



Together in God's love, we learn, inspire and grow



Science Policy

This policy has been adopted by the governing body
of
St Andrews' C of E Primary School.
It will be reviewed annually or as required.

Science Subject Leader: Gemma Bell

Signed: P.Dwan Deputy Head



Our aim for every child in St Andrew's C of E Primary School, is to leave with a strong core of Scientific knowledge, learnt and secured through a range of different experiences. Each unit will be explored in an investigative approach, and the knowledge developed appropriately as they move through the school. Our science covers the main principles of Biology, Chemistry and Physics through a variety of engaging topics.

When planning and teaching science lessons at St Andrew's, we ensure that children are carrying out investigations using the 5 types of enquiry. The National Curriculum for Science for England clearly lists **5 different types of enquiry** that children should be familiar with across the primary school.

These are:

- **Pattern Seeking**- Involves observing, measuring, and recording natural phenomena, or carrying out surveys. These may be biological investigations where it is not possible to control the variables. The children then look for patterns and relationships in the collected data.
- **Comparative and fair testing**- Here children start thinking about variables and how they affect things. Children may compare two things, for example does icing sugar dissolve faster than caster sugar? They may start to think about developing a controlled test such as how the height of a drop affects the size of the crater made by a ball.
- **Observation over time**- This type of enquiry occurs when children make careful observations of objects or events over a set time. This could be over any time period from short times such as minutes, hours etc up to over a whole year.
- **Identifying, classifying and grouping**- This allows pupils to engage in activities to help them make sense of how the world is organised. They arrange a range of objects or events into manageable sets and then name them.
- **Research using secondary sources**- This is an enquiry type that is useful when it is difficult to find out by testing for yourself. This could be finding out about different planets or what lives in a desert? It's also important to look at where they source the information and how accurate the sources may or may not be.

To do this, all children will be taught in a progressive manner as they move through our school to build at least 2 forms, or categories, of knowledge.

1) **Substantive knowledge**, which is knowledge of the products of science, such as models, laws and theories.

2) **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.

Our Science curriculum is ambitious and designed to give all pupils, including disadvantaged and SEND, the knowledge they need to succeed in life. We aim for all pupils to be excited by Science, to know more, remember more and do more because of their engagement in Science lessons. Our research-informed science curriculum helps pupils build secure scientific knowledge and enquiry skills, deepening understanding through big questions and hands-on learning as it:

- is national curriculum aligned
- is sequenced, flexible, adaptable
- addresses misconceptions
- has embedded practical activities

Aims and purpose

What are the aims and purpose of our curriculum?

With this curriculum, we aim to develop an interest in passion for science by exploring answers to big questions. We combine substantive and disciplinary knowledge to make practical skills, mathematical proficiency, and scientific practices meaningful.

Links to St. Andrews' whole school curriculum intent:

Whole School Curriculum intent

Our UNIQUE curriculum is designed to recognise and have a solid **understanding** of children's prior learning, providing **knowledge** and learning **experiences** which build **resilience** and **critical thinking**.

Central to this is excellent skills in **Reading** - the essential key to the whole curriculum.

We provide opportunities to engage learning in a fun and **nurturing** way and every child is recognised as a **unique individual**.

We plan and provide a clearly mapped out curriculum which results in good **quality** outcomes.

We model and promote **positive attitudes** to learning which reflect the values of our Christian school, **enabling** children to take **responsibility** for their lives. Children leave St Andrew's with a sense of **belonging** to an **outward looking community** where opportunities and aspirations are **unlimited**.

At St Andrew's we ensure that **equality** is embedded in all that we do.

Science Intent

Understanding - Science is planned to ensure prior learning, scientific knowledge, skills and vocabulary are revisited and developed in each lesson.

Our teachers track and use children's prior learning, ensuring progression of substantive and disciplinary knowledge through the KSV documentation and through summative assessment opportunities in all lessons. Retrieval tasks, knowledge organisers and working walls are used in every lesson to revisit and embed scientific language, disciplinary and substantive knowledge. A science journey of learning is visible in all classrooms to embed 'sticky knowledge'.

Nurturing - Every child at St Andrew's C of E Primary School, is to leave with a strong core of Scientific knowledge, learnt and secured through a range of different experiences. Each unit will be explored in an investigative approach, and the knowledge developed appropriately as they move through the school. Our principal aim is to develop the children's knowledge, skills and understanding, whilst encouraging all learners to see themselves as scientists. We recognise the fact that we have children of differing scientific ability in all our classes and so we provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child.

Individual - We teach science to all children in a way that suits all individual needs. Science forms part of the school curriculum policy to provide a broad and balanced education for all children. Through our science teaching, we provide learning opportunities that enable all pupils to make progress. We do this by setting suitable learning challenges and responding to each child's different needs. We incorporate high order questions, that apply to scientific thinking, to extend the most able children in science and allow for all St Andrew's scientists to succeed in an individual way.

Quality - When planning and teaching science lessons at St Andrew's, we ensure that children are carrying out investigations using the 5 types of enquiry. Science is recorded in a variety of ways to engage all learners and to over-come possible barriers e.g. scaffolded tasks, cloze procedure, group scribes, photographic evidence, demonstrations, practical investigations.

Unlimited aspirations - Every pupil is a St Andrew's scientist and will leave with a strong core of Scientific knowledge, learnt and secured through a range of different experiences. Each unit will be explored in an investigative approach, and the knowledge developed appropriately as they move through the school. Studying science stimulates curiosity, fosters creativity and equips children with transferable skills they need in life beyond school.

Equality - We recognise the fact that we have children of differing scientific ability in all our classes and so we provide suitable learning opportunities for ALL children by matching the challenge of the task to the ability of the child. We create an environment where children do not fear speaking out and giving their opinion. As their confidence grows, they look for patterns, use logical reasoning, suggest solutions and try out different

approaches to problems.

Long term planning and curriculum design:

The science curriculum is coherently planned and sequenced through the clearly defined National Curriculum programmes of study.

Science Implementation

Science at St Andrew's ...

incorporates a variety of teaching and learning styles in science lessons. Our principal aim is to develop the children's knowledge, skills and understanding. We do this through a mixture of whole-class teaching and individual / group activities. Teachers encourage the children to ask as well as answer scientific questions. The children have the opportunity to use a variety of secondary sources of information, where it will enhance learning as well as gaining first hand experiences, for example, the use of books, photographs, graphs, diagrams, models and ICT.

The pace of the lesson is brisk, with teachers constantly asking questions to deepen understanding. There's a mixture of short tasks, explanation, demonstration, practical investigation and discussion - and scientific misconceptions are addressed whenever the need arises.

At St Andrew's we now use the 'Oak Academy' science scheme.

What do Oak have to say about their curricula?

Knowledge and vocabulary rich

This principle recognises the important role that knowledge, and vocabulary as a particularly important type of knowledge, plays in

learning. We identify and map vocabulary across the curriculum, both the introduction of new vocabulary and the necessary repetition of vocabulary that has gone before. New vocabulary, called keywords, are signalled in bold in our lesson materials to indicate their importance. Our curriculum develops pupils' knowledge and understanding of scientific concepts over time. As concepts evolve, so do their definitions, for example, 'group' becomes 'classify' as pupils move through the key stages.

Sequenced and coherent

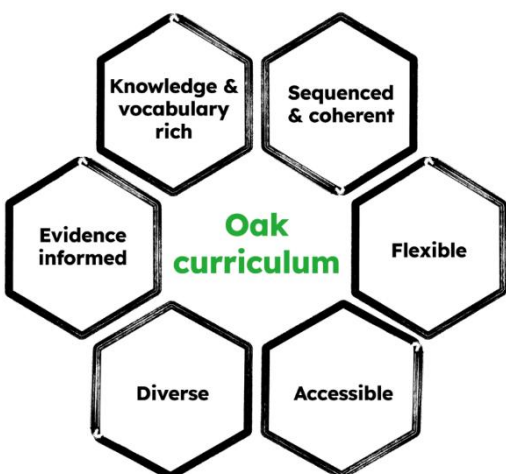
The sequencing of our curriculum content underpins its design so that pupils build on and make links with existing knowledge. Curriculum threads, which provide coherence by mapping vertical concepts across the curriculum, mirror the 'big questions' in science. For example, 'How do we explain how substances behave?' is first addressed in key stage 1 by identifying everyday materials and their properties. This foundational knowledge is built upon in key stage 2 with reversible and irreversible changes.

Evidence-informed

Our evidence-informed approach enables the rigorous application of research outcomes, the science of learning and impactful best practices both in education in general and at a subject-specific level. For example, the design of our resources reflects findings from Sweller's cognitive load theory and Mayer's principles of multimedia learning whilst our lesson design draws on Rosenshine's principles of instruction. We also draw on findings from research organisations such as the Education Endowment Foundation (EEF). At the subject level, our curriculum is inspired by the Best Evidence Science Teaching (BEST) research-informed curriculum development project and is structured to incorporate the outcomes of this research, including appropriately sequenced steps for learning progression and diagnostic questions that provide evidence of learning and common misconceptions, with response activities to challenge misconceptions.

Flexible

Our flexible approach enables schools to use our resources in a way that fits their content and meets the varying needs of teachers and their pupils. Our curriculum can be used in its entirety or units can be selected to complement existing curricula. Our resources are adaptable so that, for example, teachers can easily add in more or different examples to explanations, can edit or add checks for understanding, or adapt practice tasks to better reflect the prior knowledge of their pupils.



Diverse

Our commitment to breadth and diversity in content, language, texts, and media can be seen throughout the curriculum, for example, in the diverse school-age characters featured in our resources. Our curriculum highlights the achievements of scientists from different genders, ethnicities, and nationalities to ensure a diversity of perspectives and experiences. This approach ensures that our science curriculum is inclusive and reflective of the global scientific community.

Accessible

Our curriculum is intentionally designed to facilitate high-quality teaching as a powerful lever to support pupils with SEND. Aligned with EEF guidance, our resources have a focus on clear explanations with scientific diagrams, modelling and frequent checks for understanding, with guided and independent practice. Lessons are chunked into learning cycles and redundant images and information are minimised to manage cognitive load. We have removed reference to year groups in our resources so that they can be used when pupils are ready, regardless of their age. Our resources are purposefully created to be accessible, for example by using accessible fonts, colours with good contrast, and captions in our videos.

Oak subject principles

Building knowledge of key concepts in a way that reflects how knowledge is organised in the three scientific disciplines

Our science curriculum structures knowledge to reflect the organisation of biology, chemistry, and physics, introducing concepts in a logical sequence from basic to advanced topics. Fundamental ideas are taught with consistent language and models across disciplines. For example, students begin with basic material properties and advance to complex topics like chemical reactions.

Our curriculum combines substantive knowledge (concepts) with disciplinary knowledge (scientific methods) to enhance practical work. This approach ensures that practical activities are purposeful and clearly linked to theoretical concepts.

A 'big ideas' approach to developing subject concepts

We use a 'big ideas' approach to create 'big questions' in science that link concepts across the curriculum. For example, with the question "Why are there similarities and differences between living things?" we start with identifying plants and animals in key stage 1, study habitats and basic biology in key stage 2. This 'big question' approach helps pupils to connect new knowledge with prior learning.

Where there is a practical focus, it builds knowledge through the use of carefully planned and purposeful practical activities

Practical work is carefully planned; e.g. a physics experiment on forces is carefully designed to connect substantive knowledge of force interactions with the disciplinary skills of measuring and analysing data. Each activity is sequenced to build on previous knowledge, ensuring students engage deeply with the material. Additional materials outline the purpose of each practical task and assist teachers and pupils in carrying it out safely.

National curriculum

There are 3 aims of the national curriculum. First, is that all '**pupils develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics**'. Each of our curriculum threads is explicitly signposted as sitting within biology, chemistry or physics.

The next aim is to '**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**'. Our curriculum incorporates a diverse range of scientific enquiries. These activities encourage critical thinking, provide hands-on activities, use models such as the solar system to explain abstract concepts, and foster reflection and discussion.

The last aim is that pupils '**are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future**'. Our curriculum links scientific concepts to real-world applications.

Our science curriculum incorporates EEF recommendations from 2018 and 2023, emphasising the importance of building on pupils' prior knowledge, addressing misconceptions, and providing meaningful feedback.

Scientific language

Science lessons provide opportunities for pupils to communicate and develop scientific language through:

- **Prior assessment of key vocabulary for the programme of study.** Prior assessment is carried out at the beginning of every unit, and again at the end of the unit to measure progress. Understanding of scientific vocabulary is assessed through observation by the Class Teacher. This assessment can be carried out in a number of ways e.g. games such as 'sticky notes', paired language development activities, exploratory discussions, matching vocabulary to definitions games etc.
- Essential vocabulary at the beginning of every lesson and insisting on its use throughout
- Modelling by class teachers of scientific language
- Retrieval, both lesson on lesson and interleaving, which give a further opportunity to assess understanding through pupil explanations.

Science in EYFS

As with all other areas of learning, the teaching and learning of Science in our Reception class, takes place both indoors and outdoors through a wide range of practical and hands on activities. The staff use their knowledge and expertise to plan for a high-quality learning environment which provides children with lots of opportunities to explore different aspects of **Science** indirectly through activities that encourage the children to explore, problem solve, observe, predict, think, make decisions, and talk about the world around them. The children have a wide range of structured play resources available to them throughout the year - this is known as continuous provision. As the year progresses, children in Reception record their outcomes in books which prepares them for the learning in Year 1. As well as learning through play, all children take part in small group, adult led science activities which then feed into opportunities in the play provision.

What does a Science lesson at St. Andrew's look like?

All units of work incorporate some or all of the 5 lines of scientific enquiry across the programme of study. Each lesson will incorporate 1 or more of the 5 different types of enquiry that children should be familiar with across the primary school.

- Pattern Seeking
- Comparative and fair testing
- Observation over time
- Identifying, classifying and grouping
- Research using secondary sources

St Andrews's Lesson Structure:

- 1) **Prior assessment:** assessment through teacher observation, based on the prior knowledge the children have from previous learning
- 2) **Recap** previous learning and vocabulary.
- 3) **Introduce new learning:** introduce the main scientific concept for the lesson
- 4) **Apply the new learning:** There's a mixture of short tasks, explanation, demonstration and discussion - and a lot of practise to help reinforce learning. Use of practical activities and talk partners.
- 5) **Develop the new learning:** deepen understanding of the concept through a task based on 1 or more of the 5 different types of enquiry that children should be familiar with across the primary school.
- 6) **Plenary:** Recap and reinforce learning, address misconceptions, celebrate success

How we ensure that pupils 'know more, remember more and can do more':

Effective use of our Science displays/working walls, which are reviewed each lesson with key vocabulary and actions and the use of sticky knowledge. The recap of previous learning and vocabulary at the start of every lesson is important and is a crucial part of every Science lesson.

How the Science curriculum meets the needs of all pupils, particularly disadvantaged pupils and SEND pupils:

We have designed our curriculum to meet the needs of all our pupils in line with the school key priorities.

All class teachers know who their disadvantaged and SEND pupils are and can target them for specific questioning, support and resources in lessons. Learning opportunities within Science lessons cater for all needs and are kinesthetic, visual and auditory. Pupils can also be targeted for TA support and there are also opportunities for children of different abilities to work together. SENCO offers advice and support which enables teachers to plan activities that meet the needs of all children.

We recognise the fact that we have children of differing scientific ability in all our classes and so we provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child. We achieve this in a variety of ways by:

- Setting common tasks that are open-ended and can have a variety of responses
- Setting tasks of increasing difficulty
- Grouping children by ability according to the style of task
- Providing a range of challenges with different resources
- Using additional adults to support the work of individual children or small groups (where possible)
- Incorporating high order questions that apply to scientific thinking to extend the most able children in science

We teach science to all children. Science forms part of the school curriculum policy to provide a broad and balanced education for all children. Through our science teaching, we provide learning opportunities that enable all pupils to make progress. We do this by setting suitable learning challenges and responding to each child's different needs. Assessment against the National Curriculum allows us to consider each child's attainment and progress against expected levels. Some children may use Adult Support in lessons, either 1:1 or in small groups, in order to access tasks set with confidence and to dispel any barriers to their learning.

Where reading or writing maybe be of difficulty to a child, alongside adult support, children may use writing frames, cloze procedures, guided questions in order to carry out an investigation, as well as word banks of key vocabulary that may be needed. Children also use technology to record findings where written recording may cause a difficulty. **Where a child may have difficulty in mathematics**, as well as adult support, maths supporting materials maybe be used e.g. the axis of a graph can be produced and with support the children can record their findings; examples of tables maybe provided for children to complete; concrete maths materials can be used for counting support. All barriers to learning are addressed in order to allow all children to access and achieve in all areas of science.

Science Impact

Overview of Science assessment procedures, including the expectations of teachers using both formative and summative assessment:

Formative assessment: We assess children's work formatively in science through observations and marking. These assessments inform the class teacher's planning for future lessons.

Summative assessment: At the end of a unit of work (half termly) the class teacher leads an 'Exit Test' in a way that is suitable to all ages and abilities, makes a judgement about the children's achievements, and this information is then recorded and fed back to the Science Subject Leader. This takes the form of Exit Test Data. The Science Subject Leader carries out a termly overview of the progress of science.

At the start of the year, key objectives are identified that will be assessed in each unit and opportunities for assessment are planned for. Wherever possible, children are the first to assess their learning.

Both formative and summative assessment may take the form of a practical activity, a concept map or a written assessment. The teacher uses these assessments to inform reports to parents and the next class teacher at the end of the year, and to carry out half termly teacher assessment at the end of each unit of work within the Programmes of Study.

Half termly attainment is measured using information from formative and summative assessments to give an overall judgement of the child's level of ability (working towards, at or above, age related expectations - ARE)

Science progress and attainment

Monitoring arrangements

Book Scrutiny: These are done termly by the Science lead and a member of SLT. There is a clear focus during the book scrutiny and feedback is given to class teachers in written form. Subject leader feeds back to SLT and arranges for training for staff where necessary.

Lesson Observations/drop in: The Science lead and a member of SLT do this termly, feeding back to class

teachers and SLT.

Medium Term Planning: Medium Term Planning is provided for the Subject Lead at the beginning of each half term. This planning is adapted and developed throughout the half term and updated where necessary at the end of each unit of work.

Pupil Voice: Science lead speaks to a wide variety of children, termly to measure the children's understanding of concepts being taught, their attitude and their level of enjoyment.

How the subject lead keeps their own subject knowledge up to date, and how they ensure staff subject knowledge is also up to date;

We aim to develop and enhance our subject leads personal interest and passion in Science through:

1. high quality continual professional development (CPD) e.g: Primary Science Network STEM training. Subject knowledge, staff CPD training is offered from PSN, to all class teachers, according to their key stage or year group.
2. networking opportunities through LDST
3. engagement with the curriculum lead

We aim to ensure all staff's science knowledge is up to date through:

1. staff meetings termly
2. provision of effective resources
3. engagement with subject lead