Science Curriculum Vision

Quality of Education: Manifesto

Curriculum Intent

Our aim is to ensure our students are prepared with the knowledge and skills needed to thrive when encountering Science post Humphrey Perkins. We aim for students to have the scientific ability to question news articles on their validity and form constructive questions to support this. They will develop scientific enquiry skills and will be capable of applying this to make reasoned, well informed judgments throughout their lives, as well as equip those students who wish to study Science at a higher level with the knowledge, skills and passion for the subject required.

Our rationale is to provide a fluid and dynamic knowledge rich KS3 to KS4 curriculum. This will be achieved through a comprehensive 5 year curriculum model where we will be establishing key knowledge and skills that include effective practical and analytical approaches with Literacy and numeracy embedded throughout. This curriculum model will enable learners to gain access to higher GCSE content in earlier years to support accelerated learning and the transition between the two key stages will be bridged effectively. The scientific knowledge and skills developed by learners will provide them with a secure foundation to access Sciences at post 16 and consequently STEM related career aspirations.

This curriculum is specified in detail to ensure that knowledge is remembered (not merely encountered) that enables cognitive retrieval through sequential mapping of key concepts and interleaving. Evidence has shown that treating thinking skills as abstract from content leads to students writing surface knowledge responses. By grounding skills in relevant and enriching knowledge, students become scholarly and confident demonstrating deeper understanding. Our knowledge rich curriculum reflects this approach to Science education that will lead to automaticity in our students.

Curriculum Implementation

Five year curriculum plan (KS3 and 4)

We use the National Curriculum as our basis to ensure students are taught a wide breadth of content and skills in all Sciences. We are developing our curriculum with the trust and using the Kerboodle curriculum to ensure we embed and consolidated topics that would have been visited at KS2 and these key principles are further developed across the key stages. The curriculum builds on these foundations in terms of level of content and challenge. The curriculum interleaves topics, so content taught in Year 7 will be revisited and built upon in Year 9, then again in Year 11. We follow the AQA Trilogy and Separate Sciences (Biology, Chemistry and Physics) at GCSE level. The learners will be developing practical skills and the components of 'How Science Works' throughout the 5 year curriculum, with a greater emphasis on the required practicals at GCSE.

Our topics taught within the 5 year curriculum will have concepts that will ensure that learners have secured the necessary foundations for moving onto science courses at KS5.

Core practicals are completed regularly throughout the 5 year Curriculum. These are particular practical's that have been identified as a necessity for that topic to ensure students are gaining knowledge or a particular skill. Skills are then repeated throughout the 5 year curriculum to ensure students are competent and confident with their practical skill.

The topics that are linked together across KS3 and KS4 have been colour coded and can be mapped across this cyclic curriculum.

KS2 to KS3 themes

Organisms	Ecosystem	Genes	Matter	Reactions	Earth	Forces	Electro-magnets	Energy	Waves

Biology:

	Autumn	Spring	Summer
7	Cells	Body systems	Reproduction
8	Health and lifestyle	Adaptation & inheritance	Ecological systems
9	Cell biology	Organisation 1 (including body systems)	Organisation 2 (including body systems)
10	Disease	Bioenergetics	Homeostasis and nervous response
11	Variation, Adaptation and inheritance	Ecology	Revision

Chemistry:

	Autumn	Spring	Summer
7	The particulate nature of matter Physical change Particle models Energy in matter	Atoms elements & compounds Pure & impure substances Chemical reactions	Reactions Energetics
8	Acids and alkalis	Periodic table	Metals
9	Rocks & the earth Earth & the atmosphere	Atomic structure and the periodic table	Bonding & structure
10	Quantitative	Chemical Changes Energy Changes	Rates of reaction
11	Organic Chemical analysis	Chemistry of the Atmosphere Using Earth's resources	Revision

Physics

	Autumn	Spring	Summer
7	Forces: Balanced forces Forces & motion	Sound: Observed waves Sound waves Energy & waves	Lights: Light waves
8	Space	Electricity & magnetism: Current electricity Static electricity magnetism	Energy: Fuel uses Energy changes and transfers Changes in systems
9	Forces & motion: Describing motion	Energy Electric circuits	Mains electricity Particles
10	Atomic Physics	Forces	Waves
11	EM spectrum	Electromagnetism (Space – triple only)	Revision

Assessment and Feedback

Formative assessment plays an important role within every Science lessons. Teachers use a variety of methods, including quick answer questions in bell work, and whiteboard tasks to provide instant feedback to inform teaching and learning. Targeted questioning is used in every lesson to ensure content is understood and retrieval is practiced regularly. Within this regular retrieval practice previous topics are interleaved to ensure we keep the knowledge 'sticky'. Knowledge Organisers are given to students at the beginning of every topic (included in the homework booklet). Students will regularly use these in lessons (as well as for homework), to support their knowledge. Knowledge tests are completed regularly to check knowledge for the KO is being retained.

Within each topic there are core assessment tasks, agreed by the department. These tasks will range from extended response exam question, Mathematical or graph skills, practical writing skills (linked with the core practicals) and end of topic tests. End of topic tests are cumulative, so will always interleave content previously studied to ensure we keep the knowledge 'sticky'. All core assessment pieces will receive WWW/EBI feedback comments from the teacher, which students are expected to respond to (during DIRT). Feedback (other than tests) are often on pink paper to ensure students are clear it is an assessed task. There are two core assessment tasks for each topic, to ensure students receive two assessed tasks with extended feedback every half term (in line with the school policy). Core assessments and teacher feedback and other less formal assessments, form the data reports entered into the school system.

Homework

To develop a consistent approach to homework, teachers set from a booklet that links with their current topic. The booklet contains the knowledge organiser for the topic and various tasks to promote retrieval skills. Students either complete tasks at home or use the knowledge organiser to practice recalling certain pieces of information in preparation for a low stakes test the following lesson. Homework is peer or self-assessed and checked by the teacher for completion. We also encourage parents to check homework by signing it.

Metacognition (Learning Scientists)

Every lesson in Science is expected to have some form of retrieval practice for the student. This will often come in with bell work. The emphasis on retrieval practice is a major part of the Science curriculum and we therefore ensure that this is continued at home. All students use their homework booklets and knowledge organisers to continue their retrieval practice at home as well as in lesson.

With a broad content taught in Science over the 5 year curriculum we have made lots of opportunities to interleave content from previous learning in current topics to ensure it is regularly revisited and can be retrieved more easily, this would also link in with spaced learning . There are also many opportunities for students to use concrete examples when being taught about abstract concepts. There are used when necessary throughout the curriculum.

The use of diagrams especially within knowledge organisers, but also as part of lessons supports dual coding, ensuring that students have the opportunity to learn content in different ways.

SMSC

Spiritual development within Science involves students being encouraged to explore the development of Science over time and the relationship this has with spiritual views, for example the theory of evolution and why Darwin's theories were largely unaccepted at that time.

Students are encouraged to express their own opinions and explore their own feelings and meaning and reflect upon topics such as ethics. Students are encouraged to explore these concepts and challenge the actions that scientists are taking. This also helps students to consider the beliefs and values of other people. Moral development within Science involves students being required to evaluate, comment upon and discuss various moral issues relating to scientific ideas and practices. They will do this through the study of different scientific methods, carrying out practical methods using live organisms (plants and possibly animals) and the use of observations. This will then enable students to form judjements and opinions, expressing their views on ethical issues.

Throughout the curriculum, students are given the opportunity to develop their social skills and exercise their leadership skills. Students often work collaboratively to understand new concepts and share information researched, thus giving the students responsibility over their work.

Cultural development within Science involves students being given the chance to see how different scientists throughout history have been influenced by their environment and how this has led to their discoveries or impacted them.

Cultural Capital

It is important that students see the link Science has with day to day life and into business. We try to ensure that all students are given the opportunity to discover how Science influences them and will affect them in the future. These opportunities will help to develop their character and the skills they will need to be successful in their later life. We invite companies to come in and work with our students on various STEM endeavours including the RAF and BAE systems and Tomorrow's engineers. It is also important for students to have the opportunities to visit museums and fairs to develop their awareness of the impact of Science and develop their personal skills. We have so far organised visits to the National Space Academy and the Big Bang Fair.

We also enter competitions to enable students to develop leadership skills and develop their specific skills within a specific area. This includes the 3M competition and 'the first Lego league'. This is important to help personal development of students in the field of Science.

KS3 students have the opportunity to attend Science club, which changes every half term to cater for different students. This enables students to be exposed to areas of Science that don't fall into the national curriculum, but drive the love and enjoyment of the subject. Some students have been chosen as Science Leaders for their love of the subject and willingness to support the department. These students support in Science club and lessons to pass on their love and curiosity of the subject.