Science Progression of Knowledge

Our science curriculum provides pupils with an understanding of both substantive and disciplinary knowledge. Substantive knowledge is the subject knowledge and explicit vocabulary used to learn about the content and disciplinary knowledge considers how scientific knowledge originates and is revised. It is through disciplinary knowledge that children gradually become more expert by thinking like a scientist.

Substantive Knowledge: Concepts, models, laws and theories

- Biology
  - Living things and their environment (Animals, humans, plants, habitats)
  - Reproduction, inheritance and evolution (Evolution, inheritance, life processes, life cycles)
- Chemistry
  - States of matter (Solids, liquids, gases)
  - Materials (properties and changes including reversible/irreversible changes,)
- Physics
  - Energy (Light, sound, electricity)
  - Forces (Friction, air resistance, gravity, magnets)
- Earth Science
  - Earth and space (Seasons, day and night, solar system and beyond)
  - Rocks and fossils

Science in EYFS

All areas of learning and development at the Foundation Stage are inter-connected. Through engaging in science activities, children not only learn about the world around them but develop disciplinary skills in all areas.

Characteristics of Effective Learning

The ways in which a child engages with other people and their environment - playing and exploring, active learning, and creating and thinking critically – underpin learning and development across all areas and support the child to remain an effective and motivated learner.

'Understanding the World'

This is a specific area of the Early Years Curriculum that includes essential skills and knowledge about the world and provides firm foundations on which children can build their scientific understanding. Early Years children will be actively involved in play and exploration and be encouraged to be creative. They will be supported to think critically and ask questions, which will help them to make sense of their world through well-planned play opportunities.

ELGs:

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

National Curriculum Programmes of Study & Termly Units

	Autumn		Spring		Summer		
Year 1	Seasonal Changes	Everyday Materials	Everyday Materials	Animals inc. humans	Plants	Electricity	Animals inc. humans & Seasonal changes
Year 2	Everyday Materials	Everyday Materials	Animals inc. humans	Animals inc. humans	Plants & Living things and their habitats		Plants & Living things and their habitats
Year 3	Animals inc. humans	Animals inc. humans & Rocks	Rocks	Forces	Light & Plants		Plants
Year 4	Animals inc. humans	Electricity	States of Matter	States of Matter	Living things and their habitats & Sound		Sound
Year 5	Forces	Forces	Properties and changes of materials	Properties and changes of materials	Space		Animals inc. humans & Living things and their habitats
Year 6	Animals inc. humans	Animals inc. humans	Evolution and inheritance	Living things and their habitats	Light		Sound

Adapting the curriculum for pupils with SEND in Science

- Adaptive teaching takes place.
- For sensory or physically impaired pupils, history learning may necessitate enlarging texts, using clear fonts, using visual overlays, or audio description of images.
- Dyslexic pupils may benefit from well-spaced print.
- Teachers identify and break down the components of the subject curriculum into manageable chunks for pupils who find learning more difficult, particularly those with cognition and learning needs. These may be smaller 'steps' than those taken by other pupils to avoid overloading the working memory.
- A variety of additional scaffolds may be used in lessons, such vocabulary banks, additional visual stimuli or adult support.

End points:

By the end of EYFS, children will: identify similarities and differences between themselves and others, places, objects, materials and living things. They can make simple observations of animals and plants. They recognise that technology is used for particular purposes in different environments and can select technology appropriately. They can explore how to make things move.

By the end of KS1, children will: the basic fundamentals of the biology strand have been established. Pupils explore animals, humans and changes within environments and begin to develop simple scientific vocabulary linked to this. Children use different types of scientific enquiry to answer a range of questions. Children are encouraged to ask questions, discuss their findings and present the ideas in a variety of ways.

By the end of KS2, children will: pupils have a deep understanding of a range of scientific ideas. Children are able to link scientific ideas to the world around them and, through research, understand how scientific ideas are developed over time. Children use secondary sources of information and practical enquiry to draw conclusions and find things out.

1. Pupils have an understanding of the key domains of knowledge and can use key concepts to make links between the domains
2. Pupils can ask questions and make observations about the world around them using scientific knowledge
3. Pupils can analyse data and articulate evidenced conclusions
4. Pupils are able to follow and design scientific enquiries
5. Pupils have an understanding of some of the major issues facing our planet and an appreciation of the importance of science to wider society

Disciplinary knowledge

Disciplinary knowledge is taught and embedded within the teaching of each unit of substantive knowledge.

Year 1 – Working Scientifically
• Can recognise that scientists find out about scientific ideas by asking questions and testing them. • Can ask some simple questions to find out about the world around us and with teacher guidance, recognise that they can be answered using different types of enquiry • Can make a simple prediction, 'I think…' • Can plan a simple test guided by the teacher • Can recognise unfairness and what is being changed in a test • Can begin to observe using simple equipment provided and measure in non-standard units. For example, compare length, area and volumes visually, mass by feel, temperature by touch, time by clapping or ordering, sound, light force using senses • Can perform simple tests with support • Can describe simple features, observations and measurements and record in a variety of simple ways, e.g. pictures, words, provided tables • Can, where appropriate, record observations in a bar chart (e.g. pictogram) with axis labelled by the teacher • Can talk about what happened, communicating their findings in a simple way, e.g. talk, drawing, simple charts • Can identify which parts of the test have been done well and which need to be improved
Year 2 – Working Scientifically
• Can recognise that scientists collect evidence by making observations and measurements to answer a question. • Can ask simple questions to find out about the world around us and make simple suggestions about the different types of enquiries that could be used to collect evidence to answer a question • Can make a prediction with a simple reason, 'I think…because…' • Can make a simple plan for a test within a framework provided by the teacher, e.g., using a planning frame or set of questions, focusing on a limited number of variables • Can, with teacher guidance, identify what is being changed, what is being measured, and one or two variables which need to stay the same to make the test fair • Can use simple equipment provided to make observations and measurements related to the test, measuring in standard and non-standard units. • Can perform simple tests • Can describe observations and measurements in a variety of ways, including simple tables, labelled drawings, bar charts and using scientific vocabulary • Can, where appropriate and supported by the teacher, record observations and measurements in simple bar charts • Can explain what happened and relate this to their earlier prediction made • Can question how carefully the test has been carries out and what needs improvement

Year 3 – Working Scientifically
• Can recognise why it is important to collect evidence by making observations and measurements to answer a question, and that science has made our lived better • Can recognise how scientific ideas and concepts can be turned into relevant questions that can be investigate and put forward their own ideas about how to find the answer to a scientific question using different types of enquiries (observing changes over time, noticing patterns, grouping/classifying, comparative tests, fair tests and using secondary sources) • Can make a prediction, giving a reason based on everyday experience • Can make a simple plan which identifies the basic features of the test, e.g. what is being changed, what is being measured and which variables are being controlled to keep the test fair • Can carry out a fair test which identifies the variable being changed, measured and controlled. Recognise and explain why it is fair • Can make observations and measurements which are relevant to the test. Can measure quantities in standard units, using a range of simple equipment. • Can set up simple practical enquiries and consider fair tests • Can record observations and measurements in a variety of ways, including ICT. Can record results in a variety of ways, including simple tables, labelled diagrams, keys and bar charts. • Can, where appropriate, record observations and standard measurements in bar charts, deciding on the axes • Can identify and explain simple patterns in recorded measurements and observations, and communicate what has been found in a simple scientific way • Can suggest improvements to the test to improve accuracy
Year 4 – Working Scientifically

- Can recognise that scientific ideas are based on evidence, have made our lives better and that there is some risk in science.
- Can turn existing scientific ideas into a question form that can be investigated and begin to plan different types of scientific enquiries, including recognising and controlling variables with teacher guidance.
- Can make a prediction, giving a reason which considers scientific ideas and is based on everyday experience
- Can decide on a clear plan to answer the question which identifies the key features of a fair test, e.g. what is being changed, what is being measured and which variables are being controlled to keep the test fair
- Can make a plan which identifies how one variable is changed, while all the others are kept the same
- Can select suitable equipment for a test and make a series of accurate observations and measurements which are adequate for the test.
- Can set up simple practical enquiries and consider comparative and fair tests
- Can record observations, measurements and comparisons using tables, including ICT. Can construct their own tables, choosing headings and the number and range of measurements, draw labelled diagrams, keys and bar charts.
- Can, where appropriate, record observations, measurements and comparisons using bar charts, choosing scale and labelling axes. Can begin to plot points to form simple graphs and use these to point out and interpret patterns in data
- Can begin to relate conclusions to patterns in data and to prior scientific knowledge and understanding. Can explain conclusions using appropriate scientific language
- Can suggest improvements to the tests, giving reasons

Year 5 – Working Scientifically

- Can describe how experimental evidence and creative thinking are combined to provide scientific explanations that has changed over time.
- Can form scientific questions for enquiry based on scientific ideas/concepts and recognise which can be investigated and those which are theoretical. Plan different types of enquiries to answer questions, including identifying and controlling variables.
- Can hypothesise, giving a reason which considers scientific ideas and uses knowledge of a similar everyday experience applied it to a new situation, e.g. I think little bits of sugar dissolve faster than a sugar lump
- Can decide on an appropriate way to collect data to answer a question and with guidance, create a clear plan which identifies the independent, dependent and control variables
- Can identify key variables to be considered and with teacher guidance, choose one independent variable to change, decide how to measure the effect (dependent variable) and which variables to control
- Can select apparatus for a range of tests and use effectively, making a series of systematic observations, measurements and comparisons. Can recognise patterns and begin to repeat observations and measurements, offering simple explanations for any differences found.
- Can set up practical enquiries and use results to begin to set up comparative and fair tests
- Can record observations and measurements systematically, including the use of ICT. Can begin to choose the best method, e.g. scientific diagrams, classification keys, tables, bar and line graphs, repeated tests and averaging (mean)
- Can, where appropriate, present data as bar charts and line graphs. Can construct bar and line graphs, selecting scale and labelling axes. Can begin to interpret and systematically explain patterns in data.

- Can draw conclusions which are consistent with evidence and relate these to scientific knowledge and understanding. Can use appropriate scientific language and conventions to communicate quantitative and qualitative data
- Can evaluate the accuracy of tests and make practical suggestions about how working methods could be improved

Year 6 – Working Scientifically

- Can describe how experimental evidence and creative thinking are combined to provide scientific explanations, which change over time and has both positive and negative effects.
- Can explore scientific ideas/concepts and form clear enquiry questions about scientific phenomena, recognising which can be investigated and those which are theoretical. Select and plan the most appropriate types of enquiry to answer questions, including identifying and controlling variables, where necessary.
- Can hypothesise, giving a reason which is based on scientific concepts and uses knowledge of a similar everyday experience, applied it to a new situation, e.g. I think little bits of sugar dissolve faster than a sugar lump
- Can identify and plan an appropriate approach to answer a scientific question, identifying clear independent, dependent and control variables
- Can identify key variables to be considered and choose an appropriate variable to be varied (independent variable), measured for effect (dependent variable) and variables that need to be controlled.
- Can select apparatus for a range of tests and use effectively, making a series of systematic observations, measurements and comparisons with precision appropriate to the test. Can recognise patterns and repeat observations and measurements, offering possible explanations for any differences found.
- Can set up practical enquiries and use results to plan and set up further comparative and fair tests
- Can record observations and measurements systematically, including the use of ICT. Can record results of increasing complexity and choose the best recording method, e.g. scientific diagrams, classification keys, tables, bar and line graphs, repeated tests and averaging (mean)
- Can, where appropriate, choose to present increasingly complex data as bar charts and line graphs. Can construct bar and line graphs, selecting scale and labelling axes. Can interpret and systematically explain patterns in data.
- Can draw clear conclusions, which are linked to evidence from data patterns and relate these to scientific knowledge and understanding. Can use accurate scientific language and conventions to communicate quantitative/qualitative data and explain causal relationship.
- Can evaluate the effectiveness of their tests, the limitations and suggestion how methods could be improved.