

Science at Bacton Primary School



Intent

The 2014 National Curriculum for Science aims to ensure that all children:

- 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 skills required to understand the uses and implications of science, today and for the future.

We understand that it is important for lessons to have a skills-based focus, and that the knowledge can be taught through this

At Bacton Primary School, we encourage children to be inquisitive throughout their time at the school, and beyond. The Science curriculum fosters a healthy curiosity in children about our universe and promotes respect for the living and non-living.

We believe science encompasses the acquisition of knowledge, concepts, skills and positive attitudes. Throughout the programmes of study, the children will acquire and develop the key knowledge that has been identified within each unit and across each year group, as well as the application of scientific skills. We ensure that the Working Scientifically skills are built-on and developed throughout children's time at the school so that they can apply their knowledge of science when using equipment: conducting experiments, building arguments and explaining concepts confidently, and continue to ask questions and be curious about their surroundings.

Key messages

Intent

- **Skills-based focus (working scientifically- transferable skills)**
- **Promote curiosity and respect**
- **Acquisition of knowledge, concepts and skills**
- **Progression of working scientifically skills and knowledge**
- **Application of science skills**

Implementation

Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following;

1. Science will be taught in planned, weekly sessions that follow a logical sequence which breaks learning down into manageable chunks to ensure an emphasis on this core subject and progression across the year and the primary phase
2. Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge.
3. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly (twice per unit) to identify those children with gaps in learning, so that all children keep up.
4. We build upon the learning and skills development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence.
5. Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the science units
6. Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding. Teachers find opportunities to develop children's understanding of their surroundings by accessing outdoor learning and workshops with experts.
7. Children are offered a range of extra-curricular activities, visits, trips and visitors to complement and broaden the curriculum. These are purposeful and link with the knowledge being taught in class.
8. Regular events, such as Science Week or project days, such as Nature Day, allow all pupils to come off-timetable, to provide broader provision and the acquisition and application of knowledge and skills. These events often involve families and the wider community.

Implementation statements summarised

Implementation

Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following;

- 1. Weekly sessions ensure an emphasis on science and ensure progression due to logical sequences and breaking learning down into manageable chunks**
- 2. High quality planning of practical activities to answer questions/promote curiosity/conceptual understanding**
- 3. Quality AfL to identify and address gaps in understanding**
- 4. Progression of knowledge and skills**
- 5. Regular opportunities to practice and apply working scientifically skills which progress in complexity across the years**
- 6. Teachers modelling and providing real-life experiences**
- 7. Enrichment activities**
- 8. Broad provision/ real-life events**

Non-negotiables

Learning environment

In the classroom (learning walls)

- Learning walls are current and show science vocabulary, related resources and worked models (on flip chart paper)

Planning:

- Each unit to start with a recap of prior knowledge/skills to activate prior learning
- Lessons to be skills-based where applicable, allowing children to practise and apply Working Scientifically skills regularly
- Lessons to have a national curriculum learning objective (knowledge based, skills based or both) with SC that breaks down the LO into achievable chunks/stages
- Planning will ensure good coverage of national curriculum objectives
- Use of science knowledge organisers and MTPs to ensure a logical sequence of lessons and key information planned for
- Each lesson should have challenge planned in to ensure pupils are suitably challenged/ extended thinking
- Lessons should be mostly practical (where applicable) to promote conceptual understanding
- Topic specific vocabulary planned to teach
- Use of a range of information sources, including books, internet, videos, photos (where applicable)
- Planning for enrichment activities, including trips, visitors, science fairs etc (where applicable)

Teaching of Science should include:

- Each unit to start with revisit of prior knowledge and skills
- High quality questioning to promote curiosity, deeper thinking and to ascertain children's understanding or misconceptions
- Regular practise and application of a range of working scientifically skills
- High quality teacher modelling and use of the school/local environment to ensure real-life events which promote conceptual understanding
- Live feedback and marking is paramount- teacher/LSA should be constantly moving round the room using AFL to identify children in need of support and children in need of challenge

Non-negotiables

Pupil books (expectations and presentation):

- Unit front cover page stick in before each unit with: unit name, key vocabulary and models
- LO and SC slips stuck in for each lesson with LOs and SC which breaks the LO down into manageable chunks
- LOs to include knowledge and working scientifically (where applicable) objectives
- High standards of presentation
- High quality feedback and marking evident, with misconceptions addressed and high expectations of literacy evidenced
- A range of working scientifically skills evident
- Activities in books with evidence the LO

Timetable:

- Weekly science lessons

Cross Curricular links:

Maths SMSC Geography

Writing DT Enrichment activities

Reading History

Assessment:

Summative

- Sticky Knowledge assessments to be completed twice per unit
- Gaps from Sticky Knowledge Assessment to be addressed (morning work, intervention)

Formative

- AfL- regular questioning to identify and address misconceptions, children's understanding and to challenge

Long term plan

Phase		Autumn		Spring		Summer		
EYFS		UtW Past & Present People, Culture and Communities The Natural World	Our bodies Growth cycle Past and present events in own lives Special people	Christmas Story Halloween Guy Fawkes Remembrance Day Advent/Nativity Christmas	Keeping healthy Keeping safe Maps and travel Chinese New Year Celebrations	Food from around the world Seeds growth Easter	Lifecycles Habitats Preservation Eid and Ramadan Stories	Environment Land and sea Recycling World Ocean Day Special places
KS1	Year 1	Materials Seasonal Changes		Animals including Humans Seasonal Changes		Plants Seasonal Changes		
	Year 2	Living Things and Their Habitats		Use of everyday materials		Animals including Humans Plants		
LKS2	Year 3	Rocks Animals including Humans		Forces and Magnets		Plants Light		
	Year 4	Animals including Humans Electricity		States of Matter Sound		Living Things and their Habitats		
UKS2	Year 5	Animals including Humans Earth and Space		Forces		Living Things and their Habitats Properties and Changes of Materials		
	Year 6	Light Animals including Humans		Evolution and Inheritance		Electricity Living Things and their Habitats		

Working scientifically skills progression

KS1	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a Yes/No questions to aid sorting	Identify the headings for the two groups (it is, it is not)	Be able to compare objects based on obvious, observable features e.g. size, shape, colour, texture etc.			Sort objects and living things into two group using a basic Venn diagram or simple table	Talk about the number of objects in each group i.e. which has more or less	Children in KS1 are not expected to draw conclusions. They are expected to make observations which will help them to answer questions. They do not have the subject knowledge to give reasons for what they observe so they cannot draw scientific conclusions.	Children in KS1 are not expected to make scientific predictions as they do not have the subject knowledge to do this. That does not mean that you should not ask children what they think may happen, but this will be based on experience or may simply be a guess.	Children in KS1 are not expected to evaluate. However, children should be encouraged to consider their method and adapt this where necessary.
Researching	Ask one or two simple questions linked to a topic				Present what they have learnt verbally or using pictures	Be able to answer their questions using simple sentences				
Comparative/air testing	Identify the question to investigate from a scenario or choose a question from a range provided	Choose equipment to use and decide what to do and what to observe or measure in order to answer the question	Make observations linked to answering the question	When appropriate, measure using standard units where all the numbers are marked on the scale	Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally, using pictures or block diagrams				
Observing over time	Ask a question about what might happen in the future based on an observation					Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally or using pictures			
Pattern seeking	Ask a question that is looking for a pattern based on observations					Record data in simple, prepared tables and tally charts	Present what they learnt verbally			

Working scientifically skills progression

LKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting	Be able to put appropriate headings onto intersecting Venn and Carroll diagrams	Be able to compare objects based on more sophisticated, observable features. Present observations in labelled diagrams.			Sort objects and living things into groups using intersecting Venn and Carroll diagrams	Spot patterns in the data particularly two criteria with no examples e.g. there are no living things with wings and no legs	Draw simple conclusions, when appropriate, for patterns e.g. a flying insect with no legs might always crash land		Suggest improvement e.g. a wider range of objects – only looked at British trees. Suggest new questions arising from the investigation.
Researching	Ask a range of questions linked to a topic	Choose a source from a range provided				Present what they learnt verbally or using labelled diagrams	Be able to answer their questions using simple scientific language			Suggest limitations e.g. only had one book. Suggest new questions arising from the investigation.
Comparative/fair testing		Decide what to change and what to measure or observe	As for KS1	Measure using standard units where not all the numbers are marked on the scale, and take repeat readings where necessary	Prepare own tables to record data	Present data in bar charts	Refer directly to their evidence when answering their question	Where appropriate provide oral or written explanations for their findings	Use results from an investigation to make a prediction about a further result	Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation.
Observing over time		Decide what to measure or observe. Decide how often to take a measurement.	Make a range of relevant observations	Measure using standard units where not all the numbers are marked on the scale. Use dataloggers to measure over time.		Present data in time graphs				
Pattern seeking		Decide what to measure or observe	As for KS1	Measure using standard units where not all the numbers are marked on the scale.		Use ICT package to present data as a scattergram				

Working scientifically skills progression

UKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting and decide which ways of sorting will give useful information	Identify specific clear questions that will help to sort without ambiguity	Be able to compare not only based on physical properties but also on knowledge gained through previous enquiry			Create branching databases (tree diagrams) and keys to enable others to name living things and objects	Be able to talk about the features that objects and living things share and do not share based on the information in the key etc.	Be able to use data to show that living things and materials that are grouped together have more things in common than with things in other groups		Be able to explain using evidence that the branching database or classification key will only work for the living things or materials it was created for
Researching	Ask a range of questions recognising that some can be answered through research and others may not	Choose suitable sources to use				Present what they learnt in a range of ways e.g. different graphic organisers	Be able to answer their questions using scientific evidence gained from a range of sources			Be able to talk about their degree of trust in the sources they used
Comparative/ fair testing	Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results.	Recognise and control variables where necessary	As for KS1	Measure using standard units using equipment that has scales involving decimals	Prepare own tables to record data, including columns for taking repeat readings	Choose an appropriate form of presentation, including line graphs	Be able to answer their question, describing causal relationships	Provide oral or written explanations for their findings	Use test results to make predictions for further investigations	Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results
Observing over time						As for LKS2	Be able to answer their questions, describing the change over time			
Pattern seeking						Choose an appropriate form of presentation, including scatter graphs	Be able to answer their questions identifying patterns			

Animals including Humans

Knowledge skills progression

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• describe the changes as humans develop to old age	<ul style="list-style-type: none">• 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

Knowledge skills progression

Living Thing and their Habitats

Year 2	Year 4	Year 5	Year 6
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Materials

Knowledge skills progression

Year 1	Year 2	Year 3- Forces and Magnets	Year 4- States of Matter	Year 5
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Plants

Knowledge skills progression

Year 1	Year 2	Year 3
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Knowledge skills progression

Light

Year 3	Year 6
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Knowledge skills progression

Electricity

Year 4	Year 6
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Knowledge skills progression

Forces

Year 3- Forces and Magnets	Year 5- Earth and Space
<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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

Stand-alone units

Knowledge skills progression

<p>Year 3-Rocks</p> <ul style="list-style-type: none">• 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	<p>Year 4- Sound</p> <ul style="list-style-type: none">• 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
<p>Year 5- Earth and Space</p> <ul style="list-style-type: none">• 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	<p>Year 6- Evolution and Inheritance</p> <ul style="list-style-type: none">• 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
<p>Year 1- Seasons</p> <ul style="list-style-type: none">• observe changes across the 4 seasons• observe and describe weather associated with the seasons and how day length varies	<p>Ensuring consolidation of stand alone units/ Plants</p> <p>Plants: 1 lesson recap to take place in year 4, 5 and 6 to ensure children retain knowledge and understanding</p> <p>Rocks: 1 lesson recap to take place in year 4, 5 and 6 to ensure children retain knowledge and understanding</p> <p>Sound: 1 lesson recap to take place in year 5 and 6 to ensure children retain knowledge and understanding</p> <p>Earth and Space: 1 lesson recap to take place in year 6 to ensure children retain knowledge and understanding</p> <p>Seasons: years 2, 3, 4, 5 and 6 to make everyday links to seasons and to ensure explicit links are made to seasons through Geography</p>