

Christ Church CE Primary School

S.T.E.M



Science Progression of Skills

At Christ Church CE Primary School, we understand the need for all pupils to develop their Scientific ability as a subject in its own right but also as an essential component of all curriculum subjects. A good understanding of scientific knowledge and conceptual understanding helps to support pupils work across the curriculum. Using the PLAN assessment matrices, teachers ensure a clear progression in skills is enriching for the children as they make links across their topics, recap on previous knowledge and help our children acquire a growing understanding of the nature, processes and methods of scientific ideas. We also encourage open-mindedness, self-assessment, perseverance and developing the skills of investigation – including: observing, measuring, predicting, hypothesising, experimenting, communicating, interpreting, explaining and evaluating. Through the development in the use of scientific language, recording and techniques, we aim to provide a broad curriculum in science from Early years to year 6 and beyond.

Intent

At Christ Church CE Primary School, we believe that a high-quality science education provides children with the foundations for understanding and exploring the world around them. Science has changed our lives in a variety of ways and is vital to aid the world's future prosperity, this is apparent now more than ever. Therefore, we aim to deliver a curriculum that develops and nurtures their sense of excitement and curiosity about natural phenomena and makes sense of the world that surrounds them. The core principles of our Science curriculum develop children's ideas and ways of working through investigation and exploration as well as using and applying process skills. They are encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

High quality teaching and learning experiences allow children to explore their outdoor environment and locality, thus developing their scientific enquiry and investigative skills. Our children are immersed in scientific vocabulary during discreet Science lessons and in the wider curriculum which aids their knowledge and understanding not only of the topic they are studying, but allows them to apply this. Our well-planned progression of Science vocabulary ensures children are extending and embedding a rich and diverse vocabulary. We intend to provide all children, with a broad and balanced science curriculum.

There are a number of key documents that support our planning and delivery of Science:

- National Curriculum mapping document
- PLAN assessment matrices in progression of knowledge, skills, working scientifically and vocabulary.
- Planbee and Developing Experts
- Teacher and Child-friendly Knowledge Organisers for each unit
- The journey of a Christ Church Child in Science
- Vocabulary Progression document
- Intent, Implementation and Impact document
- Enrichment opportunities





Working scientifically skills Year 1 & 2

Asking simple questions and recognising that they can be answered in different ways

- While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions.
- The children answer questions developed with the teacher often through a scenario.
- The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.

Observing closely, using simple equipment

- Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. **Year 1 identifying senses, Year 1 identify animals by their features, Year 1 Ted's umbrella investigation, Year 1 seasonal changes in trees, Year 1 Autumn walk, Year 2 offspring development pictures, Year 2 identify the classification of an animal, Year 2 micro habitat exploration of minibeasts found there,**
- They begin to take measurements, initially by comparisons, then using non-standard units. **Year 1 testing materials to see what properties it has, Year 2 exercise activity, Year 2 pepper and handwash experiment**
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Performing simple tests

- The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. **Year 1 identifying senses, Year 1 classifying animals, Year 1 identifying material in a material hunt, Year 1 exploring materials of objects, Year 1 testing materials to see what properties it has, Year 1 weather station, Year 1 Autumn walk, Year 2 what do animals need to survive questions and answer, Year 2 exercise activity, Year 2 pepper and handwash experiment, Year 2 micro habitat exploration of minibeasts found there,**

Identifying and classifying

- Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting. Year 1 identifying senses with hands on activity, Year 1 Ted's umbrella investigation, Year 1 weather station and what to wear for the seasons, Year 2 labelling human life cycle, Year 2 habitat match, Year 2 food chains activity
- They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. Year 1 animal sort into groups (amphibians, reptiles, fish and mammals), Year 2 identify the classification of an animal, Year 2 dead or alive comparison

Gathering and recording data to help in answering questions

- The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. Year 1 labelling body parts, Year 1 material sort on a range of objects, Year 1 weather sort for the seasons, Year 2 offspring development pictures, Year 2 micro habitat exploration of minibeasts found there,
- They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. Year 1 animal sort into groups (amphibians, reptiles, fish and mammals), Year 1 changes during the seasons, Year 2 food pyramid activity
- They classify using simple prepared tables and sorting rings. Year 1 Venn diagram of herbivores, carnivores and omnivores), Year 2 food pyramid activity, Year 2 habitat match

Using their observations and ideas to suggest answers to questions

- Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources. Year 1 labelling body parts, Year 1 Venn diagram of herbivores, carnivores and omnivores), Year 1 material sort on a range of objects, Year 1 Ted's umbrella investigation, Year 1 prior knowledge of season, Year 1 dress for the weather, Year 2 exercise activity, Year 2 pepper and handwash experiment, Year 2 micro habitat exploration of minibeasts found there,
- The children recognise 'biggest and smallest', 'best and worst' etc. from their data. Year 1 describing materials using our senses, Year 2 identify the classification of an animal,



Working scientifically skills Year 3 & 4

Asking relevant questions and using different types of scientific enquiries to answer them

- The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions.
- The children answer questions posed by the teacher.
- Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

- The children make systematic and careful observations. Year 3 exploring the properties of rocks experiment, Year 3 plant murder investigation for parts and functions, Year 3 functions of a root investigation with cotton wool, Year 3 what does the stem do coloured water and leaf test, Year 3 pollination Cheetos test, Year 4 conductor testing, Year 4 circuit test, Year 4 drum and musical instrument test,
- They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements. Year 3 functions of a root investigation with cotton wool, Year 3 shadow lengths investigation, Year 3 strongest and weakest magnet investigation, Year 4 do gases weigh anything, Year 4 what are bubbles in fizzy drinks made of?

Setting up simple practical enquiries, comparative and fair tests

- The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. Year 3 plant murder investigation for parts and functions, Year 3 ramp investigation, Year 3 magnet prediction, Year 3 magnetic investigation on everyday objects, Year 3 strongest and weakest magnet investigation
- They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking. Year 3 classifying rocks by observation, Year 3 classifying igneous, metamorphic and sedimentary rock by recreating rocks with playdoh, Year 3 exploring the properties of rocks experiment, Year 3 functions of a root investigation with cotton wool, Year 4 conductor testing, Year 4 circuit test, Year 4 drum and musical instrument test, Year 4 do gases weigh anything, Year 4 what are bubbles in fizzy drinks made of? Year 4 changes in state when heating and cooling chocolate

Explanatory note

A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome.

A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

- The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams, Carroll diagrams. Year 3 exploring the properties of rocks experiment, Year 3 how fossils are made/ make your own fossil, Year 3 functions of a root investigation with cotton wool, Year 3 what does the stem do coloured water and leaf test, Year 3 sorting light sources, Year 3 shadow enquiry, Year 3 ramp experiment on motion and resistance, Year 3 magnetic investigation on everyday objects, Year 3 strongest and weakest magnet investigation, Year 3 draw and label food groups, Year 3 bone investigation, Year 4 Venn diagram sorting types of electricity around the home, Year 4 identify electricity symbols, Year 4 conductor or insulator test, Year 4 what can you see or feel when different things vibrate, Year 4 do gases weigh anything, Year 4 what are bubbles in fizzy drinks made of? Year 4 changes in state when heating and cooling chocolate
- Children are supported to present the same data in different ways in order to help with answering the question. Year 3 classifying igneous, metamorphic and sedimentary rock by recreating rocks with playdoh, Year 3 pollination Cheetos test comic strip on pollination, Year 3 which objects are more reflective investigation, Year 3 recording shadow results on a table and creating a bar graph, Year 3 magnet prediction, Year 3 pie chart enquiry on mineral and nutrients needed by an animal, Year 4 what happens to the sound of the drum the further away you go? Discussing variables and recoding results, Year 4 grouping materials into solids, liquids and gases, Year 4 explaining the water cycle

Using straightforward scientific evidence to answer questions or to support their findings

- Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence. Year 3 plant murder investigation for parts and functions, Year 3 what does the stem do coloured water and leaf test, Year 3 pollination Cheetos test, Year 3 impact of sunlight on UV beads and the dangers of the sun experiment, Year 3 which objects are more reflective investigation, Year 3 magnetic investigation on everyday objects, Year 3 strongest and weakest magnet investigation, Year 3 bone investigation, Year 4 test each material to see if it is a conductor or insulator, Year 4 vibrations investigation, Year 4 do gases weigh anything, Year 4 what are bubbles in fizzy drinks made of? Year 4 changes in state when heating and cooling chocolate

Identifying differences, similarities or changes related to simple scientific ideas and processes

- Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. Year 3 how fossils are made/ make your own fossil, Year 3 how roots work investigation (3 types), Year 3 impact of sunlight on UV beads and the dangers of the sun experiment, Year 3 materials and how shadows are made with opaque objects, Year 3 guess the skeleton activity identifying invertebrate, vertebrates, exoskeletons and no skeleton, Year 4 good conductors or bad conductors, Year 4 solid, liquids and gases identification, Year 4 changes in state when heating and cooling chocolate

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- They draw conclusions based on their evidence and current subject knowledge. Year 3 exploring the properties of rocks experiment, Year 3 impact of sunlight on UV beads and the dangers of the sun experiment, Year 4 identify types of electricity, Year 4 what happens to the sound of the drum the further away you go? Year 4 changes in state when heating and cooling chocolate
- They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. Year 3 how roots work investigation (3 types)
- Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface. Year 3 forces test and how you can change speed and direction using PE equipment, Year 3 ramp experiment on motion and resistance, Year 4 can you create an electric switch for your circuit?
- Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry. Year 3 how do reflective materials keep us safe?

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

- They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. Year 3 plant murder investigation for parts and functions, Year 3 observe and describe different seed dispersal methods, Year 3 impact of sunlight on UV beads and the dangers of the sun experiment, Year 3 which objects are more reflective investigation, Year 4 plan and make your own switch, Year 4 do gases weigh anything, Year 4 what are bubbles in fizzy drinks made of? Year 4 changes in state when heating and cooling chocolate



Working scientifically skills Year 5 & 6

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

- Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.
- Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.
- The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

- The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. **Year 5 forces enquiry of friction on slope, Year 5 measuring temperature of water for different insulators, Year 5 plant growth for asexual reproduction, Year 6 measuring shadows, Year 6 measuring the effect of exercise on our heart rate, Year 6 measuring voltage, Year 6 create own investigation on whether the number of components affects the circuit**
- During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value). **Year 5 paper experiment of objects falling to Earth, Year 5 shoe grip test, Year 5 upthrust investigation, Year 5 irreversible changes balloon and vinegar experiment, Year 5 asexual reproduction of a plant over time, Year 5 dissection of an eggs experiment for the life cycle of a bird, Year 6 light travels in straight line investigation, Year 6 angles of reflection, Year 6 measuring the width of shadows, Year 6 restricting blood flow**

Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

- The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. Year 5 bar chart of gestation periods, Year 5 line graph of foetal development, Year 5 upthrust investigation, Year 5 material investigation to classify and Venn diagram, Year 5 states of matter explanation, Year 5 life cycles of mammals, Year 5 hands span investigation, Year 5 metamorphosis observation, Year 5 dissection of an eggs experiment for the life cycle of a bird, Year 6 light travels in straight line investigation, Year 6 angles of reflection, Year 6 measuring the width of shadows, Year 6 classifying animals with their habitats, Year 6 classifying animals into the 5 kingdoms, Year 6 heart label and functions, Year 6 osmosis and diffusion experiment using gummy sweets, Year 6 how exercise affects our heart rate, Year 6 create working circuits, Year 6 investigating voltage on components, Year 6 investigate broken circuits, Year 6 create own investigation on whether the number of components affects the circuit
- Children present the same data in different ways in order to help with answering the question. Year 5 materials sort and Venn diagram, Year 5 puberty diagram comparing boys and girls development, Year 5 material investigation to classify, Year 5 solubility test and group sort, Year 5 human changes spider diagram when you get older, Year 6 reflection experiment, Year 6 angles of reflection and how a periscope works, Year 6 restricting blood flow, Year 6 pie chart explaining the function of the cells within blood, Year 6 create working circuits diagram and labels

Identifying scientific evidence that has been used to support or refute ideas or arguments

- Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. Year 5 fed in facts and what's the story picture sort in forces inc helpful and non-helpful friction, Year 5 material investigation to classify, Year 5 solubility test and group sort, Year 5 irreversible changes balloon and vinegar experiment, Year 5 reversible mixture activity, Year 5 classifying creatures based on features and life cycle, Year 6 light travels in straight line investigation, Year 6 measuring the width of shadows, Year 6 Newton colour wheel, Year 6 how exercise affects our heart rate, Year 6 investigating voltage on components
- They talk about how their scientific ideas change due to new evidence that they have gathered. Year 5 hand span investigation on developing humans, Year 5 solubility test and group sort, Year 6 osmosis and diffusion experiment, Year 6 create own investigation on whether the number of components affects the circuit
- They talk about how new discoveries change scientific understanding. Year 5 hands span experiment

Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

- In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge. Year 5 gestation data analyses, Year 5 hand span investigation, Year 5 material investigation to classify, Year 5 solubility test and group sort, Year 5 dissection of an eggs experiment for the life cycle of a bird, Year 5 classifying creatures based on features and life cycle, Year 6 light travels in straight line investigation, Year 6 habitat and animals match based on animal features, Year 6 heart label and functions, Year 6 restricting blood flow, Year 6 pie chart explaining the function of the cells within blood, Year 6 how exercise affects our heart rate, Year 6 create own investigation on whether the number of components affects the circuit
- They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. Year 5 shoe grip experiment Year 5 dissection of an eggs experiment for the life cycle of a bird, Year 6 exploring angles of reflection, Year 6 measuring shadow width, Year 6 restricting blood flow, Year 6 investigating voltage on components
- They identify any limitations that reduce the trust they have in their data. Year 6 investigate broken circuits
- They communicate their findings to an audience using relevant scientific language and illustrations. Year 5 upthrust investigation, Year 5 irreversible changes balloon and vinegar experiment, Year 6 how does a periscope work? Year 6 Newton colour wheel

Using test results to make predictions to set up further comparative and fair tests

- Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.
- Year 5 shoe grip experiment, Year 5 paper drop, Year 5 upthrust investigation, Year 5 material investigation to classify, Year 5 solubility test and group sort, Year 5 irreversible changes balloon and vinegar experiment, Year 5 dissection of an eggs experiment for the life cycle of a bird, Year 6 reflection experiment, Year 6 angles of reflection, Year 6 measuring the width of shadows, Year 6 restricting blood flow, Year 6 how exercise affects our heart rate, Year 6 create working circuits, Year 6 investigating voltage on components, Year 6 investigate broken circuits, Year 6 create own investigation on whether the number of components affects the circuit

Vocabulary: working scientifically	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	look closely observe watch touch feel smell listen same different compare ask questions record sort group	compare describe equipment explore measure observe predict record	compare classify describe equipment investigate observe predict test	classify conclusion gather identify evidence investigation prediction observation	fair test classification evidence conclusion observation variable data prediction	conclusion variable analyse fair test data precision comparative test fair test force (Newton) meter	conclusion independent variable controlled variable analyse fair test precision comparative test fair test

