



## Science

### Overview

Children across both schools are engaged, curious and excited about science. Science is defined as knowledge about the natural world that is based on facts learned through experiments and observation.

At the core of teaching and learning is the focus to ensure that children are ultimately given the tools to take ownership of their own learning and that they are given the opportunity to develop the knowledge and skills which will best serve them when undertaking the next stage of their learning journeys. In a reflection of our schools' visions and values, the aim of science at our federation is to commit to academic achievement as well as promoting creative and practical learning.

	Early Years
	Early Learning Goals
Objectives	<ul style="list-style-type: none"> <li>• I can explore the natural world around me, making observations and drawing pictures of animals and plants</li> <li>• I know some similarities and differences between the natural world around me and contrasting environments, drawing on my experiences and what has been read in class.</li> <li>• I understand some important processes and changes in the natural world around me, including the seasons and changing states of matter.</li> </ul>
<p>Science at The Gem Federation begins with understanding things close to home.</p> <p>In Early Years, science is incorporated throughout the year to enable children to achieve their Early Learning Goals. Children are encouraged to comment and ask questions about the world around them including how to best look after living things and the environment. As they progress through school, children are taught to recognise similarities, differences, changes and patterns in nature, and how environments might vary from one another.</p>	

	Year 1					
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Seasonal Change	Animals Including Humans	Everyday Materials	Seasonal Change	Plants	Seasonal Change
Knowledge Objectives	<ul style="list-style-type: none"> <li>I can observe changes across the 4 seasons</li> <li>I can observe and describe weather associated with the seasons and how day length varies</li> </ul>	<ul style="list-style-type: none"> <li>I can identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals</li> <li>I can identify and name a variety of common animals that are carnivores, herbivores and omnivores</li> <li>I can describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)</li> <li>I can identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense</li> </ul>	<ul style="list-style-type: none"> <li>I can distinguish between an object and the material from which it is made</li> <li>I can identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock</li> <li>I can describe the simple physical properties of a variety of everyday materials</li> <li>I can compare and group together a variety of everyday materials on the basis of their simple physical properties</li> </ul>	<ul style="list-style-type: none"> <li>I can observe changes across the 4 seasons</li> <li>I can observe and describe weather associated with the seasons and how day length varies</li> </ul>	<ul style="list-style-type: none"> <li>I can identify and name a variety of common wild and garden plants, including deciduous and evergreen trees</li> <li>I can identify and describe the basic structure of a variety of common flowering plants, including trees</li> </ul>	<ul style="list-style-type: none"> <li>I can observe changes across the 4 seasons</li> <li>I can observe and describe weather associated with the seasons and how day length varies</li> </ul>
Working Scientifically	Observing over time - Take weather measurements and make observations over time. Record time it gets dark each day. How much daylight is there in	Pattern seeking - Children generate questions for investigation such as: do people with longer arms have longer legs?	Classifying - Classify objects made from the same material (e.g. lots of things made from plastic). Classify one object made from different materials	Observing over time - Take weather measurements and make observations over time. Record time it gets dark each day. How much daylight is there in	Classifying - classify leaves, flowers, and seeds, choosing their own criteria.	Observing over time - Take weather measurements and make observations over time. Record time it gets dark each day. How much daylight is there in

	<p>different seasons? What happens to nature in different seasons?</p> <p>Pattern seeking - Does it rain more in spring? Do we have more sunny days in the summer?</p>	<p>Comparative/fair testing - Can I taste the difference between different flavoured crisps/skittles/smarties?</p> <p>Classifying – classifying animals as herbivores, omnivores and carnivores.</p>	<p>(e.g. cups made of different materials). Classify paper/plastics/fabrics.</p> <p>Comparative/fair testing - Test objects made of different materials to see how effective they are e.g. umbrellas/hats/coats for waterproofness, cloths/nappies for absorbency, socks for elasticity etc.</p>	<p>different seasons? What happens to nature in different seasons?</p> <p>Pattern seeking - Does it rain more in spring? Do we have more sunny days in the summer?</p>	<p>Observing - Observe a tree through the year. Observe a trail/patch to identify how plants change through year.</p> <p>Pattern seeking - Based on observations, encourage children to identify patterns e.g. after comparing the size of leaves on different plants, children may suggest “bigger plants, bigger leaves.</p> <p>Researching - Use secondary sources to name plants (including trees) based on observations of leaves, seeds, flowers, buds, and bark</p>	<p>different seasons? What happens to nature in different seasons?</p> <p>Pattern seeking - Does it rain more in spring? Do we have more sunny days in the summer?</p>
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**Year 2**

	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
<b>Topic</b>	<b>Animals including Humans</b>	<b>Uses of Everyday Materials</b>	<b>Living Things and their Habitats</b>	<b>Plants</b>		<b>Consolidation</b>
<b>Knowledge Objectives</b>	<ul style="list-style-type: none"> <li>• I can notice that animals, including humans, have offspring which grow into adults</li> <li>• I can find out about and describe the basic needs of animals, including humans, for survival (water, food and air)</li> <li>• I can describe the importance for humans of exercise, eating the right amounts of</li> </ul>	<ul style="list-style-type: none"> <li>• I can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</li> <li>• I can find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching</li> </ul>	<ul style="list-style-type: none"> <li>• I can explore and compare the differences between things that are living, dead, and things that have never been alive</li> <li>• I can 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,</li> </ul>	<ul style="list-style-type: none"> <li>• I can observe and describe how seeds and bulbs grow into mature plants</li> <li>• I can find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.</li> </ul>		

	different types of food, and hygiene.		and how they depend on each other. <ul style="list-style-type: none"> <li>I can identify and name a variety of plants and animals in their habitats, including micro-habitats</li> </ul> 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.		
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Working Scientifically	<p>Classifying - classify materials e.g. samples of wood, metal, plastic, etc.</p> <p>Comparative Testing - Test materials for different uses (e.g. Which material can you use to make an aeroplane? Which fabric would you use for curtains?)</p>	<p>Classifying - classify food items, classify animals.</p> <p>Observing over time - Observe a life cycle (e.g. caterpillars, chicks, farm animals).</p> <p>Researching - Research adult animals and their young</p>	<p>Classifying - Find things that are living/ dead /have never been alive and classify them. Classify minibeasts found in the environment based on physical structure.</p> <p>Observing over time - Explore plants and animals in micro-habitats (under a rock, in a pond, in a meadow throughout the year.</p>	<p>Classifying – seeds and bulbs</p> <p>Observing over time - Plant seeds and bulbs and observe how they grow</p> <p>Pattern seeking – Do big seeds germinate more quickly? Does it matter which way round you plant a bulb or seed? Which comes first, the root or the shoot?</p>	
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**Year 3 and 4**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	
Topic	States of Matter	Living Things and their Habitats	Animals Including Humans	Sound	Electricity	Consolidation	
Knowledge Objectives	<ul style="list-style-type: none"> <li>I can compare and group materials together, according to whether they are solids, liquids or gases</li> </ul>	<ul style="list-style-type: none"> <li>I can recognise that living things can be grouped in a variety of ways</li> <li>I can explore and use classification keys to</li> </ul>	<ul style="list-style-type: none"> <li>I can describe the simple functions of the basic parts of the digestive system in humans</li> </ul>	<ul style="list-style-type: none"> <li>I can identify how sounds are made, associating some of them with something vibrating</li> </ul>	<ul style="list-style-type: none"> <li>I can identify common appliances that run on electricity</li> <li>I can construct a simple series electrical circuit, identifying and</li> </ul>		

	<ul style="list-style-type: none"> <li>• I can 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)</li> <li>• I can identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</li> </ul>	<p>help group, identify and name a variety of living things in their local and wider environment</p> <ul style="list-style-type: none"> <li>• I can recognise that environments can change and that this can sometimes pose dangers to living things</li> </ul>	<ul style="list-style-type: none"> <li>• I can identify the different types of teeth in humans and their simple functions</li> <li>• I can construct and interpret a variety of food chains, identifying producers, predators and prey</li> </ul>	<ul style="list-style-type: none"> <li>• I can recognise that vibrations from sounds travel through a medium to the ear</li> <li>• I can find patterns between the pitch of a sound and features of the object that produced it</li> <li>• I can find patterns between the volume of a sound and the strength of the vibrations that produced it</li> <li>• I can recognise that sounds get fainter as the distance from the sound source increases</li> </ul>	<p>naming its basic parts, including cells, wires, bulbs, switches and buzzers</p> <ul style="list-style-type: none"> <li>• I can 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</li> <li>• I can recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</li> <li>• I can recognise some common conductors and insulators, and associate metals with being good conductors</li> </ul>	
<p>Working scientifically</p>	<p>Classifying - Different materials as solid, liquid or gas.</p> <p>Comparative/fair testing What affects melting rate of chocolate/ice? What affects the rate of evaporation?</p> <p>Observing over time- Water as a solid, liquid and gas. Watch it being heated and cooled.</p> <p>Researching - Stages of the Water Cycle</p>	<p>Classifying – Classify living things in our environment. Learning how to use and make a classification key.</p> <p>Observing over time - Making systematic and careful observations of living things in local environments</p> <p>Researching - How different habitats are under threat from humans</p>	<p>Classifying - Compare and contrast different types of teeth. Recording findings using drawing and labelled diagrams. Comparing the teeth of carnivores and herbivores</p> <p>Pattern seeking – Which drinks are the worst for teeth?</p> <p>Researching - The different parts of the Digestive System</p> <p>Asking relevant questions – why are teeth different?</p>	<p>Comparative/fair testing Compare volume and pitch from different instruments. Compare how volume changes away from a source. Use data loggers to record findings.</p> <p>Observing over time – What sounds can be heard in different areas of the school?</p> <p>Pattern seeking – How do the features of an instrument affect the pitch? How do the strength of vibrations affect the volume?</p>	<p>Classifying - Household appliances as using batteries/ mains</p> <p>Comparative/fair testing Using results to draw simple conclusions and make predictions – would this bulb light in this circuit? Which materials are the best conductors?</p> <p>Asking relevant questions – will this circuit work?</p>	

	Year 5					
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Properties and Changes of Materials	Animals Including Humans	Forces	Living Things and Their Habitats	Earth and Space	Consolidation
Knowledge Objectives	<ul style="list-style-type: none"> <li>• I can 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</li> <li>• I know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>• I can use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> <li>• I can give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>• I can demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>• I can explain that some changes result in the</li> </ul>	<ul style="list-style-type: none"> <li>• I can describe the changes as humans develop to old age</li> </ul>	<ul style="list-style-type: none"> <li>• I can explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>• I can identify the effects of air resistance, water resistance and friction, that act between moving surfaces</li> <li>• I can recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect</li> </ul>	<ul style="list-style-type: none"> <li>• I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>• I can describe the life process of reproduction in some plants and animals</li> </ul>	<ul style="list-style-type: none"> <li>• I can describe the movement of the Earth and other planets relative to the sun in the solar system</li> <li>• I can describe the movement of the moon relative to the Earth</li> <li>• I can describe the sun, Earth and moon as approximately spherical bodies</li> <li>• I can use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky</li> </ul>	

	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					
Working scientifically	<p>Classifying - Different materials (e.g. magnetic/electrical conductors)</p> <p>Comparative/ fair testing Take measurements with a range of scientific instruments - What cup makes the best insulator? Was the change reversible or irreversible e.g. melting vs burning? How long does it take different types of sugar to dissolve?</p>	<p>Researching - Characteristics of humans at different points in development.</p> <p>Pattern seeking – Do male and female babies grow at the same rate?</p>	<p>Comparative/fair testing Carrying out a scientific enquiry into air resistance (effective paper helicopter shapes) and water resistance. Compare friction by using a forcemeter</p>	<p>Classifying - Classify animals according to their life cycle</p> <p>Observing over time - Grow from cuttings and observe whether they grow roots/stem/ leaf/flower. Observing the changes of trees in the playground across the seasons.</p> <p>Pattern seeking - Do larger mammals have longer gestation periods? Do larger animals live longer?</p> <p>Researching - Different methods of seed dispersal</p>	<p>Observing over time - Shadows throughout the day</p> <p>Research - Compare the time of day at different places on Earth. How would life be different on Earth and Mars?</p> <p>Comparative/fair testing Compare orbits of planets, phases of the moon.</p>	

**Year 6**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Light	Living Things and Their Habitat	Electricity	Evolution and Inheritance	Animals Including Humans	Consolidation
Knowledge Objectives	<ul style="list-style-type: none"> <li>I can recognise that light appears to travel in straight lines</li> <li>I can use the idea that light travels in straight lines to explain that objects are seen because</li> </ul>	<ul style="list-style-type: none"> <li>I can describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences,</li> </ul>	<ul style="list-style-type: none"> <li>I can associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</li> <li>I can compare and give reasons for</li> </ul>	<ul style="list-style-type: none"> <li>I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</li> </ul>	<ul style="list-style-type: none"> <li>I can identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> </ul>	

	<p>they give out or reflect light into the eye</p> <ul style="list-style-type: none"> <li>• I can 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</li> <li>• I can use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</li> </ul>	<p>including micro-organisms, plants and animals</p> <ul style="list-style-type: none"> <li>• I can give reasons for classifying plants and animals based on specific characteristics</li> </ul>	<p>variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches</p> <ul style="list-style-type: none"> <li>• I can use recognised symbols when representing a simple circuit in a diagram</li> </ul>	<ul style="list-style-type: none"> <li>• I can recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li> <li>• I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> </ul>	<ul style="list-style-type: none"> <li>• I can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</li> <li>• I can describe the ways in which nutrients and water are transported within animals, including humans</li> </ul>	
Working scientifically	<p>Comparative/ fair testing Investigate the shape of shadows and link this to light travelling in straight lines.</p> <p>Observing over time - What happens when light shines through a prism</p>	<p>Classifying living things in our local environment Classify animals according to Carl Linnaeus' system. Classify plants into flowering, mosses, ferns and conifers, based on specific characteristics.</p> <p>Researching - The difference between bacteria, virus and fungi to give reasons why these are not plants or animals. Research how microorganisms can be helpful or harmful.</p>	<p>Comparative/ fair testing Experimenting with voltage – brightness and volume (adding more bulbs/cells to a circuit) Systematically identifying the effect of changing one component at a time in a circuit</p>	<p>Classifying (to show variation within a species) Classify a species of plant e.g. daffodils, tulips, lilies.</p> <p>Observing and raising questions about local animals and how they are adapted to their environment</p> <p>Researching - Identifying scientific evidence that has been used to support or refute ideas or arguments – evidence for evolution</p> <p>Researching - How some living things are adapted to survive in their habitats including extreme conditions, for example, cactuses, penguins and camels.</p>	<p>Comparative/ fair testing Exercise and pulse experiment</p> <p>Observing over time - Pulse rate before, during and after exercise</p> <p>Pattern seeking Do older people have lower pulse rates?</p> <p>Researching - The role of the heart and blood</p>	

## 5 Types of Enquiry

### Comparative and Fair Testing



Pattern Seeking

Observing Over Time

Identifying and Classifying

Researching.