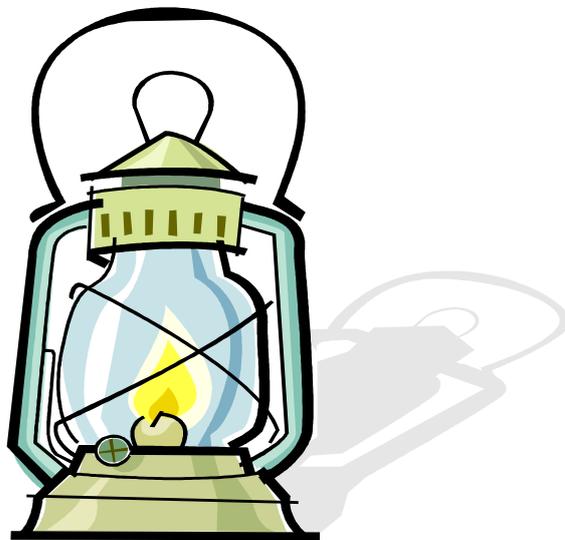




# *SCIENCE POLICY*



Autumn 2021



*“Shine like a lantern in the presence of the Lord.”*

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## 1. Science Rationale

Science at St Bede's is an introduction to the world of living things, materials and physical processes. It is a largely practical subject which develops a spirit of enquiry built up through the experimental testing of ideas which encourages and develops the child's natural curiosity.

At St Bede's, we believe that science will lead to a better understanding of ourselves and the world. It provides opportunities to appreciate scientific facts and concepts and to experience scientific discovery.

We believe that enjoyable scientific experiences foster confidence, encourage the ability to ask questions and helps children absorb the knowledge and skills associated with scientific methods of investigation. Through their powers of observation, prediction, investigation, and by interpreting their results children can, in collaboration with others, develop their knowledge about the world in which they live.

Learning opportunities will follow and build upon the National Curriculum guidelines.

### Aims of our Science Curriculum

- To develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
- To 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.
- Children are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.
- Engage children as learners at many levels through linking ideas with practical experience.
- Help children recognise the cultural significance of science and trace its development.
- To develop attitudes of curiosity, originality, co-operation, perseverance, open mindedness, self-criticism, responsibility and independence in thinking.
- To enable children to effectively and confidently communicate their scientific predictions and discoveries as they are given the opportunity to observe, describe, illustrate, hypothesise, evaluate and interpret, using appropriate scientific vocabulary.

### Implementation of Policy

We have created a well sequenced and progressive curriculum map containing the key concepts children need to be procedurally fluent in to work and think like professional scientists.

Our science pedagogy is based on the development of these key scientific concepts:

- Conceptual understanding
- Processes
- Skills of enquiry
- Scientific attitudes

At St Bede's, scientific method is about developing and evaluating explanations through experimental evidence and modelling. This is an ignition to critical and creative thought. Through science, children understand how major scientific ideas contribute to technological change – impacting on industry, business and medicine and improving the quality of life. Children recognise the cultural significance of science and trace its world-wide development. They learn to question and discuss science-based issues that may affect their own lives, the direction of society and the future of the world.

Good science lessons at St Bede's should:

- Give a learning objective at the start which is referred to throughout the lesson and is evaluated at the end.
- Provide opportunities for children to 'spin plates' from previous years, units and lessons, which alternate with the use of the '3Ps' of Past (any year level prior to current), Previous (from the unit studied prior), Present (from the current unit of study).
- Give opportunities for speaking and listening.
- Have questions of different levels and styles with opportunities for children to confer and discuss their ideas.

- Have interesting and varied activities.
- Have opportunities for assessment for learning such as self-marking to evaluate own understanding.
- Allow for discussion of misconceptions.
- Focus on our local area where possible, including but not limited to developing a knowledge of the animals you would find if walking around the area.

Children will be given opportunities to:

- Develop their understanding through systematic enquiry, using both first hand and secondary sources as appropriate.
- Use ICT to collect, store, retrieve and present scientific information.
- Relate their work in science to everyday life.
- Consider simple scientific ideas and the evidence for them and, at Key Stage 2, also to collect evidence to test scientific ideas in a variety of ways.
- Communicate scientific ideas and observations using appropriate scientific vocabulary.
- Present information in a variety of ways including drawings, diagrams, tables and charts and in speech and writing; at Key Stage 2, children should also use standard units of measurement and include graphs to record and present information.
- Consider health and safety in the context of their science work and take action to control risks.
- Develop the ability to work both independently and in collaboration with others.
- Develop their understanding of scientific concepts.
- Develop the ability to devise and safely carry out investigations and other practical work.
- Develop the ability to communicate ideas using appropriate methods.
- Develop enthusiasm for science.

## 2. The National Curriculum

The programmes of study describe a sequence of knowledge and concepts. While it is important that children 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.

‘Working scientifically’ specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Children should seek answers to questions through collecting, analysing and presenting data.

Children should read and spell scientific vocabulary at a level consistent with their increasing word-reading and spelling knowledge at Key Stage 1 and into Key Stage 2.

## 3. Planning

From November 2021 the school has adopted the ‘Developing Experts’ (Appendix 1) scheme, which we utilise alongside ‘Switched on Science’ as well as websites such as Explorify for the study for science. This ensures full coverage of the content for each year group and more, ensuring that children are given access to lively ideas and ways of working scientifically in a range of contexts, thus providing appropriate repetition and reinforcement which helps to ensure retention. ‘Developing Experts’ also allows us to address gaps we have identified as a result of the Covid-19 pandemic lockdowns. A broader curriculum in science will be delivered in EYFS, through ‘Understanding the World’, making links with other areas of the curriculum. At the start of every unit, there is a starter activity which aims to elicit what children already know about the area of science they will be learning.

Children will be provided with opportunities to generate questions to investigate, predict and hypothesise. Further opportunities are given for children to experience using variables, including measuring and observation of these. As the children move into Key Stage 2, evidence shows children regularly use tables and occasionally graphs to represent and then interpret results. Teachers will use their flair, enthusiasm and professional judgement to identify the most sensible, enjoyable and safe methods for the work being conducted.

There are a variety of ways in which teaching may be effective and our school encourages learning through investigation with lots of first-hand experience. It is, however, frequently acceptable to demonstrate, use illustrative activities, research and explore with individuals and groups according to the need assessed.

Children are encouraged to work as individuals, in pairs, in groups and also as a whole class, when appropriate.

Working Walls are clearly visible within classrooms, displaying key vocabulary and concepts from each unit. These are regularly updated with each lesson and unit. A communal interactive display is used to celebrate children's work and extend their learning.

At St Bede's additionally, the practical nature of science is recognised and opportunities for learning through play and first-hand experience should be provided, especially in the early years. Science plays an important role in the development of investigative skills and draws upon strong mathematical links, for example measurement, pattern recognition, graphical skills and data handling. Curricula links to other areas, for example, language, are recognised and developed.

#### **4. Learning Stages**

##### **Early Years Foundation Stage**

At St Bede's children in EYFS will be introduced to science through the EYFS Curriculum Guidance. The Early Learning Goals (ELGs) for 'Understanding the World' forms the foundation for later work in science, design and technology, history, geography and ICT. Science in the foundation stage is based on developing children's knowledge and understanding of the world around them, as well as developing their scientific skills. Children will be provided with the opportunities to explore science first hand. Children will also be encouraged to use scientific vocabulary to express their observations and experiences.

##### **Key Stage 1**

At St Bede's, children 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 preparing for the future in a caring environment.

Children use reference materials including ICT 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 where appropriate.

Each year group's curriculum progression follows the National Curriculum, ensuring all areas of the Programme of Study are covered. Children further develop their understanding of the world around them which they have gained in the Foundation Stage. Children are able to observe, explore and ask questions about living things, materials and physical phenomena.

Children begin to work collaboratively with others, enabling them to develop their scientific knowledge and understanding and to link scientific concepts. Children communicate ideas orally using taught scientific language and begin to develop written methods for communicating their ideas (to include drawings, diagrams, use of ICT, tables and charts).

##### **Key Stage 2**

At St Bede's children 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 including ICT in their work. They talk about their work and its significances, using a wide range of scientific language, conventional diagrams, charts, graphs and ICT to communicate their ideas.

The KS2 curriculum follows the National Curriculum, ensuring all areas of the Programme of Study are covered. Children learn, explore and ask questions about a wider range of living things, materials and

physical phenomena. Children think about the impact of scientific developments and technologies on themselves and the world around them.

Children are encouraged to develop an independent approach to their science learning, through asking questions, suggesting improvements to their work and supporting each other towards achieving a heightened understanding of scientific concepts. Science is promoted across KS2 with children being given the opportunity to plan, carry out and evaluate experiments. Children are encouraged to develop their own methods for presenting ideas (to include drawings, diagrams, use of ICT, tables and charts).

### **Progression**

At St Bede's, as children move from Early Years to KS1 and up to KS2, science teaching and effective assessment should allow opportunities for them to progress in a range of ways. (See Implementation of Policy, page 3.)

## **5. Children recording their work**

At all levels co-operation and considerate safe codes of conduct should be praised and encouraged. Children are taught to use a variety of means of communicating and recording their work.

In Year 1 and 2 children have a simple format of observational questions to follow as a guide (Appendix 2) and a simple layout for their investigational work (Appendix 4).

In Years 3 - 6 children are encouraged to develop more independence in carrying out investigation, especially fair testing. The use of tables and graphs is encouraged in the recording of results and they base their conclusions on scientific knowledge (Appendix 3) and there is an investigational layout to be used for practical work. (Appendix 4)

## **6. Assessment**

Children are assessed in science twice per unit, using materials from Developing Experts, on their subject knowledge and their scientific enquiry skills. They are given the opportunity to show what they already know at the beginning of a unit through concept maps and a post-test to see what they have learnt. Their work is levelled and a copy of this information is kept in the science assessment folder. Workbooks are marked in line with the St Bede's Effective Feedback and Marking Policy.

## **7. Evaluation and Monitoring**

The science policy of the school is reflected in our practice. This is monitored by the Science Leader and is reviewed annually by the staff. New members of staff will be introduced to the policy by the Science Leader and the members of staff in the same year group will team plan.

The Science Leader will monitor books and displays regularly to ensure work is appropriate to the age group and in line with the school policy and schemes of work. The Science Leader will observe the teaching and learning of science across the school at least once a year.

Success of our science teaching will be judged by:

- the motivation and interest displayed by our children
- the development, over time, of children's understanding of scientific concepts and processes
- children's ability to apply their understanding in a variety of new situations

## **8. Equal Opportunities and Special Needs**

Teachers will have high expectations of all children regardless of gender, race, class and special needs.

We believe that every individual within the school has the opportunity to achieve their full potential and should have the same chance and equal access to all areas of the curriculum. Planning will be adapted by teachers as required.

In science, this means that all children will have the opportunity to:

- develop the process of scientific enquiry

- relate their understanding of science to everyday life and in environmental contexts
- communicate using appropriate vocabulary and present scientific information in a number of ways
- explore aspects of health and safety when working with living things and materials
- carry out experimental and investigative science
- develop and apply their ICT capability in their study of science

Teachers make every effort to use stimuli that reflect the cultural diversity of our school and to draw on children's own experiences. We aim to create a rich scientific enquiring environment.

## **9. Information and Communication Technology**

Computers are used throughout the school to enhance the work of the children. Children from Year 3 upwards are able to work on mini-laptops.

Children use the internet for research in both the classroom and the ICT suite. There are also a range of interactive activities located online that children can use to further develop their scientific knowledge. We also have a range of programs to communicate children's ideas and findings. iPad's can be used to record evidence of practical work.

## **10. Role of the Science Leader**

At St Bede's, the Science Leader will:

- ensure the development of a progressive curriculum map and monitor its implementation and impact
- promote the integration of science within appropriate teaching and learning activities
- manage the provision and deployment of resources and give guidance on classroom organisation support
- inspire colleagues to deliver high quality teaching and learning opportunities
- lead INSET within the school, and investigate suitable courses elsewhere
- act as a contact point between the school and support agencies, including the LA
- analyse data to identify strengths and weaknesses in outcomes, planning for improvement accordingly
- write, monitor and evaluate an action plan for science
- manage the budget for this curriculum area
- monitor and review the science provision within the school

## **11. Health and Safety**

It is the responsibility of the staff to adhere to all safety measures in the school Health and Safety Policy. (Appendix 6)

In accordance with The Department for Education Statement dated 28<sup>th</sup> November 2011, when children work with tools, equipment and materials, in practical activities and in different environments, including those that are unfamiliar they are taught:

- about hazards, risks and risk control
- to recognise hazards, assess consequent risks and take steps to control the risks to themselves and others
- to use information to assess the immediate and cumulative risks
- to manage their environment to ensure the health and safety of themselves and others
- to explain the steps they take to control risks.

The school has a risk assessment form which focuses on health and safety issues surrounding the teaching and learning of science.

## **12. Organisation of Science Resources**

Classrooms are equipped with a selection of books that are age-appropriate and support the science curriculum. In Key Stage 1 and 2 teachers have access to books from the Rising Stars "Switched on Science" Scheme of Work, Switched on Science activity book and other useful websites. Teachers across

EYFS, Key Stage 1 and Key Stage 2 have access to the Developing Experts website, where they have access to lesson plans, knowledge organisers, presentations and expert videos.

Resources are stored in the resources cupboard and boxes are numbered according to the units of work they support. (Appendix 5).

The school grounds are a valuable resource also. Children will become familiar with animal life, plant growth and seasonal change by visiting the gardens as much as possible.

## St Bede’s Science Curriculum Map (2021-2022)

	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 1	Animals including Humans – About Me	Exploring Everyday Materials	Seasonal Changes	Animals including Humans – About Animals	Introduction to Plants	Uses of Everyday Materials
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 2	Animals including Humans – Diet and Health	Everyday Materials	Living Things and Their Habitats	Living Things and Their Habitats – Habitats around the World	Plants – Growth and Care	Animals including Humans - Growth
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 3	Rocks	Animals including Humans – What makes us	Light	Exploring the World of Plants	Plants – Life Cycles	Forces and Magnets
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 4	Sound	Classifying Living Things	Living Things and their Habitat – Nature and the Environment	States of Matter	Electricity	Animals including Humans – Food and Digestion
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 5	Earth and Space	Properties of Materials	Studying Living Things	Changes of Materials	Animals including Humans – Human Life Cycle	Forces
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
Year 6	Living Things and their Habitat	Animals including Humans – The Heart and Health	Light	Evolution and Inheritance	Electricity	Animals including Humans – Blood and Transportation

### Working scientifically

During Years 1 and 2, children 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

During Years 3 and 4, children 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 straightforward scientific evidence to answer questions or to support their findings.

During Years 5 and 6, children 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 a 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

Experimental and investigative Science  
Key Stage 1

1. **Planning experimental work**  
**Ask questions and predicting**

Thinking ahead

Suggest ideas  
Ask questions  
Make predictions  
Know what order to test in  
Think forward

- Suggest ideas
- Change ideas into investigations
- Think about what might happen
- Use predictions in plan
- Be able to tell when a test is fair

2. **Obtaining Evidence**  
**Observe, measure and manipulate variables**

Doing it

Observe/measure  
What kind of measurements?  
When to measure  
How to record observations & measurements

- use senses
- observe/measure
- record observations
- record measurements

3. **Considering Evidence**  
**Interpret results and evaluate**

Thinking about what you did and your result

Think about what the observations & measurements tell you  
Were your ideas and predictions any good?  
Tell other people

- communicate what happened
- use drawings, tables & graphs
- make simple comparisons between results
- look at results and think about what they tell you
- think back to predictions, were they any good?
- use your knowledge to explain what happened and what your results tell you.

EXPERIMENTAL & INVESTIGATIVE SCIENCE

KEY STAGE 2

1. Planning Experimental Work

<p><b>Thinking Ahead</b></p> <p>Turn ideas into investigations</p> <p>Think forward, suggest what might happen and use it to help you plan.</p> <p>Plan for fair test, take useful measurements</p>	<ul style="list-style-type: none"><li>• Suggest ideas for investigation</li><li>• Change own and other people's ideas so they can be investigated</li><li>• Think about what might happen to help you plan your investigation</li><li>• Decide what observations and measurements to collect</li><li>• In the investigation:<ul style="list-style-type: none"><li>• change some things</li><li>• keep some things the same</li><li>• observe, measure something</li></ul></li><li>• Think about what equipment to use</li></ul>
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2. Obtaining Evidence

<p><b>Doing It</b></p> <p>Think about the kind of observations or measurements you will take.</p> <p>What kind, when, how many?</p>	<ul style="list-style-type: none"><li>• Use equipment correctly</li><li>• Make careful observations</li><li>• Take accurate measurements</li><li>• Check observations and measurements are correct, repeat three times for a fair test</li></ul>
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3. Considering Evidence

<p><b>Thinking about what you did and your results.</b></p> <p>What did your results tell you?</p> <p>How well do you think you did in your investigation?</p> <p>Use your knowledge to explain what happened.</p>	<ul style="list-style-type: none"><li>• Know when to use tables, bar charts and line graphs. Note patterns and trends (i.e. which direction results are going)</li><li>• Think about what the results say</li><li>• Come to a conclusion</li><li>• Think about whether your prediction was a good one</li><li>• Use your knowledge to help you understand what happened and explain your conclusions.</li><li>• Improvements</li></ul>
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**Investigation layout in Key Stage 1**

- What do I want to find out?
- What things will I need?
- What I think will happen?
- How will I make it a fair test?
- What did I do?
- What did I find out?
- Were my predictions right?

**Investigation layouts for Key Stage 2**

Aim

Hypothesis/prediction

Diagram

Equipment/apparatus

Fair test-independent and dependent variables

Method

Results-written, tabulated and graphed

Conclusion

Improvements/Evaluation

Title

What did we:

Keep the same?

Change?

Measure?

Results-written, tabulated and graphed

**Topics and which science box to find them in**

Box 1 = Forces

Box 2 = Various teaching books on different science topics

Boxes 3, 7 and 16 = Materials

Box 4 = Sound

Box 5 = Essentials for investigation

Box 6 = Light and shadow

Boxes 8, 9 and 17 = Electricity

Box 10 = Earth, moon and sun

Box 11 = Rocks and soil

Box 12 = Solids, liquids and gases

Box 13 = Plants and mini-beasts

Boxes 14 and 15 = Human body

Box 18 = Magnification

*Bottom of the cupboard:*

*Intel computer microscope      900 power microscope      2 x metal clamps*

*Control box      Electric scales      Electric box*

*Body/Organs model      Wind/Weather kit      Ramps*

## Safety Measures

The following points should be clearly understood by staff and children before beginning any science or technology work. Explaining the safety points to the children as appropriate is a valuable way to spend teaching time.

1. Children should not run when carrying equipment
2. Plastic should be used wherever possible, i.e. pots and mirrors
3. Plastic bags can cause suffocation and should be carefully supervised
4. Balloons, especially when burst should be disposed of as they can cause suffocation
5. Polystyrene should not be used with infants and only under supervision with juniors as it can cause choking if eaten
6. Children have to carry scissors with the handle uppermost and need strict supervision when using knives. Sawing should be supervised and only completed with appropriate age group.
7. With naked flames children should have their hair tied back and ties tucked away in case of fire. Water should be available nearby in case of an accident. Candles should be stood in trays of sand and any utensils used should have wooden handles.
8. Matches should only be used under strict supervision. Matches should be kept out of children's reach when not in use.
9. Children should not look directly at the sun even through dark glasses or plastic. They should not look directly at any intense source of light.
10. Liquids which produce flammable vapours should not be used
11. Any liquid or object that may be immediately spilt should be cleaned up immediately in case it may cause any person to slip
12. Mains electricity should not be used for electricity and magnetism experiments in school
13. The use of glue guns should be supervised and preferably gloves worn when being used
14. Tasting of substances should be strictly supervised, not only because of choking, but because there is a chance of an allergic reaction
15. Hands should be washed before and after some activities. Equipment should be disinfected if it goes in the mouth
16. Children should be closely supervised near the pond
17. Food experiments should not be left uncovered i.e. observing foods' deterioration over a period of time
18. Children should be told that some plants are poisonous. Leaves and berries of a poisonous nature should not be used in the classroom
19. Hands should be washed, particularly after handling animals or soil
20. Any scratches or cuts should be dealt with immediately if resulting from contact with animals
21. All electrical equipment should be kept away from water i.e. DO NOT use a hairdryer to power a boat in a tray of water