

Coteford Junior School Progression in Science

Essential characteristics of scientists:

- **Fascination** - is excited and curious about natural phenomena occurring in the world around them
- **Knowledge** - demonstrates a high level of scientific knowledge and understanding
- **Enquiry** - can raise relevant questions which will further their scientific knowledge and understanding and suggest an appropriate type of scientific enquiry for investigating a question
- **Investigation** – confidently undertakes practical work in a variety of contexts, including fieldwork; and have the initiative to work independently or collaboratively
- **Works scientifically** - competently investigates questions: planning enquiries, working logically and systematically, making relevant observations, taking accurate measurements using a range of different equipment and using mathematical skills confidently when organising, recording and presenting and analysing results
- **Evaluation** - evaluates investigations, suggesting possible reasons for unexpected results and improvements to methods and carefully considers evidence supporting scientific ideas
- **Communication** - uses correct scientific vocabulary and refers to scientific ideas when interpreting and explaining results either verbally, in writing or as a diagram
- **Application** - applies knowledge independently in different contexts, across the curriculum and in real life
- **Passion** – displays a high level of interest in science at work in the world around them and is inspired to study scientific subjects to a higher level

Long term Overview for SCIENCE

Topics taught in the three main sciences (**Biology**, **Chemistry** & **Physics**) are indicated by these colours.

Year group	Throughout the year	Autumn	Spring	Summer
Year 3	<p>Plants – lifecycles</p> <ul style="list-style-type: none"> Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Investigate the way in which water is transported within plants. 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. <p>Observe the annual cycle of a range of plants e.g. when in the year different plants have buds, flowers, seeds or fruits. Gather evidence linked to their life cycle e.g. collect seeds, take photographs or make observational drawings. Review evidence at the end of the year to exemplify a range of plants' life cycles</p>	<p>Plants – lifecycles observe in different seasons</p> <ul style="list-style-type: none"> Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. <p>Animals including humans</p> <p>Nutrition</p> <ul style="list-style-type: none"> 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. <p>Movement</p> <ul style="list-style-type: none"> Identify that humans and some other animals have skeletons and muscles for support, protection and movement. 	<p>Plants – lifecycles observe in different seasons</p> <p>Rocks</p> <ul style="list-style-type: none"> 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. <p><i>Make links between the Plants, Rocks and Light topics explicit for the children.</i></p> <p>Forces</p> <ul style="list-style-type: none"> 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 	<p>Light</p> <ul style="list-style-type: none"> 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. <p>Plants – lifecycles observe in different seasons</p> <p>Plants - enquiry</p> <ul style="list-style-type: none"> 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 <p><i>*Plant any seeds collected when investigating lifecycles.</i></p>

Year Group	Throughout the year	Autumn	Spring	Summer
Year 4	<p>Living things & their habitats</p> <ul style="list-style-type: none"> • Visit local habitats at different times of the year & observe & collect evidence to show which plants and animals live there • Be able to name and identify a range of common plants which grow in local habitats, drawing on a range of different clues: <ul style="list-style-type: none"> -the appearance of stems, leaves, buds, flowers, seeds or berries & other fruits which may be present at different times of year -whether they lose all their leaves in autumn (are deciduous) or are evergreen. • Be able to name and identify a range of common animals which live in local habitats • Be able to use the information collected about plants and animals in local habitats to construct food chains in the summer term. 	<p>Living things & their habitats</p> <ul style="list-style-type: none"> • 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. <p>States of matter</p> <ul style="list-style-type: none"> • Compare and group materials together, according to whether they are solids, liquids or gases. • Describe the differences between solids, liquids & gases <ul style="list-style-type: none"> • 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). 	<p>Living things & their habitats Repeated to observe seasonal changes</p> <p>Animals including humans</p> <ul style="list-style-type: none"> • Describe the simple functions of the basic parts of the digestive system in humans. • Identify the different types of teeth in humans and other animals & their simple functions. <p>Electricity</p> <ul style="list-style-type: none"> • 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. 	<p>Living things & their habitats Repeated to observe seasonal changes</p> <p>Animals including humans</p> <ul style="list-style-type: none"> • Construct and interpret a variety of food chains based on first-hand experience, identifying producers, predators and prey. • Recognise that environments can change and that this can sometimes pose dangers to living things.

Year Group	Autumn	Spring	Summer
Year 5	<p>Sound</p> <ul style="list-style-type: none"> • Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium (solid, liquid or gas) 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. <p>Materials - Properties</p> <ul style="list-style-type: none"> • Compare and group together everyday materials (solids) on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. 	<p>Living things and their habitats</p> <ul style="list-style-type: none"> • 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. (could be done in Summer term with PSHE puberty) <p>States of matter</p> <p>REVISE - definitions of solids, liquids & gases using drama for modelling structure</p> <ul style="list-style-type: none"> • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. <p>Materials – Properties</p> <ul style="list-style-type: none"> • 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. 	<p>Forces</p> <ul style="list-style-type: none"> • 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. <p>Living things and their habitats</p> <ul style="list-style-type: none"> • 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. <p>Animals including humans</p> <ul style="list-style-type: none"> • Describe the changes as humans develop to old age. <i>Link to puberty and Sex Education</i>

Year Group	Autumn	Spring	Summer
Year 6	<p>Electricity</p> <ul style="list-style-type: none"> • 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. <p>Changes in materials</p> <ul style="list-style-type: none"> • 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. <p>Earth & Space</p> <ul style="list-style-type: none"> • 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. 	<p>Living things & their habitats</p> <ul style="list-style-type: none"> • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. • Give reasons for classifying plants and animals based on specific characteristics. • Identify how animals and plants are adapted to suit their environment in different ways <p>Animals including humans</p> <ul style="list-style-type: none"> • 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. 	<p>Evolution & Inheritance</p> <ul style="list-style-type: none"> • 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. • Explore further how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. <p>Light</p> <ul style="list-style-type: none"> • 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.

Intent

In our science teaching, we endeavour to ensure that pupils are engaged, excited and increasingly curious about natural phenomena occurring in the world around them and encourage them to ask questions and to discuss and explain their ideas. We provide opportunities to ensure progression in their scientific knowledge and understanding of the three main areas of science: biology, chemistry and physics and enable them to use their knowledge to communicate their ideas scientifically using correct vocabulary in a range of different ways.

Links between science topics and with other subjects are made to enhance learning of knowledge and skills across the curriculum and to illustrate how combined knowledge from different disciplines contribute to our understanding of the world. We aim for pupils to become increasingly confident in choosing and using the appropriate type of enquiry to use when investigating a question and competent when carrying out scientific enquiries and using specific scientific skills and equipment. As pupils move through the key stage, we expect them to increasingly develop the initiative to work independently and cooperatively with others when carrying out practical work or interpreting and discussing results and ideas and the ability to reason, think logically and work systematically and accurately.

We aim to increase the science capital of our pupils by making a range of beautiful, illustrated books about our world and child-friendly topic-based guides available to staff and pupils and providing opportunities to 'read around' the subject during independent reading time and guided reading; exciting experiences through enrichment days, topic-linked trips and in-school visitors; by discussing applications of science knowledge and skills in everyday life and in jobs and careers (including those of their own families); and engaging them in activities which can be done at home through our home learning platform (ItsLearning), where ideas and links to relevant websites and topical television programmes, as well as resources to support learning, are provided.

Implementation

Within all year groups and across the key stage, topics are sequenced so that pupils have been taught the relevant prior knowledge and skills required before studying a new topic. For progression documents see: <https://www.planassessment.com/product-page/plan-progression-in-knowledge>

Conceptually more challenging topics are taught later in the school year and due to the wide range of educational needs of our pupils, some of these are taught in a higher year group than the National curriculum suggests. Relevant prior learning is assessed and revised before beginning a new topic to inform planning. Scientific vocabulary is taught, with pre-teaching to some pupils if beneficial, and opportunities are provided for pupils to practise using correct vocabulary when asking questions or describing and explaining ideas, with support as needed. As pupils progress through the school, their knowledge of each topic is built upon and extended. Teachers use a variety of types of activity and learning resources from the medium-term plans to engage and excite pupils, selecting the most appropriate resources and activities to meet the needs of their class, including SEND pupils and those with English as an additional language. Opportunities to revise facts and apply knowledge in different contexts are built into lessons as are opportunities to assess understanding against key objectives and to revisit these with pupils who are not secure whilst providing enrichment activities and challenge to those who are. Specific assessment activities, adapted to meet pupils' specific needs, are used alongside formative assessment at the end of topics and pupils' progress tracked across the key stage.

Pupils learn to use a range of measuring devices accurately and safely and to be able to select the most appropriate to use when carrying out an investigation. The range of different science enquiry skills (observing over time: identifying, classifying & grouping; pattern seeking; comparative & fair testing; and researching using secondary sources) are taught and revisited across year groups to consolidate knowledge,

understanding and skills. Teachers use agreed success criteria, which show progression from lower to upper key stage, for planning investigations, recording predictions, drawing graphs and diagrams and writing conclusions. They are taught to present scientific ideas and findings in different ways e.g. tables, graphs, diagrams, using ICT, taking photographs or in writing and have opportunities to apply these when communicating to different audiences in a relevant context. Well-matched practical activities provide further opportunities to consolidate knowledge and apply new learning through appropriate science enquiries as well as to further develop specific skills in 'working scientifically'. Progress in 'working scientifically' is also tracked across the key stage. For a progression document in 'Working scientifically' see: <https://www.planassessment.com/plan-progression-in-ws-skills>

Impact

The approach to science teaching at Coteford Junior School will provide pupils with the foundation knowledge for understanding our world and a range of investigative skills that prepares them well for secondary education. They will continue to be curious about the world around them and want to learn more about the science of our planet so that they can make informed decisions about the part they can play in its future.

Having a choice of different activities and resources which closely match objectives to select from the medium term plans will enable teachers to choose those which are most likely to engage their class and to ensure that the needs of specific pupils can be met, therefore giving all pupils the opportunity to reach their potential. This will be seen across the school with in an increase in the profile of science in terms of children, staff and parents talking positively about their learning and practical experiences and displays work from children of all abilities.

Using a tracking grid to monitor children's' progress in their use of 'working scientifically skills' across the different types of enquiry, as well as their knowledge, will ensure that both the range of enquiries and these essential skills are taught and revisited across the key stage. It will also raise the level of understanding of these aspects of the science curriculum and therefore increase confidence among all teaching staff.

The consistent use of success criteria for 'working scientifically skills' across the school will improve learners' understanding and application of specific skills. The use of mid-topic reviews, planned opportunities to revisit objectives and skills with children who are not secure and assessment tasks which can be adapted to suit different learners will result both in a greater number of pupils achieving expected standard in each year group and at the end of the key stage. Additionally, providing enrichment activities and opportunities for pupils to apply their scientific knowledge and skills in less familiar contexts will develop both their ability to think independently and their understanding of the world around them.

Whole-school and parental engagement and enthusiasm about science will also be improved by providing opportunities to read around the subject, enrichment days, topic-linked trips and in-school visitors; by discussing applications of science knowledge and skills in everyday life and in jobs and careers (including those of their own families) and the use of science-specific home learning tasks or projects and opportunities provided on our home learning platform- ItsLearning.