Science Curriculum Statement

Intent

Here at St Anne’s, our Science curriculum strives to provide children with engaging tasks, set in purposeful, real-life contexts wherever possible, ensuring this is significant to them. We take a ‘hands-on’ approach to our science lessons, where children are able to develop a sense of excitement and explore their curiosities about the world around them. They are able to appreciate the wonder of science and its role in solving global challenges in society. Our curriculum is based on the 2014 framework provided by the National Curriculum. We focus on the acquiring of both substantive and disciplinary knowledge throughout each unit of work, which allows children to build on prior learning and enables them to advance and deepen their understanding and skills in Science. Designed with our children at its core, the Science curriculum goes beyond the content of the National Curriculum, introducing knowledge which is specifically relevant to them and additional ‘stepping-stone’ units where required. It is broken down into four main threshold concepts: Biology, Chemistry, Physics and Working Scientifically. These concepts form the basis of lessons which are appropriately challenging, and where children have the opportunity to guide the learning through asking and where appropriate, answering their own questions.

The conceptual and procedural knowledge that forms the St Anne’s Science curriculum is organised into two main categories: substantive and disciplinary. This structure ensures that both the products and practices of science are taught, advancing knowledge of content and context. Although scientific knowledge becomes established through scientific enquiry, our curriculum recognises that without both substantive and disciplinary knowledge, effective, skilful scientific enquiry cannot take place. The disciplinary knowledge is embedded within substantive contexts.

The knowledge is organised around the main scientific concepts, is well-structured and introduced sequentially over time to ensure progression. This also ensures that it is manageable for the children and their working memory capacity is not overloaded, aiding retention. When pupils learn new knowledge, it is integrated with the knowledge they already have, allowing them to develop conceptual frameworks and schemas which are both meaningful and easier for them to access.

Our curriculum is designed so that every child, including those with a disability or who have special educational needs, has the opportunity to succeed as scientists. No child is taken out of studying science on a regular basis. All children regardless of economic disadvantage and ability have the same knowledge-rich, high quality teaching and teachers modify and adapt their practice to ensure that this is accessible to all. We recognise that learning in Science is often intertwined with maths, reading and writing, however we have designed a curriculum where the tasks set are concerned with building scientific skills and knowledge. This ensures that children are not held back in making progress in science because of weaknesses or difficulties they experience elsewhere in the curriculum. The units of work are on a fixed basis, so teachers in each year group teach the same topics each year. This enables teachers to develop their resources, expertise and effective curriculum links.

We want our children to be aware that science is all around them, in everyday life and in every career, and to recognise that it is both vital and accessible to them for their future. Through Science at St Anne’s we increase the cultural capital of all pupils. This is done through exposing the children to a wide range of experiences, visitors and visits, which are carefully planned and sequenced. Providing the children with these opportunities that they would otherwise not encounter allows them to apply the knowledge they have, develop this, question it and engage with natural phenomena. These opportunities are open and accessible to all children, with financial support and places available to those children who need it to ensure no one misses out.

Below are our science principles, that we as a staff, along with our Science Ambassadors, review and agree on annually:

Science at St Anne’s should be:

* Hands on
* Engaging
* Relevant

Implementation

The implementation of the intended curriculum at our school supports its coherence. Each week Years 1 – 6 engage with science, both inside, and outside of the classroom. This includes covering the content from the national curriculum which is embedded in our bespoke St Anne’s Curriculum. Activities are carefully planned in order to develop a deep understanding of an associated scientific concept. Teacher-directed instruction plays a fundamental role in our curriculum, particularly when explaining a new or abstract scientific concept. In these instances, lessons will feature a range of high-quality texts (including fiction, non-fiction, poetry and picture books), animations, images or concrete objects and simulations to aid the children’s understanding. In addition to this, we may use an enquiry-based teaching approach where appropriate, with varying degrees of scaffolding, which allows the children to acquire both substantive and disciplinary knowledge through exploration, and challenge misconceptions. Our students have the opportunity to explore, investigate and analyse through various types of scientific enquiry, which allows time for our children to deepen their understanding and consolidate their learning. If any misconceptions are still present, we use the Snap Science assessment tool in small groups or on a one-to-one basis to address these and support children in developing their knowledge of a particular concept or skill.

Repeated exposure is a key element within the structure of our science curriculum. The substantive and disciplinary knowledge taught in each unit of work and is retained, and then built upon each year as their understanding of the concepts widens. This progression is evident in their learning through the type of tasks they will encounter at each stage of their learning, whether this is basic, advanced or deepen. In order to aid children’s retention, regular retrieval sessions of previous knowledge are carried out at the beginning of each lesson. This offers the opportunity for teachers to talk to children about their learning in previous units and year groups, and provides the children with opportunities to develop their oracy, using scientific language. In turn this writing and speaking allows pupils to retrieve and reorganise their knowledge in their schemas as they communicate scientific ideas.

Where possible, we work hard to develop meaningful connections between our science units and other curriculum areas throughout the year, further enabling the children to make links between their learning and develop schemas. Elements of the maths curriculum feature throughout our Science curriculum at age-appropriate levels. Where mathematics is present in a science lesson, but this has not been covered as part of the maths curriculum, this is made explicitly clear to the teachers (through the medium term plan) and the children in the lesson. We discuss with our children to appreciate the different ways in which scientists engage in their work: through reading, talking, writing and representing science, and encourage them to use the same disciplinary literacy. They learn linguistic and grammatical features that are particularly relevant to science within our English curriculum, and have the opportunity to orally rehearse using these features, before applying these appropriately in their Science work. This will enable them to speak with confidence and fluency when presenting their work or critiquing a scientific idea, agreeing and disagreeing with others respectfully.

One week at the end of each year is dedicated to working scientifically, where children initially participate in discovery learning, we call these ‘Curiosity Weeks’. Our whole school from nursery up to year 6, has the same stimulus, which in previous weeks has been nappies, biscuits and skittles! Our children begin by ‘playing’ and generate their own scientific questions through this child-led exploration. We work together to sort the children’s questions into the various types of enquiry, then they work in groups to plan and carry out their own investigations at an age-appropriate level, as well as having the freedom to explore the other forms of enquiry that they desire. Through this, they demonstrate their understanding of and skills in working scientifically concepts that they have focussed on for the year. This week is not curricular, and is carried out in order to provide an opportunity for the children to take ownership and apply their disciplinary knowledge. Although this week produces many ‘wow’ moments, it is fundamentally embedded as an assessment tool for teachers.

We are extremely lucky here at St Anne’s to have some excellent science resources in school, as well as expertise, with Mrs Clegg having received the acolade of Primary Science Teacher awarded by the Primary Science Teaching Trust, of which she is fellow. At our school, we have invested in quality science equipment and books over the years, which ensure that all our children are able to access the science curriculum in a way that suits them. All our resources are carefully selected and where quality online resources are used, such as Explorify and STEM Learning, these enrich our teaching. Our students regularly use technology to both illustrate and record scientific content, such as microscopes, pulsometers, data loggers and a wide range of iPad apps. We also use Now Press Play, an immersive, interactive experience that allows the children to take part in a story as a character moving through a certain scientific discipline. This experience provides them with first-hand experience of an abstract scientific concept, and the opportunity to listen to subject-specific vocabulary being used in additional contexts.

As a school, we strive to connect with individuals and organisations in our wider community that we can work with in order to provide our children with eye-opening experiences that ignite new passions. Each year, we participate in British Science week, where we have a whole-school theme, and the learning focuses on STEAM subjects. We incorporate visits from STEM ambassadors, parents with ‘secret science’ careers, and experts from various fields, embedding learning within a context. We continue to develop strong links with Our Lady’s High School, who we invite come into school to share their expertise with the children and staff alike and to provide additional science-based experiences that we would otherwise find it difficult to provide in our school. Our Lady’s regularly run workshops for our year 5 and 6 children to attend, such as electricity and evolution, which engage and provide in depth knowledge of these areas, as well as discussing potential careers in these sectors, raising aspirations and broadening horizons. St Anne’s have developed strong links with the SEERIH Hub at The University of Manchester through our school’s contribution to projects such as Science 4 Families (<https://seerih-innovations.org/science4families/>) which extended a love of science to our families. Previously, this has resulted in a Science Extravaganza led by five of our families, for another thirty families and was a huge success.

Wherever possible throughout the year, we take part in science-based projects and events such as the VEX IQ robot competition, the Greater Manchester Engineering Competition and the Great Science Share, which allow our children to take their knowledge and skills to other venues, and share this with a wider audience. We also organise educational visits and experiences that support our Science curriculum, for example visiting exhibits at the Manchester Museum and the RSPB, carrying out field-work in Heaton Park or exploring the exotic animals with Zoo Lab. Where possible, our local area and the people within it are utilised in order to develop a strong sense of community.

St Anne’s have regular science CPD both externally, primarily through the FASCINATE SEERIH Hub, and through our science lead who provides regular feedback on any curriculum developments, new strategies and whole school approaches. These include making science assessment meaningful through well thought-out activities, using the TAPs structure for scientific enquiry, how to track attainment and use this to influence planning and teaching, using the Snap Science resource to address any gaps in understanding, and evidencing attainment in books development. Our Science lead continues to support staff with developing their teaching and implementing a range of effective assessment strategies.

Impact

Formative assessment occurs continually throughout the teaching of our science curriculum through a range of questioning and assessment tasks. The choice has been made to steer away from summative assessment in the form of tests as we believe that they are not a sufficient method to measure all outcomes of our science curriculum. However, test-style questions may be incorporated into teaching sequences where appropriate as an assessment tool or to indicate the impact of the curriculum. The continual revisiting and retrieval, and assessment tasks, allow children to show what they have learnt and remembered over the units and that this information is embedded and is readily available to access in the longer term. It also allows teachers to assess which information has been remembered and is available for children to use when needed in the future, and which knowledge may need to be re-covered by groups or individuals.

At the end of each year, children will complete a knowledge quiz based on the substantive knowledge statements of the topics covered that year. This provides information to the subsequent teacher about which areas are well remembered and understood and which areas could be the focus of retrieval practice the next year.

Throughout their time at St Anne’s, children will understand the importance of science for their own future and that it truly is in everything they do and see. They will be enthusiastic and curious, pursuing different routes to answer questions they have, whilst knowing that science is not always about finding the answer, but asking the question. Our children will be self-motivated and confident as a result of gaining a sound conceptual understanding of all aspects of the national curriculum for science, delivered by competent educators. This will result in them becoming better prepared to navigate the world around them.

Children will:

* develop substantive and disciplinary scientific knowledge 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