Barnfields Primary School: Science Subject Rationale

Science Subject Quest at Barnfields:

To predict and explain the behaviour of the natural world by observing and testing in a controlled manner.

Knowledge Types in Art

Substantive	Disciplinary
	

Science Intention

At Barnfields, all children are taught essential aspects of the knowledge, methods, processes and uses of science. These key areas of knowledge have been identified and labelled as two different strands, substantive and disciplinary, which need to be taught in conjunction with each other. Through building up a body of substantive and disciplinary knowledge and substantive concepts, pupils are encouraged to recognise the importance of rational explanation and develop a sense of excitement and curiosity about natural phenomena.

Provision, Planning and Delivery

Provision

We bring our vision for science to life by:

- Prioritising science as a dedicated subject within the school timetable.
- Designing an ambitious, knowledge-engaged science curriculum whereby children will become scientific experts in the concepts being taught throughout their time at school.
- Delivering a well-considered sequence of science at Barnfields, we will take the dispersed practice approach to promote long-term knowledge retention
- Encouraging collaborative discussions in pairs and small groups, fostering respectful and positive communication of thoughts, feelings, and ideas.
- Alongside Progression Grids, carefully constructed Medium Term Plans (MTP) are used to inform planning which ensures full coverage, identifying prior and future learning, where children can build on and apply their knowledge to subsequent learning year-on-year.
- Using MTPs to ensure that the relevancy of the learning the pupils will undertake is linked to the individual child and their lives.
- Promoting the use of science-specific vocabulary.
- Supporting children in articulating their observations and ideas, helping to refine and expand their thinking.
- Organising our curriculum into substantive concepts: *Animals, including Humans, Materials, Light, Sound and Space, Living Things and their Habitats, Plants, Forces and Electricity*.

- Implementing retrieval practice at the beginning of, and throughout, science lessons allowing previous learning to be revisited; this deliberate retrieval practice facilitates the transference of knowledge from working memory to long-term memory, enabling children to learn more and remember more.
- Encouraging our children to have enquiring minds. Different scientific enquiry types are referred to each lesson:

- Including practical elements of science being woven into science lessons, promoting disciplinary knowledge (working scientifically) as this knowledge can then be 'taught and revisited at the same time as the most relevant substantive knowledge is taught'
- Encouraging self-evaluation and constructive feedback on their own and others' work, emphasising growth and continuous improvement.
- Exploring a diverse range of scientists, both historical and contemporary, to develop a deeper understanding of science, ideas and theories over time.
- Knowledge Organisers are used within every unit of learning. These documents contain essential, fundamental knowledge that children MUST know in order to be successful and progress in their learning. They support children in being able to recap, revisit and revise what they have learnt in lessons, enabling them to move the knowledge from their short-term memory to their long-term memory.

Planning

Adhering to the science Subject Road Map, the children at Barnfields access a balanced and ambitious science curriculum that builds year on year. In every year group from Yr1 onwards, the children explore six substantive concepts. Each area is split into substantive knowledge and disciplinary knowledge.

EYFS deliver their science curriculum through lessons following 'the natural world'.

Teachers use the Barnfields Knowledge Progression Grid (which outline the knowledge content to be taught) to create a Medium-Term Plan (MTP) for each unit of learning. Teachers consider the key concepts to be taught, the enquiry types needed to be covered, the important vocabulary and key scientists.

Delivery

To enable the children to be immersed in their study, lessons are delivered weekly in Key Stage 1 and Key Stage 2, with a minimum of six hours per term dedicated to study in this specific curriculum area.

Progression

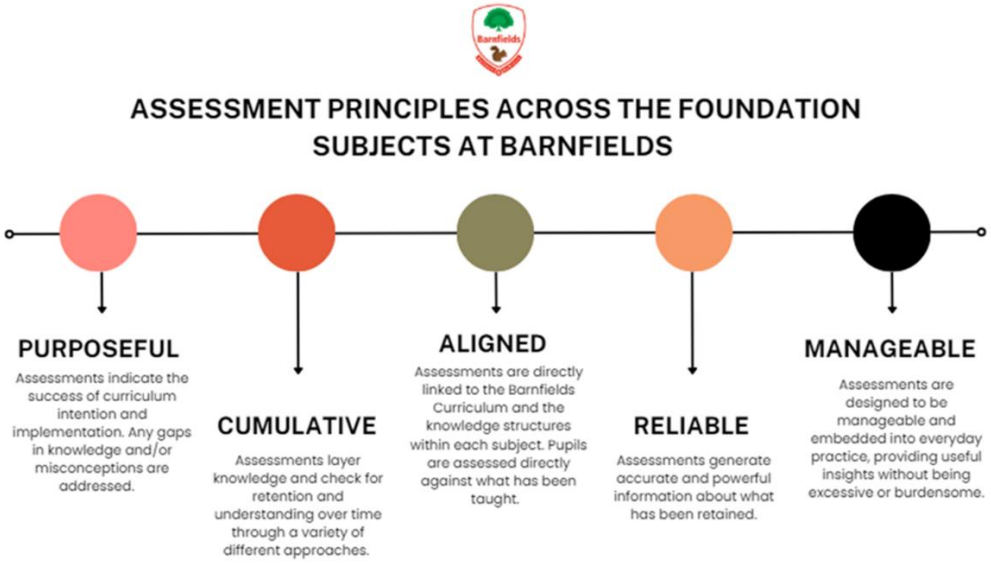
At Barnfields, we ensure progression in science education by having designed a curriculum that builds children's knowledge systematically over time. We understand that progression means children 'knowing more, remembering more', and being able to do more with their knowledge. To achieve this, we carefully sequence learning so that children develop substantive and disciplinary knowledge in a structured way. Our goal is to ensure that all children become proficient and passionate about this subject, as outlined in the National Curriculum.

To support this, we plan our curriculum so that each new concept builds on prior learning. We make sure children have a strong foundation by teaching essential knowledge first, looking at vertical and horizontal links between and within year groups. We balance substantive knowledge with disciplinary knowledge, ensuring that all children get a balance of both strands. All children are encouraged to develop and use a range of skills including observations, planning and investigations, enabling them to become enquiry-based learners and to think scientifically. We know that 'where science is strong, pupils learn detailed and connected knowledge of the curriculum and remembered what they had learned previously' (Ofsted Science Subject Report: Finding the Optimum, 2023).

Assessment, Recording and Reporting

Assessment

Assessment in Science follows the school's five assessment principles for foundation subjects: *purposeful, cumulative, aligned, reliable, and manageable.*



Assessment plays a key role in science education by helping to evaluate children's knowledge, but also to inform future planning. Assessment helps inform children's current understanding, highlights misconceptions and inform future planning.

Teachers evaluate each child's proficiency in science through a combination of formative and summative assessments. Formative is ongoing and used all the time, whereas summative tends to take place at the end of a lesson, unit or topic. Assessment strategies include, but are not limited to: learning conversations, questioning, self/peer assessment, marking, observing them during lessons, retrieval practice, quizzes, Explorify activities (e.g. odd one out) and concept cartoons.

End of Unit Assessments are conducted in the penultimate or final lesson of each unit, based on content from Knowledge Organisers and Barnfields' Progression Grids. The assessments include a variety of question types, such as multiple choice, matching, missing word problems, and short answers, allowing for a comprehensive evaluation of understanding.

This multi-faceted approach to assessment is then used to inform adjustments to the learning sequence for both individuals and entire classes. Based on continuous assessment, teachers determine whether to revisit, reinforce, or advance units of learning in future sessions.

Recording
Science learning is documented in children's books, with each piece of learning tailored to the specific learning objective. Evidence produced may include the child's own recording of learning, photographs, group work, class teacher recording of group/individual discussions and teacher anecdotal evidence.

Reporting
Teachers upload pupil attainment data onto SONAR at the end of each term, determining if a child is either below age-related expectation, age-related expectation or exceeding age-related expectation. The aim of this assessment is to provide an evaluation of how much knowledge pupils have learned and remembered. They enable leaders to identify whether specific curricular goals have been achieved. This, therefore, plays an important role in evaluating the impact of the curriculum.

Children's progress in science is formally communicated to parents annually through end-of-year reports. Additionally, informal updates are provided during any science-themed exhibitions held and parents evening.

Supporting Research:
Ofsted (2022) Research Review Series: Science
Ofsted (2023) Finding the Optimum, Science Subject Report