



Science Curriculum

Statement of Intent, Implementation, Impact

The school's vision and educational aims for Science are to provide a **rigorous curriculum** that is **ambitious, challenging, enriching, inclusive** and **enjoyable**. This is in line with the school's aim to encourage high aspirations in order to maximise progress and enable all pupils to experience the joy of success. Science touches all of our lives, whether we are looking into the furthest reaches of space or at the tiny microbes that damage our health. A study of Science involves addressing huge moral issues such as climate change, energy production, food and overpopulation, health and how we better use our dwindling resources. At Broughton the intention is that all pupils will have a good understanding of Science which will enable them to make sense of and adapt to a rapidly changing world. The Science curriculum is planned and sequenced so that new knowledge and skills build on what has been taught in Primary Schools. This necessitates considerable amount of liaison and transition meetings because of the variability of Science education at Primary level. At Broughton, there is a commitment to a **three-year programme of Science in Years 7, 8 and 9** to ensure that every pupil has the opportunity to continue to study Science at an appropriate depth /level at GCSE.

Science should enable pupils to:

- Have an understanding of the world through the specific disciplines of Biology, Chemistry and Physics and understand how Science has changed our lives and is vital to the world's prosperity.
- Develop a sense of excitement and curiosity about natural phenomena.
- Understand how science can be used to explain what is occurring, predict how things will behave and analyse causes.
- Develop their own ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills.
- Develop a repertoire of ambitious vocabulary which aids the pupil's knowledge and understanding not only of the topic they are studying but the world around them.
- Develop practical skills and their ability to make accurate and appropriate measurements to give pupils the opportunity to use a wide range of scientific equipment.
- Develop their use of ICT in their science studies by the use of data loggers and laptops for research.
- Approach sensitively and respectfully how different backgrounds, faiths and beliefs may affect interpretation of scientific explanation.
- Develop their ability to apply numeracy skills to analyse, evaluate and interpret data.

Studying Science helps shape a pupils' sense of ethical values by giving them an opportunity to understand and discuss the impact of scientific developments on society. Some examples

of key issues that are discussed are; Nuclear energy, MMR vaccination, antibiotic resistance, genetic testing, genetic diseases, drug testing, nanotechnology, climate change, recycling and finite resources. Through **discussion of key scientific matters, experiences gained from trips** (visit to London Science and Natural History museums, Science Live lectures, Faraday competition at Lancaster University and talks from STEM shows), to **understanding the utility and broad application of science qualifications, knowledge and skills used in science**, the department **build on pupil's science capital**.

Implementation

At Key Stage 3, pupils have 3 one hour lessons per week, all taught by the same teacher (a member of the Science department). At Key Stage 4, all pupils are taught by well-qualified subject specialists. Combined pupils have 5 one hour lessons per week, two of which are taught on a rota basis. Triple Science pupils have a total of 7 one hour lessons per week, shared equally over the three scientific disciplines over a two year KS4 course. Triple Science is an option for pupils (up to a maximum of 64 pupils) who have demonstrated high ability in Science. All pupils are entered for at least Combined GCSE Science and the current model means that the KS4 Science curriculum accounts for 20% for Combined and 30% for Triple of the school curriculum, which is line with national expectations.

All science lessons are delivered by **well-qualified, experienced subject specialists**. The **quality of teaching and learning** in all science lessons is **excellent**. All teachers present subject matter clearly, prompting appropriate discussion and incorporating practicals/experiments at every possible opportunity. All Science teachers create an environment which is safe and inspires, interests and excites pupils to want to be inquisitive. Pupils, and particular groups of pupils, have excellent educational experiences in Science; **pupils enjoy Science lessons**. The curriculum is engaging and varied, and these ensure that they are very well-equipped for the next stage of their education training or employment.

Sharing the very best practice has been the highest priority and staff routinely, **consistently teach great lessons**. **Collaboration** is a corner stone of the department and the relationships between all staff members are excellent. Staff understand the need to constantly develop their subject knowledge and skills in this core curriculum area. Self-evaluation and a desire for improvement drive departmental development. The department continues to receive CPD for new initiatives and ways of teaching the new GCSE specifications by regularly attending HUB meetings organised by the examining board. Cooperative lesson planning is a significant feature of the department which allows for a wider pool of knowledge and pedagogical understanding to be incorporated into all schemes of work. Sharing good practice is a key part of the department. All members of the department are encouraged to share good examples of subject-specific teaching resources in the departmental shared area. In addition, colleagues will routinely teach their subject specialism and model good practice to other members of the department.

The Science Key Stage 3 curriculum is designed in such a manner that all of the skills necessary for success at GCSE are practiced and honed throughout the pupils' initial three years of study. The KS3 curriculum is based around the national curriculum and is informed by our knowledge of the requirements at KS4. Deliberate structuring and scaffolding is used lower down school to ensure that assessments are accessible and challenging to all pupils. This allows the department to more effectively track progress of pupils' knowledge skills and application from year 7 all the way through to the end of year 11. Topics are sequenced in a deliberate way,

ensuring that pupils' knowledge and understanding develop appropriately over the KS3 course and to ensure that they are suitably prepared for the start of the KS4 course.

All Science teachers routinely check pupils' understanding of topics throughout the course of study. **Teachers teach in an adaptive manner** using starter activities as well as whiteboard tasks to assess knowledge and misconceptions. There is an expectation that **teachers teach in a pro-active and responsive manner** as a result of this information. Teachers provide pupils with relevant, subject specific, detailed feedback, based on whole school and departmental agreed criteria. This is via verbal feedback during lessons, formative written feedback on specific pieces of work and summative written feedback at the end of each topic.

The department continues to place considerable focus on **improving the long-term memory** of pupils and building upon previous learning. All teachers routinely use **low stake testing, spacing and interleaving** to ensure that pupils are able to learn more effectively. All end of unit tests have spacing of at least two weeks and include interleaving questions from prior topics. All pupils are aware of and are encouraged to use revision resources from year 7 onwards to ensure techniques are embedded in practice, resulting in them taking a greater responsibility for their own learning.

Metacognitive talk is also routinely a part of lessons. Pupils are encouraged to show their metacognitive thought processes by demonstrating planning of extended answers. Teachers also model metacognitive processes, for example when analysing exam questions. This approach is vital to ensure pupils are confident in their approach to tackling exam questions with ease.

The teaching of **subject-specific vocabulary** is demonstrated and is an integral part of all Science lessons and there is an insistence on correct spelling and understanding of key scientific words. Etymology of key words is taught explicitly to improve pupils' understanding. Lists of key words for topics at KS3 are found in homework booklets and core practical booklets.

Reading closely for information, understanding and clarification is a key element of all Science lessons. Instructions, data and relevant facts are explained and interrogated by teacher/pupils. All teachers routinely ensure pupils read correctly so that they can de-code questions and interpret instructions accurately. Common mis-conceptions are corrected as a matter of course.

Mathematics and numeracy necessarily feature strongly in many Science lessons: for example, plotting graphs, rearranging equations, titration calculations. The *GCSE Edexcel guide to Maths for Scientists* is used as a model for teaching maths skills. The department also liaises closely with the Maths department to ensure a consistent approach to teaching.

Assessment within Science is through a variety of homework and classwork tasks together with summative assessments at the end of each topic (end of unit test) and a final end of year exam. Scores from end of unit tests and end of year exams are recorded on the department's internal database. Pupils overall progress is assessed based on a combination of the end of unit tests and end of year exam alongside teacher assessment.

All teachers routinely adopt the whole school approach to **DIRT**. Pupils are prepared to improve their work in response to feedback, which is an integral part of all units. There are numerous examples of this, but some especially good practice can be seen after an assessment where pupils use their DIRT time to come up with a personalised learning checklist.

Impact

The Science department continues to foster an enjoyment and curiosity of the subject. Approximately 50% of A band pupils opt for Triple Science and this has been the trend for many years. Pupils enjoy their experience in Science lessons and this is proven by the positive responses from pupil voice and the excellent behaviour, participation and enthusiasm of pupils during lessons. Pupils are genuinely interested in their Science education. Almost all pupils have high expectations and are prepared to work independently and creatively to solve problems, producing solutions of an excellent standard. In addition, they are prepared to spend time outside the lesson on research or to complete and improve work to ensure they meet or excel beyond their targets.

Consistently high-quality teaching in Science has resulted in **attainment at KS4** which is **significantly above national standards**. Furthermore, routinely excellent teaching enables **all groups of pupils** to make **significant progress**, whatever their starting points. This proves the impact that our curriculum and approaches and quality of teaching and learning have. Sharing the very best practice is always the highest priority and the department understand the need to constantly develop their subject knowledge and skills in this core curriculum area. The department constantly reflect upon the Edexcel analysis of exam performance to evolve as practitioners and use this information to improve and enhance teaching. Internal monitoring of pupils continues to play a key role in this as teachers are able to closely track the progress of their pupils and intervene where necessary. Tests throughout KS3 show pupils' knowledge is progressing. The end of KS3 exam taken by all pupils at the end of year 9 assesses knowledge and understanding from the whole of Key Stage 3 and this demonstrates the solid foundation that pupils have to prepare them and ultimately give them success at the end of Key Stage 4. The quality of pupils' work across Years 7-11 is consistently of high quality as evidenced by work scrutinies and daily visits to lessons.

To enhance the curriculum and enjoyment for the subject the department hosts a number of extra-curricular activities. Science club takes place after school, and currently we have approximately 50 pupils attending across years 7, 8 and 9. Each year a number of pupils apply to be science ambassadors and assist the department at science club, open evening and other events. Annually, we take 50 year 7 pupils to London so that they can visit world renowned museums. Pupils are also exposed to STEM activities, both from the department and external providers. Giving pupils opportunities to explore STEM related concepts will hopefully encourage them to develop a passion and hopefully pursue a job in a STEM field. Year 10 triple pupils attend Science Live lectures, the purpose of which is to broaden and hopefully ignite even more interest in all areas of science, with the hope of them moving onto study this at college and university. Most pupils who take triple science will go on to study at least one A level in science.

Covid curriculum

During the second lockdown period all Science teachers delivered high quality lessons through Microsoft Teams. The department are now able to use Teams to good effect and have continued to receive training to inform their lesson planning. Teams has also been used in school to ensure that pupils who are isolating have the same experience as the pupils who are in the classroom. Lessons were varied and included demonstrations, modelling,

explanations and animations. The levels of engagement across all years were exemplary meaning that most pupils did not fall behind with the curriculum.

After the first lockdown we rescheduled some of the KS3 units to optimise the teaching of them and so pupils could carry out the related practicals to enhance their learning and experiences.

Photosynthesis and plant reproduction units were moved from year 7 to year 9.

A three-week catch-up period towards the end of year 8 to cover the topics human reproduction and separating techniques (specifically filtration, chromatography and distillation).

Summative assessments were not completed during the lockdown periods, however, formative assessments using Activelearn, SENeca, Microsoft forms and multiple-choice questions were integral parts of all teachers' planning and delivery of lessons.

All pupils in KS3 were bought a revision workbook; this ensured that any pupil who did not have access to a printer was not disadvantaged, it also helped to provide consistency in the delivery of the KS3 curriculum.

Learning Recovery

Unfortunately, we cannot provide interventions on a one to one level for all, so as a department we must ensure we identify and support all pupils within the classroom. Quality first teaching will always be the most important lever for enhancing pupil progress. Every teacher is responsible for ensuring that all pupils who are underperforming are identified early and appropriate interventions are put in place. Intervention must include obligatory catch-up or booster sessions.

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