

Science

Year 8 Curriculum Principles and Overview

At Dixons Kings we develop students to lead successful and happy lives and make a positive contribution to their community. Our curriculum in each year is designed to provide experiences, opportunities, knowledge and skills that enrich and challenge our students. We understand that the curriculum is key to determining the life chances and choices for our students and therefore we will not compromise on providing the very best. We achieve this in science through the below:

By the end of Year 8 students at Dixons Kings studying science will be exposed to:

- The fundamentals of biology, chemistry and physics outline in the Big Ideas of Science Education. We teach key ideas and build a strong core body of knowledge alongside ensuring that the students develop strong investigative skills.
- Students will develop a love for science and start to think like scientists by questioning and suggesting explanations for the science they see.
- An encouragement to link the science they learn to what they know about the world in which they live and ask questions about this.

	Cycle 1	Cycle 2	Cycle 3
Content / Themes Introduced	<p>Unit: Cells to organ systems</p> <p>Unit : Metals and reactivity</p> <p>Unit: Forces and motion</p>	<p>Unit: Electricity and magnetism</p> <p>Unit: Plants</p> <p>Unit: Chemical reactions</p> <p>Unit: Variation, adaptation and evolution</p>	<p>Unit: Plants</p> <p>Unit: Earth and atmosphere</p> <p>Unit: Health and disease</p>
Spaced Content	<p>Unit : Cells to organ system Spacing diffusion before students learn about respiratory system.</p> <p>Unit : Metals and reactivity Spacing atoms, compounds and formulae before students learn about word and symbol equations.</p> <p>Unit: Forces and motion Spacing forces before students learn about weight and mass. Spacing balanced and unbalanced forces before students learn about Hooke's law.</p> <p>Unit: Health and disease Spacing cell specialisation before students learn about white blood cells and disease.</p>	<p>Unit : Chemical reactions Spacing elements and compounds before students learn about chemical reactions.</p> <p>Unit : Cells to organ system Spacing conservation of mass before students learn about rates of reaction.</p> <p>Unit : Variation, adaptation & evolution Spacing inheritance before students learn about variation, continuous and evolution.</p> <p>Unit : Cells to organ system Spacing sexual reproduction before students learn about natural selection.</p>	<p>Unit : Plants Spacing diffusion before students learn about gas exchange in leaves.</p> <p>Unit : Plants Spacing exchanges of substances before students learn about active transport in root hair cells.</p>



Experiments	Parachute investigation Hooke's Law Food tests Action of amylase Physical & chemical change Metals and water Metals & acid Making and separating a salt Displacement reactions	Building circuits Series & parallel circuits Resistance of a wire investigation Investigating electromagnets Testing leaves for starch Leaf structure & function Chromatography of chlorophyll Endothermic & exothermic reactions Measuring the rate of a reaction The effect of concentration on the rate of a reaction The effect of temperature on the rate of a reaction	Combustion
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By the end of Year 8 students at Dixons Kings studying science will be taught the following skills:

- Carrying out investigations to test hypotheses
- Identifying and using a wide range of scientific equipment safely & accurately
- Identifying independent, dependent & control variables
- Taking accurate measurements and observations using a range of instruments
- Recording measurements/observations effectively in tables
- Recording data in bar charts and line graphs
- Creating their tables, bar charts and line graphs to record data
- Drawing lines of best fit on line graphs
- Identifying trends in data
- Predicting further patterns based on trends seen
- Identifying anomalous results and sources of error in an experiment
- Evaluation of an investigation identifying improvements that could be made
- Using their scientific knowledge to explain the results seen
- Analysis and synthesis of results from a number of experiments to produce a scientific conclusion
- Calculating the mean from a range of results
- Performing simple calculations
- Measuring angles

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In order to truly appreciate the subject and create deep schema science has been sequenced with the following rationale:

- We have looked in detail at best evidence for science teaching and mapped out the sequence of units based on the evidence provided to avoid misconceptions. The lessons are sequenced so the fundamentals are taught first and subsequent knowledge is built on the strong base. The topic of forces and motion in Y8 reviews and then extends the knowledge gained in Forces and Space in Y8. Cells to organ systems in Y8 takes the knowledge on how individual cells work from the topic in Y7 and looks at this on a much larger scale in cells to organ systems. In order to understand the topics of metals and reactivity, and chemical reactions, we revisit content from Y7 particles & solutions and elements and compounds and then build on and extend this to look at how atoms rearrange themselves in chemical reactions.



- We visited our primary partner schools prior to the development of our new KS3 curriculum so we had a better understanding of the knowledge that the students bring to Year 7 in terms of content, skills and language used. This has informed the content taught in Y7 (we no longer teach the solar system) allowing us to build on the knowledge they have.
- All students are taught a skills unit at the start of Year 7 through investigative work rather than skills in isolation. This is to ensure that students have had an attempt to master the skills that they will need throughout the year in a realistic context. These skills are constantly revisited and thus embedded throughout the year. The practical skills are revisited again in Y8 through the practical tasks that all groups are required to do.
- Biology, Chemistry and Physics are interleaved to allow the students to make links across all areas of science and see them as linked rather than discrete subjects thus facilitating a deeper understanding. Spacing of topics is built in within the scheme of work at the appropriate stages. Most units in Y8 build on and extend knowledge gained in Y7. By revisiting content in Y8 students help develop their schema and see how the new content links with what they already know.
- The lessons are planned to a high standard. There are various opportunities for AFL in order to identify and address misconceptions using MWB activities in addition to Q&A between teacher and student and student to student. Activities are included to address any misconceptions identified. The lessons and tasks are structured to manage cognitive load whilst still maintaining challenge. Wherever possible we use modelling to help students develop a deeper understanding of scientific concepts.
- Practical work is a key priority in the KS3 scheme of work with all practicals included being compulsory. There are individual experiments to secure and embed knowledge of content and eight investigations through the year to allow constant repetition of planning, identifying variables, using a range of equipment effectively and safely, recording results in tables and graphs, creating tables and graphs, identifying anomalous results, analysing & synthesising results and evaluating results and methods. These investigations also secure and embed content knowledge.
- We do not want lack of knowledge to be a barrier to application and recall of knowledge is a fundamental part of the end of topic assessments. In these assessments, 40% of the marks will be for pure recall. There are sanctions for falling below a pass mark which will link to the pupil's ability. A further 60% of the marks will be for application of the knowledge. Gaps in knowledge identified through this element of the test will be addressed through specific DIRT activities related to the ability of the student. Knowledge retrieval is also constantly assessed through the Do Now activities at the start of every lesson which will be monitored through MWB responses. The knowledge navigator sheets are also used, often as part of homework, to ensure students are constantly revisiting with spot tests.

The science curriculum at Kings has been influenced by:

- Best Evidence Science Teaching University of York Science Education Group
- EEF Improving Secondary Science Report
- Working with Big Ideas of Science Education
- AQA Science KS3 Syllabus
- ASE Science Skills age 11-14
- Rosenshine's principles
- Efrat Furst and building schema
- Misconceptions in Science by Adam Boxer
- Learning scientists – six effective learning strategies
- Fiorella and Mayer's Generative Learning in Action by Mark and Zoe Enser

The order in which they have been taught and the content in each unit has been determined by the following:

- MAT wide policy
- BEST evidence science teaching which provides a clear sequence for the order in which scientific ideas and concepts should be taught.
- CPD from the maths department has allowed us to more closely align our sequencing of science content with maths. For example, calculating acceleration using the gradient from a graph has now been moved from Y7 to Y8 as this is when gradients are delivered in maths. The CPD ensures that the way we deliver the maths in science is consistent with the way it is delivered in maths.

Our science curriculum ensures that social disadvantage is addressed through:

- Exposing our students to content that provides a deeper understanding of the world around them. The construction of our science curriculum not only ensures that students are taught the relevant knowledge, but also provides them with the skills to interrogate the world around them. This innate ability to question the world and to analyse information gives all our students, but especially our disadvantaged students, a complement of skills that will benefit their long term learning. We believe that without the power to question and develop hypotheses using scientific methods, individuals are dependent on those that possess these attributes and are unable to challenge the world around them.
- Recognising the lack of cultural capital many of our students have. An example would be when Ecology is taught. Students have a very limited knowledge of the natural world and plants and animals within this. When this topic is taught pictures and videos of habitats, animals and plants are constantly used in order for students to visualise what they are being taught.
- At KS3 we run a trip to the science museum in London and a fieldwork trip to the Yorkshire Dales. Priority on both these trips is given to disadvantaged students
- Disadvantaged and SEN students have their books marked more frequently compared to their peers. This allows for rapid identification of any misconceptions and errors. SEN and disadvantaged students are highlighted on staff intervention folders thereby ensuring these students are receiving the attention they need.

Our belief is that homework is used for deliberate practice of what has been taught in lessons.

- Homework is marked is set through Carousel learning. The focus is on ensuring the students learn the key facts for each unit and the platform allows an opportunity to quiz themselves on the questions before finally answering and submitting their answers. The platform allow teachers to identify any misconceptions for a particular homework across the class or to identify individual misconceptions across a cycle. Students self mark their homework and it is checked by the class teacher
- Each homework contains questions from previous topics in order to practice retrieval of prior learning and to support all students with committing knowledge to long term memory.
- Students are introduced to a range of ways to revise at home

Opportunities to build an understanding of social, moral and ethical issues are developed alongside links to the wider world, including careers: (This needs more detail)

- The schemes of work ensure topical issues are covered to allow students to have an educated and informed opinion on global issues. In Y8 this includes the topic on food and diet and the link to the high diabetes rate in Bradford; increase in antibiotic resistance and the link to superbugs; metal ores and the link to dwindling resources; global warming and human impact on the Earth.
- A KS3 trip to the Life Centre in Newcastle provides an opportunity to see the theory they have learned in class in a museum context with interactive exhibits
- There is an annual careers fair where the students can discuss potential careers of interest and learn about careers related to science.
- In KS3 we have a STEM Club which allows further opportunity to use science to solve problems and an outdoor science club where environmental issues are explored.
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Further Information can be found in:

- Long term plans
- Knowledge navigator sheets
- Schemes of work
- Best Evidence Science Teaching University of York Science Education Group
- EEF Improving Secondary Science Report
- Working with Big Ideas of Science Education
- AQA Science KS3 Syllabus
- ASE Science Skills age 11-14

