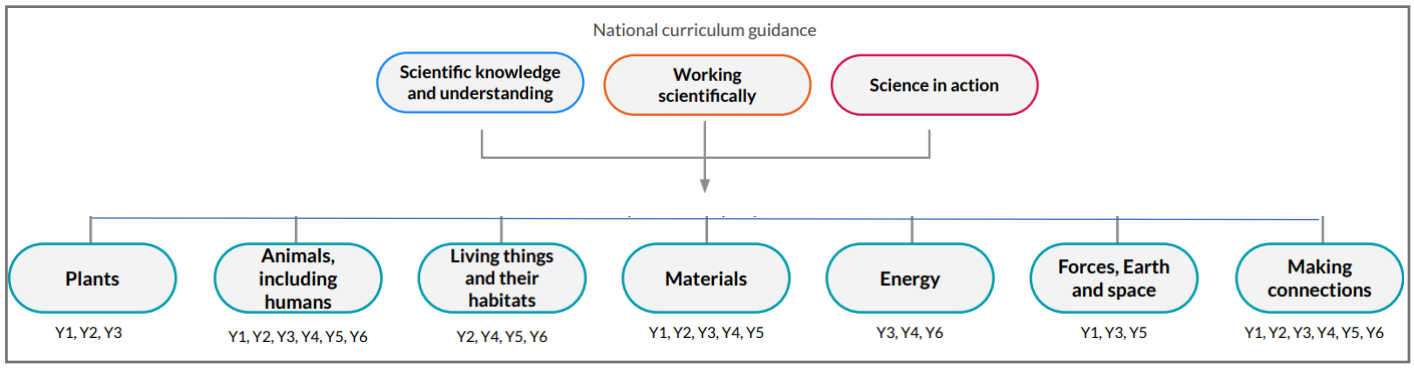
Planning for Science at Richard Lee Primary School

To fulfil the requirements of the national curriculum, three strands run throughout our Science curriculum. These are **Scientific knowledge and understanding, Working Scientifically** and **Science in Action.**

★ develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics	**Scientific knowledge and understanding**
★ develop understanding of the nature, processes and methods of science through different types of scientific enquiries that help them to answer scientific questions about the world around them	**Working scientifically**
★ are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.	**Science in action**

These **three stands** run throughout each of our Science units.



Pupils will develop Scientific knowledge and understanding in seven key areas.

Animals, including humans	**Living things and their habitats**	**Plants**	**Materials**
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.	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.	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.	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.

Energy	**Forces, Earth and space**	**Making Connections**

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.	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.	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	Referred to as Scientific knowledge and conceptual understanding in the National curriculum and units of work. Progression of skills and knowledge build over time to develop pupils' understanding of key concepts in **Biology, Chemistry and Physics**. Over time, knowledge will become increasingly organised and connected to build schema.
Disciplinary knowledge	Working scientifically specifies the understanding of the nature, processes and methods of science for each year group and is covered alongside the Scientific knowledge and understanding strand in each and every unit, never in isolation.
Science in Action	Science in action gives pupils the opportunity to see 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 in Science

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. The types of scientific enquiry should include: **observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); researching using secondary sources;** and exploring and scientific discussion (Learning and making discoveries through scientific investigations and discussions).

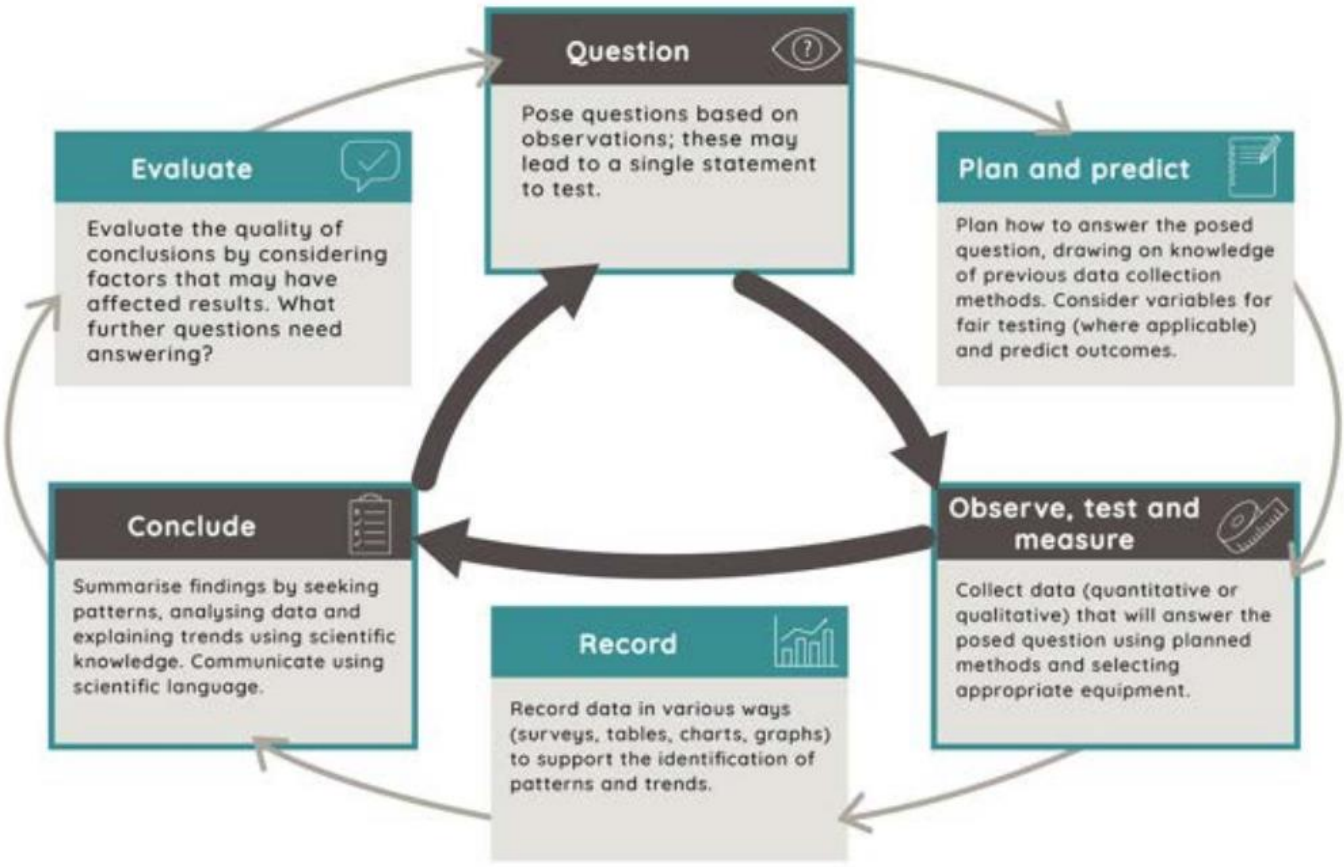


The Ofsted research review states that there are four main content areas for disciplinary knowledge:
1. Knowledge of methods that scientists use to answer questions. use of models, classification, description and the identification of correlations (pattern-seeking) have played important roles, alongside 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.

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.

Enquiry Cycle

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.



Science in Action		
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 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.

Making connections unit aims:

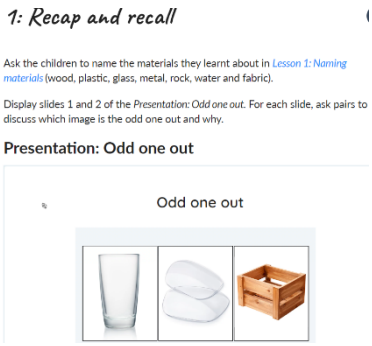
● To revise key knowledge and skills from units throughout the year, embedding disciplinary knowledge within substantive content.
● To provide further opportunities for practical, hands-on learning, engaging pupils in experiments and scientific investigations to apply their knowledge practically and 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 in 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

Formative Assessment

Each lesson begins with the **'Recap and recall'** section which allows pupils retrieval practice of key knowledge relevant to the upcoming lesson. This section also provides teachers with an opportunity to make informal judgements about whether pupils have retained prior learning and are ready to move on.

Each lesson contains the '**Assessing progress and understanding'** section which helps teachers to identify those pupils who are secure in their learning or working at a greater depth in each lesson.

Portrait of Progress (PoP) tasks act as the vehicle through which formative judgements can be made regarding a child's learning and progress. These will happen at various points within and after a unit depending on when teachers feel these are best placed. Pop tasks should vary in complexity (remembering, knowing, reasoning).

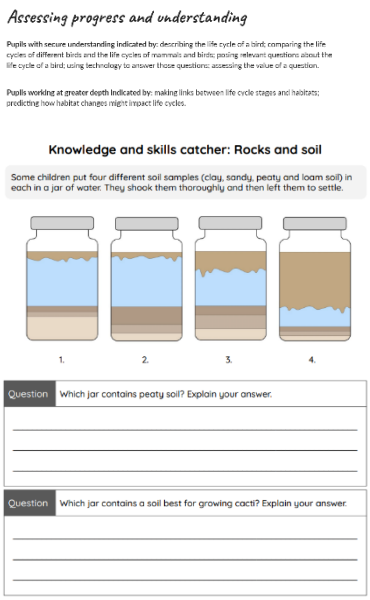

1: Recap and recall

Ask the children to name the materials they learnt about in Lesson 1: Naming materials (wood, plastic, glass, metal, rock, water and fabric).

Display slides 1 and 2 of the Presentation: Odd one out. For each slide, ask pairs to discuss which image is the odd one out and why.

Presentation: Odd one out

Odd one out


Assessing progress and understanding

Pupils with secure understanding indicated by: describing the life cycle of a bird; comparing the life cycles of different birds and the life cycles of mammals and birds; posing relevant questions about the life cycle of a bird; using technology to answer those questions; assessing the value of a question.

Pupils working at greater depth indicated by: making links between life cycle stages and habitats; predicting how habitat changes might impact life cycles.

Knowledge and skills catcher: Rocks and soil

Some children put four different soil samples (clay, sandy, peaty and loam soil) in each in a jar of water. They shook them thoroughly and then left them to settle.

1. 2. 3. 4.

Question: Which jar contains peaty soil? Explain your answer.

Question: Which jar contains a soil best for growing cacti? Explain your answer.

Summative Assessment

Each unit of work assesses children's understanding and retention of key knowledge using an **assessment quiz** with nine multiple choice questions and one open-ended question.

In addition, each unit uses either a **skills and knowledge catcher**. This can be used at the end of a unit and gives children the opportunity to further demonstrate their understanding of the key concepts covered.

Science in EYFS

Science in EYFS/Reception is designed to target 'Understanding the world' statements and is integrated with the Key stage 1 and 2 curriculum.

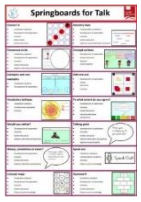
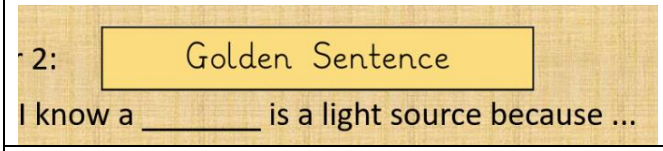
The Science EYFS (Reception) 'units' are flexible, small-step activities, around three core units, allowing teachers to personalise lessons to fit in with their chosen themes or topics. The activities have been designed for continuous provision. An adult will need to explain the outcome of the station at the beginning of the week, but after this, independent learning should be encouraged.

Each unit has explanatory videos to assist teachers in their planning and implementation. These videos provide insight into how the activities can support skills and knowledge development, which will lay the foundations for pupils' Science learning in Key stages 1 and 2.

Science Long Term Overview

Please see additional document.

Other Science Strategies

Retrieve and Remember *Retrieval Practice is the act of remembering previously taught content.* • Recap and recall • Flashback 4 / quiz	Every lesson begins with the **'Recap and recall'** section which allows pupils retrieval practice of key knowledge relevant to the upcoming lesson. This section also provides teachers with an opportunity to make informal judgements about whether pupils have retained prior learning and are ready to move on.
Oracy *Learning to talk / Learning through talk.* • *Oracy Springboards* • *Encouraging opportunities to talk* • *Developing Oracy skills*   	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.
Knowledge Categories 	knowledge categories help children to remember and express their understanding about a topic by recalling prior knowledge through categories. Linking knowledge helps to build schema. These category symbols should be made visible to children on teaching displays and worksheets. There are knowledge categories relating to the 7 key areas, and working scientifically.
Vocabulary Boost  	Vocabulary should be taught explicitly to children with vocabulary taught taken from our Science vocabulary progression document. Images are taken from either Widgit, noun project or Kapow. Every lesson should start with vocabulary boost.
Golden Sentences  	Golden Sentences help children understand and retain curriculum content. Children learn to compose 'golden sentences' that serve as complete thoughts and are syntactically sound.
POP Tasks	Portrait of Progress (PoP) tasks act as the vehicle through which formative judgements can be made regarding a child's learning and progress. These will happen at various points within and after a unit depending on when teachers feel these are best placed. **These are always printed on green paper.**
Questioning • Stem Sentence Questions E.g. Why do we need light? Stem Sentence: We need light …. • Hinge Sentence Questions	*Questioning is the act of eliciting information from pupils that* *(a) requires recall to support memory retention of taught content and* *(b) helps the teacher check for level of understanding and* *(c) help the teacher to identify and address misconceptions.*

• Cold Calling • Think, pair, share • Exit tickets	
Success Criteria	Success Criteria should be made available to children in each lesson.
Adaptive Teaching 	Learning should be accessible for all children. Adaptive teaching should be considered in every lesson.