Science

Curriculum Implementation

'A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. 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.'
(National Curriculum, 2014)

Programme of study

At Green Ridge, we adapt and use 'Switched on Science' as a Scheme of Work to outline the scientific progression across Key Stage One and Key Stage Two. By doing so, we ensure that teachers have the necessary resources and subject knowledge to support them in their subject teaching. As a minimum, Green Ridge seeks to provide children with the knowledge, skills and understanding outlined in the National Curriculum (2014). Teachers will follow the 'Switched on Science' scheme of study to assist with the planning of each unit in the curriculum. Working scientifically skills will be built into most lessons and evidenced through a range of investigations and experiments.

Key stage 1

Year 1

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

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
- 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

- 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 4 seasons
- observe and describe weather associated with the seasons and how day length varies

Year 2

Plants

- 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

- 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

- 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

Key stage 2

Year 3

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

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

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

Year 4

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 (°C)
- 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

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

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

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 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 6

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 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

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

Progression of Working Scientifically

'Working scientifically' skills will be taught through the scientific content in the programme of study. Teachers will evidence a range of working scientifically skills throughout the children's time at Green Ridge. The progression of these skills is outlined below.

Years 1 & 2	Years 3 & 4	Years 5 & 6
• 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	• 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.	• 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 when 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 a 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

How often is Science taught?

Children have a dedicated science lesson as a minimum one afternoon a week, lasting between 1 hour 40 minutes and 2 hours, which is delivered by their Class Teacher. In KS2 classes have split this into 2, 1 hour dedicated Science lessons a week. There will also be a dedicated Science week during the spring term where the teachers will teach a variety of science lessons or activities over the period.

Curriculum overview

At Green Ridge we are following the 'Switched on Science' scheme of work and teachers are using the planned units as a starting point for their lessons except for Year One where they do not follow the Rising Stars scheme of work, instead follow the national curriculum statements for Key Stage One . The unit themes will be taught in each year groups as outlined below.

Year One	Working Scientifically and Investigations Seasonal changes	Everyday Materials Seasonal changes	Animals, including humans Seasonal changes	Animals, including humans Seasonal changes	Plants Seasonal changes	Plants Seasonal changes
Year Two	Materials Monster	Squash, Bend, Twist and Stretch	Healthy Me	Young Gardeners	Little Masterchefs: Animals: Life cycles & staying healthy	Our Local Environment: Living things, habitats Food chains for animals
Year Three	Light and Shadows	Rocks, soils and fossils	Nappy Investigation	Forces and Magnets	Plants How does your garden grow?	Animals, nutrition, skeletons and muscles
Year Four	Teeth and Eating	States of matter	The Big Build	What's that sound?	Power it up	Living things and their habitats
Year Five	Out of this World	Amazing Reactions	Material World	Let's Get Moving	Circle of Life	Growing Up and Growing Old
Year Six	Healthy Bodies	Classifying Living Things	Electricity	Light	Evolution and inheritance	The Titanic

Please refer to Progression and Vocabulary documents for further information

Lessons

Lessons are timetabled weekly. This is made up of one afternoon of Science in KS1 and two separate hour-long lessons in KS2, allowing for lessons to be extended over multiple days but also allowing for shorter knowledge-based lessons. Children will record their learning within a separate Science book, which will be marked (see marking policy). When suitable, next steps should be included within lessons, so children have opportunities to progress within their learning, based on teachers' marking.

Across the school, a 'typical' Science lesson will include these key elements:

- Next steps/Revisit (10 minutes) - Lessons should always start with the classes next steps from the previous lesson. These can be presented to the children on the SMART TV, through written responses or through printed questions. All next steps will need to be completed by the children using blue pencil (KS1) or blue pen (KS2). The aim of the next step is to allow the children to revisit and consolidate their previous learning.
- Scientific Enquiry starter (5 minutes) – Children should be given a Science starter at the beginning of each lesson. A good resource to use here is Explorify. These starters/questions allow children to develop their scientific reasoning skills.
- Teaching input (15 minutes) with reference to the working scientifically skill they are going to be using in the lesson on that day. Children should remain an active participant in this part of the lesson as a new skill/topic is covered. Lessons should have a SMART board to accompany it, with a clear learning intention displayed.
- Practical element (10 minutes) – Children should be allowed to use their enquiry skills to explore their topic or skill practically. This may include specific experiments and equipment.
- Theory element (15 minutes) – Children should be able to link their practical work to their theory-based work and should get used to writing predictions or conclusions based upon what they have found out during the lesson.
- Focused plenary (5 minutes) – This can be a time for children to revisit what they have learnt as a class and should also be used as a time for children to self-assess their learning for that day.

Planning

As previously mentioned, lessons are created from the 'Switched on Science' materials, except for Year One. This will outline units and lesson objectives that must be completed within a series of lessons. Planning will need to be completed on the separate Science planning document. This allows teachers to review the 'Switched on Science' materials and allows them to build upon these materials to ensure that lessons are appropriately catered for individual cohorts and their needs. Planning should also link to the typical lesson structure above.

Sequencing

Lessons are sequenced using the 'Switched on Science' scheme. This scheme gives us a series of units to cover across a year. As a school we then handpick these units to link to wider topics that the students are studying. For example, Year 3 study the Stone Age in Autumn 2 and their Science topic is Rocks, Soils and Fossils. This is to ensure that cross-curricular links can be made to enable children's learning to stick. These links have been made, where possible, across the school. The way in which our lessons are sequenced also link to progression across the school. For example, Years 1, 2, 3 and 5 all complete some Science learning on Plants. Year 1 learn about planting and caring for the plants whilst referencing simple components of a plant. Year 2 learn about what plants need to survive and the plant life cycle from a seed to a mature plant. Year 3 revisit the parts of a plant but look deeper into their function. They also study how water is transported in plants and pollination/seed dispersal. Finally, in Year 5 children look at plant reproduction.

Assessment

In each unit studied, teachers will use a knowledge assessment as outlined in the 'Switched on Science' scheme. This will allow teachers to assess the children's subject knowledge during a unit. At the end of a unit, teachers will give the children the Switched-on Science Assessment Task to complete. This, in conjunction with teacher assessment from books, will allow the teacher to make an assessment, noting whether the children are working towards the expected standard or whether they have met the expected standard in the unit they have covered. These outcomes are recorded, on the year group assessment tracker document and feed into the summative assessment completed at the end of each year giving an overall attainment grade. Data will be submitted at the end of Key Stage 1 and Key Stage 2 summarising where the child is working in regard to their science knowledge and understanding.