The Science curriculum

Justifications for the pursuit of science are often given in terms of the medical, technological and social breakthroughs that it is responsible for and the vast improvements that these have had on our day to day lives. While this is undoubtedly true it can have the unfortunate effect of making people think that science is only for a very stereotypical cohort of people, locked away in the labs of universities or large companies and is not accessible to everyone.

The truth though is very different, we are all scientists. The Science Council defines science as "the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence." We are all constantly striving to make sense of the world around us, and it is science that gives us the tools to be able to do this effectively. Every time we find ourselves presented with a problem to solve, we take what we already know, learn what we can about the situation at hand and then look for correlations between the two. Each attempt at a solution that doesn't work brings us closer to finding one that does in the exact same way that, in science, a hypothesis is written, tested, and then rewritten based on what has been learned. More than anything, science teaches students the resilience to recognise that each failure is a step closer to success.

Providing everyone with a quality science education ensures that society remains curious and questions what happens to them and around them, with the skills necessary to find the answers to those questions by thinking scientifically.

KS3

Students begin their KS4 course immediately upon arrival at the Thomas Hardye School, however, the science department works collaboratively with its main feeder schools in order to develop a common curriculum for KS3 science that fully prepares students for their GCSE science journey. In year 9 there is an introductory stage where students learn key substantive knowledge such as subject specific vocabulary and disciplinary skills such as experimental design.

KS4

We deliver two AQA specifications at KS4, with most students pursuing the 'GCSE Combined Science Trilogy' route, equivalent to two GCSEs and some completing the separate science specifications leading to 3 individual GCSEs in Biology, Chemistry and Physics. Regardless of which specification a student follows they receive 3 lessons for each of the subjects, delivered by individual teachers. All content from the combined science course is also taught to separate scientists, in the same order, with additional content delivered within each of the topics. The sequence of lessons has been carefully designed so that students understand that Science subjects are intricately connected.

The biology course begins with cells as they are the building blocks of all life on Earth. In the same way that biological systems are organised with cells working together to form tissues, and organs students then use their knowledge to develop their understanding of more complex systems and processes. Lessons move on from the very small, through human and plant biology to whole ecosystems encompassing evolution and the transfer of energy through photosynthesis and respiration.

Chemistry also begins with the fundamental chemical building block, the atom, and how they relate to the elements in the periodic table. From these simple units of matter students can construct compounds, focussing on the formation of different bonds to produce inorganic and organic molecules that are a part of everyday life such as the production of petrol and plastics from crude oil. Importantly, students also consider the environmental impact of these processes and materials which complements their learning in Biology.

Physics is the study of physical systems and is governed largely by the transfer of energy. As such, students begin by studying energy stores and transfers and subsequent topics apply these to more specific scenarios, for example, electrical circuits, waves and radioactivity. The physics topics also draw and expand on the content previously introduced in other subjects. Ernest Rutherford's alpha particle scattering experiment provides additional evidence for the model of the atom in chemistry, allowing students to revisit this key concept. It is also an example of how disciplinary knowledge is threaded through the course, demonstrating how scientists make hypotheses, collect data from observations and then modify models to fit their evidence.

KS5

We continue to offer the AQA specification for A-level biology, chemistry and physics in order to ensure a clear progression from KS4 with common language used across GCSE and A-level.

Biology is an exciting and varied subject, covering a broad range of topics and issues that are up-to-date, relevant, and challenging. The course includes a mixture of theory and practical lessons developing a wide range of scientific thinking skills with an increased emphasis on developing relevant mathematical and practical skills. Students are prepared for a wide range of potential post-18 options thanks to an incredibly broad curriculum offering, including microbiology, bioenergetics, human and plant physiology and genetics.

The chemistry course is taught through three strands: physical chemistry, organic chemistry and inorganic chemistry and AQA have made sure all three are co-teachable. The course subject content is relevant to real world experiences and will show students the value of chemistry to society and how it may be used responsibly in social, economic, environmental, and technological applications. Lessons provide numerous opportunities to use practical experiences to link theory to reality and equip students with the essential practical skills they need. The course will also foster imagination and critical thinking as well as the acquisition of knowledge and intellectual discipline. A-level chemistry is a steppingstone to future study and will inspire students, nurture their passion for chemistry and lay the groundwork for further study in courses such as chemistry, medicine, and pharmacy.

Physics allows students to appreciate how fundamental science works. There are eight units in the specification, with five in the first year and three in the second year, this includes an optional unit, for which we have chosen astrophysics. This choice has been made due to the subject expertise we are fortunate enough to have within the Physics team and because the students regularly express their interest in this topic. A-level physics builds on the concepts and skills developed in the physics GCSE and students are required to be highly numerate and must relish the challenge of undertaking one of the most academically demanding and challenging A-levels. It is recommended that students study maths alongside physics due to the level of maths included in the course.

In addition, students can choose to follow the BTEC Level 3 Applied Science course which has a weighting equivalent to a single A level subject. This course follows the Edexcel National Extended Certificate specification and includes content from all three sciences with a greater emphasis on skills and ongoing assessment than in A-level courses. This course is ideal for students who are interested in pursuing alternative post-18 qualifications such as degree-apprenticeships.

Enrichment

We are incredibly proud of the extra-curricular offering from the Science department with a wide range of trips, experiences, clubs, and opportunities available to develop students scientific and cultural capital. Students are encouraged and supported to get involved in STEM competitions from external agencies such as the ‘flying start’ competition at Leonardo helicopters in Yeovil, and ‘curiosity’ from BAE systems. Trips run locally, for example our fieldwork trips to Studland Bay and internationally with students able to visit the Large Hadron Collider at CERN in Switzerland or NASAs Kennedy Space Centre in Florida. Our afterschool offering includes GENEsis club in which students get to use University level equipment to investigate DNA and present their findings at a scientific conference. Forensics club puts students in the shoes of a crime scene investigator using a range of techniques including blood splatter analysis and fingerprinting. Our reputation also means that we are regularly asked to host guest speakers from prestigious universities to discuss their world-leading research for our community lectures, often leading to workshops delivered in school for our students too.