

Curriculum Q & A in Science – updated 9.12.21

<i>Subject Curriculum</i>	<p>Does the subject curriculum match or exceed the breadth of the National Curriculum?</p> <p>The National Curriculum is taught in full and we have a matching document to evidence this. KS1 and KS2 objectives such as scientific enquiry skills, are revisited in every year group, adding extra depth and understanding. Biology life processes, chemistry and physics are taught sequentially throughout the child’s primary education.</p> <p>Our science curriculum goes beyond the breadth of the national curriculum because scientific learning is reinforced through well planned visits and visitors. Children’s learning is enhanced by for example, visits to London Zoo, The Aquarium, Camley Street Nature Reserve, Hampstead Heath and The Natural History Museum. We also have excellent links with The Crick Institute. Children visit and are visited by world class scientists and take part in practical and engaging experiments with them.</p>
	<p>Is challenge understood in terms of curriculum end points?</p> <p>Yes, skills are built on step by step and progress is made across the Key Stages in small steps so that the challenging end points can be met.</p> <p>For example, in KS1 children are introduced to the idea of different materials and the properties that these materials have. In Year 3 they look at properties relating to rocks and their uses. Later (in Year 4) they are introduced to the idea of solid, liquid and gases and the properties of each. In Year 5, pupils are then taught about reversible and irreversible changes. This leads well into the Year 7 curriculum where pupils learn about the periodic table.</p> <p>An example of progression of enquiry skills is in KS1 pupils carry out simple tests. In lower KS2 they set up practical enquires and fair tests. They learn to recognise when a fair test is necessary and help to decide how to set it up. In upper KS2 pupils recognise when and how to set up fair tests and explain which variables need to be controlled and why.</p>
<i>Curriculum components</i>	<p>Do pupils have the prior knowledge necessary to learn new curriculum content?</p> <p>Yes, lessons build on each other and the curriculum is sequential.</p> <p><u>Within a unit plan:</u></p> <p>For example, in Y5’s lessons on forces, they start by learning about measuring friction between moving surfaces before moving onto using evidence to explain how objects fall through the air and testing results about air resistance. Then they measure the effects of water resistance and demonstrate how levers work. This provides the children with the knowledge and skills needed to complete the composite task of explaining why a larger mass stretches a rubber band or spring more than a smaller mass.</p> <p><u>Across the Key Stages:</u> (see also timeline example in box above)</p> <p>For example, when developing their knowledge and understanding of animals, including humans, EYFS start with looking at the natural world around them, making observations and drawing pictures of animals and plants. They are taught to use accurate vocabulary for naming and describing common animals. This is built</p>

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	<p>on in Y1 where they observe, describe, label and compare the features of animals. Year 2 then learn about the needs of animals and their different diets.</p> <p>Moving into KS2, Year 3 learn that animals cannot make their own food and about the skeletal system. Year 4 learn about the teeth and the digestive system and then in Year 5 they move on to learning about that animals reproduce. In Year 6, pupils learn about the impact of substances and lifestyle choices. They learn about oxygen and how it is used in the human body (blood circulation).</p> <p>Does curriculum planning identify small enough component steps so that all pupils can ultimately achieve ambitious end points? Yes, see the previous example of Y5's unit plan on Forces.</p> <p>Within each lesson, teachers use their professional judgement to help those children with SEND access the curriculum and also achieve the end points through careful differentiation. This may be greater scaffolding or access to simpler secondary sources of information for example.</p> <p>Are unhelpful substitutes used instead of identifying and teaching component content? No...</p>
<p><i>Curriculum sequencing</i></p>	<p>Does planning consider the sequencing of content at different scales to create readiness for future learning:</p> <p>a) Within the lesson sequence Yes, each lesson plan specifically reviews the previous learning at the start of the lesson. Teachers are given questions to ask to refresh memory. Where applicable, this may be retrieving relevant information from a few lessons previously. Small steps of knowledge are built on within the lesson.</p> <p>Within the topic Yes, in all year groups, topics have been sequentially planned so that pupils are building on previous learning and are prepared for future learning in each topic. A series of component tasks build to a composite task. In addition, weekly quizzes help children retain this knowledge outside of their Science lessons. In KS2, Knowledge organisers help children identify and remember the key learning from each topic.</p> <p>b) Within the year or phase? Yes, the planning is sequential and the scientific enquiry skills are revisited in every year group.</p> <p>See previous detailed examples.</p>
<p><i>Rigour (where relevant)</i></p>	<p>Do pupils gain disciplinary knowledge of how the subject 'works' and engage in disciplinary practices? Yes, Science is taught as a specific subject, rather than as part of a wider topic. Children in EYFS, KS1 and KS2 are taught to use practical scientific methods, processes and skills. Enquiry skills move from completing simple practical investigations in KS1 , to setting up practical enquires and fair tests in lower KS2. They learn to recognise when a fair test is necessary and help to decide how to set it up. In upper KS2 pupils recognise when and how to set up fair tests and explain which variables need to be controlled and why.</p>

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	<p>Throughout topics, they learn how to use correct scientific vocabulary, such as gravity, newtons, evaporating etc.</p> <p>We explicitly teach subject specific vocabulary. We model this and get children to use the vocabulary in their explanations. Science display around the school and in classrooms further support this.</p> <p>We take every opportunity to show children how what they do in the classroom relates to the world of work. We are very fortunate to be located so closely to the World famous Crick Institute which enables pupils to see and be inspired by scientists in action.</p>
	<p>Do teachers ensure pupils are drawing on enough knowledge to answer subject-specific questions or engage meaningfully in subject disciplinary practices?</p> <p>Yes, teachers start each lesson retrieving the relevant prior knowledge to aid understanding. They then explicitly teach the new vocabulary which children will need in the lesson. Each lesson is ‘knowledge led’, so the key knowledge is taught and modelled explicitly by the teacher. This enables children to have the vocabulary and in-depth knowledge to answer scientifically. Additionally, children re-visit learning through weekly retrieval practise.</p> <p>Science is a practical as well as knowledge-rich area of the curriculum. For this reason, there are lots of opportunities in our planned curriculum to take part in subject disciplinary practices (e.g. investigations.)</p>
	<p>Do teachers confuse ‘learning through doing’ (a pedagogy) with the curriculum goal of acquiring disciplinary knowledge?</p> <p>Science is a knowledge-led curriculum. Teachers ensure that the key vocabulary and knowledge is taught first, before the skills (for example enquiry) are applied. However, there are practical elements to the subject. Our curriculum has been carefully planned with practical work embedded within the knowledge-led curriculum.</p> <p>The knowledge children should know by the end of the unit is explicitly set out in each plan. Children are then quizzed on this weekly. This is supported by a knowledge organiser which has all the key information children should know.</p>
<i>Memory</i>	<p>Do teachers identify crucial components, emphasise and repeat these and ensure they are remembered long term?</p> <p>Yes, each lesson starts with revisiting prior knowledge.</p> <p>Retrieval practise each week ensures that children know and remember more of the key information for each unit.</p> <p>In KS2, knowledge organisers are used to help children know and remember more.</p> <p>When pupils struggle, do teachers check which prior knowledge components are missing/not automatic?</p> <p>Yes, this would become apparent both in the weekly retrieval practise and at the start of each lesson. Teachers have key questions to identify the prior learning necessary for that lesson (this may be from the lesson before, a few lessons previously or even the previous year). They can then address this immediately.</p>
<i>Pedagogy</i>	<p><i>Do teaching decisions achieve curricular intent?</i></p> <p>Do teachers apply generic pedagogies, e.g. differentiation, feedback without considering curricular intent?</p>

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	<p>Differentiation is carefully planned for SEND children, so that they can access the curriculum. All other children are expected to attain the learning objectives, but scaffolds may be used, for example key word mats. Children are also given information strips from Year 2 up, which prompts them to use scientific vocabulary that they've learned when writing up experiments.</p> <p>Is 'challenge' misunderstood as generic activity types? The curriculum has challenging end-points across the key stages. Children are expected to meet these challenging end-points through carefully planned component steps, rather than extra 'challenges' at the end of the lesson.</p> <p>Do activities require confident knowledge of too many 'fragile' components, overloading working memory? No, units are planned to have small steps leading to a component task. Learning is revisited at the start of lessons and through the spiral curriculum to aid working memory.</p>
<i>Assessment</i>	<p><i>Timely feedback on component learning?</i></p> <p>Is formative assessment fit for purpose, e.g. a timely check that curriculum components have been remembered, rather than, more problematically, a summative test of composites being used to identify components? Yes, at the start of each lesson Weekly in retrieval practice</p>
	<p>Is summative data collection disproportionate, inefficient or unsustainable for staff? No, teachers highlight the objectives children have understood which demonstrate whether they are at Expected Standard or not.</p>
	<p>Are pupils who fall behind identified within the lesson sequence, or less helpfully, are interventions based on data from a summative assessment? There are no specific extra interventions for Science but teachers use questioning throughout the lesson to assess who may need extra support. Teachers use their professional judgement to use scaffolds for children with SEND where appropriate.</p>
<i>Culture</i>	<p><i>A climate of high expectations where pupils' love of the subject can flourish</i></p> <p>How do teachers get the best from pupils? Throughout each topic, pupils take part in a new set of experiments exploring fundamental concepts in science. These concepts are brought to life through hands-on experiences and investigations. Lessons are interesting and engaging. Children apply their scientific skills in a range of different ways. In addition, Childrens' own life experiences are drawn on wherever possible, for example in Year 4 children learn about their teeth and the digestive system. Extending learning beyond the classroom is a key feature of teaching at our school – see listed visits and visitors above.</p>
	<p>How do teachers enrich the curriculum subject? Where possible, teachers are encouraged to enrich with trips and visitors, for example Y5 recently visited the Crick Institute to investigate chemical reactions.</p>
	<p>Are there mechanisms for taking action when pupils display low effort, for example in written work and homework? If children showed low effort in classwork, they would repeat it. High expectations are demanded of all.</p>
<i>Systems</i>	<p><i>Subject processes and staff support</i></p>

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	<p>What do the strengths or weaknesses already identified indicate about effective functioning to deliver a quality subject curriculum? Teachers are given training in PDMs. Where potential weaknesses are identified (for example through book scrutiny's or extra support for new members of staff), 1-1 coaching meetings are held with the subject leader.</p> <p>Probe systems for staff support and subject CPD, curriculum construction and to ensure consistent quality of subject education. Weekly PDM's offer coaching for staff. These can be subject specific for Science (usually once a term) to enhance subject knowledge and pedagogy or improve science teaching. One example of a recent PDM, was the use of information strips to ensure that children can draw on relevant information and key scientific vocabulary when writing up experiments. Also, a PDM was held on helping SEND children access the curriculum, ensuring they can access the high standards of the curriculum.</p>
<i>Policy</i>	<p>Impact of whole school-wide policies on subject delivery? How whole-school timetabling, marking, assessment, CPD policies and priorities etc affect the quality of subject education.</p> <ul style="list-style-type: none"> • Timetabling – Science is taught once a week throughout the year. • Marking – This is fit for purpose and not onerous for teachers. Where possible, teachers mark alongside the children so they have immediate feedback. • Assessment – formative assessment is used continually throughout the lessons and teachers use their marking to feed into their next lesson. • CPD policies – PDM training for ALL staff, including TAs • Priorities (link to school improvement plan) – the school improvement plan promotes oracy across all subject areas which is supported by the key vocabulary taught in science and giving children the knowledge and confidence to speak clearly and knowledgeably about the subject.