



Oasis

Academy:
Oldham

Creating a
community of
choices & chances

Actively teaching the OAO
'Just Cause'

IN..

SCIENCE





How do we actively teach the Just Cause in Science?

Science exists all around us and is an integral part of our everyday life. Not only does it help our understanding of the world but advances in technology and science are transforming our world at an incredible pace. Human progress throughout history has largely rested on advances in science. From landmark inventions to cutting-edge medical advances, students of science have shaped our modern world. It is remarkable to think that future generations will experience leaps in technology, not yet discovered that will influence society's view of the world. The significance of science is increasing at such a rapid rate that being "science literate" will no longer be just an advantage but an absolute necessity.

For our students to understand the notion of 'community', we teach the essential aspects of 'how science works' which involves developing their understanding of nature, processes and methods. We also afford the students the opportunity to explore how the knowledge gained at classroom level links with science in the outside world (from a political, social, religious and economic perspective) with explicit links made to its impact on the local community. For instance:

- Biology is a fundamental science used to help medical advances. Through biology the students study and grow their knowledge on health and fitness, the human body and factors that affect it, as well as plants and the environment. They also study topics such as stem cells and genetic engineering which contributes further to their understanding of medicine and technology and the role that advances in science play in saving millions of lives worldwide.
- Chemistry too has its uses in the medical field through a deeper understanding of chemicals and how they work and react to each other. Pharmaceutical companies use the science of Chemistry to develop new treatments for medical conditions and symptoms. Students also explore how Chemistry helps us to understand materials, how they are obtained and how scientists use certain formulations and techniques to enhance the properties of materials.
- Students explore global Issues such as Animal Extinction, Temperature Change, Global Warming, Pollution, Deforestation, Carbon Footprint, Recycling and Natural Disasters.
- Students discuss the conflict between religion and science in topics such as Reproduction and Natural Selection. Topics such as Organic Chemistry, Chemistry of the Atmosphere and Energy affords pupils the opportunity to discuss political issues in relation to the use of crude oil and society's reliance on it as a source for producing useful materials.

- In Physics, advances in our knowledge of waves and electrical currents have led to landmark discoveries. Knowledge of forces has developed our understanding of Space and the universe.
- Throughout Science, student study units of measurement in helping us to understand the world around us.

As part of our commitment to establishing links between science and the local community,

- In Biology, when learning about Fertilisation, students will be made aware that the first IVF baby, Louise Joy Brown was born in Oldham on 25th July 1978. In Infection and Response, references will be made to the role of science in medical advances. The first tubular bandage was invented and developed in Oldham in 1961.
- In Chemistry, during the teaching of Organic Chemistry and The Chemistry of the Atmosphere, pupils will learn about coal mining and the mills in Oldham.
- In Physics, references will be made to famous physicist such as Professor Brian Cox and the scientists educated in Manchester whose work contributed to the development of the atomic model.

For our students to make informed **'choices'** they are required to carry out a range of scientific investigations that help them to explore certain patterns and develop analytic and problem solving skills to formulate ideas and draw conclusions. This supports them to answer scientific questions about the world around them. For instance:

- Analyse a range of information to draw conclusions, make evaluations and justify their answers with clear and coherent explanations or calculations.
- Answer multiple choice questions using a variety of techniques and approaches.
- Analyse methods with a goal to find the error and correct it with clear reasoning and justification.
- Interpret and compare sets of data making various judgements and conclusions.
- Make a choice of the most suitable way to present observations and other data using appropriate methods.
- Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to an experiment.

For our students to understand the notion of **'chance'** we encourage the development of knowledge and understanding in science through opportunities for working scientifically. Working scientifically is the sum of all the activities that scientists do.

Students develop scientific thinking and understand how scientific methods and theories develop over time. For instance:

- When presented with a range of data, they decide whether or not given data supports a particular theory.
- Translate data and use it to make predictions and develop scientific explanations and understanding of familiar and unfamiliar facts.
- Appreciate the power and limitations of science. Being able to outline a simple ethical argument about the rights and wrongs of advances in technology. This skill is explored in topics such as embryo screening and stem cells.
- Explain every day and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.
- Recognise the importance of peer review of results and communicating results to a range of audiences. Explain that the process of peer review helps to detect false claims and to establish a consensus about which claims should be regarded as valid. Explain that reports of scientific developments in the popular media are not subject to peer review and may be oversimplified, inaccurate or biased.



Students develop experimental skills and strategies. For instance:

- Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative.
- Assess whether sufficient, precise measurements have been taken in an experiment.
- Evaluate methods with a view to determining whether or not they are valid.

Students develop their analysis and evaluative skills, applying the cycle of collecting, presenting and analysing data. For instance:

- Apply the idea that whenever a measurement is made, there is always some uncertainty about the result obtained.
- Being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential source errors.

We are committed to our efforts being focused upon addressing the Academy Development Priorities.

1. Improving the engagement of our parent community.

Research from the EEF (Working with Parents to Support Children's Learning, December 2018) and the DfE (Understanding KS4 attainment and progress: evidence from LSYPE2, October 2018), both emphasise the importance of an effective home school partnership to ensure the best possible outcomes for young people. To that end, all aspects of school improvement activity this academic year will be considered from the perspective of the parents/carers.

Students love the feeling of getting answers right and this is more challenging in a subject like Science where there are often multiple explanations. The Oasis Science Curriculum is a knowledge-rich, interleaved curriculum that is designed to ensure that students have truly mastered content and not

just learnt it for their exams. We want students to feel secure in their subject knowledge, make links between topics, develop a love of learning science and promote a curiosity about the world as they apply their understanding to wider contexts. As part of our 100% homework strategy, we provide every student with access to online tools such as Seneca learning, knowledge organisers, a revision guide at KS4 and homework packs designed to encourage the students to regularly review their prior knowledge. We recognise that some of our parent community are not confident with their own ability to tackle all the three disciplines in Science. To support with this, we will provide regular communications with home about how students can effectively use these tools to improve and consolidate learning. This allows all parents to positively engage with their child's home learning for Science regardless of their own ability.

2. Improving the literacy of all our young people.

Our student population is weaker than the national average particularly in terms of reading ability. This is further compounded by some of the language difficulties our students face where English is an additional language. As such, we have a moral imperative to ensure that literacy across the curriculum is well taught. Moreover, our pupils' literacy directly correlates to their communication skills and their emotional literacy. It is essential this year that we equip our students with the necessary communication skills to better prepare them for the rest of their adult lives. In order to improve our outcomes, we must also engender a love of reading in all our young people.

As a result, the curriculum has been designed to develop the literacy skills of the students by encouraging the teaching of root words and breaking the keywords down to unlock the meaning of the words. We explicitly teach/refer to the difference between the meaning of commonly used words in spoken language and their scientific meaning or different variation of the words used in different subjects. In addition, pupils are shown how to

structure 'model answers' which builds their success rate and resilience when answering questions that require extended written answers.

3. Building a collaborative and positive school culture for all our staff and students.

The Academy has endured a number of volatile and turbulent years. Numerous Principals and significant staffing changes have contributed to lack of permanence and instability characterising the school. It is imperative this year that the Academy becomes harmonious; that agreed behaviour strategies for learning are consistently applied across all areas of the school. That staff and student wellbeing is of paramount importance to ensure high figures of retention and attendance respectively. Our Oasis 9 Habits should characterise the lived experience of all our staff and students and this will only happen with a collective will to adhere to our 5 Ps in all daily interactions: PREPARED, POLITE, POSITIVE, PUNCTUAL & PROUD.

We allow and plan for many opportunities for our students to practice and improve upon the Oasis 9 Habits and adhere to the 5 P's. This includes a positive example of showing all 5 P's during the 5 in 5 by meeting and greeting students at the door at the start of each lesson.

For our students to practise the Oasis habits and to develop their character, we study topics and themes that pose challenging questions and regularly present our students with a range of opportunities to provide and justify their own opinions. In topics such as Natural Selection or the Earth's Early Atmosphere, they are encouraged to explore both religious and scientific explanations. This reinforces the idea of the need to view topics from different perspectives so they can make informed judgements. Throughout the teaching of science, the students are encouraged to work collaboratively to plan and carry out scientific investigations. They learn about the importance of peer review and how ideas have changed overtime as a result of scientists building on the ideas of other scientists. It is expected that this will highlight to the students, the positive impact of working

collaboratively with their peers to develop their ideas and formulate their answers. This will also develop the students' practical, writing, speaking and listening skills so that they are able to articulate themselves with clarity. Explicit teaching of effective communication skills and how to formulate evidence driven arguments will present students with a safe, positive and stimulating environment within which to express their views, while building mutually-respective relationships amongst peers, and between staff and students.

4. Ensuring all aspects of leadership & teaching are well-planned and well-executed.

The Academy Leadership has a duty to ensure the appropriate systems and structures are in place to enable teachers to do their job well. All strategies and innovations must be clearly planned, communicated, executed and evaluated in a timely fashion and thus reduce the number of 'reactive' responses. All lessons must contribute to a coherent, challenging and enjoyable curriculum that enables our young people to become fully rounded, well prepared global citizens.

Throughout the academic year 2019-20 we have reviewed and developed our curriculum provision in Science. The curriculum has been designed to:

- Introduce the pupils to fundamental concepts and these ideas are built upon as the scheme of learning progresses.
- Spiral where pupils have the opportunity to revisit key knowledge and deepen their understanding as they progress through from Year 7 to Year 11.
- Develop pupil's retrieval practice-key knowledge organisers shared with the students, regular quizzing on current and previous knowledge to move this content from their short term to long term memory. The Do Now's contain interleaved questions to revisit previous topics and are designed to test the key areas (maths for science, knowledge, required practical's as well as an application questions).

- Develop their skills as the students are provided with a range of opportunities to view 'model answers' and practise doing a range of exam questions and practical work.

In the academic year 2020-2021, pre-assessment will be introduced. They have been designed as a diagnostic tool to identify gaps in students' knowledge that would have a negative impact on the progress that they are capable of making. Identified gaps or misconceptions will be addressed prior to the introduction of new content that relies on the students having a secure prior knowledge. This will ensure that they have a secure understanding of the key concepts that will allow genuine progression and aid their understanding of 'higher-order content'. To support our staff in their practice, we work to a consistent model of pedagogy. All of our lessons begin and end with our Academy '5 in 5' and '5 out of 5' protocol. We want to ensure that students feel like the content they are learning at each point is consistent – i.e. the definition that they learn is the same as they progress through the key stages. We have worked hard to ensure that the vocabulary we use, the definitions we give and the techniques we teach students are the same across the curriculum to ensure students feel supported, confident and successful.

Our teachers actively seek opportunities to extend the students' vocabulary and pay particular attention to explaining the meaning of key terms to deepen their understanding and help them make sense of the extensive vocabulary in science. We explicitly teach/refer to the difference between the meaning of commonly used words in spoken language and their scientific meaning or different variation of the words used in different subjects to help the students understand key vocabulary.

Unit overviews for each topic consisting of the fundamental concepts, residual knowledge to be secured by the end of the unit, misconceptions/barriers to students' learning, practical skills, numeracy skills, key terminologies, ideas that the students have encountered previously, the new ideas that will be learnt and 'SMSC,' a section that highlights how the topics link to science in the outside world and the local area will be introduced.

This will play a vital role in ensuring that our teachers, at all stages of their careers are confident in their subject knowledge. We want all teachers to feel empowered to deliver a carefully planned and high quality curriculum even when they are teaching out of their specialism.

The human body



Deforestation



Professor Brian Cox





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