Science

Subject Guide

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Introduction

Intent

At Frith Manor our intent is to give every child a broad and balanced Science curriculum which enables them to confidently explore and discover what is around them so that they have a deeper understanding of the world we live in. We want our children to love science, to have no limits to what their ambitions are and to remember their science lessons in our school as well as to cherish these memories and embrace the scientific opportunities they are presented with. To achieve this, it involves exciting, practical experiences that encourage curiosity and questioning. Our aim is that these stimulating and challenging experiences help every child secure and extend their scientific knowledge and vocabulary, as well as promoting a love and thirst for learning. At Frith Manor, we have a coherently planned and sequenced curriculum which has been carefully designed and developed with the need of every child at the centre of what we do. We want to equip our children with not only the minimum statutory requirements of the science National Curriculum but to prepare them for the opportunities, responsibilities and experiences of later life.

Implementation

At Frith Manor, Science topics are taught within each year group in accordance with the National Curriculum.

- Topics are blocked to allow children to focus on developing their knowledge and skills, studying each topic in depth.
- Every year group will build upon the learning from prior year groups therefore developing depth of understanding and progression of skills.
- Teachers promote enjoyment and foster interest of the scientific disciplines; Biology, Chemistry and Physics.

- Children explore, question, predict, plan, carry out investigations and observations as well as conclude their findings.
- Children present their findings and learning using science specific language, observations and diagrams.
- In order to support children in their ability to 'know more and remember more' there are regular opportunities to review the learning taken place in previous topics as well as previous lessons.
- At the start of each topic children will review previous learning and will have the opportunity to share what they already know about a current topic.
- Children are given a knowledge organiser at the start of each topic which details some key Science Curriculum Statement information, dates and vocabulary. This is not used as part of an assessment, but to support children with their acquisition of knowledge and are used as a reference document. They will also generate what they know, want to learn and, at the end of the topic, have learnt, in the form of a KWL grid to share ideas and to think about how they would like their learning to proceed throughout the unit of work.
- Effective CPD and standardisation opportunities are available to staff to ensure high levels of confidence and knowledge are maintained.
- Effective use of education visits and visitors are planned, to enrich and enhance the pupil's learning experiences within the Science curriculum.
- Teachers use highly effective assessment for learning in each lesson to ensure misconceptions are highlighted and addressed.
- Effective modelling by teachers ensures that children are able to achieve their learning intention, with misconceptions addressed within it.
- Through using a range of assessment tools, differentiation is facilitated by teachers, to ensure that each pupil can access the Science curriculum.
- Children are given clear success criteria in order to achieve the learning intention with differing elements of independence.
- Pupils are regularly given the opportunity for self or peer assessment, which will then be used to inform planning, preparation, differentiation and address misconceptions within that lesson, or for the next lesson.

Impact

The impact of this curriculum design will lead to outstanding progress over time, across key stages, relative to a child's individual starting point and their progression of skills. Children will therefore be expected to leave Frith Manor reaching at least age related expectations for Science. Through various workshops, trips and interactions with experts our Science curriculum will lead pupils to be enthusiastic Science learners and understand that science has changed our lives and that it is vital to the world's future prosperity. We want to empower our children so they understand they have the capability to change the world. This is evidenced in a range of ways, including pupil voice, their work and their overwhelming enjoyment for science.

Yearly Overview

LTP	Aut 1	Aut 2	Spr 1	Spr 2	Sum 1	Sum 2
Little Acorns	Breakdown of Little Acorns Curriculum can be found in Little Acorns Yearly Curriculum Overview Areas of learning: Understanding the World					
Little Oaks	Breakdown of Little Oaks Curriculum can be found in Little Oaks Yearly Curriculum Overview Areas of learning: Understanding the World					
Reception	Breakdown of Reception Curriculum can be found in Reception Yearly Curriculum Overview Areas of learning: Understanding the World					
Year 1	Plants and Trees	Animals including Humans 1	Everyday Materials		Animals including humans 2	Seasonal Changes
Year 2	Living Things in their Habitats	Use of Everyday Materials	Animals		Plants	
Year 3	Animals including humans	Rocks and Soils	Forces and Magnets		Light	Plants
Year 4	Sound	Electricity	States of Matter	Living things and their habitats	Animals including humans	Living things and their habitats

Year 5	Forces	Earth and Space	Materials and Properties	Living Things and their habitats	Animals including humans
Year 6	Light	Animal including humans	Living things and their habitats	Evolution and Inheritance	Electricity

Curriculum coverage

KS1

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	• Year 1 Autumn 1 (Plants and Trees)
• observe and describe how seeds and bulbs grow into mature plants • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	• Year 2 Summer 1 and 2 (Plants)

Animals including Humans	
• 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	• Year 1 Autumn 2 (Animals including Humans) • Year 1 Spring 2 (The Human Body)

• 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	
• notice that animals, including humans, have offspring which grow into adults • find out about 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	• Year 2 Spring 1 and 2 (Animals)

Everyday Materials

• distinguish between an object and the material from which it is made • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • describe the simple physical properties of a variety of everyday materials • compare and group together a variety of everyday materials on the basis of their simple physical properties	• Year 1 Autumn 2 (Everyday Materials)

• identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	• Year 2 Autumn 2 (Uses of Everyday Materials)

Seasonal Changes

• observe changes across the 4 seasons • observe and describe weather associated with the seasons and how day length varies	• Year 1 Summer 2 (Seasonal Changes)

Living things and their habitats

• explore and compare the differences between things that are living, dead, and things that have never been alive • identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other	• Year 2 Autumn 1 (Living things and their habitats)

• identify and name a variety of plants and animals in their habitats, including microhabitats • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	

LKS2

Plants	
• identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	• Year 3 Summer 2 (Plants)

Animals including Humans	
• identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • identify that humans and some other animals have skeletons and muscles for support, protection and movement	• Year 3 Autumn 1 (Animals including Humans)
• 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	• Year 4 Summer 1 and 2 (Animals including humans)

Rocks	
• compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter	• Year 3 Autumn 2 (Rocks and Soils)

Light

• recognise that they need light in order to see things and that dark is the absence of light • notice that light is reflected from surfaces • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • recognise that shadows are formed when the light from a light source is blocked by an opaque object • find patterns in the way that the size of shadows change	• Year 3 Summer 1 (Light)

Forces and Magnets

• compare how things move on different surfaces • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having 2 poles	• Year 3 Spring 1 and 2 (Forces and Magnets)

• predict whether 2 magnets will attract or repel each other, depending on which poles are facing	

Living things and their habitats

• recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • recognise that environments can change and that this can sometimes pose dangers to living things	• Year 4 Spring 2 (Living things and their habitats)

States of Matter

• compare and group materials together, according to whether they are solids, liquids or gases • observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)	• Year 4 Spring 1 (States of Matter)

• identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	

Sound

• identify how sounds are made, associating some of them with something vibrating • recognise that vibrations from sounds travel through a medium to the ear • find patterns between the pitch of a sound and features of the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it • recognise that sounds get fainter as the distance from the sound source increases	• Year 4 Autumn 1 (Sound)

Electricity

• identify common appliances that run on electricity	• Year 4 Autumn 2 (Electricity)

• construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • recognise some common conductors and insulators, and associate metals with being good conductors	

UKS2

Living things and their habitats	
• describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • describe the life process of reproduction in some plants and animals	• Year 5 Summer 1 (Living things and their habitats)
• describe how living things are classified into broad groups according to common observable characteristics and based on	• Year 6 Spring 1 (Living things and their habitats)

similarities and differences, including micro-organisms, plants and animals • give reasons for classifying plants and animals based on specific characteristics	

Animals including Humans

• describe the changes as humans develop to old age	• Year 5 Summer 2 (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 bodies function • describe the ways in which nutrients and water are transported within animals, including humans	• Year 6 Autumn 2 (Animals including Humans)

Properties and Changes of Materials

• compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets	• Year 5 Spring 1 (Materials and Properties)

• know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • demonstrate that dissolving, mixing and changes of state are reversible changes • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda	

Earth and Space

• describe the movement of the Earth and other planets relative to the sun in the solar system • describe the movement of the moon relative to the Earth	• Year 5 Autumn 2 (Earth and Space)

• describe the sun, Earth and moon as approximately spherical bodies • use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	

Forces

• explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	• Year 5 Autumn 1 (Forces)

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	• Year 6 Autumn 1 (Light)

• 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

• 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	• Year 6 Spring 1 (Evolution and Inheritance)

Electricity

• associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit	• Year 6 Summer 1 and 2 (Electricity)

● 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	

Strand development

The strand development section of this subject guide focuses on the 'Working Scientifically 'objectives.

Topic specific strand developments are outlined in each year group's respective medium term plans.

Working scientifically

Asking Questions and recognising that they can be answered in different ways

Years 1 and 2

Asking simple questions and recognising that they can be answered in different ways

• While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions.
• The children answer questions developed with the teacher often through a scenario.
• The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.

Years 3 and 4

Asking relevant questions and using different types of scientific enquiries to answer them

• The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions.
• The children answer questions posed by the teacher.

• Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.

Years 5 and 6

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

• Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.
• Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.

Making Observations and Taking Measurements

Years 1 and 2

Observing closely, using simple equipment

• Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations.
• They begin to take measurements, initially by comparisons, then using non-standard units.

Years 3 and 4

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

• The children make systematic and careful observations.

• They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.

Years 5 and 6

Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

• The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.

• During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).

Engaging in practical enquiry to answer questions

Years 1 and 2

Performing simple tests

• The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time.

Identifying and classifying

• Children use their observations and testing to compare objects, materials and living things.They sort and group these things, identifying their own criteria for sorting.

• They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing.

Years 3 and 4

Setting up simple practical enquiries, comparative and fair tests

The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.
Explanatory note: A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome. A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.

Years 5 and 6
Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
• The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

Recording and presenting evidence

Years 1 and 2
Gathering and recording data to help in answering questions
• The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs.
• They classify using simple prepared tables and sorting rings.

Years 3 and 4
Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

• The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams, Carroll diagrams.
• Children are supported to present the same data in different ways in order to help with answering the question.

Years 5 and 6
Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
• The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys.
• Children present the same data in different ways in order to help with answering the question.

Answering questions and concluding

Years 1 and 2
Using their observations and ideas to suggest answers to questions
• Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.
Using their observations and ideas to suggest answers to questions
• The children recognise 'biggest and smallest', 'best and worst' etc. from their data.

Years 3 and 4
Using straightforward scientific evidence to answer questions or to support their findings.

• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.

Identifying differences, similarities or changes related to simple scientific ideas and processes

• Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

• They draw conclusions based on their evidence and current subject knowledge.

Years 5 and 6

Identifying scientific evidence that has been used to support or refute ideas or arguments

• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer.

• They talk about how their scientific ideas change due to new evidence that they have gathered.

• They talk about how new discoveries change scientific understanding.

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

• In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.

Evaluating and raising further questions and predictions

Years 3 and 4

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

• They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.

Years 5 and 6

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

• They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used.

• They identify any limitations that reduce the trust they have in their data.