Higher Quality Learning in Science

Focus

Ensuring students understand the context and the learning expected.

Lesson structure in the Faculty of Science follows the **accelerated learning cycle** where students are engaged with a connect activity, learning is activated and demonstrated (once or multiple times depending on the lesson objectives) and then consolidated at the end of a session. **Learning outcomes** are shared either verbally or displayed as part of the lesson presentations- linking both to scientific concepts and/or skills. These will focus on pupils working towards a '**Big Question**' in each lesson.

The Science **Curriculum** is **ambitious and broad**, with the intention of developing curious, enquiring and evidence-based future scientists. Elements of Biology, Chemistry and Physics are covered through each year. Our intention is for the development of both scientific understanding and skills in all our pupils The curriculum is delivered through themed schemes of learning that build in both concept and pedagogical demand as pupils move through Years 7-11. The curriculum is structured so that pupils transition from KS3 to KS4 in Year 9- working on bridging units including key numeracy and scientific skills alongside key knowledge for GCSE.

Scientific content is derived from the National Curriculum and AQA specifications which are then written **collaboratively** into **schemes of learning** that support students in their learning of the necessary **knowledge and skills**. Staff follow the schemes of learning but have freedom to adapt the lesson delivery to suit the pupils in their class. Throughout each year, the scientific knowledge and key skills are taught and refined multiple times, allowing for more complex ideas to be layered on these key foundations.

Challenge

Meeting the needs of all learners in order to build confidence, provide challenge and ensure success.

Teaching structure is planned to ensure pupils build confidence and receive the appropriate level of support and challenge. Year 7+8 classes are taught in mixed ability classes, Year 9 are taught in streamed classes to allow for strengthened specialist preparation for GCSE study. At KS4, students get specialist teaching of the 3 disciplines in separate lessons where classes are streamed broadly (but not solely) into higher and foundation groups- allowing more bespoke teaching and pace for these students. This allows for greater specialist support of each subject. Our foundation learner GCSE group is taught by two teachers rather than 3 to allow for more consistency in support for these pupils. Seating plans, desk planners and internal faculty data sheets are used to track progress and provide evidence for timely **intervention** as part of the faculty's quality first teaching.

Differentiation in science lessons can be explicit or subtle and is based on the need of the student. Lessons are structured in way that students can access the learning regardless of learning need. Examples may include scaffolded activities, modelled examples of tasks, simplified practical instructions and use of visual and memory aids in lessons. Student's learning is also stretched by using more complex contextual examples of science, research projects or extension activities. Knowledge assessments for all year groups in science are split into a foundation and higher paper, with overlap between them. Frequent **retrieval** and teaching through **metacognition** strategies supports this

Science proactively engages with **technology** that can support the learning and engagement of our students. Examples of this include the use of Seneca, Edpuzzle or videos to support GCSE required practicals. These often allow for the revisiting of key knowledge in a different context, which can be especially useful for SEND students.

Assessment

All students know how to improve, progress is reviewed regularly and feedback supports improvement.

Formative assessment of learning **during a lesson** takes place continuously and can include (amongst others); structured peer/self-assessment, use of mini-whiteboards or verbal questioning and feedback. Self and peer assessment take place in green pen. S**kills assessments** focus on the key skills as required by scientists both at school and beyond. **Knowledge assessments** focus on the scientific facts and concepts that have been covered in that unit of work. These are designed to assess the key concepts required in order for students to make progress towards future concepts in later years. These take the form of a short written test. The outcomes from these assessments then allow staff to intervene in a targeted and effective way- for example using writing frames, modelling good practice.

Marking of work in Science is targeted at both knowledge and skills assessments which are 'deep marked' by staff using green and pink. Green indicates what the student has learnt successfully. Pink indicates a section not complete or incorrect- this indicates where the student will take-action in a DIRT lesson. During DIRT- this feedback is acted on by the student using green pen. Homework and other pieces of work may be marked by the teacher in this way or by red pen. Praise is shared with pupils but with a focus on effort rather than attainment. DIRT lessons are also a chance for the teacher to give more focused support to a child/group or re-teach a section of the topic that requires more attention.

Where assessment has found a pupil has not made progress that would have been expected, staff **intervene** to support that student's learning in a number of ways. This may include the physical environment the student is learning in (changing seats or position in the room), the tools the student learns with (writing frames, modelled answers etc) or more bespoke support (re-teaching a section of the work, catch up sessions or a chance to re-do an assessment following advice and feedback).

Climate

Creating a positive climate of learning, behaviour and engagement.

Environment -The science faculty uses a combination of student work, points of interest and learning aids as the main ways of **supporting learning** through the environment that lessons take place in. These may include information on science careers, scientific key-words and definitions, current issues in science or inspiring examples of student work. There is an added importance in science laboratories that the environment must be both **healthy and safe**. Each Science lab has a copy of the Faculty of Science safety rules, intermediate first aid measures (green poster) and the relevant signage for fire-fighting equipment clearly visible.

Routines in science lessons also link to the health and safety of pupils and staff. Pupils line up for lessons beforehand and are not allowed in science laboratories without staff present. During lessons with practical work, pupils put coats and bags to the sides of the room or out of harm's way. Safety glasses are provided in each room and pupils remain stood throughout a practical session. Eating and drinking is not permitted in science laboratories.

Motivation - The Faculty of Science engages its students through praise in class, the sending of postcards or letters home and use of the **Fernwood Award**. This is used to reward high effort levels, encourage students to go 'above and beyond' and recognise particular achievement in science lessons. **Behaviour**- the Faculty of Science mirrors the whole school behaviour and sanction systems. During science detentions, pupils fill in a behaviour reflection form that can be used to support a restorative conversation. Pupils can be placed on a Science Report to encourage more positive behaviour. Pupils acting unsafely in practical lessons can be withdrawn from practical activities.

Fluency

Developing the language fluency and learning skills students need to access learning and make progress.

There is an emphasis in Science lessons on the importance of using **academic scientific language** correctly as well as practicing different opportunities to use that language both verbally and in written work. Science supports the whole-school focus on **reading and literacy** with pupils asked to read out loud in lessons e.g. news articles or the method for an investigation. **Numeracy** skills also play a large role in the teaching and learning of science. Pupils are explicitly taught some of these skills in science and given opportunities to develop and practice these skills multiple times. This is often done in liaison with the Mathematics Faculty.

Science relies on a substantial body of knowledge and so as part of the teaching in science, we teach students about different strategies for memory retention and factual recall through the use of embedded **retrieval practice.** We also use different strategies to support this such as **visual imagery** to support memory retention for less able students, or the teaching of different revision strategies and approaches. We aim for our pupils to become aware of how they learn and to demonstrate metacognition throughout their learning.

Science in the modern world faces up to complex issues about humanity and our interaction with our environment. The science curriculum acknowledges and reflects this, giving opportunities to develop pupil's abilities to **critically analyse evidence** from their own and other people's perspectives. This includes considering the **nature of bias** and the role social media has to play in forming a student's understanding of science. We work alongside other faculties in developing all the skills outlined above.

Our Faculty intent: We seek to nurture, develop and enable students' **curiosity**, to explore and develop their **scientific knowledge** and **enquiry skills; discovering themselves**, **our world** and the **processes** that take place within it; honing their powers of **questioning, investigation** and **experimentation**.

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The Science Faculty

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Focus

-Each lesson is based around a 'big question'
-Key concepts are layered and build in demand, with a balance of Biology, Chemistry and Physics in all years
-Schemes of Learning developed collaboratively- driven by the accelerated learning cycle
-Practical with purpose

Challenge

-Ambitious learning outcomes set for all pupils with differentiation in place to support and stretch all students on their learning journey
-Science teaching incorporates a range of different types of learning activities to suit all learners- including group work and collaborative learning
-Seating plans, marksheets and APRI tool used to track progress by identifying and supporting students

Assessment

-Frequent low stakes testing of knowledge to embed long-term memory by retrieval practice.
-Science lessons contain a variety of different methods of formative assessment
-Knowledge and skills are assessed in a summative assessment once per topic.
-Assessments are marked in pink and green to indicated areas of development and success.

Climate

-Clear routines for encouraging good behaviour, safe working and productive practical work.
-Use of the Fernwood Award to motivate and reward pupil's efforts in Science
-Working environment that highlights aspirational careers, good examples of work and that supports the learning of key scientific ideas

Fluency

-Scientific academic language used consistently in teaching and emphasised in both written and verbal work.
-Key common misconceptions identified in schemes of learning and teaching solutions offered.
-Pupils are encouraged to become self-aware of how they learn through modelling answers, metacognition and self-regulation.
-Frequent use of retrieval and other memory based activities to allow pupils to build the foundations of key knowledge.