



Science

Intent

Vision Statement:

We recognise that the Curriculum reaches far wider than the learning that happens in formal lessons in each classroom. It includes everything that a child experiences in their time at our school and develops the very person they are becoming, with their talents, their needs and their aspirations for the future. Each experience provides a learning opportunity to develop and prepare our children for life in modern Britain as global citizens through the lens of Catholic life.

At St Gregory's, we are inclusive and recognise that everyone has their own unique God-given talents. Our curriculum is progressive and builds on prior knowledge, understanding and skills so that we develop our whole school community academically, spiritually, emotionally, morally and socially. This enables our children to develop cultural capital and become righteous citizens who give to society. We provide creative and engaging opportunities that inspire and motivate our children to become lifelong learners and aspire to be the very best they can be.

In science, we aim for all of our children to see themselves as scientists. We endeavour to inspire a sense of curiosity in our children and develop their enthusiasm for science, recognising that the skills and knowledge they learn through science can be used to have a positive impact on God's world around them.

To be able to be a scientist, children will need to build up the skills, knowledge and understanding of scientists. They will need to understand and use the language of science and apply these scientific skills and knowledge across the curriculum, making connections both within science and across other subjects too.

To be a scientist, children need to understand the world through the specific disciplines of biology, chemistry and physics. Within each of these, the children are taught to understand essential aspects of the knowledge, methods, processes and uses of science. Our carefully designed curriculum then encourages them to recognise the power of rational explanation and to develop a sense of excitement and curiosity about natural phenomena. They also use scientific vocabulary to explain what is occurring, predict how things will behave, and analyse causes.

Implementation

Statement of Implementation:

The aims of the National Curriculum (2014) for Science are:

- To develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics



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- 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
- To equip children with the scientific knowledge required to understand the uses and implications of science, today and for the future.

The National Curriculum is the part of the St Gregory's curriculum that maps out the knowledge and skills that we want our children to learn and experience in each subject. The wider curriculum includes a number of vehicles to develop the whole child and includes:

- **Inclusion using teaching for mastery** – Our mastery approach ensures that all children are exposed to the same curriculum content by breaking sessions down into small learning intentions and focusing on developing deep understanding, providing support and intervention to address each individual pupil's needs. This enables all children, including those with SEND, from disadvantaged backgrounds and from multi-lingual backgrounds to achieve their true potential through careful support and scaffolding.
- **Oracy, vocabulary and reading for pleasure** – We provide a language-rich environment with a sharp focus on Oracy and the development of rich vocabulary which includes technical vocabulary relevant to the progression of each child's learning. Talk is central to learning and as such, Oracy activities are woven through all activities and experiences to give children plenty of opportunity to develop and practise their speaking and listening skills. Reading is integral to our curriculum design with daily opportunities to hear and read a range of texts – this exposes children to a wider range of vocabulary and develops a love of reading.
- **Catholic Social Teaching** – are the principles to living life through the lens of a Catholic. They are principles that support children to make links from their learning through to the world in which they live and helps them to be givers rather than takers in our society. These are woven carefully through the subject lessons and also used to apply the knowledge of the topics through discreet lessons to help deepen their understanding of the context of their learning in the wider world and empowering them to challenge social injustice.
- **Metacognition and self-regulated learning (including growth mind-set and restorative practice)**
 - Children are supported to manage emotions, develop a positive sense of self, set themselves aspirational goals and have confidence in their own ability. This is supported by the use of our St Gregory's learning profile and growth mind-set approach giving our children a better awareness of how they learn, the emotions linked to this and the transferable learning skills needed to be the very best they can be and reach their potential.
 - Teachers support pupils to plan, monitor, and evaluate their learning. Developing the children's **metacognitive** knowledge of how they learn and their knowledge of themselves as a learner and strategies that help them – these things support them in becoming independent learners.
 - **Restorative practice** helps our children to develop stronger relationships, and become problem solvers within these relationships, setting firm foundation for learning, so that they are more resilient to overcome adversity within their lives.
 - **Self-regulated learners** are aware of their strengths and weaknesses, and can motivate themselves to engage in, and improve, their learning.



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- **Retrieval opportunities** – enable our learners to embed knowledge by transferring it from their working memory to their long term memory. We make deliberate connections between current and prior learning and recall learning by providing opportunities such as quizzes, oracy activities and challenging discussions based on question stems.
- **Extracurricular opportunities** – provide a wide range of additional experiences for the children to inspire them within their learning and add a wider context for them. This also enables us to seek out and develop the talents in every child. Each month, children are introduced to a new Scientist and their work. They encouraged to link the work of these scientists to our Catholic Social Teaching Principles. Each year, we provide Science afterschool clubs designed specifically for KS1 and KS2 children which is run by school staff, using guidance from the British Science Association– this ensures that all the activities promote involvement in STEM subjects. In addition, we also run an eco-team and work closely with the school council and communication team within our school to raise awareness and motivate change through innovation. Alongside this, the whole school participates in yearly trips to the Cheltenham Science Festival which is one of the UK's leading science festivals and encourages science in everyday life through celebrating British Science Week. We also have an Eco Hub onsite which enables children to learn science in an outdoor environment and encourages their investigative skills and risk taking through a hands-on approach. They can see sustainable energy sources actually at work to help them become stewards of God's creation.

These aspects are expanded further in our [teaching and learning policy](#).

How we plan for progression in Science at St Gregory's:

The St Gregory's Curriculum is designed around year group themes. Each has been structured and sequenced in order to engage pupils in purposeful learning by building on prior knowledge and helping connect knowledge, understanding and skills year-on-year both within science and across other subjects too.

Science is taught mainly discreetly within our school, but links to topics are made when they aid the teaching of scientific objectives. For example, Year 2 teach a unit of writing all about habitats which closely links to their Science topic, 'Living Things and their Habitats'.

In KS2, individual science objectives may link to topic work when appropriate, but science lessons are delivered independently.

In KS1/ KS2, Science is taught for at least an hour (up to an hour and a half in KS2) every week across the whole school. In KS1, this comprises of the four NC units in each year group and in KS2, this includes the five NC units. Working scientifically skills are embedded and taught within these units throughout the year. In EYFS, scientific exploration is facilitated within 'understanding of the world' and is child led.

We recognise that foundations for becoming a scientist are laid in the Early Years Foundation Stage through all seven strands of the Early Year Framework (especially Understanding of the World) and to be ready for the next stage in their education, the starting point that we strive for every child to have upon entry to Y1 and working towards the aims of the National Curriculum is:



Understanding the World	Exposure to experiences that support children's understanding of the world around them.
Understanding the World	Engage with text that foster understanding of our ecologically diverse world

Once children enter Y1, they work progressively towards the aims of the National Curriculum. To ensure progression, the teaching team worked together to plan out curriculum coverage and then the subject leader identified the progression of skills and vocabulary required at each stage of learning to prepare children for the next stage in their learning.

Science curriculum coverage

Coverage is based on the National Curriculum 2014 PoS with objectives allocated across phases and year groups, to ensure a progression of knowledge, skills and understanding. For example, Year 6's curriculum coverage:

Year 6	Living things and their habitats, Animals including humans. National Curriculum objectives Living things and their habitats: - describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals - give reasons for classifying plants and animals based on specific characteristics. Animals including humans: - identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood - recognise the impact of diet, exercise, drugs and lifestyle on the way their <u>bodies</u> function - describe the ways in which nutrients and water are transported within animals, including humans.	Electricity, Light National Curriculum objectives Electricity: - associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit - compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches - use recognised symbols when representing a simple circuit in a diagram. Light: - recognise that light appears to travel in straight lines - use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye - explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes - use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	Evolution and Inheritance National Curriculum objectives Evolution and Inheritance: - recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago - recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents - identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
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The Science curriculum also includes a strand of scientific enquiry to enable learners to become confident and accurate practical scientists. The National Curriculum sets out a clear pathway of progression from Key Stage 1, Lower Key Stage 2 and Upper Key Stage 2.



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Years 5 and 6 Working Scientifically objectives	During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: - planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary - taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate - recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs - using test results to make predictions to set up further comparative and fair tests - reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations <u>identifying</u> scientific evidence that has been used to support or refute ideas or arguments.
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In line with our mastery approach, the units build on prior skills and knowledge ensuring strong progression in science as children move through the school.

Science Progression of skills

As per the National Curriculum, some Science units are repeated each year, some are repeated in certain year groups, and some are not repeated. Therefore, we created a separate progression overview which details the main objectives alongside key ideas, prior and future learning objectives and vocabulary.

Animals including humans – Year 3

National Curriculum objectives: - Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. - Know how nutrients, water and oxygen are transported within animals and humans. - Know about the importance of a nutritious, balanced diet. - Identify that humans and some other animals have skeletons and muscles for support, protection and movement: Know about the skeletal and muscular system of a human. <i>Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.</i> <i>Pupils might work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. They might research different food groups and how they keep us healthy and design meals based on what they find out.</i>	Key ideas: - Different animals are adapted to eat different foods. - Many animals have skeletons to support their bodies and protect vital organs. - Muscles are connected to bones and move them when they contract. - Movable joints connect bones. Vocabulary: Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints
Prior learning: In Year 2: - Know that animals, including humans, have offspring which grow into adults - Know the basic stages in a life cycle for animals, including humans. - Find out and describe the basic needs of animals, including humans, for survival (water, food and air). - Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Future learning: In Year 4: - Describe the simple functions of the basic parts of the digestive system in humans. - Identify the different types of teeth in humans and their simple functions. - Construct and interpret a variety of food chains, identifying producers, predators and prey

Having a clear overview ensures children have opportunities to master a wide range of skills, and allow us to clearly see the journey the children are on and can celebrate their prior learning and successes.

Science Progression of Vocabulary

Vocabulary, at an age appropriate level, is paramount to the children's understanding and ability to articulate their intent and enable questioning. It is, therefore, a key consideration in Science planning. Alongside unit specific vocabulary, key 'working scientifically' vocabulary is introduced at the appropriate time, building on prior knowledge.



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Science – Working Scientifically	
EYFS/KS1	Question, answer, observe, observing, equipment, identity, classify, sort, group, record – charts, diagrams, map, data, differences and similarities, evidence, fair test.
LKS2	Research, relevant, questions, scientific enquiry, comparative and fair test, accurate measurements, present, record – drawings, labelled, keys, bar charts, tables, explanations, conclusion, predictions, interpret, variables
UKS2	Arguments, degree of trust, causal relationships, scatter and line graphs.

Planning

Objectives are taken from the National Curriculum and planned within units. These objectives are broken down into the topic area of Science (for example, Electricity and Sound in Year 4) and Working Scientifically. The objectives are built upon when revisited later on in a child's primary education. Following the statutory guidance from the National Curriculum, there is variation as to when topics are reviewed and taught again later on in the school. For example, the Animals including Humans (Biology) is re-visited and built upon in every year group and thus taught yearly, however Electricity is only being scheduled to be taught in Years 4 and 6.

Lesson planning uses a consistent planning proforma across the school to ensure consistency and inclusion of elements covered above. Included are the objectives for the unit in a progressive order, the mastery elements included in each lesson, the main activities set including go deep and go deeper elements, and the vocabulary used.

Year 1 Example: Spring Term

National Curriculum Objectives Plants - identify and name a variety of common wild and garden plants, including deciduous and evergreen trees - identify and describe the basic structure of a variety of common flowering plants, including trees. Animals - identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals - identify and name a variety of common animals that are carnivores, herbivores and omnivores - describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) - identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Working Scientifically - Beginning to ask simple questions and recognising that they can be answered in different ways. - Beginning to observe more closely, using simple equipment. - Beginning to perform simple tests. - Beginning to identify and classify. - Beginning to use their observations and ideas to suggest answers to questions. - Beginning to gather and record simple data to help in answering questions.	
Driver Words KS1 Recognise, identify, describe, Observe, Select, Categorise, Classify, Sequence, Compare and contrast, recall, Reason/ Speculate LKS2 Summarise, Explain, synthesize, Demonstrate understanding UKS2 Empathise, reach informed conclusions, make reasoned judgements, justify, apply, evaluate, critique, hypothesize	
Key Vocabulary Question, answer, observe, observing, equipment, identity, classify, sort, group, record – charts, diagrams, map, data, differences and similarities, evidence, fair test.	



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Session	WALT	Main Teach Including questions stems, oracy skills and mastery strategies Problem Solving - Active Argument - Convince Me - Do You Agree? Contextualised learning - Always/Sometimes/Never - What's the Same? What's Different? - True or False	Activity	Key Vocabulary
1	WALT: name the 5 senses and which body parts are associated with them.	Intro: Sing Head shoulders knees and toes / play Simon Says with body parts Main Activity: Have senses written and hidden on flipchart (under post its) Tell the children that we have 5 senses which we use to experience the world. We're going to find out what they are. Blindfold some children - put an orange in front of them. Ask them to tell you what you are holding. How did you know? What did you use to tell you? Nose for smell. - Tell the children that you are going to walk towards them clapping. Ask them to tell you when you are near them. How did you know? What did you use to tell you? Ears for hearing - Give some children sweets to eat. What are you eating? How did you know? Mouth for taste. - Give some items for children to feel – book bag, book. What are the items? How did you know? Hands/ skin for touch Do we only feel with our hands? Can you feel the clothes on your skin? Can you feel if you bump your knee? What do you think the other sense is that we have? We took it away while we used our other senses. Eyes for sight Reveal each sense on flip chart as the class name them.	Carousel 1. Mr potato head Children to take turns to roll sense and build their Mr potato head when they roll the sense.  2. Match the animal patterns Children to match animals to close ups of their animal pattern 3. Observational drawing Place fruit from The Handa's Surprise story in the centre of table and children to sketch a fruit. 5. Feely boxes Children to place an object in the box. The other children guess what's in the box using the sense of touch. 	Sense Sight eyes Touch Hands/ skin Smell nose Taste mouth Hearing ears Take photos of the different activities for evidence

Alongside the medium term plan, teachers then create notebook slides for each lesson with the following structure:



Mastery in Science

The idea is to **avoid mechanical repetition** and to create an appropriate path for practising the **thinking process** with increasing **creativity**.

Structure of the lessons. These may be taught in a different order but you should try and include all features in **MOST** lessons.

- ☐ **Response to feedback**
- ☐ **WALT and STS** - The WALT should be linked to the NC objective. This may include WS objectives within the WALT itself or can just be in the STS.
- ☐ **Learning Pit** - A breakdown of the vocabulary in the WALT and a prior assessment of the children's understanding. This may link to the learning pit on their overview.
- ☐ **Starter activity/ Retrieval opportunity** - This could link to previous learning or NC objective. **It could also be reviewing or creating part of the knowledge organiser from the previous lesson.** It should be taught through the mastery approach.
- ☐ **Main Teaching - Hook** E.g. video, picture, concept cartoon, practical element. Something that promotes discussion or reflection.
- ☐ **Main Teaching - Science concept** Sharing the main teaching information in a straightforward way (information giving). This may be posing an investigation.
- ☐ **Main Teaching - Relevance and Scientist** Sharing of **WHY** we are learning about this/ how it relates to the real world. Could be a list of jobs it relates to. Include a scientist who is connected with the concept (diverse scientists if possible).

ONE OF THE FOLLOWING

- ☐ **Main Teaching - Conceptual Variation** e.g. What it is, What it's not (use of mistakes and misconceptions)
- ☐ **Main Teaching - Procedural Variation** e.g. applying to different contexts, making connections, what do you notice?
- ☐ **Main Teaching - Twist it** turn it on its head and try to confuse the children to check their understanding
- ☐ **Main Teaching - Activity for children**
- ☐ **Review of learning** - WS check. Children to identify which skill they have been using.
Possible inclusion of knowledge organiser.
- Plenary. Learning pit.

Support for additional needs in science

We recognise that some pupils may require support in particular lessons or tasks. Support is planned mindfully and tailored to the needs of each pupil. Teachers are flexible in their approach to planning support and intervention and recognise that specific SENDs do not necessarily need support across the entirety of the curriculum.

Typical support in place within Science includes: deliberate talk partner choices and seating arrangements, targeted questioning, oracy opportunities, availability of wider resources, use of investigation planning frames, concept cartoons to aid reasoning and pre-teaching of key vocabulary and concepts.

Where children are withdrawn from Science for interventions within other subjects, we endeavour for them to be removed from different areas of the curriculum each time so they continue to receive their broad and balanced curriculum.



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Planning to challenge in Science

As a school, we have developed a working descriptor for Greater Depth learning which is used across the curriculum. Through teaching for mastery, all children are exposed to opportunities for greater depth thinking. A child who is learning at Greater Depth can consistently:

- Apply their learning to different contexts, identifying relationships within the subject and between other areas of the curriculum.
- Work independently, showing resilience.
- Apply their skills and knowledge consistently and fluently.
- Explain and reason using accurate vocabulary.
- Show curiosity and take responsibility for deepening their own learning by asking questions.
- Teach others what they have learnt in a sensitive and thoughtful way to enable them to learn too.

We recognise that a child will often show a particular gift or talent in specific subjects rather than across the whole curriculum and therefore in Science, we are specifically looking for children who do this within the knowledge, skills and understanding of Science. It may be that a Greater Depth scientist receives support in other areas of the curriculum, for example and therefore in this subject can show greater confidence and will not require support.

Because we teach using the teaching for mastery approach, we expect all pupils to meet the objective to a greater or lesser extent (some will require support to do this), with all children being exposed to aspects of greater depth learning and some children able to prove they've learnt at greater depth about a specific objective.

How staff are skilled to teach in Science

Whole staff training takes account of training in curriculum drivers such as metacognition, retrieval, growth mindset, vocabulary building, oracy, reading, teaching for mastery and how to support and challenge. It also allows staff to develop their skills in supporting children with additional needs in Science.

Science staff meeting time has been allocated and this is a chance for the subject leader to share their passion with others to inspire the staff team in Science.



Impact

Statement of Intended Impact and Monitoring of this:

As a school, we continuously reflect on the impact that our Science curriculum has on our whole school community, in helping our children to know more and remember more as well as preparing them to be the best they can be as righteous global citizens.

To assess how a child's journey to becoming a scientist is progressing, we use a range of assessment methods to ensure the intended curriculum and the way it is implemented at St Gregory's is having an impact on their journey.

Our vision for Science is that each and every child sees themselves as a scientists. To do this, we use our progression documents which consider what knowledge, skills, vocabulary and understanding a child should have at assessment points throughout their St Gregory's journey to becoming a scientist. As Science is a core subject, these formal assessment points happen three times a year at the end of Autumn, Spring and Summer term. The data is then analysed by the subject leader and successes and next steps are shared.

To reflect on the impact that the science curriculum is having on each child, we use both qualitative and quantitative means including:

- Teachers evaluate children's knowledge, understanding and learning characteristics through a range of informal and formal means. This informs the further implementation of the curriculum. Core subjects such as Science are formally assessed three times a year against broad threads from the National Curriculum. These are input into our in house tracker as a broad judgement against the assessment points on the progression documents. This is detailed further in our [assessment, recording, reporting and tracking \(ARRT\) policy](#) and uses observations of practice, work in books, pupil conversations, low stakes testing to make judgements. These judgements are moderated at least three times a year across the year group during PPA time before data is locked for analysis. Subject leaders are available to support with this and cross phase moderation takes place upon request of the subject leader when analysis has been undertaken and if the need requires it.
- Data in its widest sense forms the strategic direction of each subject. This is detailed in our [subject leader guidance](#) booklet. It helps us to identify areas of strength and areas for development within our subject curriculum and wider curriculum so that CPD can be put in place, support can be structured and gaps can be identified. This also allows for us to identify whether there are particular groups of pupils who have similar strengths and areas for development so that whole school practice can be altered in response to emerging trends and ensure that our curriculum offer continually meets the needs of our pupils.
- We strive for every child to see themselves as a scientists and be able to talk about the skills and knowledge they have that would help them in that role both now and in the future. They can make links with their learning both within the Science curriculum and across the wider curriculum.
- Children are self-regulated learners who can talk about their strengths and weaknesses, and can motivate themselves to engage, and improve, their learning by using tools such as the learning pit, self and peer assessments, metacognition strategies. All of these help them to



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apply their learning both now and in their future lives to satisfy the ambitions that they have for themselves.

- Children are righteous citizens who have high ambitions for themselves, are economically active and give to society in a variety of ways. They value the gifts and talents that everyone brings to the diverse local and global community in which they live. They recognise ways that they can challenge social injustice and are empowered to do this both now and in the future.

Subject leader time is allocated to allow for this monitoring of impact to take place throughout the year. The school leadership team receive headlines and triangulate this with their own monitoring. Members of the governing board attend Key Area Team meetings to understand the implementation and impact of each subject within their KAT and annual formal monitoring by the Curriculum Committee takes place through a report and consequent pupil conferencing to triangulate the information they have received. This allows for the testing of impact and support and challenge about Science (within the STEAM KAT) at many levels.