

SCIENCE
Upper Key Stage 2



Our Intent Statement:

At Great Finborough Church Primary School, Science is a core subject. We believe that a high quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics.

Our curriculum aims to ensure that all our children develop scientific knowledge and conceptual understanding. Developing the ability to discuss, explain and ask questions using scientific vocabulary is a key aim of our Science curriculum.

It aims to develop their understanding of the nature, processes and methods of science and aims to ensure that our children are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Through working scientifically we aim to foster a sense of excitement and curiosity for a subject that has, and continues to, change the world we live in. Our children will be encouraged to understand how science can be used to explain what is occurring, using the power of rational explanation, predict how things will behave and analyse causes.

We aim to support our children in presenting their findings in a variety of ways.

Our curriculum aims to be inspiring and to foster and develop a life-long interest and passion in Science.

Upper Key Stage 2

At Upper Key-Stage 2, our aim is to enable our children to build on the foundations from key-stage 1, lower key-stage 2 to develop a deeper understanding of a wide range of scientific ideas. We aim to do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. We aim to provide our children with the opportunity to encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates.

We aim to provide, through their lessons, prior knowledge and homework on well-known scientists and research on changes in science, to recognise that scientific ideas change and develop over time.

It is our aim to enable the children to 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. We further aim to support our children to draw conclusions based on their data and observations and use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

We aim for the majority of learning about science to be through the use of first hand practical experiences with some use of secondary sources such as books, photos and videos. They will further develop their ability to read, spell and pronounce their growing scientific vocabulary correctly.

Our Implementation Statement:

Science is planned on a 3 Year cycle.

Our planning and delivery is supported by TigTag. We selected this because it has high quality video resources which brings the subject to life with many of the videos supporting the childrens understanding and connection of the science concept to everyday life. The learning objectives are clear and easy to access by everyone. It also provides good quality optional resources to support the childrens learning. The lesson plans provides a good structure for lesson delivery including extension options to support the most able pupils. A key feature of the planning are the range of scientific enquiry options suggested. Supports the subject knowledge of the teacher and provides clear vocabulary to be developed during the lesson. It has question prompts relating to the video.

Oracy in Science

The foundations of our Science teaching is 'talk'. To develop ideas, deepen knowledge and enhance experiences and scientific enquiry, the children are provided with the opportunity to participate in regular speaking and listening opportunities. They are encouraged to develop, ask and answer questions of their teacher, visiting specialists and of each other. They are supported to learn, develop and grow their scientific vocabulary and key-words. The children are provided with opportunities to work individually, with response partners, in small groups and as a class as a whole. They are provided with opportunities to present their work orally to others.

Reading in Science

Every topic has its own age appropriate bank of non-fiction texts which are available in their classrooms from the school library for the period of time they are studying the unit of work. This enables the children to broaden their subject knowledge and vocabulary, research independently for themselves using secondary sources of information and, with many of the books relating to everyday life, this helps the children to make links to their own lives.

Writing in Science

The children are taught how to structure their scientific writing. At key-stage 1, this will involve developing their use of captions, labels and simple sentences. The teacher, working with the class, create shared pieces of writing. The children are not only taught how to use the scientific vocabulary in the correct context, they are also taught the structural language of beginners scientific vocabulary for example when writing about the method of an experiment, the children are encouraged to use words such as first, next, after that and finally.

Basic Planning & Lesson Structure:

When planning a series of lessons for our Upper Key-Stage 2, the following basic structure is as follows:

Experience & Time 2 Remember (Prior Learning)

At the beginning of each unit of work, the children are provided with the opportunity to explore and experience a range of resources and materials associated with the topic and/ or explore in local areas including resources and science experiences they have previously had which will help with the recalling of previous learning and making connections with the next part of their learning.

The children are also provided with the opportunity to explore online for research. All children are also provided, as part of this process, to use secondary sources of information such as the bank of age appropriate topic books from the library.

Children are encouraged to explain what they are doing and why and formulate questions. They are supported to explain what they have found out and are encouraged to use scientific vocabulary which initially is modelled verbally by the teacher and increasingly independently.

Discover (Developing New Knowledge and Understanding) & Time 2 Remember (Prior Learning)

After providing opportunities for sharing prior knowledge and how this will support our new learning, new subject knowledge and new vocabulary is taught using a range of resources and materials including the use of TigTag.

Scientific Enquiry (Planning & Predicting)

Time is then allocated to the planning of a scientific enquiry, investigation or experiment.

At upper key-stage 2 this involves the children being provided with the opportunity to create and plan their own different scientific enquiry, investigation or experiments and supported in identifying the most appropriate type of scientific enquiry they might use to answer their question.

The children will be provided with a key question and will be provided with an opportunity as part of a group to discuss the question and agree possible methods to investigate the question.

The children will then be given the opportunity to discuss, agree and verbalise their method including deciding what observations to make, what measurements to use, how long to make them for, and whether to repeat them including decisions about variables (independent, dependent and controlled). They will also be encouraged to discuss why and how they will make the experiment a fair test.

They will be introduced to scientific equipment that is available and make group decisions about the best equipment to use. They will be given opportunities to practise using the equipment safely and correctly with increasing accuracy and precision.

Individually or in pairs, they will, through discussion, finalise the method required for carrying out their experiment and the most suitable way to collect and record their results including deciding when to take repeat readings.

Finally, the children will develop their ability to make their own predictions ready for investigation and verbalise why they think this may be the case.

The children will then participate in writing a method for their experiment including the key question/ title, equipment list, labelled diagram, methodology, statement on how it will be a fair test and a statement relating to their prediction.

At this point they will also create any formats required to collect and record their data.

Investigate & Gather Results

The children then carry out their scientific investigation, test or enquiry task.

They then set up their experiment using a range of scientific equipment and explain how and why they are setting up their experiment in this way and how they plan to use the equipment safely and correctly.

The children then carry out their investigation making close and careful observations, take measurements and gathering and recording data.

Throughout this process the children are expected to verbalise what they are doing, how they are using their equipment safely and correctly, what they are observing is happening including noticing patterns and relationships as they develop. They will be provided with opportunities to verbalise what they are doing to make the experiment fair and initial thoughts on whether what is happening is what they were expecting.

Present and Analyse Results:

The children are provided with an example set of data, a number of ways of presenting the data and chance to analyse and discuss the data.

This is then replicated with their own data.

Conclusions (what happened and why):

The children are given the opportunity to discuss what happened, why and how they know. They are given the opportunity to discuss the conclusions they have drawn supporting their ideas and outcomes with the evidence available and their scientific knowledge and understanding linking back to their earlier research at the beginning of the topic.

The children are then provided with time to write up or present their conclusions in a variety of ways, once again using their evidence, scientific knowledge and understanding.

Evaluate:

The children with the time to discuss how successful their experiment had been, how reliable the results are and the degree of trust that can be placed in those results. They are encouraged to consider how the experiment could be improved if repeated and whether any further experiment or research needs to be undertaken to strengthen their understanding and support of the outcomes.

The children are then provided with the time to write up or present their evaluation in a variety of formats.

Recording of Pupils' Work Assessment:

The children in Year 1, 2 and 3 are provided with a red and black Science Topic book. For children in Year 4, 5 and 6, they are provided with a dark green A4, lined exercise book. Throughout all year groups, the children will be given a Learning Objective sticker for each lesson which also outlines the specific Success Criteria to be achieved. All Learning Objectives and accompanying Success Criteria will match the Science Skills Progression Document.

Cross Curricular:

Cross curricular outcomes in science are specifically planned. In science, there are close links to their learning in English (Speaking and listening), reading and writing scientifically. Analysing and presenting data links closely to data handling in maths. Links are also made to other subjects such as RSE and PSHE when studying topics such as their changing bodies, healthy eating etc.

Resourcing:

The science provision is also well resourced and specific resources are mapped to specific year groups and topics to support effective teaching and learning. The local area is fully utilised to achieve the desired outcomes, with extensive opportunities for learning outside the classroom embedded in practice.

How do we monitor our Science Curriculum?

The Science Lead, the Senior Leadership Team and the Curriculum Governors will monitor the curriculum in a variety of ways, such as:

- Pupil voice opportunities
- Science Topic book scrutinies
- Lesson observations that demonstrate and show clear links to the Science Curriculum

Impact Statement:

High quality oracy, reading and writing opportunities will allow the children to articulate and communicate their knowledge, understanding and skills increasingly using more scientific vocabulary.

Through exploration, discovery of new knowledge and understanding, scientific enquiry and research the children will deepen their skills, knowledge and understanding in the areas below:

End of upper key-stage 2:

Working scientifically, the children will be able to:

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

Through their knowledge and understanding of living things and their habitats, the children will:

- be able to describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
- be able to describe the life processes of reproduction in some plants and animals
- be able to describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals
- be able to give reasons for classifying plants and animals based on specific characteristics

Through their knowledge and understanding of animals including humans, the children will:

- be able to describe the changes as humans develop to old age
- have identified and be able to name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- know the impact of diet, exercise, drugs and lifestyle on the ways their bodies function
- be able to describe the ways in which nutrients and water are transported within animals, including humans

Through their knowledge and understanding of evolution & inheritance, the children will:

- know that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- know that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- have identified how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

Through their knowledge and understanding of light, the children will:

- know that light appears to travel in straight lines and be able to use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
- use the idea of light travelling in straight lines to explain why shadows have the same shape as the objects that cast them

Through their knowledge and understanding of electricity, the children will:

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- have compared and be able to give reasons for variations in how components function, including the brightness of the bulbs, the loudness of buzzers and the on/off position of circuits
- be able to use recognised symbols when representing a simple circuit in a diagram

Through their knowledge and understanding of materials, the children will:

- have compared and be able to group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- know that some materials will dissolve in liquid to form a solution, and be able to describe how to recover a substance from a solution
- be able to use their knowledge of solids, liquids and gasses to decide how mixtures might be separated, including through filtering, sieving and evaporating
- Be able to give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- know that dissolving, mixing and changes of state are reversible changes
- be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Through their knowledge and understanding of earth and space, the children will:

- be able to describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- be able to describe movement of the Moon relative to the Earth
- be able to describe the Sun, earth and Moon as approximately spherical bodies
- understand the idea of the Earth's rotation and be able to use this knowledge to explain day and night and the apparent movement of the sun across the sky

Through their knowledge and understanding of forces, the children will:

- be able to explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and a falling object
- be able to identify the effects of air resistance, water resistance and friction that act between moving surfaces
- be able to recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect

Through the study of a number of scientists, the children will:

- have a good knowledge of influential scientists from the past and present
- have developed an understanding of how science and scientific ideas and concepts can vary and change over time
- know how the work and discoveries of scientists has influenced their daily lives
- have used secondary sources of information and evidence as part of their research including considering the validity of the information and whether it is fact or opinion
- have presented their work in a variety of different ways to a variety of audiences
- have developed their use of scientific vocabulary in their oral and written work

Careful recording of their work and use of clear learning objectives with accompanying skills based success criteria enables the teacher to track progress and the children to record how their confidence, skill, knowledge and understanding is developing. When passed on to the child's next teacher, this enables initial learning the following year to be more closely matched to the correct new starting point.

Making links between Science and other areas of the curriculum enables the children to make connections, transfer skills, deepen their knowledge and understanding and enables the children to make further connections to their everyday life.

Our monitoring will provide a clear understanding on the strengths and weaknesses of the curriculum will become evident, as well as highlighting additional CPD needs. This will also enable the school's Governors to develop a better understanding of the Science Curriculum.

Ultimately, we want our children to have developed a love and passion for scientific enquiry and have a broader knowledge, understanding and scientific skills set to not only be ready for the next stage of their learning but also to have a lifelong and growing passion for the subject.