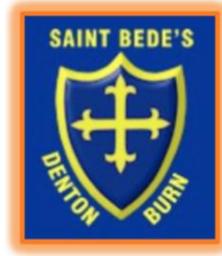


St Bede's RC Primary School

Science Policy



Science Principles

- ★ Wonder
- ★ Questions
- ★ Experiments
- ★ Hands on
- ★ Explore
- ★ Alive
- ★ Inspire

Science Vision

Science is everywhere and we use it daily. Through science we encounter new experiences and develop our knowledge and understanding of the amazing things around us. Science allows us to learn about ourselves, find out how things work and to **explore** and discover our world. Science never sleeps; it is continually evolving and it **inspires** us. Advancements in science give us hope for the future in fields such as medicine, technology and environmental protection. Scientific developments shape our world and lead to new ways of living. Science is exciting, engaging and a source of awe and **wonder**.

Science at St Bede's is explorative and investigative with practical, **hands on** learning at its core. We create opportunities to test theories, to debate and discuss, to plan and to predict. Through varied experiences, good quality resources, demonstrations and **experiments**, science helps us to find results and answers to our own **questions**. It gives us 'reasons why', stimulates questioning and helps to develop enquiring minds; it ignites curiosity and leaves us wanting to find out more. Children should be able to confidently explore what interests them and what is relevant to their daily lives. We look to facilitate investigations which are shaped or led by children, support children to work collaboratively in groups and to conduct their own research. We want children to experience the joy of science, to be adventurous and inquisitive, to extend their scientific knowledge and to deepen their wealth of vocabulary. We want children to be equipped with the skills needed to navigate an ever-changing world, such as: observation, communication, reasoning, adaptive thinking, problem solving and teamwork; and to leave our school with big aspirations and broad horizons.

We seek to promote and advance science by ensuring teachers have strong subject knowledge and access to quality resources and equipment. To provide further interest and variety we enrich our learning in science via focus weeks, visitors to school, cross-phase activities and links with external agencies and other schools. The future of science at St Bede's is to be evermore **alive**, evermore practical and evermore engaging.

Written collectively by St Bede's teaching staff, 2019

The National Curriculum 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.

Our Aims

- ★ to encourage the development of positive attitudes, enjoyment and interest in science
- ★ to help children acquire a growing knowledge and understanding of scientific ideas
- ★ to allow children to make sense of the world around them and apply science in everyday life including current issues
- ★ to equip children with vital life skills to thrive in a constantly changing world
- ★ to help children realise opportunities brought about by technology
- ★ to increase our pupils' science capital
- ★ to help pupils make informed decisions as scientifically literate members of society
- ★ to promote concern, care and respect for the environment
- ★ to promote healthy lifestyles
- ★ to promote creativity and curiosity
- ★ to introduce pupils to the language and vocabulary of science

Our Approach to Science

- ★ to teach science through practical activities and enquiries
- ★ to actively teach working scientifically skills
- ★ to give children experience of all five enquiry types
- ★ to encourage children to ask and answer their own questions and to lead their own enquiries
- ★ to maximise cross-curricular links with other subjects: art, design technology, geography, PE, computing, history, maths and English.
- ★ to use science to explore social and moral questions e.g issues relating to evolution or the effects of smoking
- ★ to use IT where appropriate
- ★ to use the school's network to share science resources and planning - in the folder 'Science is a Core Subject'
- ★ to plan opportunities for outdoor learning
- ★ to plan one educational visit per year which is science based

Entitlement

Science should be taught for 1.5 hours each week in KS1 and 2 hours each week in KS2. In EYFS science is delivered through the *Understanding the World* programme on a cross-curricular basis.

Planning

Key Stage 1 and 2 teachers plan Science lessons using the National Curriculum (2014)

Long term planning: units of work are mapped out across the year in a whole school science curriculum map. Each year group has a curriculum jigsaw for each term which shows science units in relation to other areas of the curriculum, making cross-curricular links where possible. Teachers are to inform the Science Subject Lead if they change the order in which units of work are taught. Science Subject Lead is responsible for keeping the science curriculum map up-to-date.

Medium term planning: Each unit of work has a scheme of work (half-term plan) so that class teachers can plan for clear progression. The scheme of work should identify learning objectives, main learning activities, differentiation, scientific vocabulary and opportunities for formative assessment. Opportunities to 'work scientifically' and links to other curriculum areas should also be clearly shown. The plan should begin with eliciting prior understanding, then activities to develop an idea/skill with opportunities to deepen understanding and contexts in which they can apply their knowledge and skills. Class Teachers are responsible for keeping schemes of work up-to-date.

Short term planning: Is linked closely to the scheme of works but adapted as a result of formative assessment and children's responses in lessons. Each science lesson has a dual objective, one objective relating to knowledge and one relating to working scientifically. See Appendix A for the working scientifically objectives.

Information about the science curriculum is **(will be)** available online.

Scientific Enquiry (Working Scientifically)

Working scientifically is the way in which scientific knowledge is acquired "Science enquiry is what children do in order to answer scientific questions about the world around them" Turner (2011) 'Working scientifically' specifies the understanding of the nature, processes and methods of science.

Learning about scientific enquiry should be integral to learning scientific content, and is just as much part of scientific content as the other aspects of science such as learning about plants, planets or circuits. Working scientifically is central to our science curriculum so that pupils can gain a deeper understanding of science concepts via questions they ask and answer. They should be encouraged to use this knowledge so they are able to find out more about the world and how it works. Lessons are planned to achieve specific outcomes related to scientific enquiry, so that children are clear about what and how they are learning, and how these outcomes are transferable.

We understand that scientific enquiry describes an approach to learning about science and ^[1]_[SEP] it is not the same as 'enquiry based learning'.

Five types of enquiry are used in all year groups:

- ★ Observing changes over time
- ★ Noticing patterns
- ★ Grouping and classifying things (noticing similarities and differences)
- ★ Comparative and fair testing
- ★ Finding things out using secondary sources of information (researching)

N.B. A sixth enquiry type, that of modelling, is not explicitly mentioned but is used

To be able to work independently pupils need to develop a set of skills that they can then use whilst carrying out different types of enquiry. They need to be able to:

- ★ Ask questions
- ★ Make predictions
- ★ Decide how to carry out an enquiry
- ★ Take measurements
- ★ Record data
- ★ Present data
- ★ Answer questions using data
- ★ Draw conclusions
- ★ Evaluate their enquiry

In EYFS 'noticing' is the start of understanding that science is based on collecting evidence and making observations.

In KS1 teachers compare the way children are working to scientists

In all year groups children are given opportunities to freely explore without teacher intervention. Children are then supported to make more systematic observations, to spot patterns and to evaluate their evidence.

Another important aspect of Working Scientifically is to support pupils to gain an understanding of how the science community works scientifically. In years 5 and 6 pupils will begin this process by identifying scientific evidence that has been used to support or refute ideas or arguments, learning about how ideas have changed over time. We recognise that 'school science' is not the same as 'real science' but that it should provide opportunities to understand how science really works.

A further important area of understanding is the pupils' appreciation of the need for quality evidence on which to base theories. Again, this is introduced in year 5 and 6 in the pupils' own enquiry work as they are expected to begin taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. They are also expected to start reporting and presenting findings from enquiries, including explanations of and degree of trust in results.

Science Capital

'Children start to develop perceptions about whether science is "for them" towards the end of primary school. It is therefore essential that all primary school pupils experience inspiring science that builds their understanding of the value and place of science in their lives. This will lay the bedrock for their future studies, enable them to make well-informed decisions in our increasingly hi-tech world and give them access to a wide range of rewarding careers.'

(Wellcome Trust, *Primary Science: is it missing out?*, 2014 pg 4).

Cross Curricular Links

<https://www.stem.org.uk/cross-curricular-topics-resources>

Mathematical Skills

Mathematical literacy is a key skill in understanding, analysing and communicating science. Science lessons should provide opportunities for developing mathematical skills and make explicit use of maths. The mathematical skills used in learning science need to be taught in science contexts. When teaching new mathematical skills in science, we should use familiar science contexts to reduce the conceptual demand. Where possible the language and procedures used when teaching mathematical skills in science lessons should reflect those used in maths lessons. There needs to be a balance between developing scientific understanding and developing mathematical skills: science lessons are not an excuse to teach more mathematics, but to use mathematics in the learning of science.

The mathematical skills used in science include:

- ★ Collecting data
- ★ Doing calculations and representing values
- ★ Choosing how to represent data
- ★ Drawing charts and graphs
- ★ Working with proportionality and ratio
- ★ Dealing with variability
- ★ Looking for relationships between variables
- ★ Scientific models and mathematical equations

Examples where scientific understanding could be developed through an understanding of mathematics are:

- ★ Finding a mean and other ways of dealing with variability in data
- ★ Finding a value from a graph which has not been measured directly
- ★ Calculating an unknown value from two measured values e.g. speed
- ★ Rank in order a series of values to find a trend or pattern

Educational Visits

Classes should undertake at least **one** educational visit per year linked to the science curriculum. Ideas for visits can be found in the 'Science is a Core Subject' folder on the shared area.

Outdoor Learning

Outdoor learning is that which takes place beyond the four walls of the traditional classroom environment, this could be within school grounds, Denton Dene, Scotswood Community Garden, the urban environment or further afield.

There are 10 references to 'use of the local environment' in the National Curriculum. We value outdoor learning as an effective, engaging and inspirational way to teach science and plan for opportunities to teach science outdoors.

Outdoor learning provision should be planned to be frequent, continuous and progressive and take place in school grounds and further afield all year round. Opportunities for learning outdoors should be an integral part of residential visits, where scientific comparisons to our local environment can be made.

We try to give space for spontaneous responses to infrequent outdoor events e.g. snow and ice, rainbows, storms, solar eclipses.

Resources

Science resources are stored centrally in Study Room 2. Resources are labeled and should be returned after use. Teachers and TAs should encourage the science ambassadors in their class to become familiar with equipment and where to find it. There is a shared maths and science cupboard for measurement resources. Staff should notify the Science Co-ordinator of any extra resources required, of any breakages or losses that occur and of any new materials, that might prove useful

The school grounds and Denton Dene are outdoor resources which can be used for teaching science.

The school is a member of the ASE (Association for Science Education) and has access to their online resources.

Visitors are encouraged into school to support the science curriculum and to promote careers in science.

Display

Each classroom has on display our science principles, the working scientifically objectives and the vocabulary related to the current unit of work. Teachers also produce larger displays on a regular basis to support and celebrate work in science. N.B. Orange is the old national curriculum colour for science and is often used by the Science Subject Lead to denote science-related materials.

Recording

Children's work in science is recorded in science books. Cross-curricular work in maths and English should be recorded in maths and English books. Cross-curricular work in other subjects can be recorded in either science or the relevant subject's book. Although not mandatory, some photographs of practical science are taken for use as evidence, for children to respond to in their work e.g. as part of their results, and for use on blogs.

Assessment

Teachers plan with assessment in mind. Formative assessment, including the use of notes on weekly plans, is used to inform future lessons. Teachers should consider what it means for children to have secure knowledge and understanding of a chosen aspect of the science curriculum, and what tasks will provide evidence of learning. Questioning plays an essential part in formative assessment.

Children's work in science is assessed through informal judgements observed during lessons. We provide opportunities for children to express their understanding in a variety of ways, not just on paper: what might they say, do, write or draw? This will lead to the use of a variety of assessment strategies. We favour assessment activities that probe understanding and reveal misconceptions so these can be tackled, rather than focusing solely on knowledge and key words. An over-reliance on test/examination questions as a basis for formative assessment should be avoided as this could limit progress in scientific understanding.

Assessment is based on observation, participation and written outcomes. We assess by:

- Talking to pupils and asking questions
- Discussing work with pupils

- Marking work against the learning objective and in accordance with the Marking Policy
- Observing pupils carrying out practical tasks
- Facilitating pupils to self evaluate their work

In EYFS, profiles are kept up to date with summative assessments of pupils achievements.

In Key Stages 1&2, at the end of a unit of work, teachers make a summary judgement about the work of each pupil in relation to the National Curriculum objectives. Teachers record the progress of each child in all Science topics. These records are used as the basis for assessing the progress of each child; information which is reported to parents and passed on to the next teacher at the end of the year.

Teachers assess each child at the end of each academic year, based on the expectations for children in that year group. The following descriptors are used:

- **Emerging** (starting to learn)
- **Developing** (demonstrating an increasing understanding; yet to be secure)
- **Expected** (secure in understanding and applying in most areas)
- **Exceeding** (has an intense depth of scientific knowledge, strong science capital and can apply their knowledge and skills confidently)

Monitoring

Is achieved via:

- Learning walks
- Pupil voice sessions
- Monitoring of planning (planning scrutiny)
- Environment walks, including taking note of displays
- Lesson observations
- Book scrutinies

Moderating

The Science Subject Lead keeps samples of children's work and we use the PLAN resources (Pan London Assessment Network) to demonstrate what the expected level of achievement is in Science for each age group in the school.

At least once a year, there will be moderation of science books in our school and in our cluster.

Reporting

Science is reported to parents in the end of year report. Reports describe children's attitude to science, effort in science lessons, progress in working scientifically and acquisition of scientific knowledge.

Teachers meet with parents in the Autumn and Spring terms and children's learning in science is discussed.

Staff Development

Teachers are entitled to high quality subject specific training and CPD (Continuing Professional Development) which supports their professional learning journey and performance management at all stages of their career. CPD has a focus on improving and evaluating pupil outcomes. CPD includes science curriculum development, practical activities for use in lessons, research and developments in science as well as pedagogical developments and innovations. CPD reflects teacher's needs e.g. training, coaching, mentoring, peer observation, lesson observation, online learning and subject research. Individual needs are audited on a biennial basis. The impact of CPD is evaluated and next steps are identified.

ReachOut CPD provide online CPD relevant to our curriculum units which teachers can access prior to teaching a unit.

The Science Subject Lead is currently working towards gaining the PSQM (Primary Science Quality Mark) for the school.

Governance

Governors provide effective support and challenge in relation to science. They ensure that science provision is appropriate to the needs of the pupils and meets legal requirements. They are responsible for setting the strategic direction of the school, monitoring progress and ensuring value for money through actions such as: agreeing a budget, including staffing, facilities and resources; agreeing the priorities for the school improvement plan; standards; approving the policy for appraisal of staff and ensuring that it is linked to school priorities and the provision of suitable CPD; safeguarding including health and safety; appointing staff. Science makes specific contributions and has particular needs in these areas, which governors need to be aware of.

The named governor with responsibility for science is Mrs Clare Casson. The chair of Governors, Termly meetings are held between the Science Subject Lead and the Governor Responsible for Science

It is the role of the governor to be proactive in providing challenge to the Headteacher and school leadership team, to evaluate evidence about standards and resourcing in the science curriculum in their school and, where there are deficiencies, to facilitate and monitor improvements.

The contribution science makes to the curriculum and the requirements for safe and effective teaching of science should be understood by the Governing Body, as should the implications of its status, in England, as a core subject. Decisions about budgets, policies, staffing and curriculum should be informed by this understanding and by the most recent recommendations and requirements.

Governors are invited to join the Science Subject Lead on learning walks to view, but not judge, science lessons.

Inclusion: Equality and Diversity

Every learner should have an entitlement to access excellent science teaching and learning, and be able to realise their scientific potential. We ensure that all our children have the opportunity to gain science knowledge and understanding regardless of their background, particular circumstances, age, gender, race, ethnicity, religion, physical ability or intellectual attainment.

We aim to teach science in a broad global and historical context, using the widest possible perspective and including the contributions of people of many different backgrounds. Contexts for teaching science and science displays should reflect wider diversity, from children as scientists, to inventors and academics in the science field. [SEP]

Teachers reflect on own practice to avoid inadvertently reinforcing stereotypes.

Cultural Discoveries: <http://www.1001inventions.com>

Girls in STEM: <https://www.wisecampaign.org.uk/what-we-do/expertise/inspiring-girls-with-people-like-me/>

Teaching Pupils With EAL: <https://www.stem.org.uk/elibrary/resource/29160>

<http://valuediversity-teacher.co.uk/3029-2/>

We positively and actively promote female scientists as role models in our efforts to promote science as a subject for all children and to avoid the restrictions of gender stereotyping.

Both boys and girls are encouraged to take an active part in scientific investigation.

Inclusion: Children with SEND and Higher Attaining Pupils

Potential barriers to inclusion should be identified and appropriate strategies used to overcome them.

Teachers should have the necessary training and on-going professional development opportunities to enable them to understand and meet the specific needs of all their learners.

Inclusion should ensure appropriate support and adjustments to the science curriculum, environment and resources, to provide for all groups of learners including SEND, EAL and those with chronic illnesses.

Best practice should seek to include:

- ★ Planning of teaching and learning to support the inclusion, participation and engagement of all learners, taking account of individual needs.
- ★ Reasonable adjustments to the learning environment to give access to the full science curriculum and assessment
- ★ Consideration given to multisensory learning opportunities using appropriate resources to support all learners.

We recognise the particular importance of first-hand experience for motivating children with learning difficulties and ensure tasks are differentiated to support all learners. Children who need extra support receive it in a variety of ways, such as additional input from an adult or extra resources to support their learning.

We recognise that science may strongly engage our gifted and talented children, and we aim to challenge and extend them.

Safe Practice

Equipment given to children to use is in good condition and suitable for the purpose for which it is intended.

Children should be taught to use equipment safely as part of their science lessons.

Exercise care when using anything that may aggravate individual pupils' allergies.

The school is a member of CLEAPSS Consortium of Local Education Authorities for the Provision of Science Services.

Username: bronze

Password: coin19

See separate CLEAPSS Health and Safety Policy for Primary Science

School has purchased the Association for Science Education publication 'Be Safe' which teachers are aware of for reference purposes.

Teachers consider risk when planning for practical science and perform a visual health and safety check whenever practical work is undertaken.

Safe practice must be promoted at all times. Teachers must take into account the school's Health and Safety policy.

Date Written: June 2019

Date of Review: **TBC**

APPENDIX A – WORKING SCIENTIFICALLY OBJECTIVES

The following skills are statutory:

Years 1 and 2

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking simple questions and recognising that they can be answered in different ways
- observing closely, using simple equipment
- performing simple tests
- identifying and classifying
- using their observations and ideas to suggest answers to questions gathering and recording data to help in answering questions.

Years 3 and 4

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
using straight forward scientific evidence to answer questions or to support their findings.

Years 5 and 6

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

