

**Science at CVPS**

**Curriculum Intent**

**What do we want to achieve with our Science curriculum?**

The aim of our Science curriculum is to give children at CVPS the opportunity to become scientists, developing their enquiry skills and being able to pose questions and carry out investigations. Science at primary level provides the foundations for understanding the world around us. At CVPS, science promotes children to seek answers to ambitious questions and wonder about how things work. Science plays an important and progressive role within the school’s curriculum and it is essential that children build knowledge about how science has changed our lives and is vital to the world’s future prosperity. A fundamental role of science at CVPS is to allow children to discover, explain and develop their knowledge and skills through exploring collaboratively in investigations and working scientifically.

Key Stage 1 & 2 National Curriculum for Science aims to ensure that all pupils:

* 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.

Procedures and concepts that underpin scientific methods are developed through the systematic focus on disciplinary knowledge. Every unit of work contains opportunities to develop the Working Scientifically skills of asking questions, planning enquiries, observing, measuring, recording, presenting and interpreting results, drawing conclusions, predicting and evaluating, according to the progression in these skills. Thus, essential science concepts are developed whilst children investigate the world around them. The different approaches to science enquiry, such as fair testing, research and classifying are also systematically developed in the scientific enquiries progression map. Each science unit of work is then framed around an enquiry question, ensuring a systematic, contextualised development of both substantive and disciplinary knowledge.

**Curriculum Implementation**

**How will this be achieved?**

Science is taught discretely, with a focus on substantive knowledge-rich content and the development of essential disciplinary knowledge. The National Curriculum programmes of study and Early Years Foundation Stage framework are fully adhered to and then supplemented with additional knowledge-rich content. This provides a coherent science curriculum that both prepares children extremely well for future learning and gives them the tools to independently investigate and explore the world further.

The progression of Science skills, knowledge and understanding are divided into the following areas of learning:

* Substantive Knowledge (Biology, Physics and Chemistry)
* Disciplinary Knowledge (Working scientifically and approaches to science enquiry)

Each of the three areas of learning (Biology, Physics and Chemistry) are revisited during each new unit of work, building on prior learning and effectively developing the skills, knowledge and understanding to become an effective scientist.

Our Science curriculum aims to excite the children and allow them to develop their skills as scientists. We plan visits and visitors to provide first-hand experiences for the children to support and develop their learning within the science unit they are learning about. During career’s week and through our STEM links, our children learn first-hand about how vast science careers can be and what they entail.

**Unit Structure & Lesson Structure**

We want our children to remember the concepts they learn. Therefore, the curriculum focuses on the sequential development of essential substantive knowledge underpinning biology, chemistry and physics, as per the science LTP. Each year group deepens their understanding of key concepts, adding new generative knowledge to existing schema. For example, the biology strand of ‘plants’ is revisited multiple times throughout the year groups, with the component learning of basic plant structure in Year 1 transforming into the composite learning of water transportation within plants in Year 3.

**EYFS**

**Key Stage 1**

Within this Key Stage, each year group is taught four units of science, which are delivered over three terms. The science lead will plan how this is covered during the term, by creating MTP’s and end points to ensure coverage. This will be communicated and agreed with the class teachers prior to the commencement of the new academic year. Children are introduced to each unit of work through an enquiry question which is revisited throughout, before answering at the end.

Children learn through discrete sequential lessons that build upon their prior knowledge. Their understanding of key science concepts is further enhanced through discovery where children are able to explore through purposeful provision. Most of the learning about science in Key Stage 1 is done through the use of first-hand practical experiences, but there is also some use of appropriate secondary sources, such as books, photographs and videos.

Within Key Stage 1, there are opportunities to revisit areas of learning. For example, in Year 1 children will learn about seasonal changes and make observations throughout the year whereas in Year 2, children will explore a variety of habitats and plants at different times of the year.

**Key Stage 2**

Within this Key Stage, each year group is taught five units of science, which are delivered over three terms. The science lead will plan how this is covered during the term, by creating MTP’s and end points to ensure coverage. This will be communicated and agreed with the class teachers prior to the commencement of the new academic year.

Children learn through discrete sequential lessons that build upon their prior knowledge. Children are introduced to each unit of work through an enquiry question which is revisited throughout, before answering this at the end.

Children begin their exploration of working scientifically in Key Stage 1 and this is built upon in Key Stage 2 as children are immersed in first hand experiences.

Teachers model and develop key concepts to cement knowledge, skills and understanding, using the “I do, we do, you do” pedagogical structure, ensuring that teacher modeling is built around appropriate success criteria. The use of concrete and pictorial models also help pupils develop a deeper understanding of abstract scientific concepts. As part of science, the relevant mathematical knowledge is explicitly taught to enhance their scientific understanding and enquiry. Further details are provided in [‘Opportunities for applying maths in science’.](https://drive.google.com/drive/u/0/search?q=opportunites%20for%20applying%20maths%20in%20science)

Throughout the units of Science, children will: be taught to develop their enquiry skills, learn how to use scientific equipment and understand the important role science plays in our life today and the impact for the future. Class teachers will carefully plan for the use of visits and visitors to complement and enhance the teaching of Science. During careers week, children are given the opportunity to learn about many jobs within the science field of work and are able to ask questions to promote a love of science and how things work. We also use STEM ambassadors to enhance our understanding of science in the ‘real world’ as well as visiting the science and media museum in Bradford.

Knowledge Organisers for each unit support pupils in building a foundation of factual knowledge by encouraging recall of key facts, vocabulary and understanding what this looks like in the real world by learning about a scientist. These will be introduced to the children at the start of each unit and continue to use these within each lesson. Low-stake quizzes and retrieval tasks will be used in the classroom to help children to recall key facts and make links with previous learning. Knowledge organisers are also used as a pre-teaching tool to support pupils with SEND and EAL.

The Science curriculum design follows the spiral curriculum model by Jerome Bruner in which key concepts are presented repeatedly throughout the curriculum, but with deepening layers of complexity, or in different applications. Throughout the teaching of Science, pupils will;

* Return to the key concepts again and again during their time in primary school.
* Deepen their understanding with each revisit as key concepts are covered with greater complexity.
* Utilise prior knowledge so they can build upon previous foundations, rather than starting again.

**Curriculum Impact**

The impact of the teaching and learning of Science will be demonstrated as follows:

* Children will know more, remember more and understand more about History.
* Children will understand and use the key skills of chronological understanding, knowledge and understanding of events in the past, historical interpretation, historical enquiry and organisation and communication.
* The large majority of children will achieve age related expectations in History.
* As historians, children will learn lessons from history to influence the decisions they make in their lives in the future.

**Assessment**

Formative Assessment will be used to determine children’s understanding and this will be summarised at the end of each Science unit to inform the class teacher and Science Subject Leader of the numbers of pupils working below, at and above age-related expectations. The completed summary on Arbour will be shared by the class teacher. To make these assessments, class teachers will use children’s understanding in relation to Knowledge Organisers, work in the children’s books and informal ongoing classroom assessments and judgements.

Ongoing classroom assessment will include: assertive monitoring and targeted questioning, addressing misconceptions quickly and remodeling where necessary. Also checking that priority knowledge has been retained to the working memory at the end of every lesson and ensuring there is a focus on target science language to enable pupils to articulate science concepts with accuracy in both the spoken and written word.

**Our Aims at CVPS**

Aim High

* Develop and enhance Maths’ skills through Scientific enquiries
* Equal opportunities for men and women in science
* Preparing pupils for an ever changing world and support this through STEM.
* Use a wide range of ICT to support subject investigations and enquiries.
* Open ended questions to inspire curiosity about periods in time

Be Respectful

* Creates a sense of place, belonging, identity, purpose
* Multi-sensory approaches
* SEND approaches used inc. use of resources and adults
* A variety of learning styles is used: visual, audio and kinetic
* Whole-class teaching methods, enquiry based group work, individual, pair, class and group work
* Build an understanding of how we can look after our world to help for the future

Create Happy Memories

* Plan a variety of visits and visitors.
* Enquiry, investigation, problem solving and decision making central to high quality learning in Science
* Use a variety of scientific equipment
* Explore science outside in the natural world
* Develop, enhance and apply scientific enquiry
* Pupils are taught through discussion, practical activity, games, investigations, problem solving, research, role-play and recording.

**Substantive Knowledge**

Substantive knowledge sets out the subject-specific content that is to be learned - i.e. the National Curriculum units that can be separated into the disciplines of biology, physics and chemistry. This is the knowledge of the products of science, such as concepts, laws, theories and models. The progression map is separated into biology, chemistry and physics, sequences the substantive knowledge from Reception to Year 6, drawing directly from the EYFS framework and National Curriculum. There are also [science end points documents](https://drive.google.com/drive/u/0/folders/1X3uJgfEI3DdeqzDYW89oBkW5KUVTAN4W) for each year group which breaks down the national curriculum objectives into clear, precise learning points which can be used for assessment of children’s learning.

**Technical skills & subject knowledge:**

Each unit has a bespoke knowledge organiser which gives key facts, associated vocabulary, key scientists and diagrams/photos that summarise the main points in order to answer the enquiry question. They act as a tool for pre-learning/overlearning and chunk learning into manageable steps - beneficial for previously low attaining/SEND children. More able pupils benefit from working collaboratively - allowing them to articulate their ideas, reason their choices and deepen their understanding of a topic through challenging questioning. The KO’s are put on our learning platforms so that they are available to children and parents to support pre/post learning and as a revision guide.

**Breadth of study:**

In addition to discrete lessons, additional aspects of science are taught through other subjects and the wider curriculum. Our STEM subjects support the use of scientific knowledge and understanding. We also have selected guided reading books which focus on scientific concepts and scientists, including books which promote the idea of significant female figures. We have a school garden, where children grow

**Developing vocabulary:**

Our aim is to ensure that our children are familiar with frequently occurring scientific words that appear in various contexts and topics (including terms and concepts). These will be identified in our knowledge organiser and shown in our [progression of vocabulary.](https://docs.google.com/presentation/d/1Un65up08ItCeNBoCDWzwc7ORpGdlHipP/edit#slide=id.p1)

**Disciplinary Knowledge**

Disciplinary knowledge considers how substantive knowledge originates, is debated and is revised - i.e. how we create, contest and evaluate substantive knowledge over time. Disciplinary knowledge tells us how we know what we know; it is through disciplinary knowledge that pupils learn the enquiry practices of science. It gives an insight into the ways that scientists think - how they ask questions, plan an enquiry, observe, measure, interpret, conclude, predict and evaluate. Disciplinary knowledge enables one to ‘think like a scientist’.

Disciplinary knowledge in science includes the Working Scientifically strand of the National Curriculum, and the key features of scientific enquiry as detailed in the ‘aims’ of the National Curriculum. Essentially, Working Scientifically skills and knowledge of approaches to science enquiry are distinct yet connected, and a particular lesson or sequence of learning is likely to incorporate elements of both. The [‘Learning How To Be a Scientist’](https://docs.google.com/document/d/1Plz8TXlp1cPjZ1jC_gpOjUivhPlvkftL/edit) document shows progression from Reception - 6 based on the EYFS framework and National Curriculum.

The Working Scientifically strand of the National Curriculum includes:

I. Asking Questions that are the starting points for different types of science enquiry.

II. Planning Enquiries that systematically require more independent decision making.

III. Observing Closely and communicating these observations via increasingly more elaborate diagrams.

IV. Taking Measurements according to relevant age-related strands of the mathematics National Curriculum.

V. Recording Results appropriately, using a variety of tables, tally charts and pictures.

VI. Presenting Results in a range of ways, including age-appropriate charts and graphs.

VII. Interpreting Results by spotting patterns and describing relationships.

VIII. Drawing Conclusions and presenting them orally and in writing.

IX. Making Predictions about further results or investigations, by drawing on what has been learnt.

X. Evaluating Enquiries by suggesting improvements and discussing the degree of trust in secondary sources and their results.

As well as the Working Scientifically skills as detailed in (I) to (X) above, disciplinary knowledge in science also consists of the different approaches that scientists employ in scientific enquiry, in order to answer relevant scientific questions. These are noted in the ‘aims’ of the National Curriculum, and include:

I. Observing over time

II. Pattern seeking

III. Identifying, classifying and grouping

IV. Comparative and fair testing (controlled investigations), by controlling variables, presenting data in graphs and describing causal relationships.

V. Researching using secondary sources

Acquiring disciplinary knowledge is an important curriculum goal and occurs alongside substantive knowledge development. The science enquiries integrate both forms of knowledge. Disciplinary knowledge is introduced, developed and mastered alongside the substantive content of biology, physics and chemistry. The science end points documents provide details of suggested scientific enquiries linked to each topic.

**Key Symbols**

| Science symbol - test tube Royalty Free Vector Image | Science  |
| --- | --- |
|  | Asking questions  |
|  | Making predictions  |
|  | Setting up tests  |
|  | Observing and measuring  |
|  | Recording data |
|  | Interpreting and communicating results |
|  | Evaluating  |