Science Progression Map

Intent
At Gayton Junior School, our intent is to spark curiosity and promote an enthusiasm for science. We aim to recognise the importance of science as a core subject and in every aspect of daily life. It is our intention to prepare children for careers in the local area and we recognise the importance of STEM in Derby city. We aim to provide a stimulating and varied curriculum which allows children to progress and provides many opportunities for scientific enquiry. We want children to be eager to ask and answer questions and explore their environment. We aim to deliver a balance of knowledge and skills. We want children to have an understanding of how and why things work, a respect for animals and the environment and the ability to look after themselves and others. We aim for children to understand the impact their actions can have today and in the future. We want our children to leave Gayton Junior School confident, motivated and ready to explore the world. It is our intention that our children are prepared to develop their science skills in their future education and see it's potential as a future career.

Implementation
In science, we implement our intent by delivering high-quality weekly lessons and providing children with as many hands on opportunities as possible. Resources are regularly used in order to allow children to ask and answer questions. Science lessons are given a purpose and the children are clear about how they could use the knowledge/skills gained in the future. The curriculum is delivered through lessons which are fun and include a range of practical activities and knowledge-based learning. Each unit is well-planned and regularly updated to ensure progression and coverage of each objective. Staff meet regularly to reflect upon the delivery and content of their lessons and to plan for whole-school themes such as Learning to Learn and Talk 4 Learning activities. Working scientifically is taught as regularly as possible with at least one planned experiment per half term. Working scientifically is also taught as a unit at the end of each year to build upon the knowledge and skills gained throughout the year and as a use of assessment. Where possible, links to the local area will be made. To prepare children for future careers, we work closely with Rolls-Royce to plan regular activities in school and on site. We also use the environment around Gayton to provide opportunities for children to explore animals and their habitats. The importance of science is also promoted outside of lessons through the planning of Science Days and the use of visits and visitors to motivate and engage children. Through Gayton's Passport of Experiences, children are able to learn about and look after other animals. They get to watch caterpillars turn into butterflies and see chicks hatch. We assess children throughout each unit by regularly questioning understanding. We assess each child at the end of each term to ensure they meet their potential and to allow us to plan intervention. We liaise with Key Stage 1 in order to ensure progression in knowledge and skills. We also work with other subject leaders to allow good practise and resources to be shared. Science is regularly moderated to ensure coverage of the curriculum through planning, books and lessons. Pupil and staff's views are also important and used to identify areas to improve. The curriculum and other extracurricular activities allows children to build upon their knowledge and skills in science whilst also promoting a love for the subject that will continue as they move onto the next stage in their education and future life.

Impact
Our approach at Gayton results in our children experiencing a fun, practical curriculum which promotes an enthusiasm for science and prepares children for the future. Our weekly science lessons ensure children develop their knowledge and skills. Talk for Learning and Learning to Learn activities are regularly used to help pupils retain knowledge. Our use of the local environment provides children with a hands on understanding of the world. Enrichment days, visits and visitors ensure children recognise the importance of science and encourages them to further develop their love of the subject. Our close link with local businesses allow the children to see links to STEM in Derby. We measure the impact of our curriculum by having regular discussions with pupils where they often talk about their love of science because of the fun lessons and the enrichment days. We also track progress each term and termly quizzes show the children are retaining lots of knowledge. Book trawls show progression is made and the quality of work is clear. Feedback from staff allows us to reflect upon the teaching of science and make improvements. Children at Gayton enjoy science and leave us with a secure science knowledge and the motivation and ability to develop this in the next stage of their education.

Progression in knowledge

Unit	Year 3	Year 4	Year 5	Year 6
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.			

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.	• 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.	• 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 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 the different types of teeth in humans and their simple functions.	• Construct and interpret a variety of food chains, identifying producers, predators and prey. • Describe the simple functions of the basic parts of the digestive system in humans. • Identify that humans and some animals have skeletons and muscles for support, protection and movement.	• Describe the changes as humans develop to old age.	• 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.
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.			

Materials		• 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.	• 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.	
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 a solid object. • Find patterns in the way that the size of shadows change.			• 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.

Forces	• 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.		• 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.	

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.		
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.	

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.		• 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 in working scientifically skills

Skills	Year 3 & 4	Year 5 & 6
Asking questions and recognising that they can be answered in different ways	**Asking relevant questions and using different types of scientific enquiries to answer them.** • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary course can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.** • Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. • Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.
Making observations and taking measurements	**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.** • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeated readings when appropriate.** • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the same size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order

		to get accurate data (closer to the true value).
Engaging in practical enquiry to answer questions	**Setting up simple practical enquiries, comparative and fair tests.** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.** • The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.
Recording and presenting evidence	**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.** • The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams and Carroll diagrams. • Children are supported to present the same data in different ways in order to help with answering the question.	**Recoding data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.** • The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled, diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.
Answering questions and concluding	**Using straightforward scientific evidence to answer questions or to support their findings.**	**Identifying scientific evidence that has been used to support or refute ideas or arguments.**

	• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence. **Identifying differences, similarities or changes related to simple scientific ideas and processes.** • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and casual relationships. **Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.** • They draw conclusions based on their evidence and current subject knowledge.	• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding. **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.** • In their conclusions, children: identify casual relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.
Evaluating and raising further questions and predictions	**Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.** • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. • Children use their evidence to suggest values for different items tested using the	**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.** • They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements

	same method e.g. the distance travelled by a car on an additional surface. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.	and the credibility of secondary sources used. • They identify any limitations that reduce the trust they have in their data. **Using test results to make predictions to set up further comparative and fair tests.** • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.
Communicating their findings	**Reporting on findings from enquiries, including oral and written explanations, displays of presentations of results and conclusions.** • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.	**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.** • They communicate their findings to an audience using relevant scientific language and illustrations.