

The scientist is not a person who gives the right answers; he's one who asks the right questions. (Claude Lévi-Strauss, 'Le Cru et le Cuit', 1964)

Science at primary school should nurture curiosity and allow children to ask questions and develop the scientific skills they need to answer those questions. Primary science helps pupils to investigate problems and discover why science matters in the world.

Rationale

Science is a body of knowledge built up through experimental testing of ideas. Science is also a methodology, a practical way of finding reliable answers to questions we may ask about the world around us. Science in school is about developing pupil's ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills. We believe that by providing structure and support to their investigations and ensuring success they will, through first-hand experience, develop the ability to question, listen and increase their scientific attitudes, skills, knowledge and concepts. We believe that it is our responsibility to create a learning environment which encourages a spirit of enquiry, the valuing of ideas, an expectation of high standards and the opportunity and support for pupils to constantly want to find things out for themselves.

Aims

In teaching science, we aim:

- To give science a high profile in our school;
- To teach science in ways that are imaginative, purposeful, well managed and engaging to all pupils;
- To provide clear and accurate explanations to pupils and to use skilful questioning to elicit ideas and to develop thinking and understanding;
- To provide links between science and other areas of learning within the curriculum to ensure a more meaningful learning outcome;
- To nurture pupils' natural curiosity to find things out and to support their desire to explore and interpret their environment by fostering the scientific attitudes of curiosity, to find things out, respect for evidence, perseverance, flexibility, critical reflection and sensitivity to all living things;
- To encourage pupils to ask questions and listen carefully to other people's ideas and to be able to communicate their own ideas by enabling them to develop the process skills of seeking to find out, observation, communication, recording and analysing, and by supporting the future application of knowledge and experience;
- To ensure that pupils are shown the 'big ideas' of science to provide a reason and purpose for science;
- To help pupils develop scientific concepts such as fair testing, change and measurement for a purpose;
- To enable pupils to set up enquiries with due regard to safety and to be able to use scientific vocabulary and be aware of the provisional nature of scientific knowledge and explanation;

- To assess, record and moderate pupil's work in order to ensure continuity and progression and help them to develop to their full potential.

Attitudes

Through the teaching of science, we aim:

- To develop positive attitudes to science;
- To build on pupils' natural curiosity and develop a scientific approach to problems;
- To encourage open-mindedness, self-assessment, perseverance and responsibility;
- To build self-confidence to enable pupils to work independently;
- To develop the social skills required to work co-operatively with others;
- To provide our pupils with an enjoyable experience of science, so that they will develop a deep and lasting interest and may be motivated to study science further.

Skills

Through the teaching of science, we aim:

- To give pupils an understanding of scientific processes;
- To help pupils acquire practical science skills;
- To develop the skills of enquiry, including observing, measuring, predicting, hypothesising, experimenting, communicating, interpreting, explaining and evaluating;
- To develop the use of scientific vocabulary and its use in recording and written work;
- To develop the use of ICT to support science;
- To enable our pupils to become effective and confident communicators of scientific ideas, facts and data.

Guidelines

We aim to achieve this by ensuring that the content of science lessons:

- Is related to the experiences of the children;
- Provides them with the knowledge and understanding of scientific ideas that helps them to understand their environment and themselves;
- Lays the foundations for a progressively deepening knowledge and understanding of scientific concepts and facts that will be useful to them in the future;
- Includes the role of science in solving real life problems.

Curriculum Provision

Science should be taught regularly throughout the term, rather than in a block. The pupils should be taught the key knowledge and facts, alongside the scientific skills they will need to plan and carry out their own enquiries. The pupils will also find out about the work of famous scientists from the past. There are opportunities to develop and use science skills in other curriculum areas as detailed below. The expectation is that science will be taught for two

hours per week in KS1 and for two and a half hours per week in KS2. This may include science skills used in other curriculum areas such as maths. In KS1 at least one third of lessons should include practical scientific enquiry and at least half the lessons in KS2. In EYFS science is taught as part of the 'Understanding the World' strand.

Continuity and Progression

The science scheme of work provides full coverage of the National Curriculum objectives and gives equal coverage to the different areas throughout the year groups to ensure continuity and progression. Our science scheme of work is in three phases (long, medium- and short-term planning). The long-term plan maps the scientific units studied in each term for each key stage (see appendix 1). The medium-term plan, which is based on the National Curriculum objectives, gives details of each unit of work for each term for each year group. Some units are repeated in different year groups so that they build on prior learning and build progression into the scheme of work, ensuring that pupils are increasingly challenged as they move up through the school. Progression through a unit can be seen in the 'Progression of Learning' documents on TEAMS, which shows how the scheme of work builds on and progresses from previous learning as the pupils move through the school. The class teacher is responsible for following the short-term plans with suggested activities. These plans list the specific learning objectives, skills, key vocabulary, and suggested teaching activities. They also include scientific enquiry questions suggested by the OGDEN TRUST. Differentiation, outcomes and adult support for each lesson is the responsibility of the class teacher. Teachers are able to adapt and modify the scheme of work to suit their pupils' interests, questions, current events and style of teaching as long as the objectives are covered.

Enquiries

The new curriculum places a bigger emphasis on teaching pupils to 'work scientifically' by planning and carrying out a range of different enquiries. There is an expectation that by the time pupils reach upper KS2 they will be able to select an appropriate type of enquiry to plan and carry out to answer their questions. The different types of scientific enquiries are:

- Fair Test (controlled investigations);
- Pattern Seeking Enquiries;
- Identifying, Classifying and Grouping Enquiries;
- Exploring or Observing Over Time Enquiries;
- Problem Solving Enquiries;
- Researching Using Secondary Sources.

For an explanation of the different enquiries and examples of questions please see Appendix 2.

Fair Tests remain the predominant type of enquiry, but pupils should be taught the other types of enquiry during their time in KS1 and KS2 so they are able to choose an appropriate type of enquiry to answer a question by the time they reach upper KS2. 'Working Scientifically' should be embedded within the teaching of the scientific content and should not be taught as a separate strand.

Teaching and Learning

Science lessons should be taught using a variety of teaching and learning styles. The aim is to develop pupils' knowledge, skills and understanding. Sometimes this is done through whole class teaching; while at other times the pupils work in groups to plan and carry out enquiries to answer scientific questions, including those that they have asked themselves. The pupils will have the opportunity to use a variety of data, such as statistics, graphs, pictures and photographs to enhance their learning. ICT is to be used when appropriate. The pupils should engage in a wide range of activities including observing, recording, measuring, presenting findings and problem solving. They will carry out practical enquiries with increasing independence.

We recognise that pupils have different experiences, knowledge and abilities and ensure that appropriate learning opportunities are provided for all pupils by matching activities to their ability. This can be achieved in a variety of ways. For example:

- Setting open ended tasks which can have a variety of responses;
- Setting tasks which become progressively more challenging;
- Providing different tasks for different groups of pupils;
- Providing a range of resources to support pupils' learning;
- Providing adult support to pupils who need extra support.

Inclusion

We aim to provide for all pupils so that they achieve as highly as they can in science, according to their individual abilities. Pupils will be set suitable and challenging learning activities which take account of their individual and diverse learning needs. Teachers will use and respond to effective assessment strategies to support pupils overcome learning barriers so that all pupils can progress to their best ability.

Equal Opportunities

Science is taught within the guidelines of the school's Equal Opportunities Policy. We ensure that all pupils have the opportunity to gain science knowledge and understanding regardless of gender, race, class, religion, physical ability or individual learning needs. Lessons are planned to include all pupils by using a range of approaches including questioning, use of resources and mixed ability grouping to enable pupils to discuss and offer peer support.

Links to other curriculum areas

Science provides a wealth of links to other curriculum areas and can be taught in a cross curricular way with these other subject areas. Examples include:

- Communication of ideas in a variety of ways: speaking and listening, reading, writing, for research, sharing ideas and findings and presentation (Literacy);
- Application of the skills in the use of measures (weight, capacity, distance, temperature and time), handling data, estimating and predicting (Maths);
- Use of data loggers, interactive programs, data handling and presentation skills, research on the internet (ICT);
- Working co-operatively, thinking skills, problem solving skills (PSHE);
- Healthy eating, hygiene, life cycles, sexual development, reproduction, drug education, looking after their local, natural and built environments (PHSE);
- Effect of exercise, circulatory system, muscles (PE).

Recording

Science should be a practical and engaging subject for the pupils. However, the recording of what they have done and their learning remains important. There should be evidence of the learning that has taken place each lesson in the pupils' books. This may be mind-maps or spider diagrams to capture initial ideas, written work, diagrams or drawings, annotated photographs of practical activities, copies of enquiry planning boards, tables of results, presentation of data either by hand or using ICT.

Assessment

Assessment in science is carried out for two purposes. The first is to understand the learning needs of the pupils to guide future planning and teaching (formative). The second is to make judgements about a pupil's progress and attainment at the end of a unit or term (summative).

Teachers will assess pupil's work in science using a range of assessment for learning strategies during lessons and through marking written work. Written or verbal feedback should be provided to the pupils to highlight what they have done well and to identify how they can progress in the future. Older pupils are encouraged to assess their own learning. The teacher can then use this information to plan appropriately for the next lesson.

Resources to assess pupils' scientific knowledge and understanding at the end of each unit of science are available in TEAMS under the ASSESSMENT folder.

At the end of KS1, teachers make a judgement of the pupils' work in science to decide whether they have reached the expected standard. At the end of KS2 teachers also make a judgement as to whether pupils have reached the expected standard in science. Teacher assessment exemplification documents provide examples of pupils' work to support teachers in making judgements against the statutory TA frameworks for science at the end of each key stage.

The subject leader will keep samples of pupils' work in a portfolio to demonstrate the expected level of achievement in science for each year group.

Resources

Practical science resources are to be found in two main locations in the school. Larger resources are kept in two tall cupboards in the corridor area between KS1 and KS2. Smaller resources are kept in labelled blue trays in the open area outside upper KS2 classes. A list of the resources to be found in each place can be found on the inside of the cupboard doors and on the side of the tall tray unit in KS2. A list of all resources is also attached as Appendix 3 to this policy.

In addition to this, each class base should have a set of laminated enquiry planning boards to support the pupils' planning of fair tests.

There is a range of resource books and worksheets available for staff to photocopy and these are kept by the science subject leader.

There is a good selection of books available in the school library to support scientific ideas and concepts and about famous scientists from the past.

Monitoring and Review

It is the responsibility of the subject leader to carry out regular monitoring of the quality of the science teaching and learning throughout the school. This will be planned and carried out with the Head teacher in three ways:

- Observing teaching;
- Monitoring planning of science lessons;
- Monitoring pupils' recording in science books.

Feedback to staff should take place at the earliest opportunity.

The subject leader is also responsible for supporting colleagues in their planning and teaching and informing staff of the latest developments in the teaching of the science.

Health and Safety

Teachers should plan carefully to anticipate any risks when working with science equipment or in an outdoor environment. Teachers should share these risks with the pupils and discuss how to reduce the risks. In the resources cupboards and trays there are safety gloves and safety goggles.

The school is a member of CLEAPSS which provides health and safety advice to schools. If you are in any doubt about the health and safety implications of any scientific activity they can be contacted and will provide up to date advice.

The Headteacher or science lead will be able to provide the username and password for access to this resource.

Appendix 1

Science Long Term Planning Overview

Year	Autumn	Spring	Summer
Y1	Animals including Humans	Everyday Materials	Plants Seasonal Changes
Y2	Animals including Humans	Use of Everyday Materials	Plants All Living Things and their Habitats
Y3	Rocks Light	Forces and Magnets	Animals including Humans Plants
Y4	Sound States of Matter	Electricity	Living Things and their Habitats Animals, including Humans
Y5	Properties and Changes of Materials	Earth and Space Forces	Living Things and their Habitats Animals including Humans
Y6	Light Electricity	Evolution and Inheritance (Science Revision)	Living Things and their Habitats Animals including Humans

Appendix 2

Fair Test (controlled investigations)

Changing one variable or factor and observing or measuring the effect, while keeping the other factors the same.

Examples: Which ball rolls further, the smaller or larger ball? How does the temperature of water affect the rate at which sugar dissolves?

Pattern Seeking Enquiry

Making observations and recordings related to natural phenomena, or carrying out surveys, where variables cannot be readily controlled, and seeking patterns in the data.

Examples: Do the tallest people have the longest feet? Do dandelions in the shade have longer leaves than those in the light?

Identifying, Classifying and Grouping Enquiries

Using observations or measurements to classify a range of objects or events into manageable sets, or recognising objects and events as members of particular sets.

Examples: Which materials conduct electricity? How can we group these invertebrates? Are all materials attracted to a magnet?

Exploring/Observing Over Time Enquiries

Making observations of objects or events, or making a series of observations over time.

Examples: How does frog spawn change in one month? What happens when different liquids are added together?

Problem Solving Enquiries

Using their own ideas to solve scientific problems.

Examples: How could you make the car cross the gap without touching it? How could you drop an egg from 1m without it breaking?

Researching Using Secondary Sources

Preparing for an enquiry by looking at work done by others, searching the internet or using data which would not be available.

Examples: How are drinks kept warm? Which planets take the longest to orbit the sun?

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Appendix 3

Resource	Quantity	Location
Earth & Beyond		
Solar System Model	1	Cupboard 1
Electricity		
Electricity Kits	10	Cupboard 1
Rechargeable Batteries and Chargers	10	Cupboard 2
Bulbs (1.5V)	100	tray
Battery Holders - single (size C)	30	tray
Battery Holders - double (size C)	20	tray
Battery Holders - single & double (AA)	50	tray
Battery cells (AA & size C)	lots	tray
Crocodile clips with wires	30	tray
Wires (various lengths and thicknesses)	lots	tray
Wires on reels (various thicknesses)	3	tray
Wire strippers	1	tray
Screwdriver	18	tray
Copper Track	1 reel	tray
Bulb Holders	lots	tray
Motors	13	tray
Symbol cards	6 packs	tray
Switches	26	tray
Buzzers	13	tray
LEDs	11	tray
Light & Dark		
Torches & batteries	36	tray
Torches (medium)	4	tray
Light Box and Optical Set	1	Cupboard 2
Concave & Convex Mirrors	10	Cupboard 2
Kaleidoscope	2	Cupboard 2
Human Eye Model	1	Cupboard 2
UV light, gel and pen set	1	Cupboard 2
Colour Filters (red and blue)	8	Cupboard 2
Colour Paddles (red and blue)	6	Cupboard 2
Sound		
Human Ear Model	1	Cupboard 2
Sound Prisms	12	Cupboard 2
Sound Box	1	Cupboard 2
Forces		
Horseshoe magnets	8	tray
Bar magnets	25	tray
Button and mini bar magnets	lots	tray

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fridge magnets	3	tray
magnetic strips	20	tray
Giant Magnetic Wands (10) and marbles (40)	1 set	Cupboard 1
Magnetic Materials Testing Kit	1	Cupboard 1
Iron Filings in sealed containers	10	Cupboard 1
Pulleys large triple	2	tray
Pulleys large double	2	tray
Pulleys large single	2	tray
Pulleys medium triple	1	tray
Pulleys medium double	2	tray
Pulleys medium single	2	tray
Pulleys small triple	6	tray
Pulleys small double	6	tray
Pulleys small single	6	tray
Marbles (mixed sizes)	1 box	tray
Rocket Factory class kit	1	tray
Plastic boat hulls	8	tray
Boats (various sizes)	20	large tray
Springs (various sizes)	lots	tray
Push & Pull Meters (5N)	3	tray
Push & Pull Meters (10N)	3	tray
Push & Pull Meters (20N)	3	tray
Push & Pull Meters (30N)	3	tray
Force-meters (2.5N)	5	tray
Force-meters (5N)	13	tray
Force-meters (10N)	6	tray
Force-meters (20N)	2	tray
Force-meters (30N)	4	tray
Force-meters (50N)	3	tray
Ramps	6	Cupboard 1
Slinky	8	Cupboard 1
Materials and Their Properties		
Metal discs (8 metals)	6 packs	tray
Metal strips (12 metals)	5 packs	tray
Metal cubes (6 metals)	1 set	tray
Balloons	2 packs	tray
Changing Materials		
Minimum-maximum thermometers	2	tray
Window thermometer	1	tray
Forehead thermometers	20	tray
Thermo-stick	1	tray
Stick thermometers	21	tray
Wall thermometers	6	tray

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Candles	8	tray
Tea lights	14	tray
Sand Trays	6	Cupboard 1
Polystyrene Cups	144	Cupboard 1
Volcano model	1	Cupboard 1
Foil Cases	80	Cupboard 1
Tea Light Holders	10	Cupboard 1
Rocks and Soils		
Rock Collection (8 types)	1	tray
Fossils	2	Cupboard 1
Fossil Collection (9 examples)	1 set	Cupboard 1
Soil Collection (4 types)	1 set	Cupboard 1
Combining and Separating Materials		
Funnels (various sizes)	33	tray
Sieves (small)	3	tray
Sieves (large)	2	tray
Filter Paper	2 packs	tray
Metal sieves (graduated)	3	Cupboard 1
Riddle	2	Cupboard 1
Jumbo Eye Droppers	12	Cupboard 2
Habitats		
Mini Microscopes	8	tray
Pooters	25	tray
Bug Jars	15	tray
Jumbo Bug Jars	6	Cupboard 2
Pond Bug Dials	10	tray
Pond life sorting keys and booklets	1 pack	tray
Freshwater Sorting Key	5	Cupboard 2
Woodland Sorting Key	9	Cupboard 2
Magnifying Glasses	19	tray
Large Magnifier	1	tray
2 way microscopes	2	tray
Tripod magnifier	1	tray
Jumbo Magnifiers	12	Cupboard 2
Ant Mountain	1	Cupboard 2
Worm World	1	Cupboard 2
Containers (150ml)	10	Cupboard 2
Containers (20ml)	10	Cupboard 2
Butterfly Garden & Vouchers	3	Cupboard 2
Butterfly House (wood & perspex)	1	Cupboard 2
Lifecycle Bag (velcro)	1	Cupboard 2
Food Chain Flipcharts	5	Cupboard 2

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Disposable Gloves	1 pack	Cupboard 2
Plants and Seeds		
Seeds and growing cards	lots	Cupboard 2
Humans and Keeping Healthy		
Pulsemeters	5	tray
Stethoscopes	10	tray
Teeth X-Rays	4	tray
Teeth Models (enlarged)	1 set	tray
Teeth	lots	tray
Teeth in jaw models (large)	1	tray
Teeth in jaw models (small)	2	tray
Model Dental Care Kit	1	Cupboard 2
Disposable mouth mirrors	100	tray
Human Torso Model with removeable organs	1	Cupboard 2
Pumping Heart Model	1	Cupboard 2
Human Skeleton (full size)	1	library
Human Skeleton (full size in pieces)	1	library
Human Skeleton (half size)	1	Cupboard 2
Humans Compared to Animals		
Animal X-Rays	28	Cupboard 2
Human X-Rays	18	Cupboard 2
Darwin Poster and Notes	1	Cupboard 2
Miscellaneous		
Safety goggles	30	tray
Tape Measures	4	tray
Measuring spoon sets	8	tray
Petri dishes	lots	tray
Pipettes	28	tray
Bubble blowers	7	tray
Metal spoons (large)	7	tray
Metal spoons (small)	8	tray
Plastic spoons	17	tray
Perspex sheets	4	tray
Wooden pegs	31	tray
Plastic tubing (various lengths)	19	tray
Syringes (various sizes)	lots	tray
Water Timers (30 secs, 1 min, 2 mins)	1 of each	tray
Tockers (5, 10, 15, 20 seconds)	1 of each	tray
Sand Timers	2	tray
Digital timer	1	tray