Science Policy

Science Coordinator – Miss Harris

Rationale

Our children are the future of science and we want them to aspire to be our next researchers, microbiologists, palaeontologists or even astronauts. They will go through school with an appreciation of the many directions that their science education can take them in the future. A high-quality science education provides the foundations for understanding the world. Science has changed our lives and is vital to the world's future prosperity, all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science developing transferable skills including problem-solving, reasoning and enquiry.

Science should provide children with a deep understanding of scientific concepts and a range of practical scientific skills which will provide them with a foundation that can be built upon in KS3 and beyond.

Primary science should foster children's curiosity in the world in which they live.

Furthermore, putting those skills into practise through a focus on environmental science will give the children a deeper understanding and appreciation of the world around them. They should be encouraged to care for our planet and the living things around us, understanding their own personal impact on the environment and how best to protect our future.

Introduction

At The Florence Nightingale Academy we are committed to providing all children with learning opportunities to engage in science. This policy sets out a framework within which teaching and non-teaching staff can work, and gives guidance on planning, teaching and assessment. It has been developed through a process of consultation with school staff and governors.

Science is taught from Early Years through to Key Stage 2. Our curriculum uses knowledge of scientific processes and methods, scientific enquiry skills as well as an understanding of the nature of science.

Through science children are encouraged to think scientifically, question the world about them and have an ability to explain processes and concepts by using scientific technical terminology. Children are encouraged to develop a sense of excitement and curiosity about science that in turn will help create scientists for the future.

This policy is a working document, subject to annual review. It is to be read in conjunction with the schemes of work.

What is Science?

Science is a body of knowledge built up through experimental testing of ideas. Science is also methodology, a practical way of finding reliable answers to questions we may ask about the world around us.

Aims

- To encourage the development of positive attitudes to science.
- To fulfil the requirements of the National Curriculum in ways that are imaginative, creative purposeful and enjoyable.
- To deliver clear and accurate teacher explanations and skilful questioning. Providing guidance but at the same time allowing children the freedom to explore as independently as possible.
- To make strong, purposeful links between science and other subjects. Using ICT in a meaningful way to extend their learning (Data loggers, video, photograph and microscopes).
- To enable children to communicate scientific facts, ideas and data effectively with peers and adults, using appropriate scientific language.
- To teach science through the five lines of scientific enquiry: Observing over time; Identifying and Classifying; Pattern seeking; Secondary Research and; Comparative and Fair Testing.
- To find out children's initial ideas so that they understand what they don't know and aren't sure about. This means that when the children have completed their lessons they can look back at their starting points and say "I used to think this … and now I think that … because …" or "I used to think this … and I still think this because …"
- To instil in children an appreciation and ownership over their own impact on the environment.

Curriculum

The children undertake a broad and balanced programme following the National Curriculum that takes account of abilities, aptitudes and physical, emotional and intellectual development. Through science the children learn a range of skills, concepts, attitudes and methods of working.

The objectives of science teaching in the school are based on the requirements of the National Curriculum programmes of study for Key Stages 1 and 2.

Long term plan for Science

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Seasonal Changes **Which season is it?** Introduction to the four seasons with a focus on changes observed in Autumn.	Materials (1 of 2) **What are things made of?** Identify and name everyday materials and understand their properties.	Animals and Seasonal changes **What animal am I?** Identify different classes of animals and their diets. Winter	Animals and Seasonal changes **How does my body work?** Identify basic parts of the human body and identify which parts of the body are associated to each sense. Spring	Plants **What can I see outside in my garden?** Identify common garden and wild plants, how they grow and can be grouped.	Materials (2 of 2) and Seasonal changes **What can I make with this material?** Focus on working scientifically. Summer
Year 2	Animals including humans **What do we need to do to survive**	Living things and their habitats **How do plants and**	Everyday materials **What can objects be made of?**	Environmental Unit **How can I look after my planet?**	Plants **How do my plants grow?** Observe seeds and	Working scientifically **How am I a scientist?**

	and stay healthy? Basic needs of animals including humans for health and growth.	**animals survive?** Habitats and simple food chains.	Suitability of everyday materials for their purpose.	Focus on environmental science and our impact on the world around us.	bulbs growing and the conditions needed for healthy growth.	Focus on scientific enquiry types and working scientifically.
Year 3	Forces and Magnets **How do magnets work?** Explore magnets and the properties of magnetic materials.	Rocks (1 of 2) **How are rocks all different?** Classification and properties of rocks.	Animals including humans **What do we need to eat to stay healthy?** Nutrition for healthy bodies.	Plants **Why do some plants flower?** Identify the different parts of plants and the processes that help them to grow.	Rocks (2 of 2) **What is a fossil?** Learning about fossils and how they are formed. Soils	Light **How are shadows formed by the sun?** Recognising dark is the absence of light, how shadows are formed and what is a reflection.
Year 4	Living things and their habitats **What is happening to my environment?** Classification and human	Animals incl humans **What happens to the food I eat?** Digestive systems, food chains and	States of Matter **Solid, liquid or a gas?** Changes of state including heating, cooling and	Sound **What's that I hear?** How sounds are made and how they can change	Electricity **How does electricity work?** Circuits and their components.	Working scientifically **How am I a scientist?** Focus on enquiry types and working scientifically.

	impact on the environment.	the importance of teeth.	evaporation.			
Year 5	Forces **What makes things move?** Investigating and learning about different forces	Earth and Space **What causes night and day?** Planets of the solar system, movement of the earth, sun and moon	Properties and changes of materials (1 of 2) **How do I decide which material is best?** Group and compare different materials and investigate how they can be best used.	Living things and their habitats **How do living things change over time?** Life cycles of plants and animals including humans	Properties and changes of materials (2 of 2) **What happens if I mix two materials?** Reversible and irreversible changes. How to separate mixtures.	Animals including humans **What happens when I grow up?** Growth and development in humans
Year 6	Evolution and inheritance **How do we know that living things change over time?** Fossils and adaptation	Light **How do we see?** Light and shadows	Electricity **What changes can I make to an electrical circuit?** Circuits, how to draw circuit diagrams and what	Animals incl humans **How does my body work?** Human circulatory systems and the impact of lifestyle choices	Living things and their habitats **Where do I fit in?** Classification systems	Working scientifically **How am I a scientist?** Focus on enquiry types and working scientifically.

			happens when components are added or taken away			
Enrichment Days		National Tree Week 28.11.21 – 06.12.21	Big Schools Birdwatch	Science Week 05.03.22 – 14.03.22	International Astronomy Day 07.05.21 World Bee Day 20.05.22	World Oceans Day 08.06.21

Early Years

In Early Years science is taught within the area: 'Understanding the World'. According to the new revised framework the level in which the child is expected to have attained by the early learning goal set below under the strand of 'The World'. The key skills in this area of learning are:

Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur, and talk about changes.

Key Stage 1

As outlined in the National Curriculum (2014) the principal focus of science teaching in Key Stage 1 enables children to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They are encouraged to be curious and ask questions about what they notice. Children are helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. Children will also begin to use simple scientific language to talk about what they have found out.

Lower Key Stage 2

As outlined in the National Curriculum (2014) the principal focus of science teaching in Lower Key Stage 2 is to enable pupils to broaden their scientific view of the world around them. They will do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. Children will be encouraged to ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They will draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

Upper Key Stage 2

As outlined in the National Curriculum (2014) the principal focus of science teaching in Upper Key Stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They will do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. Children will encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

Teaching and Learning

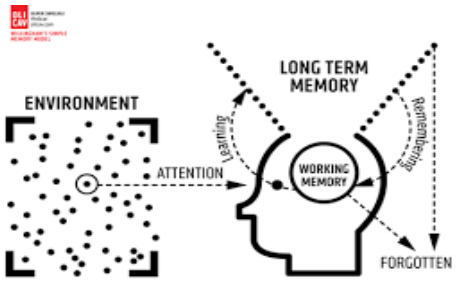
The school uses a variety of teaching and learning styles in science lessons. Our pedagogy is based on research conducted by Rosenshine and his principles of instruction (2012).

Science Delivery Document

Intent	We take the National Curriculum statements and provide an enhanced version of this. We map these in a coherent and sequential progression model that outlines the knowledge, skills and vocabulary needed at each stage that will build to clearly defined end points. Teachers take the progression grid and map this into a long-term plan for their year group. Teachers then plan at a more detailed level the sequencing of content to be taught across each unit
Implementation	Ensure that the teachers of the subject have excellent subject knowledge, and leadership supports that acquisition of this for NQT and non- specialist teachers. Subject matter is presented clearly, teachers carefully check learning and identify misconceptions, providing direct feedback. Teaching is designed to ensure children know more and remember more. Science is carefully resourced to ensure we have all the specialism and resources required.
Impact	Learners develop detailed knowledge and skills. We check this through regular pupil voice and collecting evidence of outcomes which we measure against our age base progression grids. Pupils are well prepared at each stage to be ready for the next stage of learning.

How do ensure that knowledge gained is transferred to working memory into long term memory?

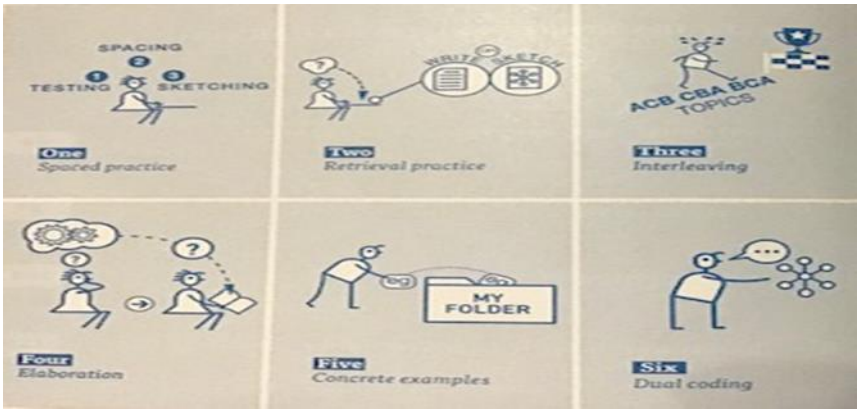
All staff use Rosenshine's (2012) principals in action when planning and delivering lessons.



Strategies identified	What do we expect to see in our Science lessons?
Regular review	Academic or subject vocabulary that has been taught will be modelled throughout teaching and regularly reviewed. Teachers will revisit prior knowledge (previous year group/lesson).
Present new materials using small steps	Science planning ensures achievable and repeated steps are provided to build children's confidence, competence and retention.
Ask questions (Blooms taxonomy)	Questions help children practice new information and connect new material to their prior learning. The teacher will question children around the specific knowledge and vocabulary they have used in this topic as well as others.
Provide models	Expert teachers /peer models identified in the lesson will exemplify the specific skills/knowledge required for the task.
Guide student practice	Teachers will spend more time guiding children's practice of new material. It will be forgotten unless time is given for rehearsal we revisit tasks over and over again, allowing children lots of time to practice. This is always guided and supported by expert teaching.
Check for children's understanding	Checking understanding at each point can help children learn the material with few errors. We would expect to see tasks/skills broken down into very small chunks, with regular assessment checking from teachers throughout.
Obtain a high success rate	In Science, we would expect to see that a skill is successfully taught before moving on. We take our time to achieve consistent success.
Provide scaffolds for difficult tasks	The teacher provides children with temporary supports and scaffolds to assist them when they learn difficult tasks.
Independent practice	Children should have the opportunity to practice regularly and independently to transfer the knowledge into their long-term memory. In science lessons there is opportunity for this.

Weekly and monthly review	Children need to be involved in extensive practice in order to develop well connected and automatic knowledge. Weekly reviews can take place in science lessons, where teachers return to knowledge learned in a previous unit, and following a period of forgetfulness the children use that knowledge again.

This is supported by the six effective learning strategies (Weinstein and Sumeracki 2019) to ensure that all of our children at The Florence Nightingale Academy become successful, independent learners who are actively engaged in their own learning.



It is our aim at The Florence Nightingale Academy for the children to develop a deep curiosity for science.

In order to learn about the world around them children must have:

- A curiosity to ask questions.
- Investigative minds to find out answers.

Our principal aim through this pedagogy is to develop the children's knowledge, skills and understanding in science.

We believe in whole-class teaching methods and combine these with enquiry and skills-based investigative activities.

We believe children as part of their Science curriculum should access a variety of activities in lessons such as:

- They have access to, and are able to handle specimens
- They go on visits to museums and places of interest
- They have access to secondary sources such as books and photographs
- Visitors talk about scientific topics and concepts
- They question and create investigations to provide answers
- They review prior knowledge and investigations to build upon previous learning
- They use drama to explain scientific concepts

- They are shown, or use independently, resources from the internet and videos
- They are able to use non-fiction books for research
- They are provided with opportunities to work independently or collaboratively, to ask as well as answer scientific questions.

We recognise the fact that we have children of differing 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 using our differentiated star challenges. We achieve this through a range of strategies which are differentiated by task, expected outcome and/or support from peers or adults.

Based on combining pedagogy taken from Rosenshine's principles of instruction and various metacognition strategies Science lessons should follow the following structure:

1) Review of prior knowledge e.g. low stake quizzes testing scientific vocabulary and concepts. Can be within the topic or recapping previous Science topics covered.

2) Introduce new knowledge and skill for this lesson in small steps taken from Knowledge statement

-Children may need the new knowledge first

-Then introduce skill/activity

-Model using this skill and applying the knowledge (Your thought processes also)

-Asking questions whilst modelling and lots of discussion

3) Children practise and apply lesson skill

-Guided practise first (Class modelling and lots of discussion)

-Children apply skill independently (Scaffolding may be required so all children can successfully apply learning)

-Use of AFL and questioning to check student understanding

4) Evaluate and reflect upon the Scientific skills used to check Student understanding.

-How have we been Scientists this lesson?

-What has been our new learning this lesson?

-How have we been successful learners?

Additionally, throughout the week in morning registration/before end of day/ lining up to check knowledge from lessons is being retained and transferred into the long-term memory.

Each year group undertakes six topics a year combining both scientific knowledge and scientific enquiry skills and these are taught in 75 minute weekly sessions for the half term that the topic is being taught.

Science Curriculum Planning

At The Florence Nightingale Academy, our curriculum is carefully planned to ensure full National Curriculum coverage. Our long-term and medium-term plans map out the skills and themes covered each term for each key stage. These plans define what we will teach and ensure an appropriate balance and distribution of work across each term. Topics are reviewed yearly by the subject leader liaising with staff and SLT.

Every effort is made to ensure that work is differentiated appropriately to meet the needs of all pupils using the school's three-star challenge system. Planning should highlight extension activities for gifted and talented children, specific English as an Additional Language needs and tasks and activities which will engage the interest of pupils with special learning needs, whilst offering them opportunities to succeed.

Planning should also make relevant links to the key skills that are being taught and then annotated on the knowledge statements at the front of each topic.

Assessment and Recording

Assessment is an integral part of the teaching and learning process at The Florence Nightingale Academy. Children will be assessed continually throughout the year to ensure that understanding is being achieved and that progress is being made on their scientific knowledge and understanding of scientific enquiry skills. Teachers assess each knowledge statement following the lesson on our online assessment platform, Insight. Teachers make a judgement using the following statements, 'taught, but not yet understood', 'some evidence but not yet secure', 'objective secured' and 'working at greater depth'. A final judgement is made at the end of each topic on Insight using 'below', 'just below', 'on track' and 'greater depth'. Data is collated every half term in line with the assessment calendar and data is to be collated by the teacher. Marking for science will follow the school's marking policy, this will ensure that when marking

science, with a block which will develop mastery or ascertain that the learning objective has been met.

Promoting links with Science and Reading

At The Florence Nightingale Academy, we ensure that we promote a love of reading across all our subjects. We ensure that the children understand how we are always using our reading skills and how this builds on phonic skills taught in EYFS. In our science lessons we access a wide variety of texts that children may need to decode and apply the skills taught in our phonics programme. Non-fiction scientific texts make great linguistic demands through the inclusion of technical vocabulary not always used in narrative works.

Monitoring

Monitoring takes place regularly through samplings children's work, teacher planning, pupil/staff voice and lesson observations.

Roles and Responsibilities

Role of Co-ordinators

- The co-ordination, leadership and development of all aspects of science throughout the primary age range.
- The development and implementation of policies and practices for science which reflect the school's commitment to high achievement and effective teaching and learning.
- Ensuring curriculum coverage, continuity and progression in science for all children.
- The audit, identification and purchase of appropriate resources for science.
- Ensuring that resources are used efficiently, effectively and safely.
- The use of assessment data and other evidence to monitor standards in science and report this to the leadership team and governors.
- To keep staff informed on the attainment and progress of science throughout school.
- Setting expectations and targets for staff and children for children's achievement and the quality of teaching.
- The evaluation of the quality of teaching of science in the school and to use this analysis to identify effective practice and areas for improvement. To take action to further improve the quality of teaching.
- Leading staff meetings in science.
- The co-ordination of high quality professional development as necessary.

Role of Teachers

Class teachers will be responsible for monitoring children's progress through target ladders in science books and for updating school pupil tracker as per the school assessment schedule.

Role of Governors

Governors will be kept informed of the latest developments in school.

Resources

Amongst many text books we have a school set of Collins International Primary Science to support the children's learning. Children develop their skills using ICT such as the internet to research, DVD's and interactive programs used on our touch screen display units.

In order to encourage an investigative approach, the school has a store of equipment to allow simple investigations, observations and measurements to be carried out in small groups.

Visits and first-hand experiences are vital to the understanding of science. Regular educational visits are made by pupils and the local area is a valuable resource for this. Risk assessments are carried out on all visits, including local walks. Visitors with expertise are also invited into school to work with the children, often engaging in a whole school approach, particularly when linked to one of our environmental science days.

Curriculum Progression

	EYFS	Year 1	Year 2	Year 3/4	Year 5/6	Year 6 only
Working scientifically	Pupils should ask questions and comment on aspects of their familiar world	Pupils should ask simple questions and recognise they can be answered in different ways.	Pupils should ask simple questions and recognise they can be answered in different ways including scientific language from the national curriculum	Pupils should ask relevant questions and use different types of scientific enquiries to answer them.		
	Pupils should look closely at similarities and difference	Pupils should use simple equipment to observe closely	Pupils should use simple equipment to observe closely including	Pupils should make systematic and careful observations and, where	Pupils should take measurements using a range of scientific equipment,	

	patterns and change		changes over time.	appropriate, take accurate measurements using standard units, using a range of equipment including thermometers and data loggers.	with increasing accuracy and precision taking repeat readings when appropriate.	
		Pupils should perform simple tests	Pupils should perform simple comparative tests	Pupils should set up simple practical enquiries, comparative and fair tests	Pupils can plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	
	Pupils should make and explain why some things occur or change.	Pupils should use his or her observations and ideas to suggest answers to questions	Pupils should use his or her observations and ideas to suggest answers to questions noticing similarities and differences and patterns.	Pupils should identify differences, similarities or changes related to simple scientific ideas and processes.	Pupils should identify scientific evidence that has been use to support or refute ideas or arguments.	
		Pupils should gather and record data to help in answering questions.	Pupils should gather and record data to help in answering questions including using secondary sources.	Pupils should gather, record, classify and present data in a variety of ways to help in answering questions.		
			Pupils should be able to identify, group and classify.			Pupils should be able to group and classify things and recognise patterns.
				Pupils should record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.	Pupils should record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables,	

					scatter graphs, bar and line graphs.	
				Pupils should report on finding from enquiries including oral and written explanations, displays or presentations of results and conclusions	Pupils should record and present 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.	
				Pupils should use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions	Pupils should use test results to make predictions to set up further comparative and fair tests.	
						Pupils should describe and evaluate their own and other people's scientific ideas related to topics in the National curriculum (including ideas that have changed over time), using evidence from a range of sources.

Knowledge Statements

Our knowledge statements outline curriculum coverage for each topic and ensure full national curriculum coverage alongside a breadth of knowledge and scientific enquiry skills.

They contain information of prior curriculum knowledge that the children have learnt throughout their primary curriculum to enable staff to support the children to make links to their prior knowledge.

Our knowledge statements also help to show links between scientific enquiry through their question approach topic names e.g. What happens to the food I eat?

Knowledge statements also outline key vocabulary to be taught within each topic to help address our whole school focus of narrowing the vocabulary gap.

Why do some plants flower?

Knowledge to be built upon	**Plants and Seasonal Changes (Year 1)** – In this unit children identify a variety of common plants. They learn the basic structure of plants and observe them closely. **Plants (Year 2)** – In this unit children explore the lifecycle of a plant and observe their growth. They learn what a plant needs in order to grow and stay healthy.	
Year 3	**LO: To explore the requirements of plants for life and growth and how they vary from plant to plant.** *Working Scientifically Skill:* *- identifying differences, similarities or changes related to simple scientific ideas and processes*	
	LO: To investigate the effect of different factors on growth. *Working Scientifically Skill:* *- asking relevant questions and using different types of scientific enquiries to answer them (removing different requirements from growing plants)*	
	LO: To identify and describe the functions of different parts of flowering plants. *Working Scientifically Skill:* *- reporting on findings from enquiries, including oral and written explanations, displays or presentations.*	
	LO: To investigate the way in which water is transported within plants. *Working Scientifically Skill:* *- using straightforward scientific evidence to answer questions or to support their findings. (for example, putting cut, white carnations into coloured water – why does the flower change colour?)*	
	LO: To explore the part that flowers play in the life cycle of flowering plants. (including pollination, seed formation and seed dispersal) *Working Scientifically Skill:* - recording findings using simple scientific language, drawings and labelled diagrams	
	LO: To look for patterns in the structure of fruits that relate to how the seeds are dispersed. *Working Scientifically Skill:* *- identifying differences, similarities or changes related to simple scientific ideas and processes*	
Key vocabulary	plant, growth, vary, factor, requirement, transported, life-cycle, function, structure, disperse	

Knowledge Organisers

For students to succeed in a particular area, they must have a foundation of factual knowledge, understand those facts in the context of a conceptual framework and organise knowledge in order to facilitate retrieval and application (Bransford et al. 2000).

At The Florence Nightingale Academy, we use knowledge organisers to support each topic. Through analysing various studies and research, we want them to support our science curriculum in the following way:

- Allow children at the start of the topic to see the learning journey that we will be completing.
- Allow children to make links between previous knowledge that links to the new topic we will be undertaking.
- Outline key knowledge that will be covered throughout the topic.
- Support low-stake quizzes at the start of each lesson through regular retrieval of the information outlined.
- Children to refer to them in lessons to support their understanding.
- Children to refer to the vocabulary outlined on them to help minimise the vocabulary gap our children encounter.