Askwith Primary School

Science Rationale

Science is a means of discovering and understanding the world around us. It consists of a body of knowledge which attempts to explain phenomena and experiences. It also involves a number of skills and processes by which this knowledge is achieved and applied. Science is also concerned with the development of attitudes concerning scientific activity. Science forms an integral part of our everyday life. It is therefore important for all children to be scientifically literate.

'Children are naturally curious. Science at primary school should nurture this curiosity and allow them to ask questions and develop the skills they need to answer those questions.' *(Louise Stubberfield Primary science programme lead, Wellcome)*

Primary Science should nurture children's natural curiosity, it should develop their understanding of the world and teach them essential enquiry skills. It should set the foundations of the process of inspiring children to become our scientists of the future as they build their understanding of the value and place science has in their lives.

Primary science helps pupils to:

- investigate problems
- learn how science works
- discover why science matters in the world

Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. (National Curriculum)

At Askwith Primary School, we believe that **all** children's education begins in Early Years (this includes SEND, EAL, PP and vulnerable children). 'Children develop quickly in the early years and a child's experiences between birth and age five have a major impact on their future life chances.' (*EYFS Statutory Framework, 2021)*

Our curriculum is aligned to the Early Years Framework and shows the sequential steps of essential knowledge acquired from Reception to Year 6. We have a determined approach that drives us to ensure that all children meet the expected standard in science and have the knowledge required for secondary school. Our intent is that all children know more, remember more and do more.

Attitudes in science

Attitudes are concerned with the way in which scientific knowledge and its application is evaluated and appreciated together with an understanding of its limitations.

Science teaching should enable the children to:

• challenge the perception that science can provide absolute truth and provide a solution to all problems
• appreciate the scientific process as one way of appreciating life
• appreciate the importance of science in everyday life
• appreciate the influence of science on society
• develop a positive critical attitude towards scientific developments
• recognise the limitations of science
• be ready to engage in science and scientific methodology
• appreciate that everyone benefits from the positive results of science

Why this, why now?

The whole school long term plan is designed in year groups but can equally be used for mixed age classes. Science is taught in a block at least once per term. Where appropriate, natural links will be made with other areas of the curriculum and the associated unit of knowledge will be taught prior to this. For example, in KS1, materials will be taught prior to 'Toys' in history. This provides the opportunity to deliberately practise the knowledge acquired.

The purpose of practical work

The purpose of high-quality practical work is to 'connect scientific concepts and procedures to the phenomena and methods being used'.

High-quality practical work should only take place after the pupils have enough connected knowledge to interpret or explain their observations and measurements thus linking theory to observation. 'If this prior knowledge is not available, pupils will be participating in discovery learning, and **not** scientific enquiry.' *(Ofsted research review series: science 2021)*

Knowledge in science

Knowledge refers to the theories and concepts making up science, the method of posing questions and carrying out investigations. Although there is no fixed way in which scientists work, all investigations tend to have aspects of common processes such as observation, classification, hypothesising, data collection, interpretation of data and evaluation.

Scientific knowledge should:

• be based on children's existing or connected knowledge of concepts in science
• arouse curiosity about natural phenomena which stimulates the posing of questions about such phenomena
• be a systematic means of enabling the children to ask and attempt to answer questions arising from observations
• provide models of scientists who have contributed to the field of science
• expose students to the various strands of specialisation but which are still related

• recognise that different students experience science differently

'By learning about the products of science, such as atoms and cells, pupils are able to explain the material world and 'develop a sense of excitement and curiosity about natural phenomena'. By learning about the practices of science, pupils learn how scientific knowledge becomes established through scientific enquiry. By learning this, pupils appreciate the nature and status of scientific knowledge: for example, knowing it is open to revision in the light of new evidence.' *(Ofsted research review series: science 2021)*

Substantive knowledge in science is the knowledge produced by the academic subject. This involves concepts which form the underpinning structure of the subject, e.g. respiration, evolution and the idea of a force as well as the scientific vocabulary needed. The list of substantive knowledge for science is extensive and must be carefully sequenced over time. Substantive knowledge can be categorised as declarative knowledge – the 'know what' and procedural knowledge – the 'know how'. In science, declarative knowledge is the skills of working scientifically to ask and answer questions. Substantive knowledge is progressive through conceptual development from Reception to year 6. Vocabulary is taught explicitly and deliberately practised and applied to different units of knowledge.

Ofsted view **substantive** knowledge as: 'knowledge of the products of science, such as, concepts, laws, theories and models.' This is specified as the scientific knowledge and conceptual understanding in the National curriculum. *(Ofsted Research review series: science 2021)*

Disciplinary knowledge in science is the knowledge needed to collect, understand and evaluate scientific evidence. It's the scientific method, i.e. changing one variable whilst keeping everything else the same – and seeing what happens. It requires a meta-cognitive approach. It is the ability to develop cognitive skills related to science such as acquiring scientific language, making observations, taking measurements, gathering, analysing and interpreting data, making generalisations, creating models, communicating and carrying out investigations thus working like scientists. Time is given to reflect on the evidence that is gathered in order to answer their scientific enquiry questions and use it to develop their substantive knowledge.

We use this knowledge every day. An example of this in everyday life is your TV remote. When it stops working, first you bang it, then you wipe the sensor, finally you change the battery. Each time you change one variable (the independent variable) before measuring its effect (the dependent variable) whilst keeping everything else the same (the control variables).

Ofsted view **disciplinary** knowledge as: 'knowledge of how scientific knowledge is generated and grows'. This includes pupils knowing how to carry out practical procedures but goes beyond simply doing practical work or collecting data. *(Ofsted Research review series: science 2021)*

Connectivity

New knowledge should be integrated with existing connected knowledge. The relationship between scientific concepts should be taught 'over multiple years, without working memory being overloaded' thus building on existing knowledge whilst revisiting connected knowledge. Deliberate practise ensures that learned knowledge is accessible and not forgotten. The ultimate goal is an alteration in the pupils' long term memory enabling them to know more, remember more and therefore do more.

Connections between different subject areas (particularly maths) should also be identified so that pupils can be taught how to transfer mathematical knowledge in to a scientific context.

Reading opportunities in science

Reading underpins our entire curriculum. Key texts and pieces of information are carefully selected ensuring that the content and reading age are appropriate. Key texts are on display and made available for the children to access during daily 'reading for pleasure' time.

SMSC in science

At Askwith Primary School, we take every opportunity to explore our locality and make natural links to the curriculum. **Fundamental British Values** and **SMSC** are interwoven throughout the science curriculum in order to enhance the cultural capital of the children.

Spiritual, moral, social and cultural attributes are developed in our pupils throughout the science curriculum:

Spiritual education in science involves the search for meaning and purpose in natural and physical phenomena. It is the awe and wonder about what is special about life, for example, the scale of living things from the smallest micro-organism to the largest plant or animal and the interdependence of all living things and materials of the Earth.

Moral education in science involves pupils becoming increasingly curious, to develop an open mindedness to the suggestions of others and to make judgements based on evidence. When considering the environment, the use of further natural resources and its effect on future generations is an important moral consideration.

Social education involves group practical work which provides opportunities for pupils to develop team work skills. Pupils must take responsibility for their own and other people's safety when undertaking practical work.

Cultural education in science involves the understanding that scientific discoveries and developments are made by a wide range of men and women from many different cultures both now and in the past. Key scientists are studied.

By the time children leave Askwith Primary School, they have the right knowledge and investigative skills for their secondary education. It is important that they are able to see the relevance of science in their own lives, and imagine future science-related careers based upon it.

Recent research by UCL has highlighted that: 'Children's 'science identities' – the extent to which they see science as 'for them' – are formed early and affect their future interests and aspirations. '

Enhancements in science

At Askwith Primary School, we have a carefully planned rolling programme of enhancements to ensure that all year groups are exposed to a wide range of opportunities that enhance children's knowledge and cultural capital in all subjects.

Science visits and visitors enables the children to gain hands-on-practical experiences that may not be possible in the constraints of a classroom. They enable children to apply their knowledge and be taught by 'experts' in the field. When choosing visitors, dispelling gender stereotypes in science and technology is key.

Science priorities for improvement 2024-2025

Science will be monitored throughout 2024-2025 to identify any emerging priorities.

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