

## Science

### INTENT - to what do we aspire for our children?

'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.'

Source: National Curriculum (updated Jan 2021).

### At HPPS science develops the school's 4 key drivers in the following ways:

#### Excellence

- Ambitious in their science learning: secure understanding of scientific processes and methods through different enquiries
- Curriculum is sequential and demonstrates progression in knowledge and scientific vocabulary
- Learn from a wide range of experiences to discover and understand the world around them
- Confident to make scientific judgements

#### Character

A HP scientist will demonstrate the following characteristics

- Curiosity, passion and enjoyment
- Take pride in their science learning and presentation
- Be articulate - both verbally and in written form
- Think like a scientist; question, observe, classify, research, critically analyse
- Collaborative; work together, build on ideas and be respectful and safe

#### Community

A HP scientist will

- understand the relevance of science in the world today
- how they as scientists can impact their community; class, local and global

#### Equity

We believe that all children regardless of need will engage in a curriculum that will enable all children to become scientists

- Spiral curriculum with key knowledge made explicit
- Explicit scaffolding of oracy
- Knowledge notes to reduce split attention effect
- Explicit teaching of tier 2 and 3 vocabulary
- Make reasonable adaptations to science lessons and resources

### Aims of the Science Curriculum

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics;
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them;
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.
- develop young scientists who can communicate their understanding both verbally and in written form through a rich vocabulary and the necessary oracy skills.

- develop a culture of scientific values and skills where asking questions, working collaboratively, testing hypotheses and reflecting on lines of enquiry is part of the everyday life of the classroom.
- develop young scientists who feel empowered and passionate to engage with science beyond their time in primary school
- have access to a broad range of scientific experiences

## Long term sequence

Our Science curriculum is knowledge and vocabulary rich, ensuring children gain a deep understanding of fundamental scientific knowledge and concepts as well as embedding key science specific vocabulary and terminology (Tier 3 vocabulary). In addition, children are encouraged to develop their scientific curiosity and understanding by working scientifically.

It is our intention that pupils become a little more expert as they progress through the curriculum, accumulating and connecting substantive and disciplinary scientific knowledge. Our curriculum follows the principles of instruction, is guided by understanding how the memory works and cognitive load theory.

Our science curriculum is delivered through a series of modules which are deliberately spaced throughout the academic year with opportunities to introduce and revisit key concepts. This approach enables staff to deepen pupil understanding and embed learning.

	EYFS Understanding the world	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Biology	The natural world  Explore the natural world around them, making observations and drawing pictures of animals and plants.  Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.		Living things and their habitats (+ revisit modules)		Living things and their habitats	Living things and their habitats	Living things and their habitats
		Plants	Plants	Plants			
		Animals, including humans (+ revisit modules)	Animals, including humans (+ revisit modules)	Animals, including humans	Animals, including humans	Animals, including humans	Animals, including humans
							Evolution and inheritance
Seasonal changes (+ revisit module)			Light			Light	
			Forces and magnets		Forces		
				Electricity		Electricity	
				Sound			
					Earth and space		
Chemistry		Everyday materials	Use of everyday materials			Properties and change of materials	
			Rocks (+ revisit module)				
				States of matter			

	Autumn	Spring	Summer
Year 1	<ul style="list-style-type: none"> <li>• Seasonal changes and daily weather</li> <li>• Introduce Plants – (trees)</li> <li>• Animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Materials</li> <li>• Revisit Animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Plants</li> <li>• Revisit Plants, Animals including humans, Seasonal change and weather</li> </ul>
Year 2	<ul style="list-style-type: none"> <li>• Living things and their habitats</li> <li>• Animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Use of everyday materials</li> <li>• Revisit Living things and their habitats / materials</li> </ul>	<ul style="list-style-type: none"> <li>• Plants</li> <li>• Revisit Living things and their habitats / Animals, including humans</li> </ul>

Year 3	<ul style="list-style-type: none"> <li>• Rocks</li> <li>• Animals, including humans</li> <li>• Revisit Rocks</li> </ul>	<ul style="list-style-type: none"> <li>• Forces and magnets</li> <li>• Light</li> </ul>	<ul style="list-style-type: none"> <li>• Plants</li> </ul>
Year 4	<ul style="list-style-type: none"> <li>• Living things and their habitats</li> <li>• Electricity</li> </ul>	<ul style="list-style-type: none"> <li>• Animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Sound</li> <li>• States of matter</li> </ul>
Year 5	<ul style="list-style-type: none"> <li>• Properties and changes of materials</li> <li>• Animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Earth in space</li> <li>• Forces</li> </ul>	<ul style="list-style-type: none"> <li>• Living things and their habitats</li> <li>• Forces continued</li> </ul>
Year 6	<ul style="list-style-type: none"> <li>• Living things and their habitats</li> <li>• Light</li> </ul>	<ul style="list-style-type: none"> <li>• Animals, including humans</li> <li>• Animals, including humans (water transport)</li> </ul>	<ul style="list-style-type: none"> <li>• Electricity</li> <li>• Evolution and inheritance</li> </ul>

In Early Years, Science is taught through Knowledge and Understanding of the World. The children learn about the scientific world around them in their play and adult led activities. Our curriculum is designed to enable children to make sense of their physical world and community. Children are encouraged to be scientists by:

- Finding out about and showing curiosity and interest in features of objects, events and living things
- Describing and talking about what they see, including noticing similarities and differences
- Showing curiosity and asking questions about why things happen and how things work
- Showing understanding of cause-effect relations
- Noticing and describing patterns
- Showing an awareness of change
- Explaining their own knowledge and understanding, and asking appropriate questions of others
- Investigating objects and materials by using their senses

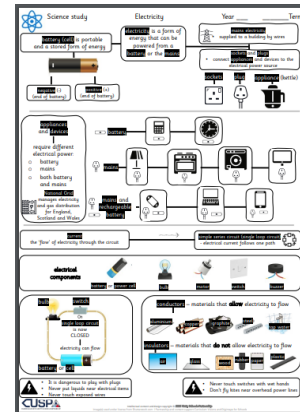
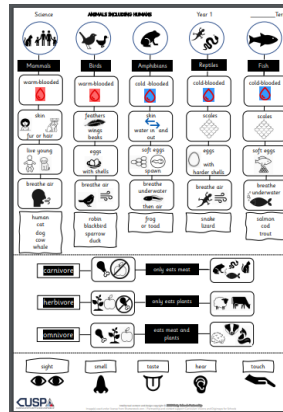
**Play and exploration experiences that support the foundational knowledge and skills for the subject.**

Continuous provision play experiences with provocations for Science.	Core books that link to foundational experiences and knowledge.	Possible adult planned experiences and contexts for interactions that support Science.	Key vocabulary that might be introduced and practised in interactions in play/activities.
<ul style="list-style-type: none"> <li>• Discussions at snack time of the importance of healthy food choices.</li> <li>• During lunch time discussions.</li> <li>• Through stories and circle time discussions. e.g. The story – Now wash your hands and Funnybones.</li> <li>• Naming body parts through songs – Heads, shoulders, knees and toes.</li> <li>• Talking about pets at home.</li> </ul>	<b>Theme; Moving on up</b>  <i>Nursery;</i> Titch. Hungry Caterpillar. Jasper's beanstalk.  <i>Reception;</i> Jack and the beanstalk Jack and the flum flum tree. The Little Red Hen.	<ul style="list-style-type: none"> <li>• P.E lessons that encourage getting dressed and undressed independently.</li> <li>• RSE (Jigsaw) link – Correct naming of body parts.</li> <li>• Going on walks to observe the local environment and to compare and learn about the seasons.</li> <li>• Taking photos to compare seasons and discuss.</li> <li>• Planting seeds and plants</li> <li>• Looking after the EYFS garden.</li> <li>• Creating bug hotels.</li> <li>• Growing plants from bulbs and seeds.</li> <li>• Making boats to explore the best materials.</li> <li>• Water tray activities to explore water, ice, and materials that float and sink.</li> <li>• Testing the best material for a raincoat for Jack.</li> </ul>	Observe Compare Noticing Identifying Classifying

[KS1](#) and [KS2](#) coverage maps

**Knowledge Organisers** are used for each unit. Summary of the main reasons for use below:

- Conveys the core knowledge in one place
- A reference point for pupils and teachers
- Used to support questioning and retrieval
- Used in books to support participation
- Highlights key vocabulary
- Reduces split attention effect



## Working Scientifically

As well as ensuring pupils are taught key knowledge, each module is designed to offer pupils the opportunity to undertake scientific enquiries and develop their skills as a scientist in asking questions, planning and carrying out experiments, collecting and analysing information and drawing conclusions. The working scientifically objectives are clearly displayed on each of our science modules for both Key Stage 1 and Key Stage 2. It is clear which of the objectives are being taught throughout a specific module which ensures full coverage and allows for skills to be built upon.

Key Stage 1	Asking simple questions and recognising that they can be answered in different ways	Observing closely, using simple equipment	Performing simple tests	Identifying and classifying	Using their observations and ideas to suggest answers to questions	Gathering and recording data to help in answering questions.		
Lower Key Stage 2								
Upper Key Stage 2	Plan enquiries, including recognising and controlling variables where necessary	Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work	Take measurements, using a range of scientific equipment, with increasing accuracy and precision	Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models	Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions	Present findings in written form, displays and other presentations	Use test results to make predictions to set up further comparative and fair tests	Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments

Mapping of disciplinary skills [KS1](#) [LKS2](#) [UKS2](#)

## IMPLEMENTATION - how will we deliver the curriculum?

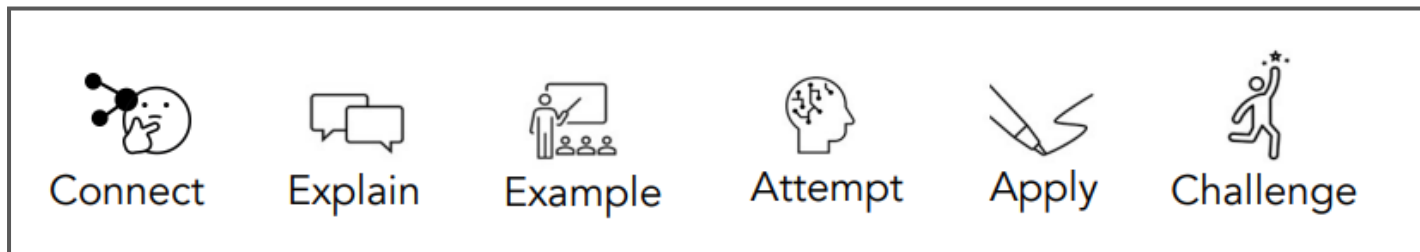
### Linking curriculum and pedagogy

Our science curriculum is taught in each year group in modules that enable pupils to study in depth key scientific understanding, skills and vocabulary. Each module builds upon prior learning and these are strategically planned throughout the academic year with opportunities to introduce and revisit key concepts to deepen pupil understanding and embed learning.

Each module is carefully sequenced to enable pupils to purposefully layer learning from previous sessions to facilitate the

acquisition and retention of key scientific knowledge. Each module is revisited either later in the year or in the following year as part of a spaced retrieval practice method to ensure pupils retain key knowledge and information. We want our children to have an expansive vocabulary and through teacher modelling and planning, children are given the opportunity to use and apply appropriate vocabulary. Scientific language is taught and built upon with vocabulary being a focus.

## Lesson design



Each lesson follows the model above.

- CONNECT to prior knowledge
- EXPLAIN new content, element of working scientifically and scientific vocabulary
- give and EXAMPLE of new learning
- Pupils ATTEMPT new learning with scaffolding
- APPLY new learning independently
- Pupils are CHALLENGED to integrate learning with prior knowledge

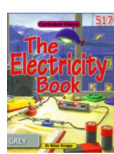
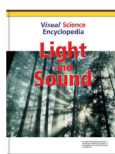
In every science lesson you would expect to see;

- Vocabulary explicitly taught and used by the pupils
- Knowledge notes and organisers used to scaffold the learning
- What success looks like; made clear

We aim to **enrich the curriculum** with:

- Local educational visits that take advantage of what's in Bristol i.e. We Are Curious, Wild Place
- Visitors - science workshops and expert visitors i.e. RSPB, Explorer Dome, Chemlabs
- Annual Art & Science Day
- Utilise the school grounds for outdoor learning & Forest School where appropriate

**Reading across the curriculum** - there are topic specific texts to support the children's learning alongside additional reading in the school library.



## SEND

The curriculum at HPPS is inherently designed to support pupils with SEND through universal quality first teaching. This includes:

- High expectations and aspirations for all learners
- A carefully structured and sequenced curriculum, specifically designed around how pupils learn
- Pre-planned and focused direct vocabulary instruction
- Modelling and demonstration
- Chunked instructions which are supported by visuals and gestures
- The use of manipulatives and multi-sensory approaches to enhance the curriculum
- Review, recall, repetition and retrieval
- Frequent formative assessment as teachers check for understanding

- Accurate and regular feedback

However, we recognise some pupils need provision 'additional to' quality first teaching in order to reach their potential as scientists. This includes:

- Carefully considered scaffolding
- Pre and post-teaching
- Pre-planned management of cognitive load
- Explicit instruction and modelling
- Structured challenge, without ceilings
- Alternative ways of recording
- Additional targeted adult support

In some instances, specialist adaptations are made to support the specific barriers of individual pupils.

## IMPACT - how do we know our curriculum is effective?

### Pupil Voice

- use scientific vocabulary
- talk about science specific concepts & skills
- talk about the 'why' behind their work
- explain how learning builds on previous knowledge
- articulate their progress regardless of starting point

### High quality outcomes: book study will

- demonstrate pride and effort
- capture increasing understanding of scientific concepts and knowledge
- demonstrate a clear sequence of learning
- vocabulary clearly seen

### Assessment

CUSP is designed and built on the premise that 'learning equals a persistent change in the long term memory.' Therefore, the assessment structures are designed to evaluate the effectiveness of the curriculum sometime after it has been taught.

#### Summative Assessment

The curriculum is a progression model. Teachers will know whether students are making progress if they are learning more of the curriculum.

The CUSP curriculum is designed to ensure sequencing of core knowledge, vocabulary, substantive concepts and disciplinary knowledge. They will know more, and remember more with the taught curriculum content. Essentially they will be able to do more with this knowledge in carefully designed learning tasks.

This will be assessed using the Book Study approach- talking with pupils and looking at their books systematically to reveal:

- Content and knowledge
- Vocabulary
- How the pedagogy and taught curriculum helps/hinders their learning

#### Formative Assessment

Pupils will be assessed formatively as each lesson progresses. Pupils will be given tasks from which the teachers will draw conclusions. Adaptations will then be made as a result of that evidence.

Strategies that might be used are:

- Making explicit the learning intention and success criteria
- Eliciting evidence of pupils' prior knowledge
- Feeding back at the point of learning

- Inclusive questioning i.e. cold call, mini whiteboards
- Retrieval practice i.e. cumulative quizzing