



Gedney Church End and Lutton St. Nicholas Federated Primary Schools

Science Policy

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Introduction

Science stimulates and excites pupils' curiosity about phenomena and events in the world around them. It also satisfies their curiosity with knowledge. Because science links direct practical experience with ideas, it can engage learners at many levels. Scientific method (working scientifically) is about developing and evaluating explanations through experimental evidence and modelling. This is a spur to critical and creative thought. Through science, pupils understand how major scientific ideas contribute to technological change, impacting on industry, business and medicine and improving the quality of life. Pupils recognise the cultural significance of science and trace its world-wide development. They learn to question and discuss science-based issues that may affect their own lives, the direction of society and the future of the world.

At Key Stage 1 pupils observe, explore and ask questions about plants, animals (including humans), living things and their habitats, everyday materials and seasonal changes. They begin to work together to collect evidence to help them answer questions and to link this to simple scientific ideas. They begin to evaluate evidence and consider whether tests or comparisons are fair. They use reference materials to find out more about scientific ideas. They share ideas and communicate them using scientific language, drawings, charts and tables with the help of ICT if it is appropriate.

At Key Stage 2 pupils learn about how to work scientifically, living things and their habitats, plants, animals (including humans), rocks, light, forces and magnets, states of matter, sound, electricity, properties and changes of materials, earth and space, evolution and inheritance. They make links between ideas and explain things using simple models and theories. They apply their knowledge and understanding of scientific ideas to familiar phenomena, everyday things and their personal health. They think about the effects of scientific and technological developments on the environment and in other contexts. They carry out more systematic investigations, working on their own and with others. They use a range of reference sources in their work. They talk about their work and its significance, using a wide range of scientific language, conventional diagrams, charts, graphs and ICT to communicate their thoughts and ideas.

Purpose

1. It establishes an entitlement for all pupils.
2. It establishes expectations for the standards to be achieved.
3. It builds on what pupils have learned previously and promotes continuity and coherence across the Federation.
4. It states the Federation's approach to this subject in order to promote public, and particularly parents' and carers', understanding of the curriculum.

Expectations

The federation has developed a detailed and comprehensive approach to the assessment of pupils in science. This is based upon age-related expectations during the autumn, spring and summer terms. For pupils to meet age-related expectations, the following model is used:

- 000%-075% of statements evidenced: **Working at an Emerging level**
- 076%-090% of statements evidenced: **Working at an Expected level**
- 091%-100% of statements evidenced: **Working at an Exceeding level**

Pupil Progress Meetings are held three times per year and the Science Subject Leader will ensure that the right level of support is in place for teachers and pupils to meet challenging targets. All pupils are assessed on an ongoing basis and records of coverage, progress and attainment are maintained and subject to regular review by the Science Subject Leader and Head Teacher.

By the end of each National Curriculum year, it is expected that the majority of pupils will be working at or above age-related expectations in Science with this proportion increasing over time.

Aims

1. To stimulate and excite pupils' curiosity about changes and events in the world.
2. To satisfy this curiosity with knowledge.
3. To engage pupils as learners at many levels through linking ideas with practical experience.
4. To help pupils to learn to question and discuss scientific issues that may affect their own lives.
5. To help pupils develop, model and evaluate explanations through scientific methods of collecting evidence using critical and creative thought.
6. To show pupils how major scientific ideas contribute to technological change and how this impacts on improving the quality of our everyday lives.
7. To help pupils recognise the cultural significance of science and trace its development.

Entitlement and Curriculum Provision

Science is a core subject of the National Curriculum and pupils will undertake some science activity every week at both key stages. The work covered in Key Stage 1 will reflect the Science Programmes of Study within the New Primary Curriculum which was introduced to pupils in years 1, 3, 4 and 5 in September 2014 and to pupils in years 2 and 6 in September 2015.

Pupils in reception will develop their knowledge, understanding and skills through play activities and direct teaching from which the pupils undertake planned tasks. The relevant early learning goals are as follows:

- ELG 13: People and Communities
- ELG 14: The World
- ELG 15: Technology

Planning in Key Stages 1 and 2 will take into account that the Federation places a strong emphasis on the development of pupils' skills of being able to Work Scientifically. In the substantial majority of lessons these skills will be taught alongside the knowledge and understanding strands. They will also form the basis for assessment within the Federation's Assessment Without Levels system. It is expected that every science short or medium term plan will give pupils an opportunity to develop their skills of Working Scientifically.

Year 1 Programme of Study

Working Scientifically:

- Asking simple questions and recognising that they can be answered in different ways
- Observing closely using simple equipment
- Performing simple tests
- Identifying and classifying
- Using their observations and ideas to suggest answers to questions
- Gathering and recording data to help in answering questions

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

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

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

Seasonal Changes:

- Observe changes across the four seasons
- Observe and describe weather associated with the seasons and how day length varies

Year 2 Programme of Study

Working Scientifically:

- Asking simple questions and recognising that they can be answered in different ways
- Observing closely using simple equipment
- Performing simple tests
- Identifying and classifying
- Using their observations and ideas to suggest answers to questions
- Gathering and recording data to help in answering questions

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
- Identify and name a variety of plants and animals in their habitats including micro-habitats
- 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

Plants:

- Observe and describe how seeds and bulbs grow into mature plants
- Find out and describe how plants need water, light and suitable temperature to grow and stay healthy

Animals including Humans:

- Notice that animals, including humans, have offspring that 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

Uses of 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 3 Programme of Study

Working Scientifically:

- Asking relevant questions and using different types of scientific enquiries to answer them
- Setting up simple practical enquiries, comparative and fair tests
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment including thermometers and data loggers
- 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
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings

Plants:

- Identify and describe the functions of different parts of flowering plants including the 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

Animals including Humans:

- Identify that animals, including humans, need the right types and amount of nutrition and that they cannot make their own food as they get nutrition from what they eat
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement

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

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

Forces and Magnets:

- Compare how things move on different surfaces
- Notice that some forces need contact between two 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 two poles
- Predict whether two magnets will attract or repel each other depending on which poles are facing

Year 4 Programme of Study

Working Scientifically:

- Asking relevant questions and using different types of scientific enquiries to answer them
- Setting up simple practical enquiries, comparative and fair tests
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment including thermometers and data loggers
- 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
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings

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

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

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
- 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 the strength of the vibrations that produced it
- Recognise that sounds get fainter as the distance from the sound source increases

Electricity:

- Identify common appliances that run on 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

Year 5 Programme of Study

Working Scientifically:

- 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 findings where 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
- Identifying scientific evidence that has been used to support or refute ideas and arguments

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 processes of reproduction in some plants and animals

Animals including Humans:

- Describe the changes as humans develop to old age

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
- 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
- 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 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 6 Programme of Study

Working Scientifically:

- 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 findings where 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
- Identifying scientific evidence that has been used to support or refute ideas and arguments

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 micro-organisms, 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 bodies function

- Describe the ways in which nutrients and water are transported within animals, including humans

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

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 to 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

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

Teaching and Learning

All lessons will have clear learning objectives which will be shared and reviewed with the pupils effectively.

A variety of strategies, including questioning, discussion, concept mapping and marking, will be used to assess progress. The information will be used to identify what should be taught next.

Science activities will inspire the pupils to experiment and investigate the world around them and to help them raise their own questions such as "Why...?", "How...?" and "What happens if...?".

Science activities will develop the skills of enquiry, observation, locating sources of information, selecting appropriate equipment and using it safely, measuring and checking results, making comparisons and communicating results and findings.

Lessons will make effective links with other curriculum areas and subjects, especially literacy, numeracy and Computing.

Science activities will be challenging, motivating and extend pupils' learning.

Pupils will have frequent opportunities to develop their skills in, and take responsibility for planning investigative work, selecting relevant resources, making decisions about sources of information, carrying out activities safely and deciding on the best form of communicating their findings. Mastery within science is predicated on effective decisions being made by pupils in this important area.

Special Educational Needs

Teachers are best placed to judge whether the learning objectives meet the learning needs of individual children and to adapt these to provide appropriate opportunities for all children to succeed. Teaching activities will be adapted to ensure that children with special educational needs of all kinds may participate fully and demonstrate their achievements.

All teachers are aware that due to the cross-curricular nature of science, children with limited literacy and numeracy skills still have the capacity to excel in science. Where this is felt to be relevant, alternative forms of expression and recording will be explored by the class teacher so that such pupils can demonstrate their awareness of key scientific concepts that do not depend on a written, verbal or data-driven response.

Assessment and Recording

Assessment will be based on a combination of teacher assessment and pupil self-assessment. Children will be assessed at the end of each taught unit and this will be included in the annual report to parents. In all aspects of assessment, pupils' attainment will be compared to age-related expectations with three possible outcomes, as follows:

- **Emerging** towards age-related expectations
- **Expected** attainment within age-related expectations
- **Exceeding** age-related expectations

It is expected that the majority of pupils will be working at or above age-related expectations and that this proportion will increase over time.

Inclusion

Planning at all levels will ensure that the interests of girls and boys are taken into account. The pupils will work individually, in pairs, as part of a small group and as a whole class each term. They will use a variety of means for communicating and recording their work.

Educational support staff, when available, will work as directed by the teacher.

All pupils, including those with special educational needs, will undertake the full range of activities. Teacher assessment will determine the depth to which individuals and groups go during each unit of work.

Curriculum

Long-term planning:

- Planning in EYFS will embrace the relevant Early Learning Goals with curriculum content being accessed through a broad range of rich, stimulating and challenging child-initiated learning opportunities within each setting. Adult intervention will be used to frame and extend the understanding of all pupils with planning to support this.
- Planning for Key Stage 1 will follow a two-year rolling programme, ensuring full coverage of the relevant Programmes of Study
- In Lower Key Stage 2, the Programmes of Study will be covered on a two-year rolling programme, which reflects the organisation of the New Primary Curriculum
- In Upper Key Stage 2, the Programmes of Study will be covered on a two-year rolling programme, which reflects the organisation of the New Primary Curriculum

Medium-term planning:

- This will identify within each unit of work the learning objectives, science activities, assessment opportunities, the vocabulary to be taught and used, safety issues, how information and communication technology and resources should be used
- There will be medium-term planning grids for each unit of work and where applicable, this will be taught as part of the Cornerstones Curriculum Unit that is being followed by each parallel class.
- Teachers will evaluate each unit of work on completion

Homework

No specific homework will be set at either of the Key Stages, although teachers may choose to involve the pupils, parents and carers in small investigative activities related to the work in hand or to complete tasks not finished within the lesson.

The Contribution of Science to Other Aspects of the Curriculum

The teaching of literacy, numeracy and Computing is promoted strongly in science as part of the Federation's drive to raise standards in English and mathematics. Science is used to extend and enable the pupils to practice the skills of language and literacy and numeracy.

- **Literacy:** in particular at Key Stage 1, pupils will be encouraged to use their speaking and listening skills to describe what they see and explain what they are going to do next. At Key Stage 2 pupils will be encouraged to develop their skills of writing to record their planning, what they observe and what they found out. In relation to science, they will be applying their literacy skills at levels similar to those that they are using in their English work, notwithstanding alternative recording arrangements for pupils who have a higher ability in science than they do in reading, writing or speaking and listening.
- **Numeracy:** at both Key Stages pupils will be expected to use their knowledge and understanding of measurement and data handling at appropriate levels. In science, they will be applying their numeracy skills at levels similar to those that they are using in their mathematics lessons, notwithstanding alternative recording arrangements for pupils who have a higher ability in science than they do in numeracy.
- **Computing:** pupils will use ICT to locate and research information (CD ROM, internet), record findings (using text, data and tables), log changes to the environment over time (sensing equipment, data loggers), gain confidence in using calculators, VCR, video cameras, digital cameras, and tape-recorders, as well as the computers and tablet PC's (Apple)
- **Spiritual development:** spiritual development will be encouraged through reminding pupils of the wonder of science and the effect of scientific discoveries on the modern world. Topical scientific issues will also be discussed as appropriate.
- **Personal, social and health education:** health education will be taught as part of the units on animals including humans, living things and their habitats, evolution and inheritance

The Contribution of Science to the Development of Unique British Values

In our federation, we recognise the duty placed on all schools to promote what are now known as Unique British Values. All subjects within the National Curriculum have the capacity to make a direct contribution to developing our pupils' understanding of what it means to be British in the 21st Century.

The Department for Education defines Unique British Values as follows:

1. **Democracy:** respect for democracy and support for participation in the democratic process
2. **The Rule of Law:** respect for the basis on which the law is made and applies in England
3. **Individual Liberty:** support and respect for the liberties of all within the law
4. **Mutual Respect and Tolerance:** support for equality of opportunity for all and respect and tolerance of different faiths, religious and other beliefs

The subject of Science can contribute to the development of these values in the following ways:

- Focusing on the lives of significant British scientists from history
- Understanding how British society has been influenced by key scientific ideas throughout history
- Promoting tolerance and understanding of different cultures by learning from the scientific ideas that have been developed over time
- The exploration of sensitive issues whilst maintaining tolerance and respect for the views and beliefs of others
- Visits to places of scientific significance including buildings, places and museums
- Helping pupils to understand the history of British culture and the important contribution made by different cultural groups both now and in the past
- Working co-operatively with others, sharing ideas and resources, peer assessment and encouraging support for each other
- Exploring controversial issues in science including oppression, the tension between scientific and religious ideas, equal opportunities including the under-representation of women, dogma, environmental issues, climate change and over/under population
- How key scientific advances over time have promoted a sense of belonging and shared identity within the local, regional, national, continental and international community

The Learning Environment

Stimulating learning environments will be created with children's work being celebrated through display where appropriate. It is recognised that Science has very strong links with Literacy, Numeracy and Computing and much of the work that the children produce will reflect their broader skills. It is also expected that the learning environment will serve to educate children through the asking of questions, displays of equipment and photographic records of work that have been completed and any visits to support their understanding.

Safe Practice

The Federation's Science policy takes account of health and safety requirements. Health and Safety awareness forms an integral part of the pupils' learning. Pupils will be taught to recognise hazards and take appropriate action. In these instances, teaching staff will ensure that appropriate Risk Assessments have been developed and incorporated within their short and medium term planning. These will be subject to monitoring and scrutiny by a variety of agencies including in-house monitoring, the Educational Visits Co-ordinator (EVC) governor scrutiny, the Education Advisor, OfSTED and any other appropriate body.

Monitoring and Evaluation

All teachers will be responsible for monitoring standards. This will be overseen by the Head Teacher and Senior Management Team. The Head Teacher currently fulfils

the role of Science Subject Leader and regular meetings of the Core Subject Leadership Team will ensure effective management at all levels.

One Pupil Progress Meeting will be held each term. The Science Subject Leader will ensure that all teachers and pupils are fully supported so that challenging targets are met over time. It will thus be expected that the proportion of pupils working at or above age-related expectations will increase on an annual basis.

A governor will be allocated to take a specific interest in Science and will discuss developments with teachers, the Science Subject Leader and the Head Teacher. A minimum of two visits will be made to each of the schools within our federation by the named governor and the Governor Visits Protocol will be used to ensure that each visit has clarity, purpose and clear lines of reporting. All reports produced by the nominated governor will be copied to the Science Subject Leader, Head Teacher, the Chair of the Standards Committee and the Chair of the Governing Body.

Agreement and Review

The Science Subject Leader will be responsible for reporting to the governors' Standards Committee about the quality of the implementation of the Science Policy and its impact on standards. It will be reviewed on an annual basis but it will be the responsibility of the Chair of the Standards Committee to ensure that this is carried out during the first meeting of the committee in the autumn term of each respective school year.

Signed by Head Teacher:

Ratified by Governors: October 2012

Updated: December 2015