# Bill Quay Primary School

# Science Policy

**1. Science Statement**

**Intent**
Science teaches an understanding of natural phenomena. It aims to stimulate a child's curiosity in finding out why things happen in the way they do. It teaches methods of enquiry and investigation to stimulate creative thought. Children learn to ask scientific questions and begin to appreciate the way science will affect their future on a personal, national, and global level.

The 2014 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 skills required to understand the uses and implications of science, today and for the future. We understand that it is important for lessons to have a skills-based focus, and that the knowledge can be taught through this.

At Bill Quay Primary School, we encourage children to be inquisitive throughout their time at school. 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 acquire and develop the key knowledge (substantive knowledge) that has been identified within each unit and across each year group, as well as the application of scientific skills (disciplinary knowledge). 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.

**Implementation**
Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all pupils are capable of achieving high standards. Our whole school approach to the teaching and learning of science involves the following:

- Weekly science lessons which are taught by the class teacher. All work completed is recorded in a specific science jotter or within a class floor book in EYFS and Year 1 when required.

- Progressive planning which involves problem solving opportunities allowing children to apply their knowledge, and find out answers for themselves. Children are encouraged to ask their own questions and are given opportunities to use their scientific skills and research to discover answers. This curiosity is celebrated within the classroom. Planning involves engaging lessons, often including resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess pupils regularly to identify those children with gaps in learning, so that all pupils keep up.

- We build upon the knowledge and skill development of the previous years by initially finding out what the children already know at the start of a topic through a pre-assessment. This is carried out using specific questioning linked to the previous year's teaching and/or through the use of KWL grids. Teachers use the progression of skills from previous years for each science topic, in order to support this. 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 they are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through the use of science knowledge organisers and direct teaching. This is developed through the years, in-keeping with the topics.

- Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills, in order to embed scientific understanding. Teachers find opportunities to develop children's understanding of their surroundings by accessing outdoor learning and workshops with experts.

- Science Week allows all pupils to come off-timetable, to provide broader provision and the acquisition and application of knowledge and skills. This event is focussed around a whole-school theme and provides pupils with the experience of meeting real-life scientists from various scientific fields.

**Impact**
This approach at Bill Quay Primary School results in a fun, engaging, high-quality science education, that provides children with the foundations and knowledge for understanding the world.

**2. Teaching and learning**
We feel that science is taught well when:

- Children apply their 'working scientifically skills' to solve problems, explore, observe and investigate

- Children ask questions and work together to discover the answers

- Science has a wow factor and promotes a sense of awe and wonder

- Learning is enhanced by outdoor teaching, specialist visitors and access to quality resources

- Children are involved in creating and carrying out investigations and can share and explain ideas and conclusions

- Children are encouraged to ask their own questions and are given opportunities to use their scientific skills and research to discover the answers (this curiosity is then celebrated within the classroom)

- Teachers ask a range of questions which enable all children to take part, listening carefully to answers and taking learning forward, using open and closed questions and allowing children time to think

- Planning involves engaging lessons, often including quality resources to aid understanding of conceptual knowledge

- Teachers use precise questioning in class to test conceptual knowledge and skills, and assess pupils regularly to identify those children with gaps in learning, so that all pupils keep up

- Lessons begin with a recap of previous learning to embed the substantive knowledge taught so far. Low-stakes quizzes help to reinforce this knowledge.

- New vocabulary and challenging concepts are introduced through science knowledge organisers and direct teaching- this is developed through the years, in-keeping with the topics

- Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career; the key knowledge for each topic and across each year group is mapped across the school and checked at the end of each science topic

**Scientific knowledge and conceptual understanding**
The programme of study describes 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. Children's starting points are identified at the beginning of each science topic and the children are able to convey and record what they know already. At the end of the block, children's knowledge is checked in line with the key knowledge identified prior to the teaching block. 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 and teachers ensure that this is developed within each lesson and throughout each science topic. The science curriculum ensures that children are provided with regular opportunities to apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data.

**The nature, processes and methods of science**
Working scientifically specifies the understanding of the nature, processes and methods of science for each year group and this is embedded within lessons and focuses 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 include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations) and researching using secondary sources. Pupils are given the opportunity to seek answers to questions through collecting, analysing and presenting data.
Spoken language
The national curriculum for science reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. At the start of

each new science topic, we provide each child with a science knowledge organiser which includes all the vocabulary linked to that unit. Science lessons also provide a quality and variety of subject specific language to enable the development of children's confident and accurate use of scientific vocabulary and their ability to articulate scientific concepts clearly and precisely. They are encouraged and assisted in making their thinking clear, both to themselves and others, and teachers ensure that pupils build secure foundations by using discussion to address misconceptions.

**3. Assessment**

Children's progress is continually monitored throughout their time at Bill Quay Primary School and is used to inform future teaching and learning. 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 as set out in the National Curriculum. These are set out as statutory requirements.

Children receive effective feedback through teacher assessment, both orally and through written feedback. Teachers use questioning within their feedback to further assess a child's understanding of the learning and to address any misconceptions. Concept cartoons are used to aid assessment of a pupil's knowledge and understanding as well as low-stakes quizzes throughout the topic.

Assessment for learning is continuous throughout the planning, teaching and learning cycle. However, children are more formally assessed half termly in KS1 and KS2 using a variety of methods:

● Observing children at work- individually, in pairs, in groups and in classes.

● Questioning- talking and listening to children.

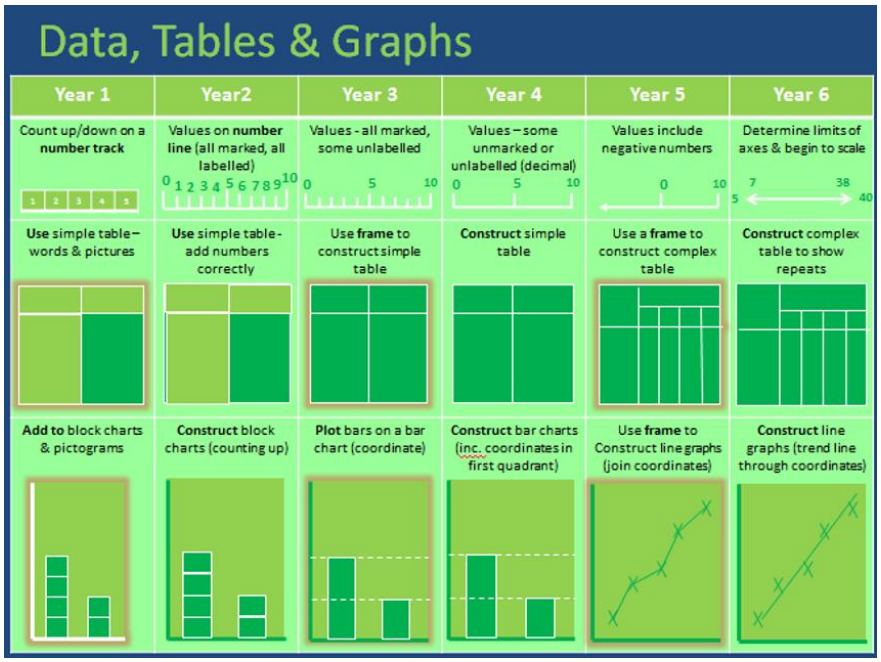
● Considering work/materials /investigations produced by children together with discussion about this with them. Children identify what they know already about each topic, as well as what they would like to know. The programme of study is responsive to the children's starting points, as well as their specific interests. It also ensures a focus on the key identified substantive knowledge of each topic, which is mapped within and across year groups to ensure progression. At the end of each blocked science topic, this key knowledge is checked. Outcomes of work also evidence its acquisition.

In EYFS, we assess the children's Understanding of the World according to the Development Matters statements, Characteristics of Effective Learning and some aspects of Expressive Arts Design are also science based.

**4. Planning and Resources**

Planning sets out the key knowledge and skills of each science topic and is informed by the Associate of Science Education's 'Planning Matrices'. Lessons are broken down into small manageable chunks with plenty of opportunities to reinforce previous learning in order to embed substantive knowledge into the children's long-term memory. Explorify, Tig-Tag World and Concept Cartoon resources are used to supplement the teaching and learning. Every lesson within each topic has been carefully considered and planned by the science leader to ensure that the progression of knowledge and skills across the school has a clear pathway. This also

includes the types of data, tables, charts and graphs which children are expected to use in order to record their results.




Further evidence of 'good science' taking place in classrooms includes:

- an active learning environment, showcasing key vocabulary and the scientific skills and lines of enquiry which have been covered during each science topic coverage.
- children being encouraged to ask and answer questions and discuss their work and ideas.
- children devising and conducting their own investigations within the context of the relevant curriculum content, as well as being given opportunities to develop their working scientifically skills.
- children recording their findings in a variety of ways.
- children showing enjoyment in the activities they are undertaking.
- the cross curricular teaching of science.

We have sufficient, high-quality science resources to aid and support the teaching of all units and topics taught, from EYFS to Y6. We keep KS1 and KS2 resources in a central store, where they are labelled and easily accessible to all staff. EYFS have a range of resources kept in their own central cupboard, for simple access for children during exploration. The library contains a good supply of science topic books to support children's individual research. Within the classroom reading areas, appropriate science books are available for children to access and use in order to further their own knowledge and understanding.

**5. Organisation (e.g. blocks or weekly lesson)**

Science is taught in weekly science lessons by the class teacher. The topics for each year group are set out as detailed below.

Science Long Term Overview 2021-2022

| Year Group | Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
|---|---|---|---|---|---|---|
| 1 | Seasons - Ongoing - Science table linked to each season and weather station to be completed each day. 10 minutes per day plus cross curricular activities linked to art, geography and maths | | | | | |
| | Animals – Our body; different animals 13 sessions | | Everyday Materials – 10 sessions | | Plants – 12 sessions | |
| 2 | Uses of everyday materials – 12 sessions | | Animals – Growth and health – 8 sessions | Plants – 10 sessions | | Living Things and their Habitats – 8 sessions |
| 3 | Rocks – 6 sessions | Animals – nutrition and muscular/skeletal systems – 6 sessions | Forces and Magnets – 6 sessions | Light – 6 sessions | Plant – growth and Transport – 6 sessions | Plant - reproduction – 4 sessions |
| 4 | Plants – growth and transport from Year 3. 4 sessions. | Animals – digestion, teeth and food chains – 7 sessions | Electricity – 6 sessions | States of Matter – 6 sessions | Sound – 6 sessions | Living Things Classification and habitats 6 sessions |
| 5 | Earth and Space – 7 sessions | Forces – gravity, air resistance, levers – 6 sessions | Properties and changes of materials – 8 sessions | | Living Things - Life cycles and reproduction – 6 sessions | Animals – Body Changes - 6 sessions |
| 6 | Electricity 7 sessions | Animals – circulation 7 sessions | Living things – classification and micro-organisms – 6 sessions | Rocks and fossils – 2 sessions | Evolution and Inheritance – 6 sessions | Light – 6 sessions |

Key:

Biology strand
Chemistry strand
Physics Strand

## 6. EYFS

The Foundation Stage deliver science content through the 'Understanding of the World: the natural world' strand of the EYFS curriculum. This 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. Within this area of learning, children are introduced to new vocabulary through discussion and stories. Quality fiction and non-fiction texts as well as nursery rhymes and songs provide a stimulus for children in EYFS to learn about the natural world. Pupils are assessed according to the Development Matters attainment targets.

## 7. 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 are encouraged to be curious and ask questions about what they notice. They are 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 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 is done through the use of first-hand practical experiences, but there is also 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. This is therefore included

in the planning used within each unit of work where substantive and disciplinary knowledge are taught in conjunction with each other.
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**
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 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 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 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. This is therefore included in the planning of each unit of work, where substantive and disciplinary knowledge are taught in conjunction with each other.

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

**Upper Key stage 2**
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 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 encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They also begin to recognise that scientific ideas change and develop over time. They 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. Within Year 6, children begin to create hypotheses to test. Pupils 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. This is therefore included in the planning of each unit of work, where substantive and disciplinary knowledge are taught in conjunction with each other.

Pupils read, spell and pronounce scientific vocabulary correctly.

**8. Equal Opportunities (e.g. Gender, race)**
At Bill Quay Primary School, we are committed to providing all children with an equal entitlement to scientific activities and opportunities regardless of race, gender, culture or class.

**9. Inclusion (e.g. EAL/SEN/PPG/Provision for HA)**
In school, we aim to meet the needs of all our children by providing a variety of approaches and tasks appropriate to ability levels. This may come in the form of additional support within the lesson from the teacher or teaching assistant. It could also mean alternative forms of recording are used for particular children or groups of children. This involves providing opportunities for SEND children to complete their own projects, with support, to develop speech and language skills, as well as scientific skills and knowledge. This enables children with learning and/or physical difficulties to take an active part in scientific learning and practical activities and investigations and to achieve the goals they have been set. Some children require closer supervision and more adult support to allow them to progress whilst more able children are extended through differentiated activities. By being given enhancing and enriching activities, more able children are able to progress to a higher level of knowledge and understanding appropriate to their abilities.

**10. The role of the science co-ordinator**
It is the responsibility of the subject leader to monitor the standards of children's work. The subject leader is also responsible for supporting colleagues in their teaching, for being informed about current developments in the subject, and for providing a strategic lead and direction for science in the school. The subject leader monitors the budget, resources, science topics and books trips and workshops to support learning. The subject leader has specially-allocated time for fulfilling the task of reviewing samples of children's work, training, liaising with other subject leaders from other schools and organising science week.