

Science Curriculum Intent



What Students Should Know and Be Able To Do

Entitled to Powerful Knowledge

All students are entitled to study an ambitious science curriculum from Years 7 to 11. We take the national curriculum and the KS3 United Learning curriculum as a starting point and adapt our curriculum from there. In KS4 science, students study the KS4 AQA Trilogy Combined Science or KS4 AQA Separate Sciences course. The students are then given the opportunity to study Biology, Chemistry and Physics at A level where we teach the AQA course.

The powerful knowledge which students are exposed to develops each year where new knowledge builds on existing knowledge. For example, in Year 7 students are taught about the cells and how specialised cells are adapted for their function such as sperm cells in reproduction. In Year 9 the students learn about the skeletal system and how muscle cells are adapted for their function and in Year 11 students learn that nerve cells form part of the nervous system and how electrical impulses are transmitted throughout the body to enable movement and to protect the body from harm in the form of reflex actions.

An example of substantive knowledge building over time is how acids react. In Year 7 students are introduced to acids and alkalis and how we can test to identify these substances. In Year 9 students build on this initial knowledge and learn about how acids react with metals and metal carbonates. In Year 10 students further develop this knowledge and enhance their practical skills by making copper sulphate which is formed from a metal oxide reacting with an acid.

Throughout the science curriculum, students have an opportunity to develop and apply mathematical skills. Mathematical skills are important in science because they enable students to analyse data and reach their own conclusions which will help them to understand the world around them. These skills are taught from Year 7 and become more complex over time. An example being in Year 7 students are introduced to equations in Physics and they are taught how to substitute numbers into the equation. Over time they are taught how to manipulate the equation so that by the end of Year 11 they are confident in rearranging equations, substituting values into the equation, converting units and doing multi-step calculations.

Studying our science curriculum allows students to have access to a broad range of topics which develop their scientific knowledge as well as developing their understanding of how the world around them works.

Knowledge is Diverse, Inclusive and Representative

All students throughout their science studies at TRS are exposed to many everyday examples of science in life. The use of everyday examples within our curriculum helps students to understand the importance of the subject and how the world around them works. In Years 8, 9 and 10 students will study the different food groups, digestion, the importance and effect of exercise and the issues and diseases associated with an unbalanced diet and students will therefore have the information needed to make informed choices throughout their life to help them live a longer and healthier life.

Students have the opportunity to engage with contested theories such as the theory of evolution which is taught in Year 11 and the evidence that science provides to now support this theory. Within the Year 10 curriculum when learning about diseases, and the importance of vaccination, students are taught about the MMR vaccine and how misleading media reporting led to many parents in the 1990s choosing to not vaccinate their children due to the possible link to autism. This presents the opportunity to teach about misinformation within the media and the importance of evaluating scientific sources before reaching an educated conclusion.

Education with Character

All students in Years 7-9 are given the opportunity once a year to partake in the annual TRS science fair. The 6-week homework project gives students the chance to plan and investigate an area of science which they are passionate about and carry out their own scientific research and practical investigation. Students then develop their presentation and communication skills by presenting their work to their own class before a group of students from each Year group have the opportunity to present their work in the grand final where the local mayor is invited to judge the projects.

Within lessons science teachers model frequently how to give feedback and celebrate success as well as the power of learning from mistakes often through the use of show call of students work. In every science lesson students also have the opportunity to develop their own resilience by making improvements to their independent work following feedback from the teacher.

How Students Acquire This Knowledge

"The ultimate aim of curriculum must be to a structured path, a movement through knowledge in time, where travel leads to acquisition and understanding, to seeing the world in a new way."

Coherent Whole

The science curriculum is carefully sequenced so that powerful knowledge builds over time. This powerful knowledge is in the form of disciplinary and substantive knowledge.

Students are taught cross curricular links between the three sciences. For example the theme of energy. In Year 7, students are introduced to energy stores and pathways within the Physics curriculum. In Year 8, students learn about energy being transferred within ecosystems when learning about ecology within the Biology curriculum and in Year 9, students are taught about endothermic and exothermic reactions in terms of energy within the Chemistry curriculum. Explicitly teaching students the links within and between subjects helps students to build their schema so that their recall of powerful knowledge is more effective over time.

Acquire and Apply

Teachers will help students to activate prior knowledge before they teach the students new content to add to their existing schema. This could be within the starter questions or immediately following them. The curriculum is carefully mapped to ensure that all teachers can make meaningful links to prior knowledge.

Lessons are carefully sequenced and chunked to ensure that students are introduced to new information in small quantities. Where appropriate, this is introduced using scientific diagrams and always via explicit instruction by the teacher. Following the introduction of new information, teachers will check for whole class understanding, often through the use of mini-whiteboards, before the students move onto carefully planned independent practice which will help students to apply their newly acquired knowledge.

Students are given the opportunity to retrieve information from their long-term memories by completing the starter questions every lesson. Teachers gather whole class information from this activity and will reteach any whole class gaps within this lesson or strategically map it to reteach in the future.

Adapt and improve

The curriculum is ever evolving and there are multiple opportunities within the academic year to adapt the curriculum to best meet the needs of our students. This is particularly evident following formal assessments (internal or external). We collate subject knowledge areas which as a cohort need to be developed and map the reteaching of this into the curriculum for that year group as well as reflecting as a department on the resources and method of delivery that were used to teach that knowledge so that they can be improved for when the next cohort are taught it to ensure a higher success rate next time.

Teachers have access to an adaptable centralised resource for them to use as a starting point in their planning for individual lessons. Teachers are expected to adapt the do now activity to address their own classes subject knowledge gaps. They also are expected to adapt the We do for their class to ensure the level of challenge and support is appropriate. The independent task should also be the most appropriate one for the students in front of them.

We regularly discuss the current curriculum and delivery of the curriculum within our department meetings and continuously reflect on how it can be improved.