

## Science at Granby Primary School 2015

### Rationale

As science permeates every aspect of daily life, we at Granby aim to introduce scientific processes to our children so that they might come to some understanding of the world in which they live. An introduction to scientific processes contributes to the intellectual development of our children and it is important that they are able to apply a scientific approach to many practical, social and economic issues encountered in modern daily life. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave and analyse causes. We believe that all pupils of this school must have regular access to science appropriate to their age and stage of development and that emphasis should be given to this as a core subject.

### Aims and Purposes

The aims and purposes of teaching science at Key Stages 1 and 2 at Granby are those that underpin the National Curriculum programme of study. These are that science teaching should offer opportunities for children to:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- be equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

### Scientific Knowledge and Conceptual Understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each block of knowledge and concepts in order to progress to the next stage.

### Knowledge and Understanding

Children should:

- be curious about things they observe, and experience and explore the world about them with all their senses;
- use this experience to develop their understanding of key scientific ideas and make links between different phenomena and experiences;
- begin to think about models to represent things they cannot directly experience;
- try to make sense of phenomena, seeking explanations and thinking critically about claims and ideas.

### The Nature, Processes and Methods of Science

'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should be embedded within the content so that pupils learn to use a variety of approaches to answer relevant scientific questions.

Children should:

- acquire and refine the practical skills needed to investigate questions safely;

- develop skills of observation over time, pattern seeking, identifying, classifying and grouping, comparative and fair testing through controlled investigations , predicting, asking questions, making inferences, concluding and evaluating based on evidence and understanding and use these skills in investigative work;
- practise mathematical skills *eg counting, ordering numbers, measuring to an appropriate number of decimal places, drawing and interpreting graphs and bar charts* in real contexts;
- learn why numerical and mathematical skills are useful and helpful to understanding.
- seek answers to questions through collecting, analysing and presenting data.

### Language and Communication

Children should:

- think creatively about science and enjoy trying to make sense of phenomena;
- develop language skills through talking about their work and presenting their own ideas using sustained and systematic writing of different kinds;
- use discussion to probe and remedy misconceptions to build a secure foundation;
- use scientific and mathematical language including technical vocabulary and conventions, and draw diagrams and charts to communicate scientific ideas;
- research and extract information from sources such as reference books, the internet and video clips.

### Values and Attitudes

Children should:

- work with others, listening to their ideas and treating these with respect;
- develop respect for evidence and evaluate critically ideas which may or may not fit evidence available;
- develop a respect for the environment and living things and for their own health and safety.

### Features of Progression

To ensure children make progress in science, teaching should provide opportunities for children, as they move through Key Stages 1 and 2, to progress:

- from using everyday language to increasingly precise use of technical and scientific vocabulary, notation and symbols;
- from personal scientific knowledge in a few areas to understanding in a wider range of areas and of links between areas;
- from describing events and phenomena to explaining events and phenomena;
- from explaining phenomena in terms of their own ideas to explaining phenomena in terms of accepted ideas or models;
- from participating in practical science activities to building increasingly abstract models of real situations;
- from unstructured exploration to more systematic investigation of a question;
- from using simple drawings, diagrams and charts to represent and communicate scientific information to using more conventional diagrams and graphs.

### Building on Children's Earlier Experiences

In reception and nursery classes children have opportunities to find out and learn about the world in which they live. These experiences are likely to include:

- asking questions about why things happen;
- investigating a wide variety of objects and materials in the natural and man-made world;

- learning about themselves and living things;
- looking closely at similarities and differences, patterns and change;
- talking about their observations and sometimes recording them.

Science is taught as an integral part of the topic work covered during the year. The scientific aspects are related to the objectives set out in the Early Learning Goals (ELGs) which underpin the curriculum planning for children aged 3-5. It makes a significant contribution to developing a child's understanding of the world.

### The School Curriculum

The programmes of study for science are set out year-by-year for Key Stages 1 and 2. The distribution of content across the year groups can be seen online on the schools website.

### Key Stage 1

The principal focus of science teaching in Key Stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over time, noticing patterns, grouping and classifying, carrying out simple comparative tests and finding out things using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources such as books, photographs and videos.

Although 'working scientifically' is described separately in the programme of study it must always be taught through and clearly related to the teaching of the substantive content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge.

### Key Stage 1 Programme of Study-Years 1 and 2

#### Working Scientifically

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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 answer questions
- gathering and recording data to help in answering questions

### Year 1 Programme of Study

#### Plants

Pupils should be taught to:

- identify and name a variety of common wild and garden plants, including deciduous and evergreen trees
- identify and describe the basic structure of a variety of common flowering plants, including trees.

### Animals including humans

Pupils should be taught to:

- identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals
- identify and name a variety of common animals that are carnivores, herbivores and omnivores
- describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)
- identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

### Everyday materials

Pupils should be taught to:

- 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 everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties.

### Seasonal changes

Pupils should be taught to:

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

### Year 2 Programme of Study

#### Living things and their habitats

Pupils should be taught to:

- 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 upon 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

Pupils should be taught to:

- 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.

### Animals, including humans

Pupils should be taught to:

- 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.

### Uses of everyday materials

Pupils should be taught to:

- identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, 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.

### Lower Key Stage 2-Years 3 and 4

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 should 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. They should 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 should draw simple conclusions and use some scientific language, first, to talk about and later, to write about what they have found out.

'Working scientifically' is described separately at the beginning of the programme of study but must always be taught through and clearly related to the substantive science content.

Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

### Lower Key Stage 2 Programme of Study

#### Working Scientifically

During years 3 and 4 pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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.

### Year 3 Programme of Study

#### Plants

Pupils should be taught to:

- 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.

#### Animals, including humans

Pupils should be taught to:

- 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.

#### Rocks

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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 source is blocked by a solid object
- find patterns in the way that the size of shadows change.

#### Forces and Magnets

Pupils should be taught to:

- 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
- 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

##### Living things and their habitats

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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 produce it
- recognise that sounds get fainter as the distance from the sound source increases.

##### Electricity

Pupils should be taught to:

- identify common appliances that run on electricity
- construct a simple series electrical circuit, identifying and naming its basic parts, including 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 circuit 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.

### Upper Key Stage 2-Years 5 and 6

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 should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. 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 scientific knowledge and understanding to explain their findings.

'Working and thinking scientifically' is described separately at the beginning of the programme of study but must always be taught through and clearly related to the science content.

Pupils should read, spell and pronounce scientific vocabulary correctly.

### Upper Key Stage 2 Programme of Study

#### Working Scientifically

During Years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings 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 or arguments.

### Year 5 Programme of Study

#### Living things and their habitats

Pupils should be taught to:

- describe the difference in life cycles of a mammal, an amphibian, an insect and a bird
- describe the life process of reproduction in some plants and animals

#### Animals, including humans

Pupils should be taught to:

- describe the changes as humans develop to old age.



## Earth and Space

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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 greater effect.

## Light

Pupils should be taught to:

- recognise that light appears to travel in straight lines
- use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
- use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

## Year 6 Programme of Study

### Living things and their habitats

Pupils should be taught to:

- 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

Pupils should be taught to:

- 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.

### Properties and changes of materials

Pupils should be taught to:

- 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 acids on bicarbonate of soda.

### Evolution and inheritance

Pupils should be taught to:

- 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.

### Electricity

Pupils should be taught to:

- 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

### Cross-Curricular Links

As well as making its own distinctive contribution to the school curriculum, science contributes to the wider aims of primary education. It offers a range of contexts for the development of Literacy, Numeracy, Information Technology and thinking skills. Through the science curriculum, children can also learn about aspects of personal, social and health education (PHSE) and citizenship.

### Teaching Strategies and Planning

It is important that the teacher identifies the most appropriate teaching strategy to suit the purpose of a particular learning situation.

There are a variety of ways in which the teaching may be effective and our school has a tradition for encouraging learning through investigation, with an emphasis on first hand experience. It is however, frequently acceptable to use demonstration, research, exploration and teacher led investigations when circumstances, resources and the needs of individuals and groups allow.

Teachers need to use their flair, enthusiasm and professional judgement to identify the most appropriate, enjoyable and safe methods for the work being conducted.

They need to plan to ensure:

- breadth, balance and relevance
- equality of access for all children
- appeal to both boys and girls of all cultural backgrounds
- that the skills and strategies involved in working scientifically are continuously developed and reinforced
- continuity and progression
- differentiation
- links across the curriculum

### In the Classroom

Teachers should look for opportunities to praise co-operation and safe, considerate behaviour. Children should be encouraged to work as individuals, in pairs, in groups and also as a whole class when appropriate.

### Equal Opportunities

Every effort is made to ensure that science activities and investigations are equally interesting to both boys and girls from all cultural backgrounds.

Children with Special Educational Needs are involved in all work planned from the Programme of Study at an appropriate level. Teacher's plans show how the activities have been adapted or extended for children of different abilities.

### Monitoring and review

The Curriculum Plans for Science indicates the Programmes of Study to be considered for each term.

Evidence of attainment is seen in children's science books and scrutiny of work and pupil conferencing are regularly conducted.

### Resources

The school's science resources are housed at the top of the stairs outside the KS2 hall. It is the responsibility of all the staff to return equipment promptly after use.

### Safety and Care

The safe use of equipment is promoted at all times. The CLEAPSS 'Model Health and Safety Policy for Science' has been adopted by the staff and the school's Health and Safety Policy should be consulted for details regarding the safe use of scissors, craft knives, electrical equipment, heavy equipment and the use of tools.

Any insects, or animals, being used for study should be treated with respect and returned to their habitat as soon as the activity is completed. Leaves and berries of a poisonous nature should be avoided in classroom displays and their dangers made clear to the children. When working with live materials teachers need to be aware that some children suffer from allergic reactions and that spores can trigger asthma attacks.

### Review

This policy is to be reviewed by the Staff and Governors every 4 years.