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 helps pupils to:

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

Intent	**Implementation**	**Impact: to be reviewed at the end of each year**
At Askwith Primary School, we believe that every child should learn about science in a way that is engaging, educational and relevant throughout their school years. By the time they leave primary school, children need 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. "	We plan units of work that will challenge prior knowledge in order to construct a good, new understanding of substantive knowledge. In addition to this, disciplinary knowledge is developed through the understanding of scientific methods, degrees of certainty and conducting investigations. Prior knowledge must be re-visited before introducing new ideas, and misconceptions are actively diagnosed and discussed. At Askwith Primary School, we follow an enquiry based approach which focuses on the acquisition of substantive knowledge before 'proving' or inquiring through investigations. (see attached **Ofsted** research February 2019)	

Knowledge and attitudes in science

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

Knowledge

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 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

Substantive knowledge

In science, this 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 subjects is extensive and must be carefully sequenced over time.

Disciplinary knowledge

In science, this 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 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.

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).

Attitudes

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

Creativity in science

If children are to have the necessary skills and capabilities to face an ever-changing future, they need to become innovative and critical thinkers. Our approach to science fosters the children's natural curiosities whilst encouraging independent enquiry.

Being creative in science includes:

- thinking about things in different or unexpected ways
- making connections between new ideas/experiences and old ones
- finding new solutions to problems
- testing out new ideas which enable the children to learn from their mistakes

Assessment

Tracking children's progress throughout their school life is vital in order to establish their acquisition of knowledge. At Askwith Primary School, learning always starts with the children's prior knowledge and any misconceptions that they may have. This can be undertaken in several different ways; teachers decide upon the most appropriate, age-related way of obtaining the children's prior knowledge. Units of work are then personalised to the needs of the groups of learners.
Any misconceptions that arise throughout the unit are identified and address appropriately. End of topic assessment take place approximately two weeks after the end of the topic. Two further recalls take place approximately six weeks and then twelve weeks later in order to embed knowledge in long term memory.

Reviewed: September 2019

In a few other schools, leaders were focused more on activity-led learning, chiefly to meet the national curriculum aims of 'working scientifically'. The belief here was that this would make learning more engaging and motivating for pupils. However, teachers' subject knowledge and their depth of planning were not strong enough to sequence the knowledge and skills that pupils needed to learn before carrying out practical experiments. Too frequently, the activities carried out were not deepening pupils' understanding of the scientific concept, because teachers had not covered the baseline substantive knowledge required sufficiently beforehand.

The misconception here is that 'working scientifically' becomes the mechanism for teaching knowledge and concepts. However, approaching the teaching of science in this way leads to a recurring problem that pupils are engaged in these lessons, but it is the experiment that is memorable and not the underlying knowledge intended to be learned. For instance, when inspectors questioned pupils during the research visits, pupils could easily recall the task carried out, but struggled to explain how the processes they were investigating actually worked.

The one school providing a successful science curriculum in the sample was providing coverage over whole science units in depth and with progression over and across years. Appropriate sequencing of content to build pupils understanding of scientific concepts was particularly evident in this school. Leaders were also using assessment effectively to recognise that areas of working scientifically were weaker. This had led to the subject leader delivering further training and support to other staff to make sure that practical science activities helped to improve pupils' knowledge and conceptual understanding.

Conclusion

Science has clearly been downgraded in some primary schools since the scrapping of the key stage 2 test. This is likely to have a serious impact on the depth and breadth of science understanding and knowledge that pupils take with them into secondary school, which may in turn stifle pupils' later curiosity and interest in the sciences.

School leaders need to ensure that teachers have deep subject knowledge and to consider what curriculum design really involves in science. We will carry out further investigations on the primary science curriculum later this year.