Science at St Alban's CE Primary School

Educating for life in all its fullness.

Science has been designated a core subject of the national curriculum, alongside mathematics and English, since the Education Reform Act of 1988. As such, a science education forms an important entitlement for all young people.

Science involves pupils learning a body of knowledge relating to the products and practices of science. By learning about the products of science, such as atoms and cells, pupils are able to explain the material world and 'develop a sense of excitement and curiosity about natural phenomena'. By learning about the practices of science, pupils learn how scientific knowledge becomes established through scientific enquiry. By learning this, pupils appreciate the nature and status of scientific knowledge: for example, knowing it is open to revision in the light of new evidence.

As pupils learn science, they also learn about its uses and significance to society and their own lives. This will highlight the significant contribution science has made in the past. For example, by eradicating smallpox and discovering penicillin. But pupils will also learn about the continuing importance of science in solving global challenges such as climate change, food availability, controlling disease and access to water.

Science education also provides the foundation for a range of diverse and valuable careers that are crucial for economic, environmental and social development

How do we structure science at our school?

We follow the ***National Curriculum*** to structure our science curriculum, as we know that this means our curriculum is ambitious for all pupils.

At St Alban's we teach science discretely.

For science, we have thought carefully about how we sequence learning over time and have broken down learning into small steps or building blocks, starting from when children enter primary school until they leave. At each step, we consider what specific knowledge and understanding we want our pupils to ***know and remember*** at each stage of their learning and in each subject. The end of the Foundation Stage, KS1, Lower KS2 and Upper KS2 are key ***end points*** for each of these building blocks of our curriculum. We know what we want our pupils to know and remember at each of these end points, focusing on what will be most useful to them, and have sequenced lessons over time to reach those end points.

To support planning, we use Switched on Science Scheme of Work. This scheme provides full coverage of the primary science programmes of study. The scheme of work provides access to all subject knowledge and working scientifically objectives in a range of contexts to support the embedding of these concepts and skills.

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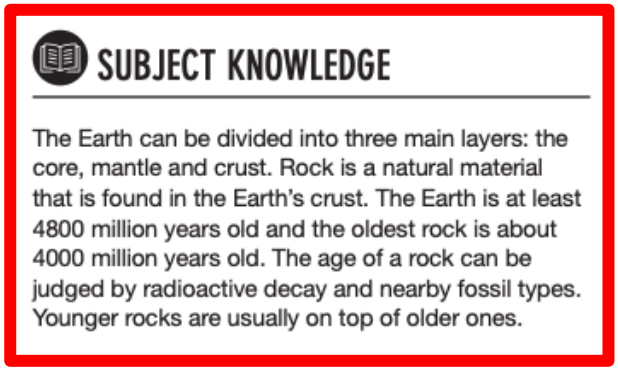
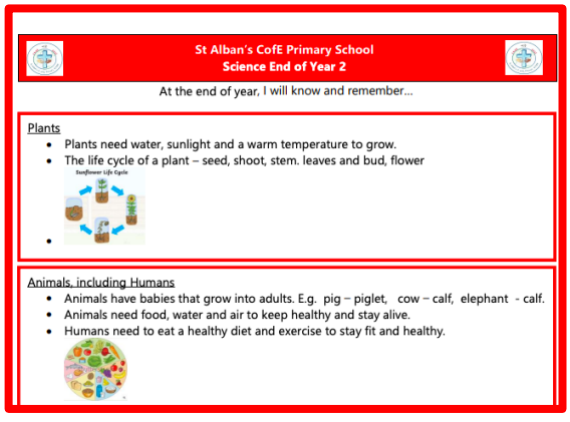
Teacher Subject Knowledge

At the start of each unit, curriculum documents outline the intentions for teaching and learning, including learning objectives (all of which are taken from the Programme of Study for Science (England)), cross-curricular links, and background subject knowledge for those teachers looking for additional support. This includes identification of misconceptions that pupils might hold in different areas of learning. There are also sections on key scientific vocabulary (with definitions) and STEAM, alongside health and safety.



Making knowledge sticky!

Expertise in science requires children to build at least 2 forms, or categories, of knowledge. The first is 'substantive' knowledge, which is knowledge of the products of science, such as models, laws and theories. The second category is 'disciplinary knowledge', which is knowledge of the practices of science. This teaches pupils how scientific knowledge becomes established and gets revised. Importantly, this involves pupils learning about the many different types of scientific enquiry. In our high-quality science curriculum, knowledge is carefully sequenced to reveal the interplay between substantive and disciplinary knowledge. This ensures that pupils not only know 'the science'; they also know the evidence for it and can use this knowledge to work scientifically.


St Alban's CofE Primary School
Science End of Year 2

At the end of year, I will know and remember...

Plants
- Plants need water, sunlight and a warm temperature to grow.
- The life cycle of a plant – seed, shoot, stem. leaves and bud, flower

Animals, including Humans
- Animals have babies that grow into adults. E.g. pig – piglet, cow – calf, elephant - calf.
- Animals need food, water and air to keep healthy and stay alive.
- Humans need to eat a healthy diet and exercise to stay fit and healthy.

Our curriculum has been carefully designed so that pupils gain more knowledge over time. Some knowledge is very important, and we return to this regularly to help it 'stick' in children's memory.

At the end of each unit of work, class teachers have worked with the subject lead to identify key knowledge that they want children to know and remember. At St Alban's we treat our children like scholars, key knowledge is added to the children's science books so that they can look back at what they have learnt in previous years.

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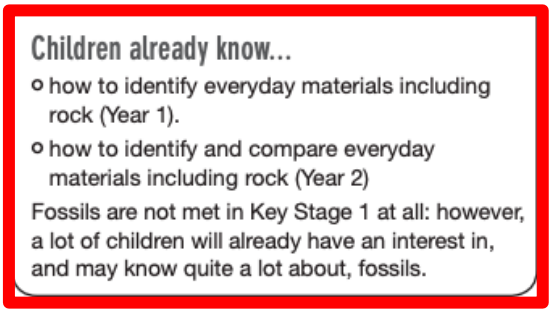
Prior Knowledge is identified and built upon

Curriculum documents outline prior knowledge that children should already know. At the beginning of a unit of work, planning outlines a 'Get started' opener which provides ideas for eliciting prior learning from previous activities as well as personal experiences at home and in the locality. 'Let's think like scientists' provides questions to the teacher or supporting adult to ask to encourage critical thinking and research, thus extending and challenging the pupils.



Know and Remember More

To help our children know and remember more, our science lead has created a powerpoint that quizzes children on key knowledge for each year group. At key points in the year, the class teacher encourages children to retrieve knowledge taught in previous years. In Foundation stage, the children retrieve knowledge from the previous term.

At St Alban's we have explored the most effective strategies to help children remember. Encouraging children to summarise or to identify the most important part of the learning, helps children remember knowledge as it sticks in their long-term memory.

Science Disciplines

As children progress through school, they develop their science skills in the disciplines of Biology, physics, chemistry through a focus on (see long term planning):

- Living things and their habitats
- Animals, including humans
- States of matter
- Sound
- Electricity
- Properties and changes of materials
- Earth and Space
- Forces
- Light
- Evolution and inheritance
- Plants
- Everyday Materials
- Seasonal Changes
- Rocks
- Forces & Magnets

Relevant and meaningful

Our science curriculum ensures that the science contexts are meaningful by setting content in a range of interesting contexts that are relevant to the pupils. It ensures that pupils relate the science they are learning to their own lives as well as working with contexts in the wider world.

First-hand and practical

Practical activity is at the core of our curriculum. Our curriculum aims to support teachers in developing pupils as independent learners who are curious and willing to ask and answer their own questions. Throughout the various units, teachers are supported in developing approaches which scaffold pupils in asking a range of questions and making their own decisions about how to answer them using the five scientific enquiry activities.

Linked to developing pupil's independence, our curriculum challenges children to reflect on their learning through discussing ideas with adults and their peers, thereby articulating their learning. Progressing pupil's ability to communicate their understanding and explain their reasoning is central to primary science and so is a feature of our curriculum. Throughout the scheme there is an expectation that children should not only be able to talk about what they have been doing, but also why and what they have learned.

Making links with other learning

STEAM (Science, Technology, Engineering, Arts and Science)

We know that knowledge 'sticks' when links are made between subjects. Webs of knowledge are created in our memories (schema) when we create meaningful links between learning. The more we introduce pupils to related content, the deeper knowledge will be. Key concepts in each subject are revisited over time and can be seen in our curriculum plans, which have the effect of making these links and building webs of knowledge. You will see some of these key concepts in our curriculum planning on curriculum pages.

In planning documents, we have made links related to STEAM (Science Technology Engineering, Arts and Maths). To ensure that STEAM is integrated into science learning, our curriculum provides suggestions of people to invite into the classroom and visits out, to support teachers in making these links to widen pupil's experience and understanding of STEAM. Links to the Arts have been included to assist teachers in providing pupils with opportunities to explore how art and science work well together, from observational drawing, creating a sculpture or learning how musicians work.

Implementation

Implementation is how the curriculum translates the objectives (intent) into activity.

Everything a pupil does and thinks in science is important, so it is crucial that sessions provide regular opportunities for pupils to engage in hands on practical activity as well as think about or research scientific ideas and skills. Throughout our curriculum children are engaged in asking questions and using one of the five science enquiry activities:

- observation over time
- fair or comparative tests
- identification and classification
- research
- pattern seeking.

Teaching Approaches

Throughout our curriculum, pupils are asked to communicate their science using different approaches, e.g. writing, drama, poetry, discussion and modelling. Engaging pupils in a range of approaches to communicating science ensures that all pupils can share ideas and by listening to themselves articulate ideas, pupils engage in self-assessment, either reinforcing their learning or changing ideas and therefore moving learning on. By using different approaches to recording and communicating, all pupils can share their science, which means that teachers can access learning through assessment and use outcomes to plan next steps.

Vocabulary and Reading Acquisition

We believe that knowledge gained also plays an important part in pupils gaining reading comprehension, and therefore, as we know that reading is so important, we place great emphasis on ensuring knowledge of the wider curriculum is sticky. We know that when pupils read and engage in reading comprehension activities, reading comprehension is dependent on knowledge of the subject being read. What we ***know*** allows us to read and understand what we have read. Knowledge learned across the wider curriculum facilitates comprehension. It also helps our pupils gain a broader vocabulary. We know that children are exposed to a richer vocabulary base when they access a broad curriculum, and this is very important to their future success. In our curriculum intent (plans), we have outlined the specific vocabulary children need to know, use and remember at each stage in their learning (see our curriculum pages).

Key scientific vocabulary for each unit of work is listed (with definitions) so that teachers can share with children the expectation that these words should be learned. A pupil's ability to use scientific words appropriately is an indicator of understanding of knowledge and skills. Teachers can use a pupil's ability to use key words as part of assessment for learning, listening for how the words are used and, if necessary, asking follow-up questions to check depth of understanding. However, this requires teachers to use a range of approaches to support learning and applying scientific vocabulary in different contexts.

EYFS

Our science curriculum planning starts in Early Years. In foundation one, we begin to lay the foundations of science through our Early Years curriculum offer. We start this journey in early years for two main reasons:

1) Access to a rich curriculum broadens children's exposure to a wealth of vocabulary, which we know to be of crucial importance in the early years.
2) Laying the foundations for the wider curriculum prepares children for transition to Year One.

In foundation stage, science is taught through knowledge and understanding of the world. To ensure that our children are ready for the year 1 science curriculum, practitioners lay the foundations of science. Ensuring that direct teaching and the environment embeds the knowledge, skills and vocabulary that children need to be young scientists.

Impact: Progress of pupils:

How do we consider progress when we are thinking about science?

We focus on two aspects:

- As children know and remember more across the curriculum area, they are making progress
- When children learn what we have intended them to learn (curriculum intent).

When we assess pupils' progress, then, we talk to them about what they know and we look in books to see what they can do and remember, and we check to make sure this matches the curriculum we have implemented.

We assess at all stages of the learning process:

Assessment for learning: assessing as we teach by observing and questioning to inform next steps needed for each pupil.

Assessment as learning: using some of these ongoing assessment strategies to consolidate learning and help children deepen knowledge in long term memory (for example, asking children to brainstorm everything they have just learned about the gravity will help us find out what they know, where the gaps are to inform future teaching but will also help children remember more in the future as knowledge will become increasingly sticky when using strategies such as these).

Assessment of learning: Capturing at key end points precisely what children have remembered over time (we called this summative assessment).

Pupils develop their knowledge and skills through a series of planned activities linked to the curriculum which build on previous and personal knowledge. To assess the impact, teachers evaluate the knowledge and skills that pupils have gained against the original expectations of activities (the intent). This is indicated by the outcomes assigned to each activity. What and how well pupils have achieved will be accessed through using a range of approaches to assessment for learning. It is important that assessment supports a pupil's journey through the science curriculum to ensure appropriate outcomes for each individual. The focus of our curriculum is to support this journey so that teachers know how well pupils are doing at each point in a unit.

Curriculum documents are written in such a way that assessment is an integral part of activities. The learning objectives at the beginning of each activity show the intention for learning and these are then used as the basis for assessment, the criteria for which are outlined in the assessment section, split into subject knowledge and working scientifically.

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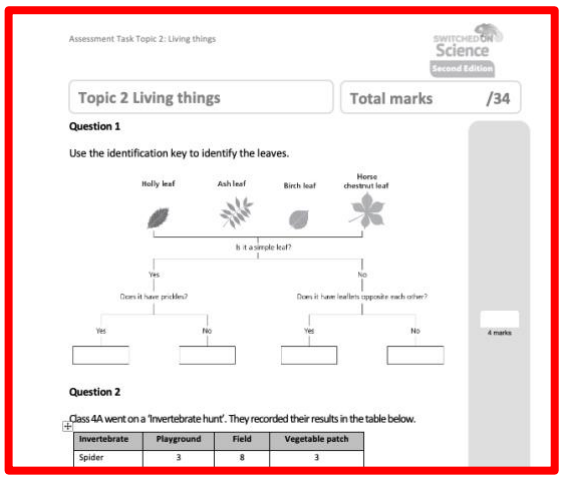
Assessment Task Topic 2: Living things

Topic 2 Living things | Total marks /34

Question 1

Use the identification key to identify the leaves.

Holly leaf | Ash leaf | Birch leaf | Horse chestnut leaf

Is it a simple leaf?

Yes | No

Does it have prickles? | Does it have leaflets opposite each other?

Yes | No | Yes | No

4 marks

Question 2

Class 4A went on a 'Invertebrate hunt'. They recorded their results in the table below.

Invertebrate	Playground	Field	Vegetable patch
Spider	3	8	3

At the end of each unit (Years 1-6) pupils complete an end-of-topic tests, these can be found online. It is expected that teachers will use a range of evidence to assess pupil's progress. This includes observing them working, listening to their discussions and using questions to probe understanding and reasoning.

As pupils progress through the primary years, self and peer assessment is another approach to complement teacher assessment. Not only does this develop a pupil's ability to reflect on their own learning, it also provides teachers access to how well pupils perceive their learning to be progressing and why.

A feature of our science curriculum is the application of 'Working Scientifically Skills' and 'Knowledge and Understanding' through regular problem- solving activities. Challenging pupils to apply their learning in new contexts provides opportunities for them to further embed ideas and skills. Assessing how pupils respond to applying their knowledge and skills is an indicator of how successful their leaning has been.

Additional materials to support teaching

At St Alban's we leave nothing to chance. All resources are quality checked to ensure that science lessons are to a high standard. Planning documents include:

- activity resources (printables)
- teaching PowerPoints
- pupil videos
- CPD (Continuing Professional Development) videos
- end-of-topic tests