

Bricknell Primary School



Science Policy



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Curriculum Intent

At Bricknell Primary School, the teaching of Science has been carefully considered to enable our pupils to become confident scientists in a range of areas. At Bricknell Primary School, we strive to deliver a high quality science curriculum which allows our pupils to recognise the significance of science in their everyday lives. We explicitly teach pupils the skills and knowledge they need to become methodical, analytical and inquisitive scientists. A high quality science education provides the foundations for understanding the world and stimulates the inquisitive minds necessary for the future. With a focus on developing skills in biology, chemistry and physics; each underpinned by scientific enquiry, pupils are able to experiment and discover just how important science is in the world today.

At Bricknell, we follow a carefully designed Science curriculum, alongside this our highly skilled subject leader has carefully worked to create a Curriculum Overview Document which demonstrates the sequencing and mapping of their subject to ensure our pupils are given the acquired skills and knowledge to further their education journey into KS3 and life beyond the classroom.

Our aim is to provide inclusive and aspirational environments and learning experiences where pupils thrive and build the cultural capital they need to make aspirational choices about their own futures, overcoming any barriers. In order to achieve this, our curriculum is underpinned by the principles highlighted in our Aspiration Curriculum.



Within the Science Curriculum Overview Document, our progressive objectives identify what pupils should know by the end of each year group and link to prior learning. These enable teachers to identify and plug gaps in pupil's knowledge and skills. Within Science, pupils will develop a deep understanding of key concepts and second order concepts. These key concepts have been carefully considered and identified as the core knowledge and skills, required to successfully achieve in Science. The Key concepts are revisited and developed as the pupils move through the school to ensure the knowledge and skills are firmly embedded within the long term memory. These key concepts compliment work carried out across the school in line with the Aspiration Curriculum. The expectation is that, by the end of Primary School, children will know and understand these key concepts and to give them a solid foundation to enter the science curriculum at KS3.

In addition to first order concepts, the subject leader has identified subject specific second order concepts. These can be used across all aspects of a subject to organise the substantive knowledge and skills taught.

Key concepts:

Through the science curriculum, pupils will develop an understanding of the following key concepts. These concepts are revisited through different units as pupils move through the school. By the end of primary school, children will know and understand these key concepts.

Biology

- **Organisms require a supply of energy and materials:** Living things are special collections of matter that reproduce, use energy and grow. Food provides materials and energy for life and growth. Plants and bacteria use energy from the sun to generate food. Animals break down food and are ultimately dependant on green plants for energy. In any ecosystem there is competition for the energy and materials needed to live and reproduce.
- **Genetic information:** Genetic information is passed down from one generation of organisms to another. Genes determine the development and structure of organisms
- **Evolution:** The diversity of organisms is the result of evolution. Different kinds of life, animals, plants and microorganisms, have evolved into different forms best suited to the environments in which they live. Organisms not able to respond sufficiently to changes in their environment become extinct

Chemistry

- All matter (stuff) in the universe is made of tiny building blocks.
- **Materials (properties and changes):** The arrangement, movement and types of building blocks of matter, and the forces that hold them together/push them apart, explain all the properties of matter (eg: hot/cold, soft/hard, light/heavy etc...)
- **States of matter:** Matter can change if the arrangement of these building blocks change (eg: chemical reactions)

Physics

- The universe follows unbreakable rules that are all about forces, matter and energy
- **Forces** are different kinds of pushes and pulls that act on all the matter in the universe. Changing the movement of an object requires a force to be acting on it. Gravity is a universal force of attraction between all objects, however large or small
- **Energy:** There are many different forms of energy eg: light, sound, electricity, heat and wind. Energy can be transferred from one object to another and can cause changes. The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen

Earth Science

- **The earth in relation to the universe:** The Earth is one of 8 planets orbiting the sun. Our solar system is a very small part of one of millions of galaxies in the universe.
- **The earth spins on its axis:** The Earth is tilted and spins on its axis leading to day and night, the seasons and climate

Enquiry strategies

As part of **working scientifically** which is embedded throughout all units, pupils will also learn to use a variety of **enquiry strategies** to answer scientific questions. Different questions lead to different types of enquiry and are not limited to fair testing. By the end of primary school, children will be able to use these enquiry strategies confidently and know that different strategies may be needed at different times.

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying and classifying:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups.)
- **Looking for patterns:** (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- **Comparative and fair testing:** (observing or measuring the effect of changing one variable when controlling others)
- **Answering questions using secondary sources of evidence:** (answering questions using data or information that they have not collected first hand)

As well as this, pupils will learn about:

- **Using models:** (Developing or evaluating a model or analogy that represents a scientific idea, phenomenon or process)

Second Order Concepts:

Second order concepts are fundamental knowledge and skills which are transferable across a range of curriculum subjects. For example, we introduce pupils to the concept of 'similarity and difference' early in their education, developing the observational skills and language needed to make comparisons. This is developed and applied as pupils move through the school so they can confidently apply this in all areas of the curriculum by upper Key Stage Two.

A summary of the second order concepts and how they apply to science are provided in the table below.

Curriculum subject	Significance	Similarity and difference	Cause and consequence	Continuity and change	Responsibility	Communication (Oracy & Written)	Enquiry
Science	Significant scientists, discoveries, laws, models and theories	Making comparisons, finding patterns, noting differences, drawing conclusions	Models and laws, reactions between materials, observing processes	Observing what changes and what stays the same	Working safely, climate change and sustainability, how science solves problems	Using scientific terms, evaluating, drawing conclusions, explaining patterns and processes, presenting and interpreting data	Working scientifically, observing, classifying, patterns, fair testing, using evidence

By the end of EYFS children will:

Explore the natural world around them, making observations and drawing pictures of animals and plants. Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

By the end of Key Stage 1 children will:

By the end of KS1, basic fundamentals of the biology strand have been established. Pupils explore animals, humans and changes within environments and begin to develop simple scientific vocabulary linked to this. Children use different types of scientific enquiry to answer a range of questions. Children are encouraged to ask questions, discuss their findings and present their ideas in a variety of ways.

By the end of Key Stage 2 children will:

By the end of KS2, pupils have a deep understanding of a range of scientific ideas. Children are able to link scientific ideas to the world around them and, through research, understand how scientific ideas are developed over time. Children use secondary sources of information and purposeful, practical enquiry to draw conclusions and find things out.

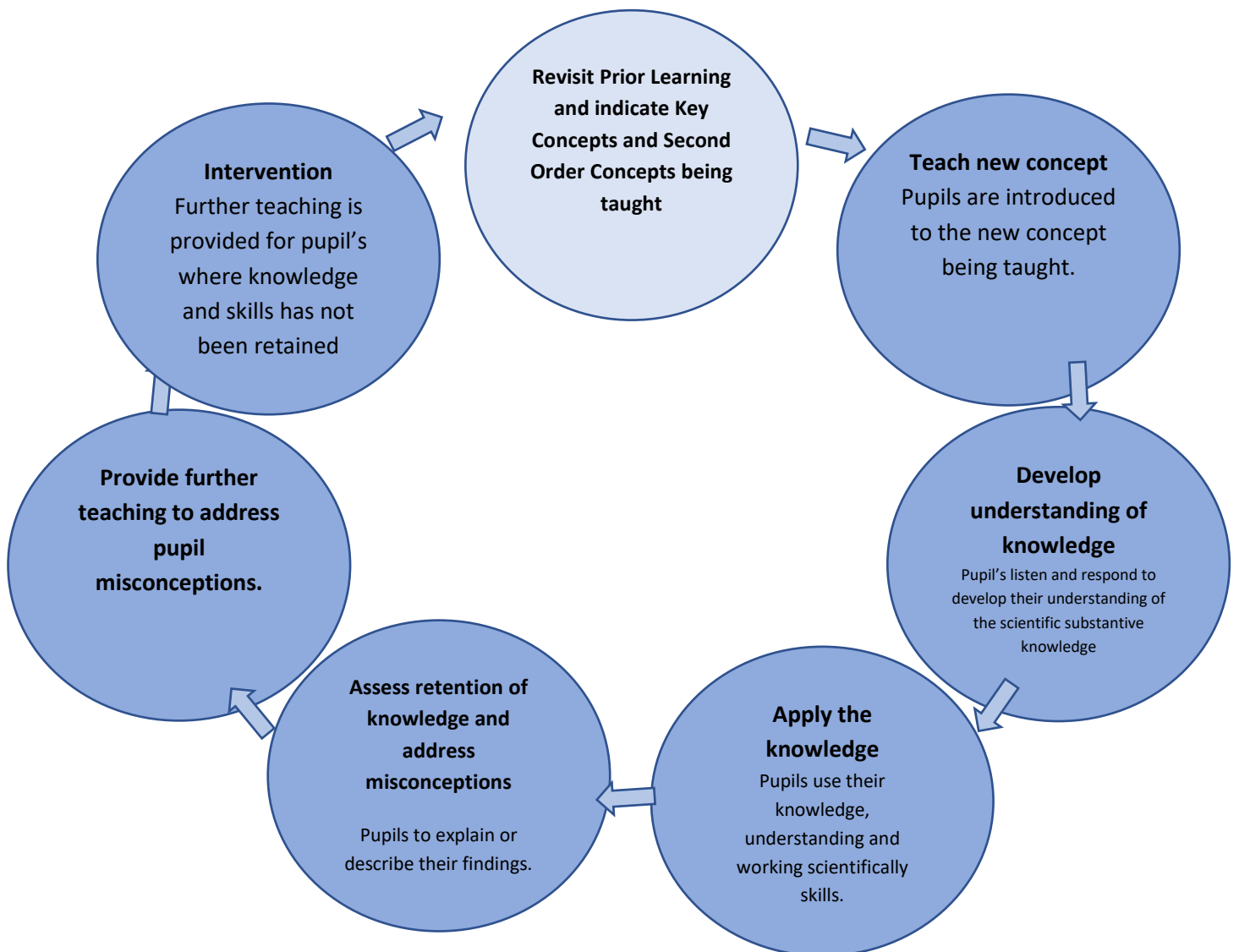
Any child working below their age-related expectation, will receive a tailored curriculum with personalised objectives taken from the Curriculum Assessment Toolkit. This will enable all children to build the skills and knowledge needed to bridge the gap between themselves and their peers enabling them to reach their full potential.

Implementation

At Bricknell Primary School, our curriculum is carefully mapped out into a Long-Term Plan by our highly skilled subject coordinator. This enables links between subjects to be identified and carefully planned for to support pupil's retention of knowledge and skills.

The academic year is broken down into mini units across the year ensuring that the breadth of the science curriculum has been taught. Science is taught weekly and outcomes are demonstrated in a variety of ways through, written work as well as photographic evidence.

At Bricknell, all Science lessons will follow the same teaching sequence outlined below.



Our curriculum is centred upon the 'big ideas in science'; this requires deep thinking, exploration, discussion, investigating and researching. The clear progression ensures that children are continually building on their prior learning as they systematically develop their understanding of key ideas and their scientific skills. Pupils have opportunities to ask their own questions and consider which types of scientific enquiry are likely to be the best way of answering them. Our pupils draw conclusions and use scientific vocabulary to discuss and present their findings in a range of different ways.

Additional to the weekly science lessons, pupils will have opportunities to access science in the real world through school visits and visitors to school. Through exposing out children to a range of science experiences, we encourage them to become the scientists of the future.

Impact

In EYFS, staff professional judgements are valued. Assessments are formative so that they quickly make a difference to children's learning. They inform the provision of activities and experiences which develop children's skills and knowledge as well as giving opportunity for further practise. We record WOW moments on Tapestry and build up a detailed picture of each child using a Child on a Page document.

A wide range of strategies are used to measure the impact of our Science curriculum. Our teaching sequence allows children to respond to a 'Big Question' to assess the knowledge absorbed into the long term memory of pupils. Scientific discussion is encouraged therefore teachers can address misconceptions quickly. Formative Assessments are also carried out by teachers after each lesson which will allow them to inform future planning. Additionally, summative assessments are carried out by using an internal assessment tool. As a result of these assessment tools, pupil's misconceptions or gaps in subject knowledge, skills, behaviours and attitudes are addressed and additional teaching and support is provided.

The Science Leader will also monitor the effectiveness of the Science curriculum through carrying out regular subject 360 evaluations. These evaluations are quality assured by the Curriculum Lead, Senior Leadership and Governors.

The effectiveness of Science is also monitored through pupil and parental voice throughout the course of the year.

Extra-curricular

This is enhanced by a range of visitors and school trips. Pupil experience includes planned visits to conduct research and gather data, STEM visits allowing pupils to meet scientists and consider the potential for a career in science and in school science weeks. Through these activities, pupils are able to foster creativity, work together and consider a real life purpose for science.

Cross curricular connections.

Basic skills are developed in science in a number of ways; communication skills are developed through group discussions, written reports and conclusions, sharing results and presenting findings.

Maths skills are developed through accurate measuring, recording results and presenting findings through graphs and tables. ICT skills are developed as children investigate record and present their conclusions. Writing skills will be further enhanced through the assessed 'big questions' after every science unit. Links will be made between science and all other areas of the curriculum which are relevant and appropriate to the age of the children.

Equality

Children should not be discriminated against in terms of gender, race, religion or disability. All children should have the opportunity to participate fully in classroom and through any science lessons and activities and reasonable adjustments will be made to ensure this. This intent is embedded and implemented across the whole Science curriculum, through a range of strands and topics. A range of activities will be easily accessible for all children to enable all, from the least to most able, to independently develop their curiosity and investigative skills.

SEND

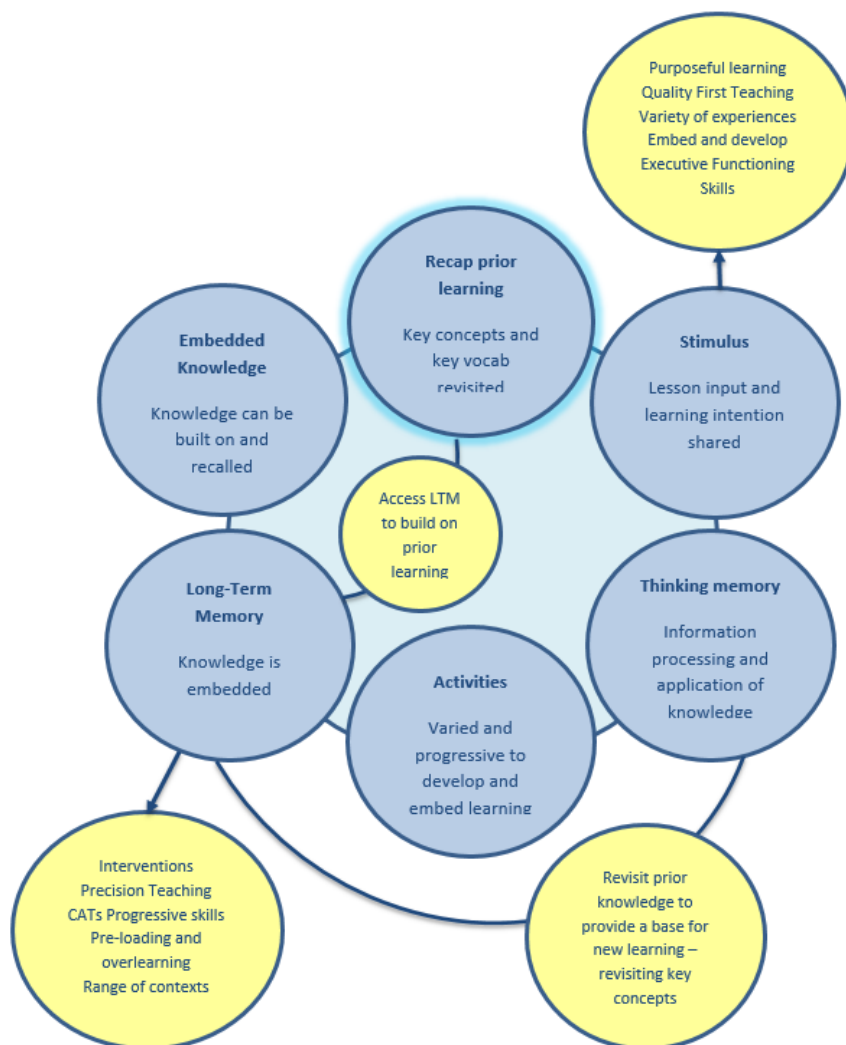
At Bricknell, we have a high SEND population and our pupils are fully immersed into the broad and balanced curriculum. However, we tailor the curriculum to meet the individual needs of SEND pupils. Where a child's need prevents them from accessing the Age Related Expectations for subjects, planning is tailored to meet the individual needs of all pupils using the CATs document. This document breaks down each objective

across the curriculum to enable all pupils to achieve success at an appropriate level for their needs. This ranges from P4 to Year 6 to ensure that there is no ceiling on any child’s learning. In addition to this, some pupils are given the opportunity to take part in an AQA life skills programme. This programme consists of a sequence of skills that children work towards and develop their independence. This programme has been developed by the external agency IPASS and is tailored to meet the individual needs of our pupils. Each skill, when mastered, is rewarded with a qualification and certificate. Prior to the children starting this at the age of seven, pupils take part in the CATs Science scheme of work which was developed alongside a local special school. This programme aims to plug gaps and remove barriers to learning.

Metacognition

Metacognition relates to thinking about thinking. It is a mechanism to enhance student learning, both for immediate outcomes and for helping students to understand their own learning processes. Metacognitive strategies are embedded into all areas of our curriculum and opportunities are planned to develop these skills over time. These skills include self-questioning, meditation, reflection, developing an awareness of strengths and weaknesses and an awareness of personal learning styles. Developing this metacognitive understanding is a skill for life. When learners “think about their thinking” they are more capable of independent self-improvement. At Bricknell, metacognitive strategies are learned, practiced and made into habits in order to improve learning, self-understanding and thinking skills impacting both the present and future.

Our metacognition and working memory model is shown below:



All staff have had extensive CPD, in collaboration with the Educational Psychologist, to support their understanding of child development and metacognition strategies to enable them to develop the knowledge and skills required to enable children to learn progressively over time.

Evaluation

In evaluating the effectiveness of our Science teaching, we should be aware of the following:

- Do we ensure the teaching of Science gives children an opportunity for exploration, and an understanding the world we live in?
- Do we provide pupils with a growing scientific vocabulary?
- Do we provide opportunities for independent investigation and space to share predictions and ideas?
- Do we create an environment which allows pupils to influence their learning journey?
- Do we ensure that children are able to work collaboratively?
- Do we create opportunities for children to take part in a range of practical activities targeting all the different types of scientific enquiry?

Resources

As a school, we subscribe to 'Snap Science'. All year groups have access to the progressive skills document, termly knowledge organisers, practical science equipment, online resources, topic books and topic boxes.

Staff CPD

At Bricknell Primary School, invest heavily in CPD to ensure all staff feel empowered to deliver lessons, across all curriculum subjects, and have the ability to embed and assess the metacognition strengths of all pupils.