Our Approach to Teaching Science

Our Curriculum Intent:

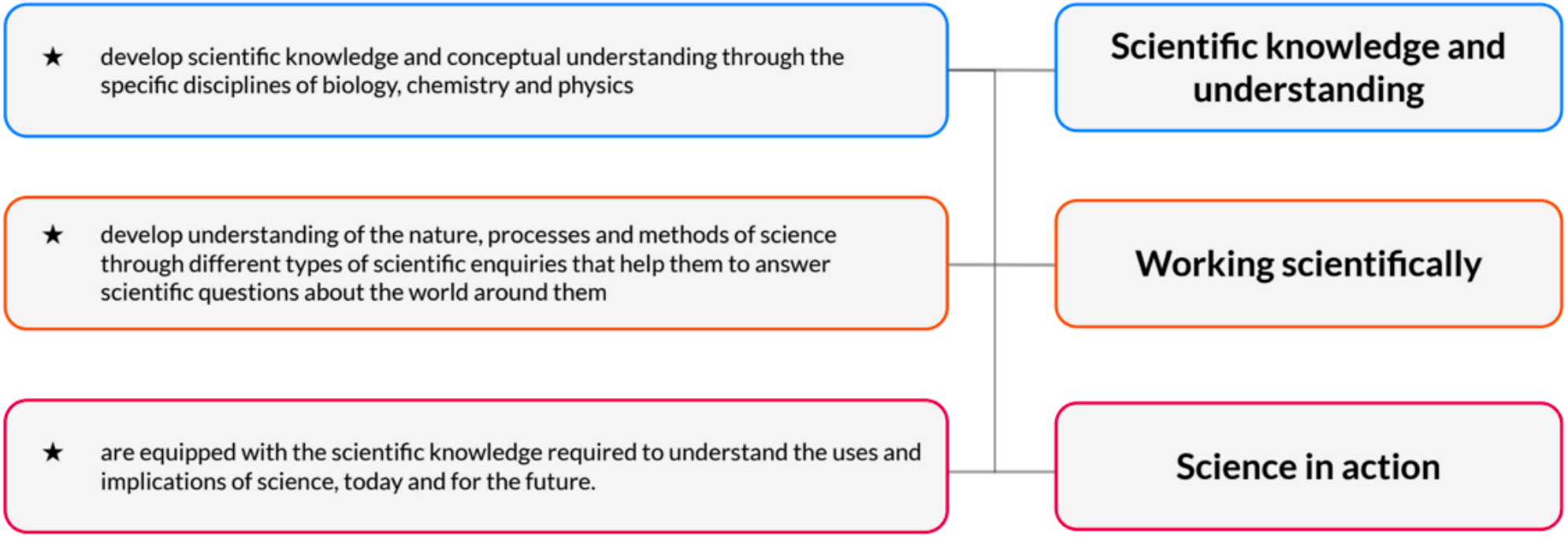
To create a flexible, responsive curriculum which can be adapted to reflect children's interests and teachers' passions whilst ensuring rigorous progression and coverage of key skills and knowledge.

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. - National Curriculum 2015

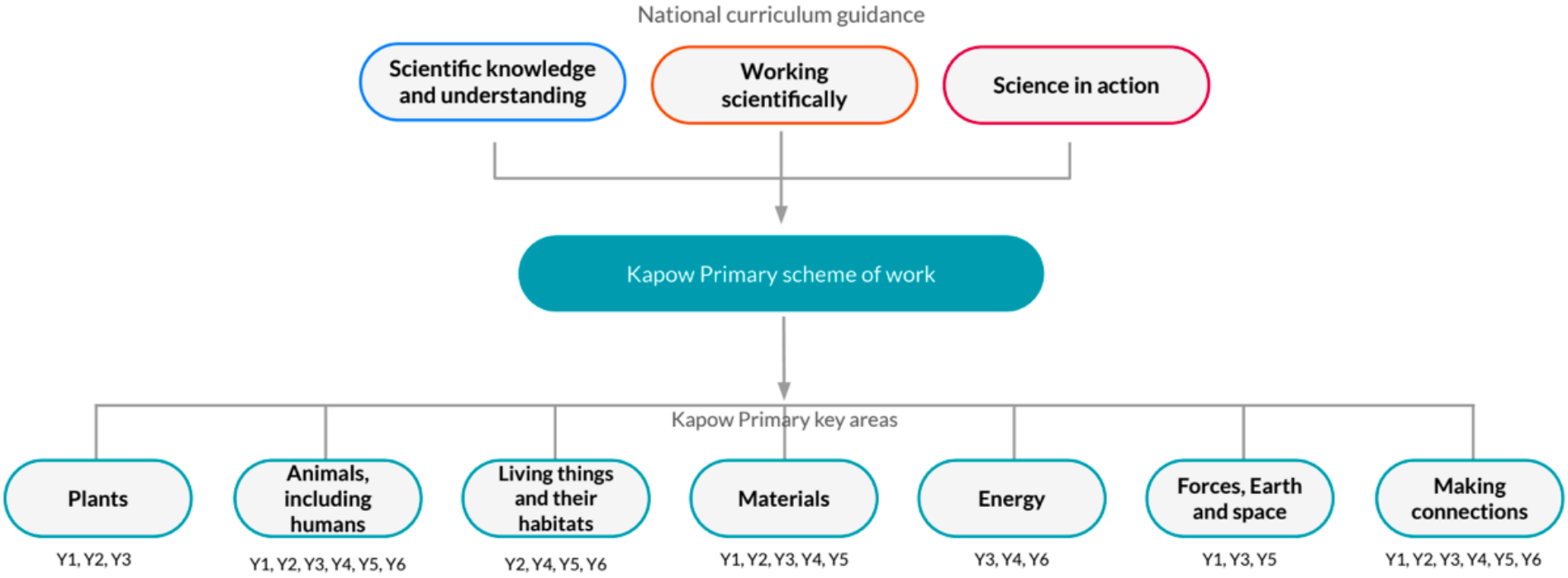
Key Concepts in Science

Hollybush Primary School uses the Kapow Science scheme. The Kapow scheme of work fulfils the statutory requirements outlined in the National Curriculum (2014).

The National Curriculum Programme of Study for Science aims to ensure that all pupils:



How is the Science Scheme of Work Organised?



Key areas in Science

Pupils will develop Scientific knowledge and understanding in seven key areas. The learning in each area is summarised below:

Animals, including humans

Identifying animals, their basic structure and their eating habits, as well as their basic needs for survival. Children learn about the life cycles of animals and their place in food chains.

Naming parts of the human body and recognising the function of skeletons, muscles, teeth and the digestive and circulatory systems. Learning about the importance of hygiene and of the right type and amount of nutrition. Children learn about the impact of diet, drugs and exercise on the body and study the life cycles of humans.

This key area covers the Year 1, Year 2, Year 3, Year 4, Year 5 and Year 6 subject content titled 'Animals, including humans' from the National curriculum.

Living things and their habitats

Identifying something as living and how it is grouped based on its characteristics, similarities and differences.

Naming different types of habitats, learning what they provide for life and the impact of habitats changing. Children learn about the life cycles and reproduction of animals and plants, and how this affects the variation of living things around us, past and present.

This key area covers the Year 2, Year 4, Year 5 and Year 6 subject content titled 'Living things and their habitats' and 'Evolution and inheritance' from the National curriculum.

Plants

Identifying different plants and their key structures, growing seeds and plants and understanding their requirements for growth. Recognising the function of different plant structures and understanding how plants reproduce.

This key area covers the Year 1, Year 2 and Year 3 subject content titled 'Plants' from the National curriculum.

Materials

Naming materials, describing their properties and understanding why materials have specific uses. Identifying how materials may change and the factors that may contribute to this, including changes of state within the water cycle. Children learn about different mixtures and how they can be separated based on their properties.

Identifying different types of rocks and their physical properties, and understanding how fossils and soil are formed.

This key area covers the Year 1, Year 2, Year 3, Year 4 and Year 5 subject content titled 'Everyday materials', 'Uses of everyday materials', 'Rocks', 'States of matter' and 'Properties and changes of materials' from the National curriculum.

Energy

Learning about light and its properties, how it enables us to see and how shadows are formed. Identifying the relationship between sounds, volume, pitch and vibrations, and how sound travels to the ear.

Recognising electrical appliances and the components that make up different circuits. Building electrical circuits and identifying factors that affect the output.

This key area covers the Year 3, Year 4 and Year 6 subject content titled 'Light', 'Electricity' and 'Sound' from the National curriculum.

Forces, Earth and space

Identifying changes across the seasons, and the weather and day length associated with each.

Recognising different types of forces and understanding their effect on objects, including the role of pulleys, levers and gears. Children learn about magnetic materials and that magnets attract and repel.

Learning about the movements of planets and moons within the solar system and how this relates to our day and night.

This key area covers the Year 1, Year 3 and Year 5 subject content titled 'Seasonal changes', 'Forces and magnets', 'Earth and space' and 'Forces' from the National curriculum.

Making connections

Finding the optimum: the science subject report (Ofsted, 2023) states that schools should ensure that teachers

'regularly connect new learning to what pupils have already learned. This includes showing pupils how knowledge from different areas of the curriculum connects.'

One of the ways in which we do this is through our Making connections units, which give pupils opportunities, beyond the National curriculum programme of study, to make connections between their science learning.

Different types of knowledge in Science

'Pupils need to develop an extensive and connected knowledge-base. When pupils learn new knowledge it should be integrated with the knowledge they already have. This ensures that learning is meaningful'. (Ofsted research review series: Science, 2021)

Substantive knowledge	Disciplinary knowledge
Referred to as Scientific knowledge and conceptual understanding in the National curriculum and Scientific knowledge and understanding in our scheme of work, this is knowledge of the products of science: concepts, laws, theories and models. In our Science: *Progression of skills and knowledge* we have broken down the National curriculum attainment targets into knowledge 'chunks' or 'components' and shown how they build over time to develop pupils' understanding of key concepts in Biology, Chemistry and Physics. Through following our scheme pupils will build their substantive knowledge base by: ● Knowing more facts. ● Giving further examples of the same concept. ● Understanding and using a wider range of vocabulary. ● Using models or concepts that cannot be seen to explain ideas. ● Making and explaining links across areas of science. Over time, that knowledge will become increasingly organised and connected. The Recap and recall section of the lesson helps pupils to activate their prior knowledge and encourages them to make connections between units.	Working scientifically specifies the understanding of the nature, processes and methods of science for each year group and is covered alongside our Scientific knowledge and understanding strand in each and every unit, never in isolation. We have broken down the Working scientifically statements from the National curriculum further to ensure gradual progression and focused teaching of the working scientifically skills. This also allows teaching to focus on the component disciplinary knowledge required to enable pupils to carry out the skills competently. Pupils should be able to see the interplay between the two types of knowledge and our Science in action strand gives pupils this opportunity through seeing how scientists have worked in the past and continue to work in the present day. This furthers pupils' understanding of how some of the substantive knowledge they learn came to be established.

Working Scientifically

National curriculum

The National curriculum states that working scientifically should be 'embedded within the content of biology, chemistry and physics' incorporating a range of scientific enquiries that look at the nature, processes and methods of science.

These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources.

Ofsted research review

The review states that there are four main content areas for disciplinary knowledge:

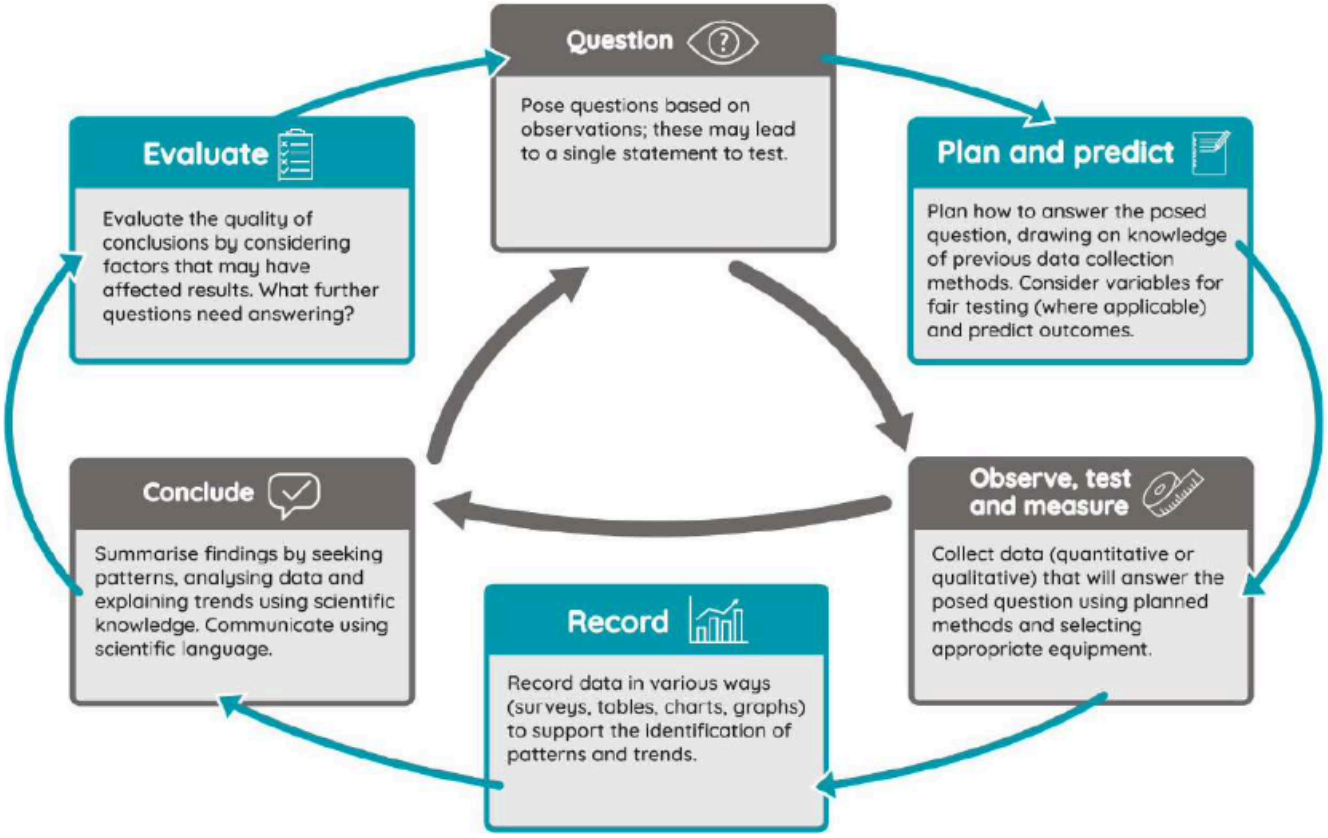
1. **Knowledge of methods that scientists use to answer questions.** use of models, classification, description and the identification of correlations (pattern-seeking) have played important roles, alongside experimentation, in establishing scientific knowledge.
2. **Knowledge of apparatus and techniques, including measurement.**
3. **Knowledge of data analysis.**
4. **Knowledge of how science uses evidence to develop explanations.**

Kapow Primary scheme

Working scientifically forms one of the strands in our curriculum, meaning that it is interwoven into each and every unit alongside scientific knowledge and understanding. We have created a Working scientifically - enquiry cycle which incorporates all the elements of working scientifically mentioned above in an easy-to understand model that also helps pupils to understand the steps involved in a complete scientific enquiry.

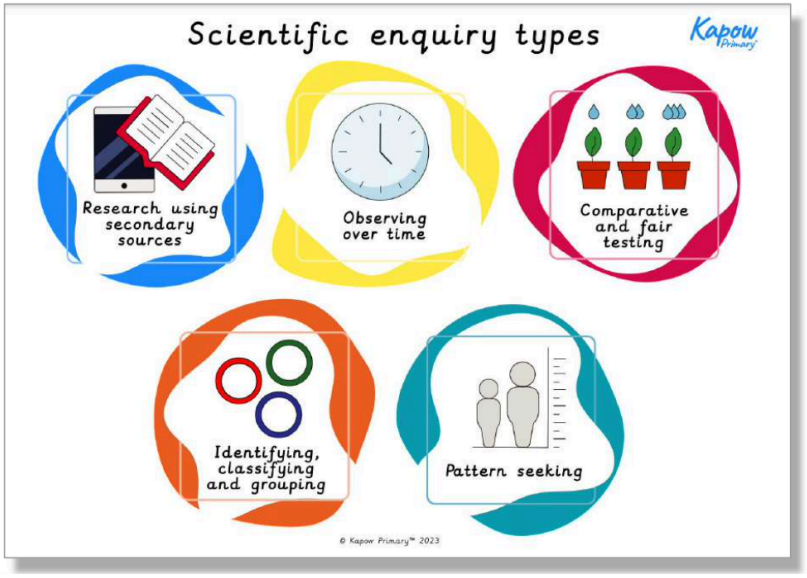
Working scientifically - Enquiry Cycle

Kapow Primary has created the working scientifically enquiry cycle below, demonstrating aspirational steps for scientific enquiry. Short enquiry opportunities will focus on a particular working scientifically skill, while ensuring the essential Question - Observe - Conclude cycle is met. Full investigation opportunities will provide an appreciation of how the steps interconnect to form a complete enquiry.



We aim for children to be able to talk confidently about scientific enquiry skills so we have created icons which are visible alongside relevant instructions and activities to help children recognise and become familiar with the stages of the enquiry process.

Working Scientifically - Different Types of Enquiry



The National curriculum states that ‘types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources’ but the Ofsted science subject report notes that ‘Overall, in primary schools, inspectors found very few examples of pupils gaining knowledge of pattern seeking or learning about secondary sources.’

The Kapow Primary curriculum aims to familiarise pupils with all these types of enquiry so that by the end of Key stage 2 they are able to choose the most suitable enquiry type to answer questions. In Key stage 1, pupils are introduced to enquiry types as 'Super science skills' and are encouraged to reflect on which skills they have used to answer questions.

Science in Action

In addition to working scientifically, the National curriculum also states that pupils should understand the uses and implications of science in the past, present and for the future. References to real-world examples are incorporated into all units, providing the rationale and motivation for why we learn Science. Science in action includes:

Historical applications of Science

- Famous scientists throughout history.
- The methods and equipment used by scientists throughout history and how these have led to modern methods.
- How knowledge and understanding has changed over time, leading to our current understanding of Science.

Careers that use Science

- Broad ranging jobs and careers that use scientific knowledge and methods.
- Scientists of today and their work.
- Science in the news and recent discoveries.
- What Science is attempting to achieve in the future.

The scientific community and beyond

- Science is a dynamic field and is always undergoing changes.
- Mistakes can be the source of new discoveries!
- Collaboration and peer reviewing is essential for effective scientific progress.
- Spiritual, moral, social and cultural links with Science.

Making Connections

The ‘Making Connections’ units are an integral part of the Science scheme, designed around the principle that deep learning occurs when pupils can link new information with existing knowledge. They are the culminating unit in each year group and allow pupils an opportunity to revisit, revise and apply their learning in a new context.

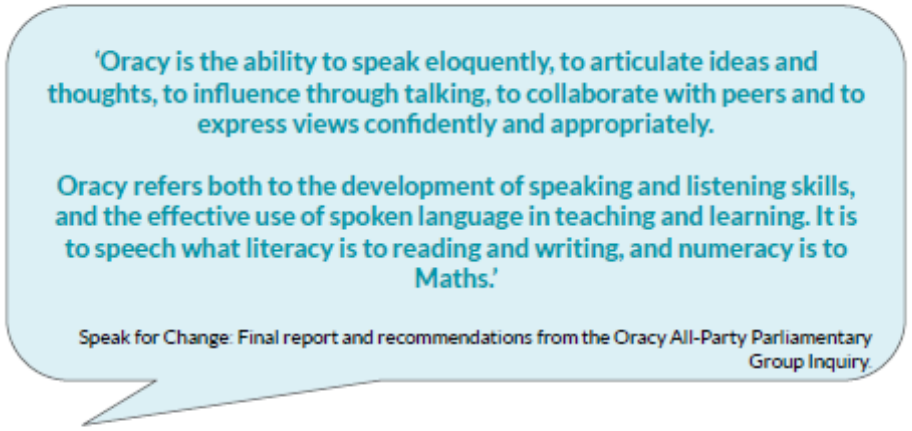
The units integrate and connect scientific concepts and working scientifically skills studied in recent units, as pupils engage in full enquiries and apply the enquiry cycle in new contexts. The emphasis on practical, hands-on lessons and guided enquiries supports the development of independent learning skills and scientific thinking.

‘Consolidation of knowledge takes time. The curriculum therefore needs to not just take account of when new component knowledge is introduced, but also ensure that there is sufficient time for this knowledge to be practised and securely remembered in long-term memory.’
(Ofsted research review series: Science, 2021)

Aims of the Making connections units:

- To **revise** key knowledge and skills from units throughout the year, embedding disciplinary knowledge within substantive content.
- To provide further opportunities for **practical, hands-on** learning, engaging pupils in experiments and scientific investigations to apply their knowledge practically and learn how disciplinary knowledge is used across different substantive contexts.
- To foster **teamwork** by encouraging collaboration and communication among pupils, enhancing social skills and cooperative learning.
- To inspire **awe and wonder i**n pupils, igniting their curiosity about the natural world and demonstrating the real-life applications and societal significance of scientific theory.
- To promote **outdoor and active** learning by using movement-based activities and outdoor space wherever possible, providing real-world contexts for scientific enquiry and exploration.
- To establish **cross-curricular links**, enhancing pupils' overall educational experience by connecting science learning with other subjects.

Oracy in Science



Learning through talk

At Hollybush, we believe it's crucial to provide pupils with opportunities for exploratory talk during their learning. This involves thinking aloud, questioning, discussing, and collaboratively building ideas.

Learning to talk

Similarly, developing oracy skills is essential for pupils to express and articulate themselves effectively across various contexts and settings, including formal ones like public speaking, debates, and interviews.

Through our Science curriculum, pupils have opportunities to develop their oracy skills by:

- Responding to questions using scientific vocabulary.
- Role-playing scientific concepts through structured and open-ended drama activities.
- Collaborating in group tasks and negotiating to take on specific roles.
- Understanding how to phrase a testable scientific question and how wording affects its usability.
- Acknowledging others' ideas and responding to different viewpoints.
- Engaging in peer review by providing positive feedback and constructive criticism.
- Performing songs and poems to enhance content knowledge.
- Presenting findings and summarising key observations.

A spiral curriculum

The scheme of work has been designed as a spiral curriculum with the following key principles in mind:

✓ Cyclical: Pupils return to the key knowledge and skills repeatedly during their time in primary school.

✓ Increasing depth: Each time a skill is revisited it is covered with greater complexity and in varying contexts.

Progression includes:
○ studying a specific scientific concept in more detail;
○ studying further examples of a specific concept to broaden contextual knowledge;
○ studying a broader range of equipment and methods to test an hypothesis;
○ explaining concepts using models or ideas that can't be seen;
○ making and explaining links across areas in science;
○ engaging with increasingly complex ideas and ethical dilemmas.

✓ Prior knowledge: Prior knowledge is utilised so pupils can build upon previous foundations, rather than starting again.

Is There Any Flexibility in The Science Scheme?

At Hollybush, our Science scheme of work is organised into five core units (six in Year 5) consisting of predominantly six lessons. These ensure that all aspects of the National Curriculum are covered.

In addition to this, Kapow offers an additional ‘Making Connections’ unit that explores beyond the statutory curriculum, enabling pupils to revise, apply and extend their learning in innovative ways. These units help pupils to foster a deeper interdisciplinary understanding and appreciation of how scientific principles connect in the real world.

Lessons are planned to be 90 minutes long, reflecting the importance of Science as a core subject in the curriculum. Within each unit, lessons must be taught in order as they build upon one another.

While the National curriculum explains that schools are only required to teach the relevant programme of study by the end of the key stage, we have planned our current Science curriculum with a sequence in mind.

The units are taught in the suggested order and year group to maximise progression of knowledge and skills across each key stage. This is because new subject knowledge and working scientifically skills are explicitly taught within certain units and then embedded in later units within the same year group and key stage.

Learning Opportunities For All

We pride ourselves on providing learning opportunities that are accessible and ambitious for all learners, enabling all children to make progress and have a sense of achievement. We achieve this through sequential planning, allowing skills to be scaffolded and extended as appropriate. We also create an ethos of not being afraid to make ‘mistakes,’ but instead, for children to be risk-takers, problem solvers and to develop resilience.

To support children with SEND to access the curriculum we will:

- Help all pupils achieve the best of their abilities, despite any special educational need or disability they may have.
- Ensure that staff are aware of and sensitive to the needs of individual pupils and that teaching is appropriate to meet those needs.
- Make suitable adaptations to the curriculum for children with SEND to fully develop their abilities, interests and aptitudes and gain maximum access to the curriculum.

Depending on the specific needs of each child, further adaptations may include, but are not limited to:

- Use of speaking frames to form reasoned answers.
- Resources labelled with Makaton symbols
- Tasks broken into chunks with communication in print instructions
- Larger/simpler resources
- Alternative resources eg. access to a you tube clip in place of a written hand out.
- Pre-teaching of key vocabulary
- Flexibility in group work eg. option to work alone if preferred

Science in EYFS (Reception)

Our Science Early Years Foundation Stage (Reception) units are designed to target Development matters ‘Understanding the world’ statements and also fully integrated with the Kapow Primary Key stage 1 and 2 curriculum for Science, offering a unified approach to teaching Science in EYFS.

Clear progression between EYFS and Key stage 1 content can be seen by looking at our Progression of knowledge and skills document, where component knowledge and skills are outlined across our strands Scientific knowledge and understanding, Working scientifically and Science in action) from EYFS (Reception) through to Year 6.

Our Science EYFS (Reception) units are designed to be taught as discrete Science lessons in the sequence outlined in this long-term plan to ensure effective progression. The 'Changing seasons' unit spans the entire school year, enabling children to observe seasonal impacts on the natural environment.

Each unit includes an explanatory video that aids teachers in planning and implementation highlighting how the activities contribute to developing foundational skills and knowledge for later Science education in Key Stages 1 and 2.

Lessons aim to spark curiosity about the world, encouraging focused observation and questioning about the environment around them. Pupils explore, test and observe changes, laying the groundwork for developing essential scientific skills and preparing pupils for Key stage 1.

Children enter Reception with a wide range of starting points, so each lesson begins with reflection time, allowing pupils to share their personal experiences before starting new learning. Engaging videos and interactive presentations capture pupils’ interest during carpet time while follow-up tasks include at least two adult-led or independent activities to reinforce learning. Units include optional ideas for continuous provision, complementing the unit’s learning objectives by reinforcing key concepts.

Suggested long-term plan: Science - Overview (EYFS and Key stage 1)

	Autumn	Spring	Summer
EYFS (Reception)	Animal adventures	I am a scientist - coming soon!	Our beautiful planet - coming soon!
	Across the year		
	Changing seasons		

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Seasonal changes	Everyday materials	Sensitive bodies	Comparing animals	Introduction to plants	Investigating science through stories
Year 2	Habitats	Microhabitats	Uses of everyday materials	Life cycles and health	Plant growth	Plant-based materials

Suggested long-term plan: Science - Overview (Key stage 2)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	
Year 3	 Movement and nutrition	 Forces and magnets	 Rocks and soil	 Light and shadows	 Plant reproduction	 Does hand span affect grip strength?	
Year 4	 Digestion and food	 Electricity and circuits	 States of matter	 Sound and vibrations	 Classification and changing habitats	 How does the flow of liquids compare?	
Year 5	 Mixtures and separation	 Properties and changes	 Earth and space	 Life cycles and reproduction	 Unbalanced forces	 Human timeline	 Does the size of an asteroid affect its impact strength?
Year 6	 Classifying big and small	 Light and reflection	 Evolution and inheritance	 Circuits, batteries and switches	 Circulation and health	 Are some sunglasses safer than others?	

Assessment

Science at Hollybush is assessed against key objectives from the National Curriculum which can be found on the skills progress document above.

Assessment takes two forms:

Formative assessment takes place on a day-to-day basis during teaching and learning, allowing teachers and pupils to assess attainment and progress more frequently. It begins with diagnostic assessment, indicating what is already known and what gaps may exist in skills or knowledge. If a teacher and pupil understand what has been achieved to date, it is easier to plan the next steps. As the learning continues, further formative assessments indicate whether teaching plans need to be amended to reinforce or extend learning.

Formative assessments may be questions, tasks, quizzes or more formal assessments. Often formative assessments may not be recorded at all, except perhaps in the lesson plans drawn up to address the next steps indicated.

Summative assessment sums up what a pupil has achieved at the end of a period of time, relative to the learning aims and the relevant national standards. The period of time may vary, depending on what the teacher wants to find out. There may be an assessment at the end of a topic, at the end of a term or half-term, at the end of a year or, as in the case of the national curriculum tests, at the end of a key stage.

A summative assessment may be a written test, an observation, a conversation or a task. It may be recorded through writing, through photographs or other visual media, or through an audio recording. Whichever medium is used, the assessment will show what has been achieved. It will summarise attainment at a particular point in time and may provide individual and cohort data that will be useful for tracking progress and for informing stakeholders (e.g. parents, governors, etc.)