

Science Progression in Skills and Knowledge

December 2023

**Intent**

At St. Mary’s we want our children to be naturally inquisitive about the world around them throughout their time at school and beyond. Our Science curriculum has been developed to ensure full coverage of the National Curriculum alongside a healthy curiosity and sense of wonder about the universe whilst also upholding our Catholic faith. We are committed to providing a stimulating, engaging and challenging learning environment in which the acquisition of knowledge, concepts, skills and positive attitudes are embedded. Throughout their engagement with the programmes of study, the children develop and use the key knowledge and skills identified within each year group which, in turn, is informed by the national curriculum. Key skills are mapped for each year group and are taught and practiced progressively throughout the school.  This ensures systematic progression towards the Working Scientifically expectations of the national curriculum.  The curriculum is designed to ensure that children are able to acquire key scientific knowledge by systematically building a schema in which connections are made in children’s learning of scientific concepts. Once children have established substantive knowledge in science they have the opportunity to apply this in their development of procedural knowledge through practical experiences incorporating scientific enquiry. Children have planned opportunities to use equipment, conduct experiments, build arguments and explain concepts confidently. We want our children to have a broad vocabulary therefore we ensure scientific language to be taught is mapped and built upon as topics are revisited in different year groups and across key stages. We want our children to be confident and capable of asking questions and demonstrating their curiosity about their surroundings. A love of science is nurtured through a whole school ethos and a varied science curriculum.

**Implementation**

To ensure high standards of teaching and learning in science, teachers create a positive attitude towards science within their classrooms and reinforce the expectation that all pupils can achieve high standards in all aspects of science no matter what their individual starting points may be. Planning for science is a process in which all teachers ensure that the school gives full coverage of The 2014 National Curriculum programmes of study for Science and Understanding of the World in the Early Years Foundation Stage. Wherever possible, Science is linked to class topics to enable a project-based approach with the intention that a greater depth of knowledge is achieved.

At the start of each topic teachers take time to find out what our children already understand and want to find out. Our teachers use this opportunity to recap prior knowledge from previous years and ensure that new knowledge is taught in the context of previous learning. This provides the teacher with an insight into the children’s starting points for the topic, enabling the use of assessment to inform planning. The children are then asked what they would like to know and class responses are collated and used to inform the programme of study. A record of this process is kept in children’s topic books either as a group mind map or individual response in KS2. At the end of the topic, children take part in a review of what they now know with reference to the key knowledge assigned to that topic. The teacher is then able to consolidate any of the key knowledge which is identified at this part of the process as not yet being secure.

Key vocabulary is introduced at the start of the new topic alongside definitions and accompanying visuals for each word (where possible) to ensure accessibility to all. This approach also means that children are able to understand the new vocabulary when it is used in teaching and learning activities and apply it themselves when they approach their work. Teachers use progressive questioning in class to test conceptual knowledge and skills, and assess pupils regularly to identify those children with gaps in learning. Learning opportunities are selected and designed to provide appropriate challenge to all learners.

As the children’s knowledge and understanding increases, they become more proficient in selecting and using scientific equipment as well as collating and interpreting results appropriately. They become increasingly confident in their growing ability to come to conclusions based on real evidence that they themselves have sought. Working Scientifically skills are embedded into lessons to ensure that skills are systematically developed throughout the children’s school career.

At St Mary’s we aspire to promote children’s independence and for all children to take responsibility in their own learning. Pupils regularly mark against success criteria to reflect how they feel about their learning in a lesson and this is used as appropriate, to aid teaching and learning. Attainment is tracked through our pupil tracking grids against National Curriculum expectations and Working Scientifically skills. Standards in science are monitored in a variety of ways to ensure the maximum impact. This includes book scrutinies, professional dialogue, pupil voice questionnaires, staff voice questionnaires, lesson observations and learning walks. The school governors are informed of standards and progression of the subject annually.

At St Mary’s we are aware of the impact of current events in an ever changing world and ensure that regular events such as Science Week and Eco-School events are offered to broaden children’s curriculum experiences. Teachers also plan trips and visitors to enhance our children’s learning experience with purposeful links made to knowledge being taught in class. Outdoor learning opportunities are integrated throughout the science curriculum and ensure engagement with the local environment which gives children opportunities to learn through varied and first hand experiences of the world around them.

**Impact**

As a result of our curriculum, the children of St Mary’s achieve their full potential in science and marvel at the awe and wonder of how science emulates throughout every aspect of our daily lives. The children recall the rich learning experiences they have been provided with and know that each new taught concept provides a new learning block that they can build upon. Children think critically, ask questions and use their metacognitive learning skills. As a result of exposure to a range of different scientists from a variety of backgrounds, all children feel they are scientists and capable of achieving - our children know to persevere and embrace challenge. They have the understanding that science has changed our lives and that it is vital to the world’s future prosperity.

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| **Progression in Working Scientifically** | | | | | | | |
|  | Reception | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
| **Asking and answering questions** | Make comments about what they have heard and ask questions to clarify their understanding;  Understand simple questions about ‘who’, ‘what’ and ‘where’ (but generally not ‘why’). | Use everyday language/begin to use simple scientific words to ask or answer a scientific question. | Suggest ideas, ask simple questions and know that they can be answered/ investigated in different ways including simple secondary sources, such as books and video clips. | Use ideas to pose questions, independently, about the world around them. | Suggest relevant questions and know that they could be answered in a variety of ways, including using secondary sources such as ICT.  Answer questions using straight forward scientific evidence. | Raise different types of scientific questions, and hypotheses. | Pose/select the most appropriate line of enquiry to investigate scientific questions. |
| **Making predictions** | Explore how things work. | Begin to say what might happen in an investigation. | Begin to make predictions. | Make predictions and begin to give a reason. | Make predictions and give a reason using simple scientific vocabulary. | Make predictions and give a reason using scientific vocabulary. | Make predictions and give a reason using scientific vocabulary.  Base predictions on findings from previous investigations. |
| **Making observations** | Talk about what they see, using a wide vocabulary. | Observe objects, materials and living things and describe what they see. | Observe something closely and describe changes over time. | Make decisions about what to observe during an investigation. | Make systematic and careful observations. | Plan and carry out comparative and fair tests, making systematic and careful observations. | Make their own decisions about which observations to make, using test results and observations to make predictions or set up further comparative or  fair tests. |
| **Equipment and measurements** | Use all their senses in hands-on exploration of natural materials. | Use simple, nonstandard equipment and measurements in a practical task. | Use simple equipment, such as hand lenses or egg timers to take measurements, make observations and carry out simple tests. | Take accurate measurements using standard units. | Take accurate measurements using standard units and a range of equipment, including  thermometers and data loggers. | Take measurements using a range of scientific equipment with increasing accuracy and precision. | Choose the most appropriate equipment in order to take measurements, explaining how to use it accurately.  Decide how long to take  measurements for, checking results with additional  readings. |
| **Identifying and classifying** | Begin to group objects based on what they observe | Sort and group objects, materials and living things, with help, according to simple observational features. | Decide, with help, how to group materials, living things and objects, noticing changes over time and beginning to see patterns. | Talk about criteria for grouping, sorting and categorising, beginning to see patterns and relationships. | Identify similarities/differences/changes when talking about scientific processes.  Use and begin to create simple keys. | Use and develop keys to identify, classify and describe living things and materials. | Identify and explain patterns seen in the natural environment. |
| **Engaging in practical**  **enquiry (investigating)** | Explore the natural world around them.  Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen. | Follow instructions to  complete a simple test  individually or in a group. | Do things in the correct order  when performing a  simple test and begin to recognise when something is  unfair. | Discuss enquiry methods and describe a fair test. | Make decisions about different enquiries, including  recognising when a fair test is  necessary and begin to identify  variables. | Plan a range of science enquiries, including  comparative and fair tests. | Select and plan the most  suitable line of enquiry,  explaining which variables need to be controlled and why, in a variety of comparative and fair tests. |
| **Recording and reporting findings** | Describe events in some detail | Begin to record simple data.  Talk about their findings and explain what they have found out. | Gather data, record and talk about their findings, in a range of ways, using simple scientific vocabulary. | Record their findings using scientific language and present in note form, writing frames, diagrams, tables and charts. | Choose appropriate ways to record and present information, findings and conclusions for different audiences (e.g. displays, oral or written explanations). | Record data and results of increasing complexity using scientific diagrams, labels, classification keys, tables, bar and line graphs and models. | Choose the most effective approach to record and report results, linking to mathematical knowledge. |
| **Drawing conclusions** | Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen. | Explain, with help, what they think they have found out. | Use simple scientific language to explain what they have found out. | Draw, with help, a simple conclusion based on evidence from an enquiry or observation. | Use recorded data to make predictions, pose new questions and suggest improvements for further enquiries. | Use a simple mode of communication to justify  their conclusions on a hypothesis.  Begin to recognise how  scientific ideas change over time. | Identify validity of conclusion and required improvement to methodology.  Discuss how scientific  ideas develop over time. |
| **Analysing data**  **Evaluating and raising further questions and predictions** | Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen. | Use every day or simple scientific language to ask and/or answer a question on given data. | Identify simple patterns and/or relationships using simple comparative language. | Gather, record and use data in a variety of ways to answer a simple question. | Identify, with help, changes, patterns, similarities and differences in data to help form conclusions.  Use scientific evidence to support their findings. | Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas. | Identify and explain causal relationships in data and identify evidence that supports or refutes their findings, selecting fact from opinion. |

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| **Progression in Units of Study** | | | | | | | |
|  | Reception | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
| **Plants** | Plant seeds and care for growing plants  Explore the natural world around them.  ELG  Explore the natural world around them, making observations and drawing pictures of animals and plants | Identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen  Identify and describe the basic structure of a variety of common plants including roots, stem/trunk, leaves and flowers.   * I can identify a range of local plants * I can name parts of a range of familiar 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.   * I can explore and identify what plants need to thrive * I can describe stages of development of a full grown plant. | Identify and describe the functions of different parts of plants; roots, stem, 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 ways in which water is transported within plants.  Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal   * I can explain what all plants need to flourish and recognise how these requirements vary in amount. * I can describe what each part of a flowering plant does. * I can explain, with the aid of a diagram or plant, how water is carried up from the soil. * I can explain how pollination, seed formation and seed dispersal play a role in the reproduction of flowering plants. |  |  |  |
| **Animals Including Humans** | Understand the key features of the life cycle of a plant and an animal.  Explore the natural world around them.  ELG  Explore the natural world around them, making observations and drawing pictures of animals and plants; | Identify and name a variety of common animals that are birds, fish, amphibians, reptiles 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 (birds, fish, amphibians, reptiles and mammals, and including pets).  Identify, name draw and label the basic parts of the human body and say which parts of the body is associated with each sense.   * I can name a variety of common animals. * I can identify and group a range of familiar animals. * I can identify key features of a range of common animals * I can relate each of the human senses to organs. | 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.   * I can describe the relationship   between adult animals and their offspring.   * I can identify human's basic needs. * I can describe the importance of a healthy diet and exercise | 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 animals have skeletons and muscles for support, protection and movement.   * I can describe why animals depend on the correct nutrition. * I can explain which parts of the skeleton provide support and protection, and how they allow for movement. | 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.   * I can identify what each of the principal organs in the digestive system do. * I can describe the function of each type of tooth in the human skull. * I can use a food chain to represent predator-prey relationships. | Describe the changes as humans develop from birth to old age.   * I can describe the changes as humans develop to old age, e.g. trends in changes to size, weight, mobility etc. | Identify and name the main parts of the human circulatory system, and explain 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.   * I can describe what heart, blood vessels and blood do, e.g. carry oxygen to all parts of the body. * I can suggest how their bodies are affected by substances and actions, e.g. that a high fat diet coupled with little exercise is likely to lead to obesity. * I can describe with aid of diagrams the route that water takes within animals, e.g. through the human body. |
| **Living Things and Their Habitats** | Begin to understand the need to respect and care for the natural environment and all living things.  Explore the natural world around them.  ELG  Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; |  | 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 on 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.   * I can explain how, for a named animal or plant, it gets what it needs from its habitat and other living things that are there. * I can identify a range of living things in habitats of various sizes. * I can construct a simple food chain and identify what is eating what. |  | 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   * I can suggest different ways of sorting the same group of living things, e.g. grouping birds according to where they live, what they eat and size of adults. * I can use classification keys to group and identify members from a range of familiar and less familiar living things * I can describe examples of living things that are threatened by changes to environments, e.g. owls and habitat loss. | 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.   * I can identify similarities and differences in two different life cycles, e.g. sparrow and butterfly, with reference to eggs and intermediate stages * I can describe in sequence the stages of reproduction in some plants and animals, e.g. dog and a thistle. | 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   * I can use similarities and differences in observable features to decide how living things should be grouped, e.g. a cat is a mammal because it is warm blooded and gives birth to live young. * I can explain why certain features are useful in classifying living things, e.g. backbones in animals and flowers in plants. |
| **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.   * I can use fossils as evidence that living things have changed over time, e.g. explain that these have died out and others have taken their place. * I can recognise that offspring normally vary from each other and from their parents, e.g. that puppies vary from each other and from their parents. * I can describe examples of a living thing that has adapted to live in a particular habitat and evolved as a result, e.g. a polar bear or cactus. |
| **Seasonal Change** | Understand the effect of changing seasons on the natural world around them.  ELG Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. | observe changes across the 4 seasons  observe and describe weather associated with the seasons and how day length varies   * I can describe seasonal changes. * I can relate weather patterns and day length to seasons. |  |  |  |  |  |
| **Everyday Materials**  Rocks (Y3)  States of Matter (Y4)  Properties and changes of materials (Y5) | Use all their senses in hands-on exploration of natural materials. Explore collections of materials with similar and/or different properties. Talk about what they see, using a wide vocabulary.  Talk about the differences between materials and changes they notice.  Use all their senses in hands-on exploration of natural materials.  Explore collections of materials with similar and/or different properties  Explore the natural world around them  ELG  Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. | Distinguish between an object and the material from which it is made.  Identify and name a variety of everyday materials, including wood, plastic, glass, 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 physical properties.   * I can correctly identify both object and material. * I can identify and name a range of materials. * I can describe a range of properties of a variety of materials. * I can classify a variety of materials into groups based on physical properties. | 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.   * I can select and justify a material for a particular use. * I can describe changes achieved by applying forces in different directions. | 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.   * I can examine and test rocks, grouping them according to the results. * I can explain how fossils are formed. * I can describe how soil is made. | 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.   * I can group materials according to their state of matter. * I can describe how evaporation and condensation happen in the water cycle, and how temperature affects evaporation. * I can identify changes of state and research values of degrees Celsius at which changes happen. | 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  Understand 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.   * I can test and sort a range of materials based on their physical properties. * I can describe how some materials, e.g. sugar, will dissolve and can be retrieved. * I can justify separation techniques proposed, with reference to materials being separated. * I can show how the original materials can be retrieved from each of these changes. * I can identify reactants and products of chemical changes and recognise these as being irreversible. * I can use evidence to justify the selection of a material for a purpose. |  |
| **Electricity** | Explore the natural world around them. |  |  |  | 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.   * I can list examples of appliances that run on electricity. * I can construct a simple circuit and name its components. * I can sort materials into conductors and insulators, identifying metals as conductors. * I can predict whether a particular arrangement of components will result in a bulb lighting. * I can predict how the operation of a switch will affect bulbs lighting. |  | 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.   * I can explain how number and voltage of cells affects the lamp or buzzer. * I can explain the use of switches, how bulbs can be made brighter and buzzers made louder. * I can represent a circuit that has been constructed using symbols. |
| **Light** | Explore the natural world around them. |  |  | 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 sizes of shadows change.   * I can relate being able to see to the presence of light. * I can describe how some objects reflect light. * I can describe how and why our eyes should be protected from sunlight. * I can explain how shadows are made. * I can describe how to change the size of a shadow. |  |  | 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.   * I can represent light using straight line ray diagrams. * I can draw diagrams using straight lines showing light travelling to the eye. * I can explain how we can see an object by referring to light travelling into the eye. * I can draw a diagram showing an object, shadow and light to relate object shape to shadow shape. |
| **Sound** | Explore the natural world around them. |  |  |  | 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   * I can explain, with reference to vibrations, how an object makes a sound. * I can describe the role of a medium in the transmission of sound. * I can describe the effect of moving further from the source of a sound. * I can explain with reference to a particular object how the pitch of the sound can be changed. * I can explain with reference to a particular object how the volume of the sound can be changed. |  |  |
| **Forces** | Explore and talk about different forces they can feel.  Explore the natural world around them. |  |  | 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.   * I can compare how an object, such as a toy car, will move on different surfaces. * I can recognise the difference between contact and contact forces. * I can describe how magnets attract or repel each other, and attract magnetic materials. * I can group materials on the basis of testing for being magnetic. * I can describe and identify the poles of a magnet. * I can predict outcomes of a particular arrangement of magnets. |  | 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   * I can explain that gravity causes objects to fall towards Earth. * I can describe how motion may be resisted by air resistance, water resistance or friction. * I can describe how some devices may turn a smaller force into a larger one. |  |
| **Earth and Space** | Explore the natural world around them. |  |  |  |  | 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   * I can draw a diagram or use a model to describe planetary orbits. * I can draw a diagram or use a model to describe the Moon's orbit around the Earth. * I can describe the Sun, Earth & Moon as spheres. * I can use a diagram or model to explain why the Sun seems to travel across the sky, and what causes day and night. |  |