

Science Curriculum at Dorothy Stringer School

Intent

In this increasingly technological world, a good science education develops a young person's scientific literacy and empowers young people to establish well-rounded opinions and make informed decisions concerning scientific issues in their future. It encourages a curiosity and wonder for the world around them, giving young people an understanding of the past and the potential of science and technology to come. It allows young people to evolve a range of transferrable skills, developing their vocabulary and linguistic styles, expanding their problem-solving skills and innovation, equipping them to become global citizens of the future.

We ignite an enthusiasm for Science in our young people by communicating powerful ideas in a simple way. We use a range of dynamic teaching techniques, including significant hands on practical experience. We can relate content taught to everyday examples as well as the latest technologies, allowing time for students to explore their interests in the classroom and through our extra-curricular opportunities.

The Science Department at Dorothy Stringer includes a diverse group of multi-disciplinary teachers with a range of experiences in industry and science. We are passionate about our subject and aim to develop that passion and curiosity in our students. As a team, we are creative and innovative in our delivery of science education as well as being supportive and approachable in our work with young people.

Our passion lies in inspiring others, sparking an interest in young people for science and broadening their horizons. We encourage young people to question what they experience, encourage analytical thinking and application to the wider world. We have a belief that all, no matter what background or ability, can access science and we endeavour to act as positive role models in a subject we love.

Implementation

Our work begins at Key Stage 3 where we aim to continue to develop scientific knowledge and conceptual understanding in Biology, Chemistry and Physics. We also aim to develop students' understanding of the nature, processes and methods of science and to be able to apply this knowledge to the science of today and the future.

The department builds on the learning students would have experienced at Key Stage 2 in working scientifically with a range of practical scientific methods, processes, and skills. We also continue to develop our students' understanding of the big ideas of science.

Our curriculum at Key Stage 3 shares the aims of the national curriculum in science to;

- ✓ Foster an enthusiasm for science and scientific thinking.
- ✓ Develop an understanding of key scientific concepts and build from first principles through to more challenging material.
- ✓ Encourage a safe working practice during practical activities.
- ✓ Develop a broad awareness of the role of science in society.

- ✓ Develop Math and ICT skills when handling and analysing data collected from practical activities.
- ✓ Develop language skills when interpreting and reporting on data collected from practical activities, linking this to Scientific concepts.

For Years 7 and 8 we use the Collins Science Activate 1 and 2 course which closely matches the 2014 curriculum reform. It is specifically designed to support every student on their journey through Key Stage 3 to Key Stage 4 success as it provides an ideal preparation for all GCSE routes, with comprehensive and flexible assessment and progression. The course sparks students' curiosity in science, whilst gradually building the maths, literacy and working scientifically skills vital for success in the new GCSEs. We have tailored the KS3 Activate course to provide accelerated progress for students and to implement key skills the students will build on throughout KS3 and KS4 years.

In Years 7 and 8 students will study the following units.

Year 7	Year 8
Introduction to Science	Particles and their behaviour
Atoms, Elements and Compounds	Light
The Periodic Table	Health and Lifestyle
Forces	Separation Techniques
Cells	Electricity and Magnetism
Sound	Metals and Acids
Chemical Reactions	Adaptation and Inheritance
Reproduction	The Earth
Acids and Alkalis	Energy
	Space

Our GCSE course is planned as a spiral curriculum over three years, allowing us to cover all aspects of the course to the depth required to gain success at the end of Year 11. Our focus for delivery is on the key concepts of each unit that allow students to gain mastery of the subject that can then be built upon in following years. Using six pillars of science including Living Organisms; The Environment; Matter; Chemical Change; Forces and Energy we can gradually develop both a student's understanding of knowledge as well as their disciplinary skills. For information regarding the mastery of key concepts for each unit and the spiral nature of our curriculum please see the department's Key Concepts chart

Groupings

In Year 9 we have a higher attaining stream, middle attaining stream and a nurture group. All streams are mixed ability in nature. In Years 10 and 11 all students are expected to complete either the GCSE Combined Science or the three separate GCSE Sciences. We have our mixed ability Triple groups, our mixed ability Higher GCSE groups and our mixed ability Foundation GCSE groups. Throughout the year, using both formative and summative assessment, there are key points where student progress is evaluated, and group changes are made.

Teaching and Learning

The department prides itself on our expertise and quality of teaching, supported by effective learning resources that enable all students to progress and achieve.

Our teaching and learning ethos is to have high expectations of all students and know that all students can achieve. We blend direct instruction with enquiry-based learning and use what is most appropriate to have the greatest impact for students' progress. The department is well equipped with Practical resources that are key in developing a student's disciplinary skills, the 'How Science works' aspect of the curriculum.

The learning of a significant amount of accepted subject knowledge is a challenge for students as they move through the five-year course. Recall and retention strategies are used throughout our units to support our students' long-term memory. By using low stakes questions at the start of each lesson from topics covered in a previous lesson, week or from last year we gradually support students in retaining the key concepts so vital for success. Every classroom has a visualiser that allows us to model good practice to students, to share examples of excellent work and to offer live feedback on student's work to the whole class.

The disciplinary skills required including the use of practical, the analysis of information and the evaluation of data is developed using practical work, some whole class and some teacher demonstration. It is also important that students understand the context with which these ideas were developed and much of the history of science is discussed including the characters involved.

Students use workbooks in class to make notes and to complete activities. We encourage every student in KS4 to have a revision guide at home that supports the course materials.

Our teaching resources also include a full range of PowerPoints, developed by subject specialists, that tackle the Tier 3 scientific language required for each topic, addressing key misconceptions often held by students, using best models, analogies and practical to support learning and scaffolding student learning to allow success for all. These are fully differentiated to enable to support and challenge appropriately for all. Every student has access to an online textbook, where they are able to review the learning of the lesson and access further animations and information to support the lessons.

Assessment and Feedback

Assessment and feedback are at the heart of our practice both at KS3 and KS4, identifying strengths and areas for development and offering activities and guidance to help students improve. Our focus is always on the mastery of the key concepts required to move onto the next stage of their learning. In every lesson a teacher will use a range of strategies such as questioning and independent tasks to assess students' learning. This will be followed by whole class and individual oral feedback and guidance on further progress.

In Key Stage 3 students are given an identified home learning assignment which assess a student's literacy, numeracy and extended writing skills. This is assessed by the classroom teacher and areas to focus on before the formal end of unit assessment are identified. Each unit has an end of unit assessment which aims to assess student's mastery of the key concepts from that topic. This is

marked by the teacher and analysed to identify any key concepts the students are still struggling on. Every student will receive a clear idea of the area they were most successful in and one area they need to focus on. The following lesson will then address these areas through direct teacher instruction.

In Key stage 4 students are asked to complete identified home learning assessments after every two to three weeks of the course. This gives teachers a clear idea of the progress made by students and allows teachers to plan accordingly in closing those gaps. Each student will then take an end of unit assessment which is written to highlight progress made on the key concepts for that unit. This is analysed by the teacher to give insight into individual and whole class student progress. Every student will then identify an area they achieved well in and an area they need to make further progress on. The following lesson is then used to close the gap on key concepts missed, either on an individual or whole class basis

Literacy

Being scientifically literate is vital to success in the sciences. The Tier 3 specialist language our students need to learn is extensive and we take every opportunity to support them in this.

We use talk to question, imagine, solve problems and develop thinking about complex issues. We select extensive and specialised vocabulary, grammatical and structural features to write for different purposes, audiences and in a range of different contexts and situations. We employ a range of reading strategies to access texts: predicting, scanning, skimming, inferring, annotating, visualising and linking.

We do this by embedding a range of literacy activities within our Schemes of work and our supporting teaching materials so that every student receives the same level of literacy learning.

Numeracy

An average of 20% of the marks gained in the Science GCSE is based on successful numeracy skills. Throughout Key Stage 3 and 4 a student's numeracy skills are developed in five key areas including arithmetical and numerical computation, handling data, algebra, graphs, geometry and trigonometry. We again do this by embedding these activities within our schemes of work and in our supporting teaching materials to ensure that every student is confident in their numeracy skills before the end of Year 11

Extra-Curricular opportunities

Learning in Science doesn't just happen in the classroom. The department offers a range of extracurricular learning opportunities. For our Year 7 and 8 we run a weekly STEM club where students work on short, directed project activities. Year 9-11 are also encouraged to attend our KS4 STEM club which focuses on designing their own investigations whereby students hone their investigative skills and learn to research previous studies in the same field. We hope that for some students this work will now feed into the HPQ that the school is offering.

The department also offers a range of off-site visits including the local Booth Museum, Wakehurst Place, Christmas lectures at the Royal Institution, University of Sussex lab trip among many more.

From KS2 to KS5

The experience of our students in Key Stages 3 and 4 is part of a wider journey in science education that starts in KS2 and extends to KS5 and beyond. By working closely with our partner primary schools, we have a good knowledge of the excellent science learning that has taken place at KS2. By listening to our primary teachers, we enhance their learning at Key Stage 3, continuing to develop their skills and understanding of the key concepts. By working with our local colleges and understanding their needs, as students move into Key Stage 5 we can support our students in moving forward in the sciences equipping them with the skills and knowledge required to be successful in further education. By introducing possible careers in Science throughout our five-year course we encourage all our students to seek the opportunities that science offers them in the future.