















# Science Curriculum Rationale



At Bradway, our approach to science is to expose children to the specific disciplines of physics, chemistry and biology. They will learn about how the physical and natural world works and what its components are. Science education is essential to provide children with a broad understanding of the world and their place in it therefore pupils have a right to enjoy and be scientifically literate. Our curriculum enables pupils to recognise the connectedness of science and how each new topic connects to everyday life and familiar contexts. Each unit provides a strong foundation of scientific knowledge and skills that can empower and equip pupils to participate, challenge and reshape the world around them.

INTENT	IMPLEMENTATION	IMPACT
<p> <b>Alignment to National Curriculum</b></p> <p>The science curriculum at Bradway begins with the EYFS framework, particularly the 'Understanding the World' strand, and then follows the National Curriculum programme of study as a basis for its content and framework, this ensures cohesion and progression. We draw upon resources from <i>Ark: My Mastery, Outstanding Science, Explorify</i> and use the key vocabulary list produced by STEM. These resources supplement the National Curriculum, ensuring teachers recognise the core knowledge and vocabulary all children must master. Through our science curriculum, pupils are equipped with the skills, vocabulary and knowledge of processes through which science is achieved and applied. By the time pupils move on to secondary school, they will be able to answer their own science questions independently, by carrying out one of the five types of enquiry: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. The end points for working scientifically, set out in the National Curriculum for Y2 (where the focus is observation and exploration) and moving towards Y4 (scaffolded enquiry), are the stepping stones towards this goal.</p> <p> <b>End Points</b></p> <p>The Bradway science curriculum has been carefully sequenced to provide progression through the domains of biology, chemistry and physics. Our spiral curriculum ensures children build the foundations of their substantive and disciplinary knowledge in each of the scientific disciplines and continue to return to these and build on them, year on year. Pupils develop their understanding of how the 'small' ideas and details they have previously mastered develop into 'bigger' ideas. This is all part of their journey towards an understanding of the 'big ideas' in science.</p> <p> <b>Sequencing</b></p> <p>We recognise that children come to us with different amounts of science capital (knowledge, attitudes, skills and experiences) but all children have a right to know and remember the core knowledge and vocabulary identified in our curriculum. We are committed to ensuring all children master this substantive knowledge and use regular opportunities for retrieval practice to close this gap. Additional science capital is gained through activities such as trips and science visitors Support is in place for disadvantaged families to ensure equity when accessing experiences in and out of school so that all children have the opportunity to engage in these.</p> <p> <b>Addressing Social Disadvantage</b></p> <p>For a proportion of our lower attaining pupils and pupils with SEND, carefully structured support and purposeful guidance is provided, where necessary, to increase their confidence and independence. Sheffield is one of the greenest cities in the world. We take every opportunity to enrich the children's scientific learning by spending time outdoors. We are fortunate to have extensive school grounds and are a short distance from Ecclesall woods and the Peak District National Park. These resources are utilised to support the teaching of science in the real world and so enhance children's science capital. We invite science experts from the area into school to share their knowledge and provide memorable experiences.</p> <p> <b>Local Context</b></p>	<p> <b>Pedagogical Approaches</b></p> <p>In science, teachers will develop the children's substantive and disciplinary knowledge. The children will gain knowledge of scientific concepts and deepen their understanding through 'working scientifically'. All children will be exposed to high quality texts and stories which will help to provide pupils with strong foundational knowledge that can empower and equip them with the skills to question and challenge the world around them. Guided, independent and retrieval practice, rooted in cognitive science, are used, where appropriate, to ensure children remember the key substantive knowledge and are able to use this in activities that require deeper thinking.</p> <p> <b>Teachers' Expert Knowledge</b></p> <p>It is essential that teachers have the required level of expert knowledge so that explanations are clear, accurate and responsive, and children's misconceptions are anticipated and addressed as they arise. Teachers looking to improve their curriculum knowledge and delivery are signposted to reading and specialist training courses, for example STEM learning at York University or to reading or using the support materials supplied by Ark. It is essential that teachers have the required level of expert knowledge so that explanations are clear and accurate, and children's misconceptions are anticipated and addressed.</p> <p> <b>Promoting Discussion and Understanding</b></p> <p>Children share observations and findings and help one another to make connections in their learning and so develop a deeper understanding. Discussion (both pupil to pupil and pupil to teacher) has an important role in the development of scientific ideas and opportunities to discuss questions using P4C should be taken when they arise. Effective questioning by the teacher is key to allow pupils to practise new knowledge and to help them make links between new material and prior learning (Rosenshine). Essentially, through these opportunities for science talk, core knowledge is fully understood.</p> <p> <b>Knowing More and Remembering More</b></p> <p>Opportunities for retrieval practice are included in science lessons to ensure knowledge is transferred into long-term memory. Retrieval activities may require children to remember learning from the previous lesson, previous topic or even previous year to ensure the retrieval strength of powerful knowledge is high.</p> <p> <b>Teacher Assessment</b></p> <p>Formative assessment is essential in the implementation of the science curriculum to ensure that all children have schemas of understanding which will move them on their journey from novice to expert. Effective questioning, as outlined in Rosenshine's principles, plays a fundamental role in checking for understanding and ensuring misconceptions are quickly addressed.</p>	<p> <b>Approach to Assessment</b></p> <p>A range of evidence based formative assessment strategies including cold calling and partner talk (Rosenshine) are used to systematically check for understanding and establish how well students are doing in making sense of the material. Focused assessment tasks, such as those shared on the Ark mastery curriculum, and specific recall activities like quizzes, are used to enable teachers and children to monitor the depth of understanding of substantive and disciplinary knowledge and the strength of its retrieval. Live feedback techniques help all children to move forward, deepening their understanding or gaining fluency.</p> <p> <b>Performance Data</b></p> <p>Data is submitted for science at the end of KS1 and KS2. The school tracks progress towards these to ensure children are on target for national expectation. Specific recall activities like quizzes, are used to enable teachers and children to monitor the depth of understanding of core substantive knowledge and vocabulary and the strength of its retrieval. This, in conjunction with formative strategies enable teachers to make judgements against National Curriculum standards.</p> <p> <b>Pupils' Work</b></p> <p>Pupils' work, in written and photographic forms, in class folders and individual books, is used to secure and demonstrate children's learning. It informs teacher assessment, both formative and summative, and is used by subject leaders as part of the monitoring process. Greater independence in written work is evident in the higher year groups.</p> <p> <b>Talking to Pupils</b></p> <p>The subject leaders talk to pupils about their learning as part of the monitoring process to gauge attainment and enthusiasm. Children's books and knowledge organisers are used to guide discussion and provide the subject leader with the necessary information to measure how much core knowledge and vocabulary has been remembered and understood.</p> <p><b>Links / References</b></p> <p><a href="http://www.mymastery.arkcurriculumplus.org.uk">www.mymastery.arkcurriculumplus.org.uk</a></p> <p>Rosenshine's Principles in Action – Tom Sherrington</p> <p><a href="https://www.youtube.com/watch?v=A0t70bwPD6Y">www.youtube.com/watch?v=A0t70bwPD6Y</a></p>