'Let your light shine' Matthew 5:16

Science Curriculum Purpose and Rationale

'At Hawkesley, we say to our children to *'let your light shine.' (Matthew 5:16).* In order to do this, we provide a knowledge rich curriculum. The bible says, 'For wisdom is better than rubies…' Proverb 8:11. We believe that through the accumulation and application of knowledge, children are equipped to experience, '*life in all its fullness' (John 10:10). '*

Taken from the Hawkesley Curriculum Vision Statement

Curriculum Purpose: Why study Science?

Why do learners at Hawkesley Church Primary Academy need to study Science?

The pupils of Hawkesley Church Primary Academy live in an increasingly scientific and technological age where they need to acquire scientific knowledge, skills and attitudes to better prepare them for modern life. A scientist observes, questions, creates, hypotheses, experiments, records data, and then analyses that data, and by developing these skills the children of Hawkesley will experience awe, wonder, curiosity, experimentation and problem solving. Additionally, our pupils are growing up in a world where there is a STEM skills shortfall, and we have a duty to prepare the next generation for jobs that are required to ensure our country and economy thrive.

What are the aims for the Science curriculum? (i.e. what do we want learners to be able to know and do by the time they leave Hawkesley Church Primary Academy?

For all pupils to receive a high-quality science education which provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. 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:

Biology

- Plants
- Animals, including humans
- Living things and their habitats
- Evolution and inheritance

Chemistry

- Materials (including their uses, properties and changes)
- Rocks
- States of matter

Physics

- Seasonal changes
- Light

- Forces and magnets
- Sound
- Electricity
- Earth and space

'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, equipping learners with the skill of:

- Asking questions and making predictions
- Planning
- Setting up and performing tests
- Observing and measuring
- Recording
- Concluding
- Reporting

National Curriculum

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Which values underpin the curriculum content?

- Community – through learning about the eco-system of their local environment and the affect that humans have upon it.
- Courage – through having the courage to question what is happening, establish their own lines of enquiry and identify the usefulness of data.
- Joy – through understanding that Science is a subject about awe, wonder, curiosity and experimentation.
- Perseverance - through learning about fair testing and proving hypotheses based on reliable evidence, identifying when things go wrong, why, and what they need to do next.
- Thankfulness – through appreciating the work and discoveries of individuals that have made our world a better and safer place.
- Wisdom – through developing an understanding of the world through the specific disciplines of biology, chemistry and physics.

How are British Values taught from Science?

- Individual liberty of own views, tolerance and mutual respect of others' views: taught through the topics where different views / ethics are involved, for example work on the theory of evolution.
- Developing an awareness of health & safety for themselves and others when working practically.
- The social skills around behaviour: ensuring collective responsibility for a safe and efficient working environment.
- Challenging each other's behaviour or practices if they fall short of the collective expectations.

Which links to careers can be made within the Science curriculum?

- **Biology**

Agricultural engineer, Anaesthetist, Biochemist, Botanist, Conservationist, Dentist, Doctor, Dietician, Farmer, Gardener, Microbiologist, Midwife, Nurse, Nutritionist, Oceanographer, Optician, Park ranger, Pharmacist Sport scientist Tree surgeon, Veterinarian/Vet, Wildlife filmmaker/photographer, Zoologist

- **Chemistry**

Agricultural engineer, Archaeologist, Biochemist, Chemist, Geologist, Meteorologist, Palaeontologist, Pharmacist, Seismologist, Volcanologist

- **Physics**

Architect, Astronaut, Astronomer, Astrophysicist, Audio technician, Builder, Electrician, Engineer, Mechanical engineer, Optician, Physicist, Pilot, Seismologist, Sound engineer

Curriculum Rationale: Why study Science in this way?

Why has the specific knowledge been selected?

The science curriculum at Hawkesley Church Primary Academy has been selected to cover all programmes of study from the National Curriculum, which allows for a clear teaching of the progression of scientific knowledge and skills within a spiralled curriculum. The core knowledge has been chosen, structured and planned for in order to aid the children's understanding of physics, chemistry and biology, while also providing opportunities for children to develop their skills of working scientifically and scientific enquiry.

How are Science lessons delivered at Hawkesley?

Teachers are provided with medium term planning for weekly science lessons. While non-negotiable lesson objectives are provided to ensure full coverage of the national curriculum, teachers are also encouraged to adapt and differentiate these plans to best suit their cohort (making learning challenging yet achievable for all) while also making links within their half-termly theme. Do Nows at the beginning of each lesson are used as an opportunity to revisit prior learning, while Exit Tickets are used to assess understanding of the lesson objective. Through this planning, we include problem solving opportunities that allow children opportunities to ask questions, follow lines of enquiry and come to conclusions for themselves. Children are given opportunities to use the scientific skills that they are taught, along with research, to discover the answers to questions. This curiosity is celebrated within the classroom.

What is the impact?

Through the implementation of our science curriculum children will acquire age-related science knowledge, while also acquiring skills which will equip them to progress from their starting points, and within their everyday lives. They will be actively encouraged to question the world around them, discuss lines of enquiry and follow their enquiry through to a conclusion. A rich vocabulary will enable children to articulate their understanding of taught concepts.

Science Curriculum Aims (end-points)

What are the aims, end-points, of specific stages of the curriculum?

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.

EYFS

The EYFS framework is structured very differently to the national curriculum as it is organised across seven areas of learning rather than subject areas. The most relevant early years outcomes for science are taken from the following areas of learning:

- Physical Development
  - To observe the effects of physical activity on their bodies (30-50 months)
  - To eat a healthy range of foodstuffs and understand a need for variety in food (40-60 months)
  - To show some understanding that good practices with regard to exercise, eating, sleeping and hygiene can contribute to good health (40-60 months)
  - To know the importance for good health of physical exercise, and a healthy diet, and talk about ways to keep healthy and safe (ELG)
- Understanding the World
  - To comment and ask questions about aspects of their familiar world, such as the place where they live or the natural world. (30-50 months)
  - To talk about some of the things they have observed, such as plants, animals, natural and found objects. (30-50 months)
  - To talk about why things happen and how things work. (30-50 months)
  - To develop an understanding of growth, decay and changes over time. (30-50 months)
  - To show care and concern for living things and the environment. (30-50 months)
  - To look closely at similarities, differences, patterns and change. (40-60 months)
  - To know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. (ELG)

- Expressive Arts and Design
    - To begin to be interested in and describe the texture of things. (30-50 months)

Key Stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

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.

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 should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best 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 should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

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 straightforward scientific evidence to answer questions or to support their findings.

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 should 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 should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should 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.

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. See Primary National Curriculum for yearly breakdown of content.