St Denys Captivating Curriculum

Science

Intent

Curriculum Drivers	Well Being	Creativity	Communication	Choice	Challenge
Our curriculum drivers shape, personalise and underpin our curriculum, bring about the aims and values of our school, and respond to the particular needs of our learners.	Our curriculum has physical, mental and emotional well-being at its heart. Children only learn if they are safe, well and happy.	Our curriculum harnesses the power of possibility and fosters creative thought, enabling children to solve problems and express themselves in different ways	Our curriculum ensures that children develop the skills necessary to communicate their thoughts, ideas and feelings successfully in a wide range of different forms.	Our curriculum provides children with the knowledge, skills and understanding to make informed choices	Our curriculum provides challenge for all learners, teaches learners to seek challenge and develops the resilience they need to embrace it

At St Denys the importance of Science in all aspects of everyday life is recognised. Children develop a thirst for learning in finding out why things happen in the way that they do. Science teaching and learning aims to give all children a sound understanding of the world around them and build on and develop their natural curiosity whilst acquiring skills and knowledge to allow them to think scientifically, gain understanding of scientific processes and understand the uses and implications of Science in our own lives, today and for the future.

The Science curriculum offers opportunities for children to; develop scientific knowledge and conceptual understanding through the specific disciplines of Biology, Chemistry and Physics; become equipped with the scientific vocabulary and language used when describing scientific processes, develop a range of key skills through observations, planning and different types of scientific enquiry and investigations and understand the relevance of Science to the wider world and their own experiences.

These are the characteristics of learning that children will develop in Science: -

Characteristics of a Scientist

As Scientists, children at St Denys have:

The ability to think independently and raise questions about working scientifically and the knowledge and skills that it brings.

Confidence and competence in the full range of practical skills, taking the initiative in, for example, planning and carrying out scientific investigations.

Passionate about science and its application in past, present and future technologies.

Show high levels of originality, imagination or innovation in the application of skills.

Excellent scientific knowledge and understanding which is demonstrated in written and verbal explanations, solving challenging problems and reporting scientific findings.

The ability to undertake practical work in a variety of contexts, including fieldwork.

This is what we aim for children to achieve in Science by the end of each Milestone: -

Pebbles Milestone Early Years Foundation Stage	**Milestone 1** Years 1 & 2	**Milestone 2** Years 3 & 4	**Milestone 3** Years 5 & 6

Subject - End of Milestone Outcomes	
By the end of **the Pebbles Milestone**, children will be able to…	• Explores the natural world, using their five senses. • Describes the impact of weather and seasons on their daily life. • Names and describes familiar plants and animals. • Investigates forces, light and vibrations. • Is beginning to talk about why things happen. • Predicts what might happen and explains why. • Records findings in a simple way. • Looks closely at similarities and differences in nature. • Participates in guided investigations and makes observations. • Asks and responds to questions about familiar objects. Talks about observable changes. • Understands that objects move in different ways depending on size and weight. • Asks questions such as 'What would happen if …?'. • Records ideas and observations.
By the end of **Milestone 1**, children will be able to…	**Working Scientifically** •Ask simple questions. • Observe closely, using simple equipment. • Perform simple tests. • Identify and classify. • Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions.

	Biology	Physics	Chemistry
	Plants • identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • identify and describe the basic structure of a variety of common flowering plants, including trees • observe and describe how seeds and bulbs grow into mature plants • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy **Animals including Humans** • identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • identify and name a variety of common animals that are carnivores, herbivores and omnivores • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) • identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense • 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 **Living Things and their Habitats** • 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 microhabitats • 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.	**Seasonal Changes** • observe changes across the 4 seasons • observe and describe weather associated with the seasons and how day length varies	**Everyday Materials** • distinguish between an object and the material from which it is made • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • describe the simple physical properties of a variety of everyday materials • compare and group together a variety of everyday materials on the basis of their simple physical properties **Uses of Everyday Materials** • identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

By the end of **Milestone 2**, children will be able to…	**Working Scientifically** • Asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.

	Biology	Physics	Chemistry
	Plants • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal **Animals including Humans** • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • identify that humans and some other animals have skeletons and muscles for support, protection and movement • 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 **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	**Light** • recognise that they need light in order to see things and that dark is the absence of light • notice that light is reflected from surfaces • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • recognise that shadows are formed when the light from a light source is blocked by an opaque object • find patterns in the way that the size of shadows change **Forces and Magnets** • compare how things move on different surfaces • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having 2 poles • predict whether 2 magnets will attract or repel each other, depending on which poles are facing **Sound** • identify how sounds are made, associating some of them with something vibrating • recognise that vibrations from sounds travel through a medium to the ear • find patterns between the pitch of a sound and features of the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it • recognise that sounds get fainter as the distance from the sound source increases **Electricity** • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • recognise some common conductors and insulators, and associate metals with being good conductors	**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 **States of matter** • compare and group materials together, according to whether they are solids, liquids or gases • observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature

By the end of **Milestone 3**, children will be able to…	**Working Scientifically** • Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments

	Biology	Physics	Chemistry
	Animals including Humans • 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 **Living Things and their Habitats** • describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • give reasons for classifying plants and animals based on specific characteristics **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	**Earth and Space** • describe the movement of the Earth and other planets relative to the sun in the solar system • describe the movement of the moon relative to the Earth • describe the sun, Earth and moon as approximately spherical bodies • use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky **Forces** • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect **Light** • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them **Electricity** • associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit • compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • use recognised symbols when representing a simple circuit in a diagram	**Properties and changes of Materials** • compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • demonstrate that dissolving, mixing and changes of state are reversible changes • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda

Implementation

Our whole curriculum is shaped by our school vision which aims to enable all children, regardless of background, ability, additional needs, to flourish, be creative and make choices in order to be the best version of themselves.

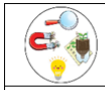
In lessons, teachers create a positive attitude to learning and reinforce high expectations in Science. The stimulating and engaging lessons, each with a clear focus, challenge the children's ideas about Science and the world around them to ensure they are always trying to make links with other areas of their learning. During the weekly Science lessons, the working scientifically skills are of key importance and are embedded into sessions to ensure they are being built on and developed though the year groups so that the children can use equipment, conduct experiments, build arguments, explain concepts confidently and continue to ask questions about their surroundings. The progression of these skills are set out within the detailed lesson plans to enable teachers to deliver high-quality teaching and learning opportunities while making them aware of possible scientific misconceptions. The sequential lessons provide effective differentiation so that all children have an appropriate level of support and challenge and provide the opportunity to regularly review and evaluate children's understanding. By the end of the school year, Y1 and Y2 complete 2-page spreads that depict a summary of their learning in Science. Years 3 to 6 complete a POP (Proof of Progress) task or 2-page spread at the end of each unit which provides opportunities for children to really challenge their thinking and deepen their learning and prove and showcase their knowledge and understanding of the content. There are also many cross-curricula links within Science learning such as extended writing opportunities and many popular children's books provide a great context for learning science. Similarly, content from Science, such as discovering materials from different climates and countries, is taught and revisited through daily/weekly 'Dashboard'.

The whole school overview for Science is as follows:

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn	Observing similarities and differences in nature Know that plants and animals need to be looked after to survive	**Physics** -Seasonal change Autumn **Biology** - Animals including humans **Humans** **Chemistry** - Everyday materials **Physics** -Seasonal change Winter	**Chemistry** - Uses of everyday materials **Biology** - Animals including humans: *growth*	**Biology** - Animals including humans: *nutrition skeletons and muscles* **Physics** -Light	**Biology** - Living things and their habitats **Biology** - Animals including humans: *teeth and digestion*	**Chemistry** - Properties and changes of materials **Physics** - Forces	**Biology** - Living things and their habitats **Biology** -Animals including humans: *circulatory system*
Spring	Observing similarities and differences in nature Know that plants and animals need to be looked after to survive Recording and observing - objects move in different ways depending on size and weight.	**Physics** -Seasonal change Winter **Chemistry** - Everyday materials **Biology** - Plants **Physics** -Seasonal change Spring	**Biology** - Living things and their habitats	**Chemistry** – Rocks **Biology** - Plants	**Chemistry** - States of matter	**Biology** - Animals including humans **Biology** - Living Things and their Habitats	**Physics** - Light **Physics** - Electricity
Summer	Recording and observing - objects move in different ways depending on size and weight. Know that plants and animals need to be looked after to survive	**Physics** -Seasonal change Summer **Biology** - Plants **Biology** - Animals including humans **Animals**	**Biology** - Plants	**Biology** - Plants **Physics** - Forces and Magnets	**Physics** – Sound **Physics** - Electricity	**Physics** - Earth and space	**Biology** - Evolution and inheritance

Our planning overviews set out the learning journey for each term. Our weekly/unit planning identifies the specific learning intentions and relevant vocabulary. Our success criteria show the context of the lesson/series of lessons, the specific learning intentions (using 'I can' format) and the associated key vocabulary.

Example of Science success criteria: -

 **Science** **Learning objective:** To understand Animals including Humans.	Me	My teacher
Learning intention: I am learning about the importance for humans of eating the right amounts of different types of food.		
• I can sort different types of food into groups.		
• I can talk about what should be included in a healthy diet and what should be limited.		
• I can name foods and drinks that can go in each part of the Eatwell plate.		
Key Vocabulary: basic needs food healthy balanced diet Eatwell plate		

Our learning resources are carefully chosen and build and sustain engagement. The purpose of the learning is driven by subject specific intent. We use Proof of Progress as part of our progression model in Science, we use **POP tasks** (Proof of Progress) which show our curriculum expectations in each cognitive domain (Milestone 1 to 3) to enable children to showcase their knowledge and promote long term retention. We use our daily/weekly 'Dashboard' learning to keep skills and knowledge current and to support long term retention

Impact

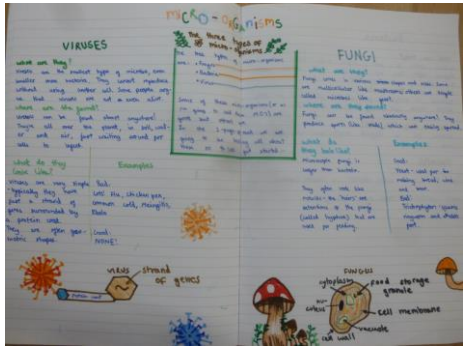
By the time the children at St Denys leave our school they should have developed:

Science at St Denys is engaging, high-quality and provides children with the foundations and knowledge for understanding our world. The science curriculum is planned to demonstrate progression with many opportunities to experience outdoor learning within the school grounds and locality. The impact of using the full range of resources will be seen with an increase in the profile of science and enables the children to learn through varied and first hand experiences of the world around them. The impact of this is measured in different ways including:

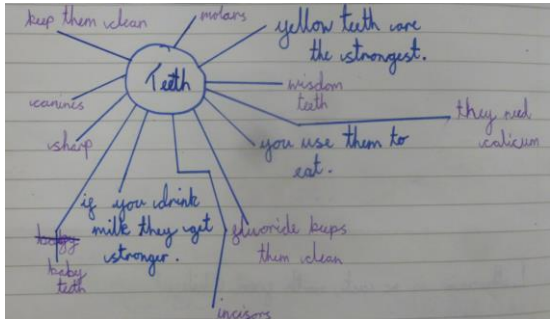
- Termly tracking of pupils' progress in depth of understanding within Science
- End of unit POP tasks where children prove and showcase their knowledge and understanding of the content and make connections between what they have previously learned and what they are currently learning
- Concept maps: used at the beginning of a unit to assess children's prior learning/knowledge and revisited at the end of the learning journey of the unit to assess their understanding
- Provision of non-routine, rich sophisticated problems to challenge children to inventively and creatively use and apply their scientific knowledge and skills
- Pupil voice is developed through discussions about learning and questioning children's views and attitudes towards Science

We capture a summary of the learning in Science using 2 page spreads and concept maps completed at the beginning of a unit to demonstrate prior/previous learning and revisited at the end of the unit learning journey to show new learning/understanding.

An example of a 2-page spread for Science



An example of a concept map for Science



Our main aim is for children to leave St Denys having used and developed the characteristics of a Scientist and they will continue to use these in their future lives.