to the Governing Body as requested.

Monitoring Science

Science will be monitored regularly by the subject lead to make sure that the subject is being taught effectively across the school, and know where support may be needed. The Science leader will monitor the subject in a variety of ways including:

- Pupil conferencing where they talk to children from different year groups
- Quality assuring where they may see what skills the children have learnt from their units by working with children on small tasks
- Book scrutinise to look at the work within science books (KS2) and topic books (KS1)
- Planning reviews
- Observation of lessons
- Staff questionnaires
- Teacher interviews
- Photo capture of work displayed around the school
- Discussions with cluster schools
- Evaluating the science RAP
- Checking learning against the progression of skills and curriculum overview.

Science will also be monitored by the Science Link Governor with whom the subject lead will communicate and feedback to about how art learning is progressing over the year.

This policy will be reviewed every 2 years or sooner as appropriate

