

## Our curriculum guide: Science

Date: September 2023 and reviewed on an on-going basis

### Our curriculum intent: overall

This Curriculum Guide relates to Science, part of the core subject of English in The National Curriculum (Department for Education, 2014). It sits alongside similar documents for Early Years, Reading, Writing, Maths, Topics and others.

We want Sphere Federation schools to be happy and healthy places to learn. This core aim permeates our schools and their ethos, whether in the classroom or around and about school. *(At St James' CE Primary, this is expressed with one additional element: 'happy and healthy place to achieve and believe'.)*

The knowledge and skills we are required to teach are set out in the National Curriculum. We set these out in a year-group based sequence of learning (age-related expectations). Alongside these statutory curriculum requirements, there is additional or explicit learning, too.



### Curriculum structure

The programmes of study set out in the National Curriculum can be grouped into the three main areas of science: biology, chemistry and physics (in the table below, the number in brackets indicates the number of times the unit appears across Key Stage 1 and 2 in the National Curriculum, although it's important to note the large overlap in many of the units, such as the four chemistry units).

Pupils are also taught about working scientifically – using practical scientific methods, processes and skills – through the teaching of the programmes of study.

biology	chemistry	physics
<ul style="list-style-type: none"> <li>animals, including humans (6)</li> <li>living things and their habitats (4)</li> <li>plants (3)</li> <li>evolution and inheritance (1)</li> </ul>	<ul style="list-style-type: none"> <li>materials (3)</li> <li>states of matter (1)</li> <li>rocks (1)</li> </ul>	<ul style="list-style-type: none"> <li>seasonal changes (1)</li> <li>light (2)</li> <li>forces and magnets (2)</li> <li>sound (1)</li> <li>electricity (2)</li> <li>earth and space (1)</li> </ul>

#### working scientifically

Working scientifically skills ensure children learn about the discipline of Science as well as the substantive knowledge set out in the National Curriculum.

The skills are embedded within lessons. This allows children to revisit and secure these skills across a Science block and across the years. Typically, there is sufficient time within the Science curriculum for children to plan and develop their own investigations. For example, an enquiry in Y4 about the freezing points of different liquids may be developed by children into a subsequent activity which investigates if the freezing points change when the liquids are mixed together.

Each science block features scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. The five types of scientific enquiry are observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and research using secondary sources.

## Key elements

Like English and Maths, Science is a **core subject** and is taught as a discrete subject.

### Cross-curricular links

When reading cross-curricular texts, teachers support children to read as a 'subject expert': in this case, reading as a scientist. In addition, there are often links with many subjects. For example, Biology links to Geography (eg learning about the environment); and the collection and presentation of data links to Computing.

### Spiritual, moral, social and cultural development (SMSC)

The National Curriculum states: 'Every state-funded school must offer a curriculum which is balanced and broadly based and which: promotes the spiritual, moral, cultural, mental and physical development of pupils at the school and of society' (2.1, p5). Science provides opportunities to promote SMSC, too:

- spiritual: developing a sense of awe and wonder at the complexity and pattern in natural phenomena
- moral: looking at good and bad uses of drugs; moral issues in the human food chain
- social: looking at ways in which the environment needs protection
- cultural: scientific development in relation to others – water supplies, new varieties of flowers and food crops

### Vocabulary

Within each Science block, there are key words/phrases that we want our children to know. These are subject-specific but might relate to previous as well as current blocks.

- At the start of the block, there is a class assessment, where teachers introduce the key vocabulary and gauge the knowledge and understanding of the words as a whole class.
- Throughout the block, these words are taught and used often. For example, children might review/revise/re-cap key vocabulary at the start of lessons.
- At the end of the block, children demonstrate their knowledge and understanding of the vocabulary. They may also use and apply the words in sentences or in a review of some sort.

### Resources

Teachers use the White Rose Science schemes of learning as the basis of their planning whilst using their professional judgement to adapt these to meet the needs of their class. The schemes of learning include:

- **Teacher guidance:** National Curriculum links, key questions, vocabulary, potential misconceptions, enquiry questions (when relevant), cross-curricular links, background subject knowledge
- **Small Steps:** lessons are carefully sequenced ensuring coherent progression through a block of learning; accompanying notes provide teachers with practical ideas and key knowledge
- **Working Scientifically:** each step has a working scientifically skill focus which develop across years and year groups and have practical enquiry at their core, as well as opportunities to research scientific ideas; the scheme equips children with the working scientifically skills they need as well as opportunities to engage with the five scientific enquiry types

### Featured scientists and careers

Across the Key Stage 1 and 2 Science curriculum, we've planned for children to learn about 25 featured scientists. The scientists we've chosen represent diversity across a range of different scientific fields. Some are especially known – Alexander Graham Bell and Charles Darwin. Others are less well-known but just as inspiring – female scientists and scientists from a non-white background, contemporary scientists as well as celebrated pioneers from the past.

We've also made links between class learning and related careers. For example, in a chemistry block focusing on properties and changes of materials, children will learn about how a chocolatier uses science learning in their job.

### Revisiting prior learning

We teach Science as part of a spiral curriculum:

*'A spiral curriculum is one in which there is an iterative revisiting of topics, subjects or themes throughout the course. A spiral curriculum is not simply the repetition of a topic taught. It requires also the deepening of it, with each successive encounter building on the previous one.'*

*'What is a spiral curriculum?'*, R M Harden, 2009

Teachers provide regular opportunities for children to revisit prior learning through retrieval practice at the beginning of each lesson; this learning could be from the previous lesson, week, term or year. The science blocks are carefully planned to allow children to build on and revisit previously taught learning. For example, in Year 3, children learn about skeletons in the autumn term and fossils in spring, with one helping to inform the other.

## Adaptive teaching

Adaptive teaching is about being responsive: adjusting teaching to better match pupil need. The extent of adaptation varies depending on individual contexts. Adaptations might include:

- targeted/tailored support
- additional practice
- breaking down content into smaller components
- teaching carefully selected groups
- well-chosen books and other resources

All three schools in Sphere Federation are inclusive and are committed to meeting the needs of children with SEND in **the most effective way** so that they achieve **the best possible outcomes**:

- we want pupils with SEND to acquire the knowledge and skills they need to reach their full potential,
- to be ready for the next stage in their education and,
- ultimately, to succeed in life.

To do this, we adapt how we implement the Science curriculum to meet the needs of pupils with SEND so that we can develop their knowledge, skills and abilities to apply what they know and can do with increasing fluency and independence. The adaptations we make are appropriate and reasonable, and are made in accordance with the Equality Act 2010 and the SEND code of practice.

Similarly, teachers provide opportunities for challenge and deeper learning. Challenge may be seen in pupils' exercise books: for example, teacher feedback which provides an additional task or thought-provoking question, or an open-ended activity that promotes reasoning. However, often the challenge may not be evident in books; for example, challenge might be provided by less support during the teacher input; an additional, practical task that isn't recorded; and teacher questioning which is targeted to meet the needs of different pupils. (In addition, some content is listed in our age-related expectations in italics – this content is taught earlier than set out in the National Curriculum.)

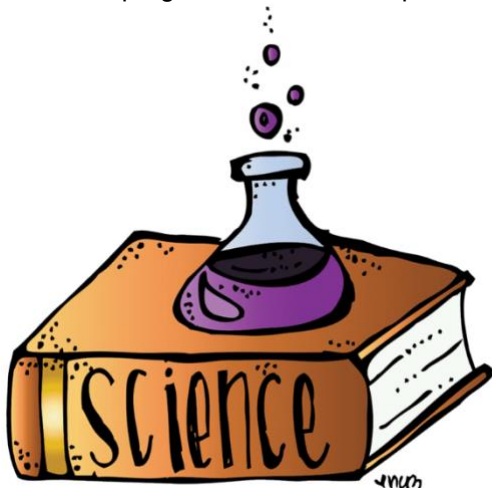
Occasionally, teachers may also adapt teaching by deviating from the Science block if it ensures learning is responsive and relevant. An example would be responding to significant local, national and world events, such as the Covid epidemic or a significant event in space. This flexibility is important as it provides opportunities for teachers to explore other aspects of learning within or beyond the Science curriculum – learning which is more spontaneous in that it meets children's questions, needs and interests in a responsive, more 'organic' way.

## Monitoring and evaluating

We continually review the Science curriculum, evaluating its impact on children's learning over time.

We measure pupil achievement – the acquisition of knowledge and skills –and progress using a number of strategies, including:

- on-going teacher assessments, based on questioning in class, observations and pupil outcomes (which includes their work in books), supported by moderation in school and across Sphere Federation
- at the end of each Science block, pupils complete online assessments which provide teachers and senior leaders with information about impact and this informs next steps
- pupils' acquisition of vocabulary and knowledge through book scrutinies, learning conversations and learning walks
- at the end of the year, more formal assessment, with data submitted to senior leaders who track attainment and progress to measure impact.



Scrutiny of progress in books and learning conversations with children are key ways to assess impact. We explore how successful our children have been in acquiring knowledge and skills in relation to their stage of learning. In conversations with children, teachers and school leaders will ask questions relating directly to age-related expectations and to times when they might have needed more support or when they experienced greater challenge. Lesson visits and the monitoring of planning support our assessment of impact. Whole school areas for development are identified as a result of evaluating the impact of what we do.

We also evaluate impact by measuring pupil attitudes using a number of strategies, including feedback during learning conversations and in pupil and parent/carer surveys; attitudes and behaviour in lessons across the curriculum; and the quality of the work they produce, including taking pride in presentation.

# Long-term plans

we follow the White Rose Science schemes of learning. Teachers use professional judgement to adapt these to meet the needs of their class. The Science curriculum is split into blocks which are written for content rather than time. This ensures that children are developing a solid understanding of scientific processes and concepts.

Year 1													Year 2												
Autumn term													Autumn term												
Spring term													Spring term												
Summer term													Summer term												
Week 1-5: Biology - The human body Week 6: Biology Seasonal changes Week 7-10: Chemistry - Materials Week 11: Biology Seasonal changes Week 12: Biology Seasonal changes													Week 1-4: Biology - Animals' needs for survival Week 5: Biology - Humans Week 6-10: Chemistry - Materials Week 11: Sustainability - Plastic Week 12: Sustainability - Plastic												
Week 1-5: Biology - Plants Week 6: Biology - Animals Week 7-10: Sustainability - Caring for the planet Week 11: Biology Seasonal changes Week 12: Biology - Plants B Consolidation													Week 1-4: Biology - Plants (light and dark) Week 5-10: Biology - Living things and their habitats Week 11: Biology - Light and dark Consolidation												
Week 1-5: Biology - Plants Week 6: Biology - Plants Week 7-10: Sustainability - Growing and cooking Week 11: Biology Seasonal changes Week 12: Consolidation													Week 1-4: Biology - Plants (bulbs and seeds) Week 5-7: Biology - Growing up Week 8: Biology - Bulbs and seeds Week 9: Biology - Growing up Week 10: Sustainability - Wildlife Week 11: Consolidation Week 12: Consolidation												
Year 3													Year 4												
Week 1-5: Biology - Skeletons Week 6: Biology - Movement Week 7-10: Biology - Nutrition and diet Week 11: Sustainability - Food waste Week 12: Chemistry - Rocks Consolidation													Week 1-4: Biology - Group and classify living things Week 5: Biology - Data collection A Week 6-10: Chemistry - States of matter Week 11: Consolidation Week 12: Consolidation												
Week 1-5: Chemistry - Fossils Week 6-10: Chemistry - Soils Week 11: Physics - Light Week 12: Consolidation													Week 1-4: Physics - Sound Week 5: Biology - Data collection B Week 6-10: Physics - Electricity Week 11: Sustainability - Energy Week 12: Consolidation												
Week 1-5: Biology - Plants A Week 6-10: Physics - Forces Week 11: Physics - Magnets Week 12: Biology - Plants B Sustainability - Bioenergy													Week 1-4: Biology - Data collection C Week 5: Biology - Habitats Week 6: Sustainability - Deforestation Week 7-10: Biology - The digestive system Week 11: Biology - Food chains Week 12: VIEW												
Year 5													Year 6												
Week 1-5: Physics - Forces Week 6-10: Physics - Space Week 11: Sustainability - Global warming Week 12: Consolidation													Week 1-4: Biology - Living things and their habitats Week 5: Physics - Electricity Week 6: Sustainability - Renewable energy Week 7-10: Consolidation Week 11: Sustainability - Renewable energy Week 12: Sustainability - Renewable energy												
Week 1-5: Chemistry - Properties of materials Week 6-10: Biology - Animals including humans Week 11: Biology - Life cycles Week 12: VIEW													Week 1-4: Physics - Light Week 5: Sustainability - Light pollution Week 6-10: Biology - The circulatory system Week 11: Biology - Diet, drugs and lifestyle Week 12: VIEW												
Week 1-5: Biology - Reproduction A Week 6-10: Chemistry - Reversible and irreversible changes Week 11: Sustainability - Plastic pollution Week 12: Biology - Reproduction B Consolidation													Week 1-4: Biology - Variation Week 5-10: Biology - Adaptations Week 11: Biology - Fossils Week 12: Consolidation Themed projects (Year 7 ready)												