

Science

Curriculum Principles

By the end of Year 6, a student of Science at Dixons Manningham will:

Have secure, connected knowledge of biology, chemistry, physics and Earth and space, and use precise scientific vocabulary to explain the natural world.

Work scientifically with increasing independence: ask questions, plan enquiries, measure and record accurately, interpret evidence, evaluate methods and communicate justified conclusions.

The sequence of knowledge is underpinned by the following strategic anchors:

Substantive knowledge is sequenced cumulatively across three cycles each year, with deliberate revisiting so that new learning is anchored to secure prior knowledge.

Disciplinary knowledge develops from close observation and simple comparison to controlled enquiry, precise measurement, data analysis, evidence-based argument and evaluation of sources.

The Science curriculum will address social disadvantage by addressing gaps in students' knowledge and skills:

All students receive the same ambitious entitlement, supported by explicit vocabulary teaching, concrete experiences, careful modelling and frequent opportunities to revisit essential concepts.

Local and global contexts, practical work and purposeful use of secondary sources build the background knowledge and scientific literacy that students may not otherwise encounter.

Scientists from varied periods and backgrounds are deliberately included so students understand how scientific knowledge develops and can see participation in science as open to them.

Science Curriculum Overview

	Cycle 1	Cycle 2	Cycle 3
Nursery	Core knowledge and exploration Nursery Garden: Explore natural materials inside and outside using the senses. Autumn: Notice seasonal change and plant life cycles; talk about what they see.	Core knowledge and exploration Dark: Explore dark and light; discuss what happens at night-time. Pushing and Pulling: Explore how things work; talk about the different forces they can feel.	Core knowledge and exploration Growing: Sow seeds and care for growing plants; begin to understand key features of plant and animal life cycles; develop respect for the natural environment and living things. Materials: Explore and compare the properties of materials.
Reception	Core knowledge and exploration Humans: Identify their body and facial features; develop basic hygiene and oral-hygiene routines; understand healthy choices, emotions and self-regulation. Celebrations: Investigate light and dark, linked to Diwali. Seasons: Notice seasonal change in autumn; describe what they see, hear and feel outside.	Core knowledge and exploration Changing States: Investigate water and ice and explore magnetic materials; look closely at similarities, differences, patterns and change; investigate polar animals and how they survive in an appropriate habitat. Materials: Explore collections of materials with different and similar properties; compare materials for recycling, linked to refuse workers.	Core knowledge and exploration Living Things: Sow seeds and care for growing plants; understand key features of plant and animal life cycles, including egg-to-chick and caterpillar life cycles. Growing Food: Explore where different fruits and vegetables grow depending on climate. Seasons: Notice seasonal change in summer.



	Cycle 1	Cycle 2	Cycle 3
		Seasons: Notice seasonal change in winter and spring.	
	Core knowledge and understanding Bodies and Senses: Students draw and label basic parts of the human body; students understand the five senses and associated body parts Animals: Students use precise scientific vocabulary to describe the structures of animals (e.g. gills, claws, scales, tentacles, antennae, fins, skin, hair, fur, tail, feathers); name common animals; recognise key features of different families of common animals within the broad groups of mammals, reptiles, amphibians, fish, birds (students do not need to classify into these groups yet); and identify carnivores, herbivores and omnivores Seasonal Changes: Students observe changes across the four seasons; describe weather associated with the seasons and how day length varies; track how plants in the local environment change across the seasons; use thermometers to compare temperatures throughout the seasons Working scientifically: Students ask simple scientific questions; observe closely, using simple equipment (e.g. hand lenses); carry out fair tests; classify using Venn diagrams; present findings in block graphs; complete their first scientific investigation (linked to senses) Building on prior learning: <i>secure knowledge of self-description, animals (invertebrates and chicks); apply and extend skills in question words; tally charts, observational skills; fair or not fair; sorting and grouping</i>	Core knowledge and understanding Everyday Materials: Students identify and sort everyday materials by their physical properties; use these properties to describe materials, including wood, plastic, glass, fabric, metal and rock; identify materials which are transparent and opaque Experimenting with Materials: Students learn how to answer their own scientific questions; experiment with materials and report scientific findings Seasonal Changes: Students observe changes across the four seasons; describe weather associated with the seasons and how day length varies; track how plants in the local environment change across the seasons; use thermometers to compare temperatures throughout the seasons Working scientifically: Students perform simple tests; make basic predictions; identify and classify using scientific vocabulary; use simple equipment such as timers; present findings in block graphs and tables Building on prior learning: <i>secure knowledge of five senses; materials (water); apply and extend skills in asking simple scientific questions, use resources responsibly; observing closely; sorting and grouping</i>	Core knowledge and understanding Plants: Students identify and name common wild and garden plants, including deciduous and evergreen trees; describe the structure of common flowering plants and trees; identify fruits and vegetables Gardening: Students plant and care for bulbs and seeds, including flowers; identify fruits and vegetables and observe how plants grow over time; report scientific findings Seasonal Changes: Students observe changes across the four seasons; describe weather associated with the seasons and how day length varies; track how plants in the local environment change across the seasons; use thermometers to compare temperatures throughout the seasons Working scientifically: Students use observations and ideas to suggest answers to questions; identify properties; use simple equipment (e.g. tape measures/rulers) Building on prior learning: <i>secure knowledge of local environment; planting in EYFS, parts of a poppy; apply and extend skills in making basic predictions; describing observations, taking care of living things</i>



Cycle 1	Cycle 2	Cycle 3
Core knowledge and understanding Living Things and their Habitats (Local): Students distinguish between things that are living, dead, and have never been alive; recognise the seven life processes; explain how different habitats provide for the basic needs of different kinds of animals; name a variety of animals in their habitats, including microhabitats Everyday Materials: Students identify everyday materials and explain how their uses relate to their properties; explore how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching; distinguish between natural, human-made and recyclable materials; explore the inventions of Charles Macintosh Working scientifically: Students use different types of scientific enquiry to gather and record data; notice similarities, differences and patterns; draw food chains Building on prior learning: <i>secure knowledge of common animals; similarities between living things; animal diet; life processes; habitats; apply and extend skills in scientific observation; asking and answering scientific questions; identifying and classifying; grouping</i>	Core knowledge and understanding Food chains and Keeping Healthy: Students understand how animals obtain food from other animals; construct simple food chains; identify sources of food; explain the importance of a healthy diet, exercise, good hygiene Animals including Humans: Students understand that animals, including humans, have offspring which grow into adults; describe the basic needs of animals for survival; observe how animals grow (e.g. life cycle of a butterfly) Working scientifically: Students learn how to carry out simple comparative tests; use simple equipment to gather data, where appropriate to answer questions Building on prior learning: <i>secure knowledge of properties of common materials; group materials by their physical properties; apply and extend skills in scientific observations; recording observations; comparing materials using scientific vocabulary; describe changes</i>	Core knowledge and understanding Plants: Students identify common seeds and bulbs; describe the flowering-plant life cycle and conditions for germination; explain how plants need air, water, light and a suitable temperature to grow and stay healthy Living Things and their Habitats (Worldwide): Students compare habitats: seashore, woodland, ocean, rainforest; explore global warming and human impact on habitats Working scientifically: Students observe changes over time; find out information using secondary sources of information Building on prior learning: <i>secure knowledge of structure of common plants; life cycles; seasons and climate; apply and extend skills in interpreting basic information; classifying, identifying and sorting; using simple equipment (e.g. thermometer, ruler)</i>



Cycle 1	Cycle 2	Cycle 3
Core knowledge and understanding Animals including Humans: Students develop secure knowledge of muscle types, the functions of a skeleton, the names of key bones, different skeleton types and types of nutrition Key Scientist: Dian Fossey Light: Students identify light sources; explain how light is reflected from surfaces; sun safety and ways to protect; explain the formation of shadows and how distance from the light source affects shadows Key Scientist: Thomas Young Working scientifically: Students ask relevant questions and use different types of scientific enquiries to answer them Building on prior learning: <i>secure knowledge of parts of the human body; five senses; skeleton; healthy lifestyles; apply and extend skills in labelling; observing changes</i>	Core knowledge and understanding Rocks and Soils: Students give examples of and describe igneous, sedimentary and metamorphic rock; explain fossil and soil formation and the structure of the Earth Key Scientists: Charles Darwin; George Washington Carver Forces and Magnets: Students describe forces including gravity, friction, magnetic forces; sort magnetic and non-magnetic materials; describe magnetic attraction; and identify forces on different objects (pushing and pulling) Key Scientist: Galileo Galilei Working scientifically: Students identify differences, similarities or changes related to simple scientific ideas and processes; accurately read scales; use standard units Building on prior learning: <i>secure knowledge of basic properties of an object; apply and extend skills in compare and classify by properties</i>	Core knowledge and understanding Plants: Students name different parts of flowering plants (anther, stigma); investigate what plants need for life and growth and how the wrong conditions make it difficult to grow; explain the role flowers play in the life cycle of flowering plants, including pollination and fertilisation; explain how water is transported within plants Key Scientist: Agnes Arber How Science Works: Students plan an investigation linked to student interest; display and analyse the results; revisit key learning Working scientifically: Students dissect parts of a plant Building on prior learning: <i>secure knowledge of flowering plants; elements required for growth; importance of water; apply and extend skills in identify differences and similarities; record findings using scientific language</i>



Cycle 1	Cycle 2	Cycle 3
Core knowledge and understanding Electricity: Students identify common appliances that use electricity; distinguish between mains and battery power; construct a simple series circuit; identify and use cells, bulbs, switches and buzzers; explore different ways of generating electricity; common conductors and insulators; recognise potential electrical safety hazards in the home Key Scientist: Thomas Edison States of Matter: Students identify everyday solids, liquids and gases by their properties; explain changes of state through melting and freezing; measure temperature in degrees Celsius; explain the water cycle; evaporation and condensation Key Scientist: Humphry Davy Working scientifically: Students use scientific evidence to answer questions and support findings; use simple electrical equipment and a data logger; produce scaled scientific drawings Building on prior learning: <i>secure knowledge of conductors and insulators; properties of materials; effect of temperature; light; why materials change state; importance of water; apply and extend skills in classifying and sorting; using standard units of measure</i>	Core knowledge and understanding Sound: Students explain how sounds are made through vibration; investigate how sounds travel in solids, liquids and gases; distinguish between pitch and volume; explain the relationship between sound and distance and describe the anatomy of the ear Key Scientist: Alexander Graham Bell; James West Living Things and Their Habitats: Animals and Plants - Students use classification keys to sort, group, identify and name a variety of living things in the local and wider environment; sort plants into the categories: flowering plants (including grasses) and non-flowering plants (ferns, algae and mosses) Key Scientist: Stuart Pimm; Jane Goodall Working scientifically: Students annotate accurately; suggest improvements to an investigation, using evidence; make predictions for new values; use and create classification keys; present information using labelled graphs Building on prior learning: <i>secure knowledge of states of matter; parts of the human body; five senses; protection of hearing; flowering plants and their life cycles; apply and extend skills in set up practical enquiries; dissection of plants</i>	Core knowledge and understanding Animals including Humans: Students explain the functions of the human digestive system; identify different types of teeth in humans and their functions; construct and interpret food chains, identifying producers, predators and prey Key Scientist: Marie Maynard Daly Living Things and Their Habitats: Habitat and Environment - Students explore climate change and environmental activism; consider changes to environments and their possible effects: deforestation, invasive species, pollution; endangered animals Key Scientist: Rachel Carson; Greta Thunberg Working scientifically: Students annotate accurately; suggest improvements to an investigation, using evidence; make predictions for new values; Building on prior learning: <i>secure knowledge of parts of the human body; teeth; taste; impact of diet; food chains; carnivores, omnivores and herbivores; habitats; changing environments; living things in the local environment; effect of the local environment; apply and extend skills in report on findings, including oral and written explanations</i>



Cycle 1	Cycle 2	Cycle 3
Core knowledge and understanding Earth and Space: Students explain the movement of the Earth and other planets, relative to the Sun; describe the movement of the Moon relative to the Earth; recognise the Earth, Sun and Moon as spherical bodies; explain day and night by describing the Earth's rotation around the Sun; name the eight planets in our solar system; understand the acceptance of the heliocentric model Key Scientist: Mae Jemison Forces: Students describe different forces acting on an object, including gravity, air resistance, water resistance and friction; explain how forces act in mechanisms (levers, pulleys and gears) Key Scientist: Isaac Newton Working scientifically: Students recognise and control variables; set up experiments independently, according to a method; Building on prior learning: <i>secure knowledge of magnetism; different forces on an object; friction; pushing and pulling; apply and extend skills in scaled drawing; using scientific equipment to take measurements, with increasing accuracy and precision</i>	Core knowledge and understanding Properties of Materials: Students compare and group everyday materials based on their properties and response to magnets; distinguish between thermal conductors and insulators and identify electrical conductors Key Scientist: Spencer Silver Changes of Materials: Students investigate dissolving and separating mixtures; use filtration, sieving and evaporation; distinguish between reversible and irreversible changes, including burning Key Scientist: John Dalton Working scientifically: Students set up comparative and fair tests; evaluate the consequences of an unfair test Building on prior learning: <i>secure knowledge of everyday materials and their impact on the quality of sound; uses of everyday materials; dissolving and mixing; reversible changes; properties of materials; apply and extend skills in using classification keys; comparing and exploring a broad range of materials; using data loggers</i>	Core knowledge and understanding Living Things and Their Habitats: Students explain asexual and sexual reproduction in plants; compare the life cycles of plants in the local environment with other plants around the world; explain different methods of seed dispersal Key Scientist: Jane Goodall; Ernest Everett Just Animals including Humans: Students compare the life cycles of a mammal, an amphibian, an insect and a bird; describe stages of human development, reproduction in animals, puberty and the gestation periods of some mammals Key Scientist: David Attenborough Working scientifically: Students construct evidence-based arguments; refute ideas using evidence Building on prior learning: <i>secure knowledge of life cycles of plants and animals; impact of the local environment; human development; adaptation; apply and extend skills in dissection of plants; identify and classify common plants and animals</i>



	Cycle 1	Cycle 2	Cycle 3
	Core knowledge and understanding Living Things and Their Habitats: Students understand the work of Carl Linnaeus and the Linnaeus system; explain how living things (plants, animals, microorganisms) are classified into broad groups using observable and common characteristics; understand that these broad groups can be further subdivided; identify similarities and differences between living things and use these to help to classify; justify why plants and animals have been classified into certain groups and sub-groups Key Scientists: Carl Linnaeus Light: Students explain that light appears to travel in straight lines; explain reflection and refraction, prisms and the spectrum of light; investigate how the angle of the light source affects shadows; explain how we see colours and apply the law of reflection Key Scientist: Albert Einstein Working scientifically: Students explain the importance of the travel of light in everyday life, including rear-view mirrors and periscopes; draw accurate light rays Building on prior learning: <i>secure knowledge of light sources; reflection; shadows; electrical insulators; series circuits; switches, bulbs, buzzers and motors; apply and extend skills in scaled drawing, with labels; identify common electrical circuit components</i>	Core knowledge and understanding Evolution and Inheritance: Students develop secure knowledge of adaptation, inheritance and variation; explain the theory of evolution and how fossils support the theory of evolution; distinguish between inherited and environmental characteristics Key Scientists: Charles Darwin; Alfred Wallace Electricity: Students investigate the relationship between the brightness of a bulb and the number and voltage of cells in a circuit; recognise electrical symbols and explain variations in how circuits function Key Scientist: Michael Faraday; Benjamin Franklin Working scientifically: Students identify patterns in data; separate opinion from fact Building on prior learning: <i>secure knowledge of classification systems; grouping living things; fossils; how living things have changed over time; apply and extend skills in group and classify; use and create classification keys</i>	Core knowledge and understanding Animals including Humans: Students identify the main parts of the human circulatory system, including heart, blood vessels and blood; explain the transportation of water and nutrients; evaluate how diet, exercise, drugs and alcohol affect a healthy lifestyle, including smoking Key Scientist: Charles Drew How Science Works: Students explore how scientific theories develop; plan an investigation linked to student interest, display and analyse the results; revisit key learning Representation in science: the importance of scientists from Black, Asian and minority ethnic backgrounds, and why greater representation is needed Working scientifically: Students use secondary sources of information to support primary findings; evaluate the trustworthiness of sources Building on prior learning: <i>secure knowledge of main body parts and internal organs (skeletal, muscular and digestive system); apply and extend skills in create graphs, with labelled scales, of increasing complexity</i>

