Science

Subject Overview

Limitless Dreams

Endless Opportunities

Science curriculum intent

Our high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. We want children to learn how science has changed and influenced our lives and is vital to the world's future prosperity. All pupils are taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, children are encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Through our study of Science, we aim to ensure all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them.
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Implementation

Curriculum structure & sequencing

We structure our Science curriculum by using the National Curriculum. This allows all our children, in every year group, to have a full and in depth understanding of the biology, chemistry and physics strands. In each year group, all children have the opportunity to study a scientist who links with a taught topic that year.

Content & concepts

Our aim is to ensure that our Science curriculum consists of more than simply learning scientific concepts and factual information. In each unit, teachers plan for multiple opportunities for children to actively participate within their learning, through a range of individual activities and investigations. At the start of each unit, teachers make sure that pupils are confident with prior learning to ensure all learning is progressive.

Enrichment and personal development:

At Boughton Heath, children have a range of enrichment opportunities. Pupils from KS1 and KS2 have the opportunity to attend STEM club and learn further about science, technology, engineering and maths. Each year, every class partakes in Science Week and engages with a school-wide theme.

Assessment and next steps

We assess Science in a variety of ways, giving pupils the opportunity to explain their reasoning and metacognition of a topic as well as their accumulation of knowledge. This may be done through practical exercises, group tasks, quizzes or discussion. We value developing scientific oracy and place great emphasis on children being able to explain how, and why; understanding the knowledge and skills within scientific learning.

Science in Early Years Foundation Stage

Whilst not a standalone area of learning within the Early Years Foundation Stage, Science forms important parts of various aspects of the EYFS framework. The very nature of scientific inquiry, trial and error and investigation; lend themselves perfectly to the way children in early years engage with and explore the environment around them, and science can be seen within the teaching and learning of the following areas of EYFS:

- Communication and Language,
- Personal, Social and Emotional Development,
- Understanding the World

Through the study of science in early years, children will not only learn about the world around them and the associated processes that occur naturally and via through stimulation; they will also learn important self care skills and ways in which they can use and look after their bodies.

Effective teaching of science within the early years establishes not only a solid foundation on which to build further scientific learning, it also develops critical thinking, questioning skills and a thirst for knowledge and enquiry which will serve children well as we strive to develop a love of learning which will stay with them throughout their school years and beyond.

Links to Development Matters

Communication and Language

1. Learn new vocabulary.
• Ask questions to find out more and to check what has been
said to them.
• Articulate their ideas and thoughts in well-formed sentences.
• Describe events in some detail.
• Use talk to help work out problems and organise thinking
and activities, and to explain how things work and why they
might happen.
• Use new vocabulary in different contexts.

Personal, Social and Emotional Development

Know and talk about the different factors that support their overall health and wellbeing:
- regular physical activity
- healthy eating
- toothbrushing
- sensible amounts of 'screen time'
- having a good sleep routine
- being a safe pedestrian

Links to Development Matters (continued)

Understanding the World

- Explore the natural world around them.
- Describe what they see, hear and feel while they are outside.
- Recognise some environments that are different to the one in which they live.
- Understand the effect of changing seasons on the natural world around them

Links to Early Learning Goals

Listening, attention and understanding

.Listen attentively and respond to what they hear with relevant questions, comments and actions when being read to and during whole class discussions and small group interactions,

.Make comments about what they have heard and ask questions to clarify their understanding,

Speaking

.Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary,

.Offer explanations for why things might happen, making use of recently introduced vocabulary from stories, non-fiction, rhymes and poems when appropriate;

The Natural World

.Explore the natural world around them, making observations and drawing pictures of animals and plants;

.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;

.Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

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Managing self

.Be confident to try new activities and show independence, resilience and perseverance in the face of challenge ,

.Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.

Inclusion within Science

We are an inclusive school and as such, do not believe in narrowing the curriculum for any learner. Our curriculum is designed with inclusion of all at heart, and our curriculum intent is therefore the same for all children.

However we are mindful that there are an abundance of factors which need to be considered in order for all learners to be able to access learning according to their individual needs; perhaps none more so than for those learners with Special Educational Needs and Disabilities (SEND).

Therefore, whilst our curriculum intent is the same for all learners; our implementation of the curriculum may well look different for different groups of pupils. Teachers will plan, scaffold, challenge and embed learning through activities which are adapted to meet children's needs – we call this adapted implementation. This is to ensure that our curriculum can be met by all within an inclusive environment, mindful and responsive to children's needs.

We use guidance set out within the NASEN teacher handbook to assist us in amending our implementation within Science. Examples of this, though not an exhaustive list, can be seen to the right. Note, these are suggestions of what may be implemented but all teachers will amend according to learner need.



Same intent, adapted implementation

- Word banks and picture resources may be supplied to assist learners with scientific language and processes.
- Staff may scribe for children to ensure a child's scientific explanations and articulation is not limited by writing competence.
- Make regular references to relevant language throughout the lesson and school day using tools such as working and display walls.
- Where necessary, provide pre teaching opportunities to hear vocabulary and develop conceptual understanding prior to the lesson.
- Use small group teaching opportunities to dedicate more time and support to provide additional learning opportunities to learners working towards a planned objective.
- Provide learners with targeted resources to support their learning and understanding such as concept cartoons and visual aids.

Science Curriculum - **approach & skill set**

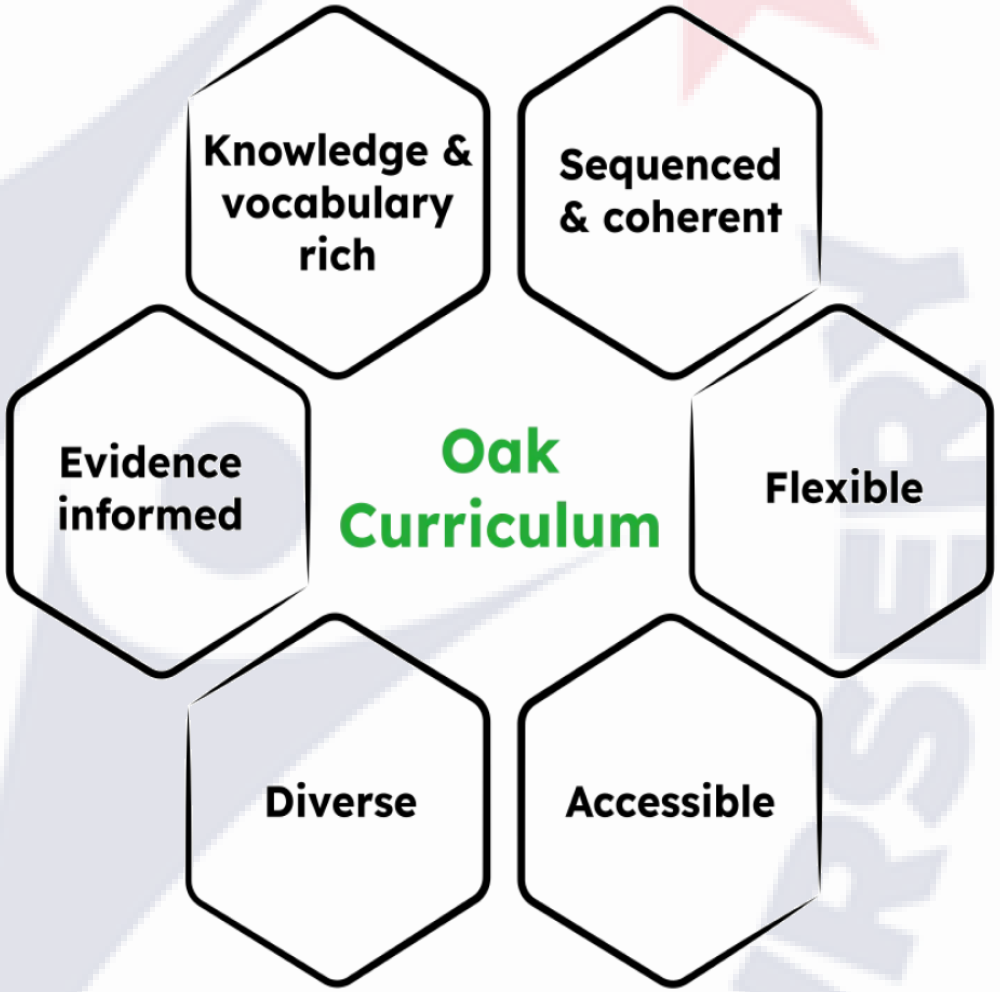
Our science curriculum is built on six guiding principles that shape everything from unit design down to individual lessons.

At its core, the curriculum is knowledge and vocabulary rich. Units are sequenced so pupils build on what they already know, developing deep subject knowledge and applying it through practical skills. Vocabulary is treated as a critical part of this knowledge, and lessons are careful to build on prior learning so pupils make meaningful connections rather than encountering ideas in isolation. This coherence is reinforced by curriculum threads, which run vertically through year groups so a concept introduced early on is revisited and deepened over time.

The curriculum is also designed to be flexible and accessible. Schools can adapt the content to fit their own context, and materials are built to meet the needs of all pupils, including those with SEND, in line with accessibility guidelines.

Alongside this, the curriculum aims to be diverse and evidence-informed. Diversity runs through teaching, staffing, and the language, texts and media used, so pupils see themselves positively represented in what they learn. Underpinning all of this is an evidence-informed approach, drawing on the science of learning and subject-specific research to make sure teaching decisions are grounded in what actually works.

Together, these six principles — knowledge and vocabulary rich, sequenced and coherent, flexible, accessible, diverse, and evidence-informed — give the curriculum both consistency and adaptability, ensuring it can be delivered rigorously while still responding to the needs of individual schools and pupils.



Manor Park Primary School Curriculum Road Map – Science

Year R

- Naming & grouping animals
- Farm and Food
- Life Cycles
- Minibeasts
- Under the Sea

Year 1

- 1. Naming & grouping animals
- 2. Seasons: autumn & winter
- 3. Human body parts
- 4. Identifying plants & their basic parts
- 5. Seasons: spring & summer
- 6. Everyday materials

Year 2

- 1. Uses of everyday materials
- 2. Growing plants
- 3. New life
- 4. Introduction to food chains
- 5. Living things & where they live
- 6. Healthy me

Units follow the Oak National Academy teaching order (1–6)

Year 6 non-statutory: 7. Materials • 8. Climate change & sustainability

Year 3

- 1. Rocks & soils
- 2. Human skeleton & muscles
- 3. Simple forces incl. magnets
- 4. Healthy eating
- 5. What plants do & need
- 6. Light & shadows

Year 4

- 1. Human digestive system
- 2. States of matter
- 3. Simple electrical circuits
- 4. Introduction to sound
- 5. Living things & the environment
- 6. More about food chains

Year 5

- 1. Materials: properties & changes
- 2. Forces incl. simple machines
- 3. Earth, Sun & Moon
- 4. Life cycles: plants
- 5. Life cycles: animals
- 6. Human development

Year 6

- 1. Human circulatory system
- 2. Changing circuits
- 3. Keeping healthy
- 4. Classifying living things
- 5. Evolution & inheritance
- 6. Light & how it travels

Science Endpoints

Year One	Year Two	Year Three	Year Four	Year Five	Year Six
Naming and grouping animals I can name and group animals into fish, amphibians, reptiles, birds and mammals, sort them as carnivores, herbivores or omnivores, and compare their basic structures.	**Uses of everyday materials** I can compare and group materials based on their properties, explain why some materials suit a purpose better than others, and describe how solid shapes can be changed by squashing, bending, twisting and stretching.	**Rocks and soils** I can compare and group rocks by their appearance and physical properties such as hardness, describe how fossils form when the remains of living things are trapped in rock, and explain how soils are made from rocks and organic matter.	**Introduction to the human digestive system** I can identify the different types of human teeth and describe their functions, and describe the simple functions of the basic parts of the digestive system, including the mouth, oesophagus, stomach and intestines.	**Properties, changes and separating materials** I can compare and group materials by properties including hardness, solubility, transparency and conductivity, and describe how mixtures can be separated by filtering, sieving and evaporating. I can explain the difference between reversible changes such as dissolving and melting, and irreversible changes such as burning and rusting.	**The human circulatory system** I can identify and name the main parts of the human circulatory system, describe the functions of the heart, blood vessels and blood, and explain how water and nutrients are transported around the human body.
Seasonal changes: autumn and winter I can describe the signs and weather of autumn and winter, and explain how day length changes across these seasons.	**Growing plants** I can observe and describe how seeds and bulbs grow into mature plants, and explain what plants need, including water, light and a suitable temperature, to grow and stay healthy.	**Introduction to the human skeleton and muscles** I can describe how the human skeleton supports, protects and helps the body move, compare skeletons across different animal groups including animals without bones, and explain how muscles work with bones to produce movement.	**Introduction to states of matter and changing states** I can compare and group materials as solids, liquids or gases, observe and measure how some materials change state when heated or cooled, and describe the role of evaporation and condensation in the water cycle.	**Forces including simple machines** I can explain that unsupported objects fall towards the Earth because of gravity, identify the effects of air resistance, water resistance and friction between moving surfaces, and explain how simple mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	**Changing circuits** I can construct and identify the basic parts of a simple series circuit and represent it using recognised symbols, and predict and explain how changing the number and voltage of cells affects a component such as a lamp or buzzer, and how switches affect the circuit.
Human body parts I can name and label parts of the human body, including my head, arms, legs and torso, and link body parts to each of my senses.	**New life** I can describe how animals, including humans, have offspring which grow into adults, and explain the basic needs of animals for survival, including water, food and air.	**Simple forces including magnets** I can compare how objects move on different surfaces, describe magnetic force as acting without direct contact, and explain how two magnets attract or repel depending on which poles face each other, and which everyday materials are magnetic.	**Simple electrical circuits** I can construct a simple series electrical circuit, name its basic parts including cells, wires, bulbs, switches and buzzers, predict whether a lamp will light if the circuit is complete, and identify common electrical conductors and insulators.	**Earth, Sun and Moon** I can describe the movement of the Earth and other planets relative to the Sun, explain how the Earth's rotation causes day and night and the Sun's apparent movement across the sky, and describe the movement of the Moon relative to the Earth.	**Keeping healthy** I can describe how a balanced diet, exercise and lifestyle affect how the human body functions, and recognise the impact of drugs, alcohol and smoking on the body.
Identifying plants and their basic parts I can name common wild and garden plants and trees, describe the structure of a tree and a flowering plant, and tell the difference between deciduous and evergreen trees.	**Introduction to food chains** I can describe how animals get their food from plants and other animals, and use simple food chains to show what eats what.	**Healthy eating** I can explain that animals, including humans, get nutrition from what they eat, and describe why the right types and amount of food are needed since animals cannot make their own nutrients.	**Introduction to sound** I can explain how sounds are made through vibrations and travel from a source to my ear, find patterns between the volume of a sound and the strength of the vibrations that made it, and explain why sounds get fainter the further you are from the source, and how pitch changes with vibrations.	**Reproduction and life cycles: plants** I can describe the life process of reproduction in plants, including reproduction from seed and asexual reproduction from cuttings.	**Why we group and classify living things** I can describe how living things are classified into broad groups, including plants, animals and micro-organisms, based on observable similarities and differences, and give reasons for classifying living things in this way.
Seasonal changes: spring and summer I can describe the signs and weather of spring and summer, and explain how day length changes across these seasons.	**Living things and where they live** I can sort things into living, dead and never alive, describe how different habitats and microhabitats provide for the needs of the plants and animals living there, and identify plants and animals within them.	**What plants do and what they need** I can explain the job of the roots, stem, leaves and flowers of a flowering plant, describe what plants need to grow and stay healthy, and explain how flowers are involved in pollination, seed formation and seed dispersal.	**Living things and the environment** I can group living things based on observable characteristics, use and construct classification keys to identify and name a variety of living things, and describe how changes to an environment can pose dangers to living things.	**Reproduction and life cycles: animals** I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird, and describe the process of reproduction in some plants and animals.	**Evolution and inheritance** I can recognise that living things have changed over time and that fossils provide evidence for this, explain that offspring normally vary and are not identical to their parents, and describe how adaptation over time may lead to evolution.
Everyday materials I can identify and name everyday materials such as wood, plastic, glass, metal and rock, describe their simple physical properties, and compare how they can be changed by squashing, bending, twisting and stretching.	**Healthy me** I can describe why exercise, eating the right amounts of different types of food, and good hygiene such as handwashing and toothbrushing are important for staying healthy.	**Introduction to light and shadows** I can explain that we need light to see and that dark is the absence of light, describe how light is reflected off surfaces, and explain how shadows form when an opaque object blocks light from a source.	**More about food chains** I can construct and interpret food chains, identifying producers, predators and prey, and describe how food chains can be affected by changes to the environment.	**Human development** I can describe the changes as humans develop from birth, through childhood and puberty, to adulthood and old age.	**Light and how it travels** I can explain that light appears to travel in straight lines, use this to explain why shadows have the same shape as the object that casts them, and explain how we see things because light travels from a source to our eyes or is reflected off an object into our eyes.
					Materials (non-statutory) I can describe how mixtures, such as salt and ice, can be separated using techniques including filtering and evaporation.
					Climate change and sustainability (non-statutory) I can explain what fossil fuels and carbon are, describe ways we can reduce our carbon footprint, and identify renewable sources of energy such as the sun, wind and water.

Progression in Substantive Knowledge

Big question (Oak thread)	Key Stage 1 (Y1–2)	Lower KS2 (Y3–4)	Upper KS2 (Y5–6)
BIOLOGY **What are living things and why are they similar and different?** BQ01, BQ04	Identify and name common animals (fish, amphibians, reptiles, birds, mammals) and plants, including trees; name the basic parts of the human body and of plants; tell apart living, dead and never-alive things.	Describe how skeletons and muscles support, protect and move the body, and the functions of roots, stems, leaves and flowers; group living things and use classification keys to identify them.	Describe the life cycles of mammals, amphibians, insects and birds; classify living things, including micro-organisms, by observable characteristics; describe the heart, blood vessels and blood.
BIOLOGY **How do living things grow, reproduce and stay healthy?** BQ02, BQ05	Describe how seeds and bulbs grow into mature plants and what they need; know that animals have offspring which grow into adults; explain why exercise, a balanced diet and hygiene matter.	Explain that animals get nutrition from food in the right types and amounts; describe the digestive system and types of teeth; describe pollination, seed formation and seed dispersal.	Describe reproduction in plants and animals and human changes from birth to old age; explain how diet, exercise, drugs and lifestyle affect the body; explain how offspring vary from their parents.
BIOLOGY **How do living things live together in their environments?** BQ03	Observe and describe seasonal changes in weather and day length; describe how habitats meet the needs of plants and animals; use simple food chains to show how animals get their food.	Construct and interpret food chains, identifying producers, predators and prey; explore how changes to environments can pose dangers to living things.	Explain how living things are adapted to their environments, how adaptation leads to evolution, and how fossils give evidence of how life has changed over time.
CHEMISTRY **What are things made of and how do substances behave and change?** BQ06–BQ10	Distinguish objects from the materials they are made from; describe and compare the properties of everyday materials; explain how solid shapes change by squashing, bending, twisting and stretching.	Group rocks by appearance and properties; explain fossil formation and that soil comes from rocks and organic matter; compare solids, liquids and gases, changes of state, and evaporation and condensation in the water cycle.	Compare materials by hardness, solubility and conductivity; separate mixtures by filtering, sieving and evaporating; distinguish reversible changes (dissolving, mixing) from irreversible changes (burning, rusting).
PHYSICS **How do forces make things happen, and how do electricity and magnetism work?** BQ11, BQ13	Build foundations by exploring how pushing and pulling (squashing, bending, twisting and stretching) can change the shape of objects.	Compare how objects move on different surfaces; describe magnetic attraction, repulsion, poles and magnetic materials; build simple series circuits and recognise conductors and insulators.	Explain the effects of gravity, air and water resistance and friction; show how levers, pulleys and gears magnify forces; explain how cell number and voltage affect components, using circuit symbols.
PHYSICS **How do we see, hear and communicate, and how does the Earth fit into the Universe?** BQ12, BQ14	Link parts of the human body to the senses; observe how weather and day length change across the seasons.	Know that light is needed to see and dark is the absence of light; explain reflection and how shadows form; explain that sounds are made by vibrations, travel through a medium and vary in pitch and volume.	Describe the movement of the Earth, Moon and planets as spherical bodies and explain day and night; explain that light travels in straight lines and how we see objects and shadows.
SUSTAINABILITY **How can we live sustainably to protect Earth for a better future?** BQ15	Begin to consider how we use everyday materials and grow plants in ways that care for our planet.	Explore healthy soil, sustainable and local food, light pollution, and how land development, waste and pollution affect habitats – and how nature reserves, reforestation and recycling help.	Explore burning fuels, greenhouse gases and bioplastics, how diet and lifestyle choices affect our planet, and the factors that affect our climate (non-statutory Climate change & sustainability unit).

Assessment within Science

We place great emphasis on the importance of assessing children's knowledge, understanding and skills within Science.

When assessing Science, it is first essential to clearly articulate two important areas:

1. The specific endpoint for the unit being delivered,
2. The substantive knowledge (biology, chemistry and physics concepts and vocabulary) and disciplinary knowledge (working scientifically) to be taught to reach this endpoint.

At Manor Park Primary School, our Science units follow the Oak National Academy curriculum sequence. We have mapped out the endpoints for every unit before specifying the substantive and disciplinary knowledge to be taught to reach them. It is this knowledge and understanding that we assess children upon, believing accurate assessment can only be a reflection of what is taught. Practical work is assessed for what it shows about pupils' understanding of the concept and their ability to plan, observe, measure, record and evaluate evidence, rather than the outcome of the investigation alone.

As an organisational tool, this is set out on a single page for each unit, with the essential knowledge for each lesson broken down. These resources can be found on the Oak Academy website.

Making judgements – formative assessment

Oak lessons include frequent checks for understanding and diagnostic questions, informed by Best Evidence Science Teaching (BEST) research, that reveal common misconceptions. Teachers record notes and reflections and address misconceptions at the start of the next lesson.
Quizzes are used at the end of lessons to identify if the relevant knowledge has been learnt during the lesson and to inform teacher planning ahead of subsequent lessons.

Making judgements – summative assessment

With the unit endpoint in mind, teachers form a summative assessment for each child within a particular unit. This will be either working towards / working at / working above the expected standard.

We define the expected standard by listing the essential substantive and disciplinary knowledge children should know, and what would classify a pupil as working below or above this. Teachers record this judgement at the end of each unit, drawing on formative assessments, discussion and evidence in children's books, with data recorded each term. At the end of the academic year, all children complete a summative assessment in Science to support the accuracy of these judgements, indicate strengths and highlight misconceptions.