

Science

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Curriculum Rationale

The vision for science is “to develop ambitious and resilient learners who exceed expectations, question and can apply their working knowledge of Science in a modern-day world”. In order to achieve this vision, the curriculum is designed around threshold concepts to ensure every pupil has the opportunity to become experts in science and therefore, pupils will exceed their academic potential and can personally question, describe and explain the world around them from a scientific perspective. The five-year curriculum plan in science identifies the threshold concepts across the three disciplines in science of Biology, Chemistry and Physics. The curriculum is carefully constructed to build on prior knowledge, revisit key ideas, provides the opportunity to consolidate knowledge in order to truly master the subject and form complex schema.

In science the threshold concepts are underpinned by:

- Biology – Cells and cellular processes, biological systems for life & organisms and their interaction with the environment.
- Chemistry – Materials and their properties, chemical changes & Earth and its atmosphere
- Physics – Energy, Forces and fields & Matter and materials

Throughout the curriculum pupils are exposed to powerful knowledge across each discipline and are guided to become independent learners as they construct complex schema. As a result, pupils develop a conceptual framework which allows them to make sense of the scientific world. For example, in KS3 pupils learn about states of matter, elements, compounds and physical separation techniques in chemistry. In KS4 pupils revisit these threshold concepts and build upon them to explore chemical reactions and bonding before being exposed to the process of electrolysis. Understanding this concept can only be made if the foundations of knowledge are secure. Similarly, in Biology pupils at KS3 explore MRS GREN, cell structure and organisation before developing a deeper meaning in KS4 of homeostasis and the regulation of blood glucose levels in the human body. Lastly, an example drawn from the physics curriculum is to ensure the subject of forces is clearly understood at KS3 to make meaning to magnetism and its application in electromagnetic induction at KS4.

The curriculum is ambitious in its content design, promotes struggle, and enriches pupils experience through the incorporation of promoting up-to-date scientific discoveries and observations founded by famous scientists, for example Darwin in the theory of evolution and Rutherford in the structure of the atom.

Our curriculum ensures that pupils master the threshold concepts across science to develop a deeper understanding of the subject in which they can question and apply their knowledge and skills in the real world. With this pupils' develop a rich cultural capital in which they can; construct debates drawing on scientific understanding, question methodically and apply their understanding to novel and unknown scenarios and/or contexts.

Curriculum Overview

In KS2 pupils are exposed to the foundations of the processes behind scientific enquiry and understanding of fundamental concepts pertinent to further science. Pupils arrive in year 7 with a varied degree of both their ability to show independence with these skills and communicate a deep understanding of concepts. Therefore, time is spent in year 7 to introduce all pupils to the foundations of scientific enquiry and build on the key concepts at KS2 to ensure all pupils have access to the same threshold concepts and develop a secure understanding before progressing throughout KS3 and onto KS4.

- At KS4 pupils have the option to study either combined science GCSE or triple science, whereby with the latter they will be awarded a separate GCSE for each discipline in science. Triple science pupils explore the same content as combined scientists, however, some modules provide a greater depth and are broader in nature. This route is more suited to those who have an undoubted passion for science and are capable of meeting the demands of a more challenging content. The strategies in place for curriculum design, teaching and learning are the same in both option pathways.
- Across KS3 and KS4, knowledge is specified in detail through the use of knowledge organisers and learning plans which are shared with pupils at the start of a module. These mechanical documents depict to the pupils the key information which they must commit to memory in order to develop a deeper understanding. Teachers within the faculty spend time collaboratively discussing the content, skills, and pedagogical approaches most advantageous to teaching modules using the curriculum overviews, medium term plans and curriculum resources.
- The design of the curriculum is spiralled across the five years to ensure that within each year group pupils revisit and build on the threshold concepts in order to interrupt pupils forgetting and increase the ability of pupils to consolidate their knowledge and understanding. As pupils progress throughout the year and within each year both the modules and scientific enquiry skills become increasingly more complex. The incremental steps in learning have been mapped out from a top down approach to ensure pupils have the knowledge and understanding in order to develop a deep and meaningful conceptual schema.
- One of the most effective tools used in the science curriculum to ensure key knowledge is revisited outside of the design of the interleaving curriculum; this is the use of low stakes quizzes and testing. In science pupils across each key stage carry out retrieval practice at the start of each lesson. At the end of a sequence of learning, pupils are expected to draw upon knowledge and understanding from more than the current module of learning. Pupils are consistently asked to clarify and communicate their understanding to an abstract and novel scenario to demonstrate their understanding. Furthermore, the faculty's homework policy has been designed to optimise low stakes quizzing and provide purposeful opportunities to practice their knowledge and understanding in the format of examination style questions at GCSE.
- KS3 pupils will clarify and communicate their knowledge and understanding at the end of each module in a task designed to provide the opportunity for pupils to demonstrate their learning and in cumulative assessments in the autumn, spring and summer. Furthermore, pupils in KS4 will clarify and communicate their knowledge in the format of GCSE examination style questions throughout modules and in cumulative assessments in the autumn, spring and summer of KS4.