



St Lawrence C of E (Aided) Junior School: **SC1 Science Progression V4**

Working Scientifically		
	Lower Key stage 2	Upper Key Stage 2
National curriculum POS Working scientifically	<ul style="list-style-type: none"> ★ Asking relevant questions and using different types of scientific enquiries to answer them. ★ Setting up simple practical enquiries, comparative and fair tests. ★ Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. ★ 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. ★ Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. ★ Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. ★ Identifying differences, similarities or changes related to simple scientific ideas and processes. ★ Using straightforward scientific evidence to answer questions or to support their findings. 	<ul style="list-style-type: none"> ★ Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. ★ Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. ★ Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. ★ Using test results to make predictions to set up further comparative and fair tests. ★ Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations. ★ Identifying scientific evidence that has been used to support or refute ideas or arguments.
Notes and guidance (Non-statutory)	<p>Pupils in years 3 and 4 should be given a range of scientific experiences to enable them to raise their own questions about the world around them.</p> <p>They should start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions.</p> <p>Recognise when a simple fair test is necessary and help to decide how to set it up.</p> <p>Talk about criteria for grouping, sorting and classifying; and use simple keys.</p> <p>They should begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them.</p> <p>They should help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.</p> <p>They should learn how to use new equipment, such as data loggers, appropriately.</p>	<p>Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions.</p> <p>Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions.</p> <p>Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why.</p> <p>They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment.</p> <p>They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them;</p> <p>Choose the most appropriate equipment to make measurements and explain how to use it accurately.</p> <p>They should decide how to record data from a choice of familiar approaches.</p> <p>Look for different causal relationships in their data and identify evidence that refutes or supports their ideas.</p>

	<p>They should collect data from their own observations and measurements, using notes, simple tables and standard units, and help to make decisions about how to record and analyse this data.</p> <p>With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions.</p> <p>With support, they should identify new questions arising from the data, making predictions for new values within or beyond the data they have collected, and finding ways of improving what they have already done.</p> <p>They should also recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.</p> <p>Pupils should use relevant scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences.</p>	<p>They should use their results to identify when further tests and observations might be needed.</p> <p>Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact.</p> <p>They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time.</p>
	<p>These opportunities for working scientifically should be provided across years 3 and 4 and 5 and 6 so that the expectations in the programme of study can be met by the end of year 4 or year 6. Pupils are not expected to cover each aspect for every area of study.</p>	
Asking Questions	<p>★ To ask questions and develop a line of enquiry based on observations of the real world.</p>	<p>★ Use science experiences to explore ideas and raise different kinds of questions.</p> <p>★ To know how to turn a question or idea into a form that can be tested.</p>
Examples	<p>Year 3: Children create questions to provide extension to a topic.</p> <p>Year 4: Children make up their own questions to investigate on a given topic. (e.g. melting ice)</p> <p><i>Appendix AQ 1 Y3 Eddie - Enquiry question</i></p> <p><i>Appendix AQ 2 Y4 Lucie - Enquiry question</i></p>	<p>Year 5: Children generate own scientific questions. Good questions from all abilities.</p> <p>Year 6: Children ask questions as next steps to investigation after microorganisms' investigation. These show a high level of creative enquiry. A question posed is about the length of time it takes for the heart to return to average BPM – which is a medical indicator of health and fitness.</p> <p><i>Appendix AQ 3 Y6 group work – Enquiry question</i></p> <p><i>Appendix AQ 4 Y5 Eraj – Enquiry question</i></p> <p><i>Appendix AQ 5 Y5 Sophie – Enquiry question</i></p> <p><i>Appendix AQ 6 Y6 Sam microorganisms and pyramids</i></p> <p><i>Appendix AQ 7 Y6 Group - use toast next</i></p> <p><i>Appendix AQ 8 Y6 Group return to usual heart rate</i></p>
Monitoring next steps	<p>Some questioning in year 3 – but this needs to be consistent across all classes. Use LKS2 Planning sheet to support questioning.</p>	<p>Work in Floorbooks shows big improvement in coverage, variety and independence allowed to children in SC1</p> <p>Examples of children writing their own questions in Toucans and Quetzals – not independent in parrots. Questions scientifically good across abilities.</p> <p>NS Still need more examples of HA questioning in Y6</p>
Notes for teaching and learning	<p>Good scientific questions are defined, measurable, and controllable.</p> <p>Tips on Asking Good Scientific Questions:</p> <ol style="list-style-type: none"> 1. Begin by asking several questions about the topic. 	

	<p>2. Eliminate questions that cannot be answered by direct observation or by gathering evidence.</p> <p>3. Break broad questions into smaller questions that can be investigated one at a time.</p> <p>4. Word questions in a way that allows them to be answered by an experiment. Here are some good ways to begin scientific questions: "What is the relationship between . . . ?" "What factors cause . . . ?" "What is the effect of . . . ?"</p> <p><i>Appendix T&L1 Question_Teacher_Resource_Updated Question: Teaching resources - BBC Teach</i></p> <p>The different types of scientific enquiry</p> <p><i>Appendix T&L2 The five key practices every good primary science teacher should know</i></p> <p><i>Information on floor books.</i></p> <p>Floorbooks Primary Science Teaching Trust (pstt.org.uk)</p> <p><i>Appendix T&L3 HOW_ro_use_floorbooks_ppt_slide_notes</i></p> <p><i>Appendix T&L4 WHY_use_Floor_books_11.3.19</i></p> <p><i>Appendix T&L5 key_stage_2_teacher_assessment_exemplification_science</i></p>	
Making Predictions	<ul style="list-style-type: none"> ★ Make predictions using cause & effect ★ Make relationship/trend predictions. ★ Make predictions about what will happen, some of which are based on scientific knowledge. 	<ul style="list-style-type: none"> ★ Make predictions based on scientific knowledge and understanding.
Examples	<p>Year 3: Causal predictions based on an observational understanding of the world.</p> <p>Year 4: Causal predictions are beginning to draw on prior scientific knowledge, although this is not always accurate.</p> <p><i>Appendix MP 1 Y3 Eddie - Causal prediction</i></p> <p><i>Appendix MP 2 Y3 Eddie - Predictions egg protecting materials</i></p> <p><i>Appendix MP 3 Y4 Nina melting</i></p>	<p>In year 5, children draw on prior scientific learning to make predictions and link to previous knowledge.</p> <p>In year 6, prediction draw on a higher level of scientific learning to write causal predictions and their use of vocabulary shows progression.</p> <p><i>Appendix MP 4 Y5 Elsie Parachute prediction</i></p> <p><i>Appendix MP 5 Y5 Molly - prediction thermal insulators</i></p> <p><i>Appendix MP 6 Y5 William thermal insulators – causal prediction</i></p> <p><i>Appendix MP 6a Y5 Tomas Referring back to previous investigation in y4</i></p> <p><i>Appendix MP 6b Y5 Floorbook gears - force and friction</i></p> <p><i>Appendix MP 7 Y6 Group causal prediction – microorganisms</i></p> <p><i>Appendix MP 8 Y6 Group causal prediction - microorganisms</i></p> <p><i>Appendix MP 9 Y6 Baxter Causal Microorganisms</i></p>
Monitoring next steps		Floorbooks SC1 – now evidence of predictions at expected standard.
Setting up Tests (<i>Fair testing. Observations over time. Pattern seeking.</i>)	<ul style="list-style-type: none"> ★ Plan a fair test by selecting variables to change & measure. ★ Design a fair test with more than one variable e.g. using different materials to cut out sound. ★ Plan how to collect sufficient evidence. ★ Explain to others why a test is fair. ★ Choose what apparatus to use and what to measure (in some simple contexts) ★ Write a simple ordered method (from a plan) 	<ul style="list-style-type: none"> ★ Plan different types of scientific enquiries to answer questions. ★ Decide how to turn ideas into a form that can be tested. ★ Recognise and control variables where necessary. ★ Choose what evidence to collect to investigate a question, ensuring the evidence is sufficient. ★ Choose what equipment to use. ★ Plan to collect repeat readings (>3) & calculate mean ★ Design & write an ordered reliable method (repeats)
Examples	<p>Year 3: Children are given the question and method of testing. They begin to use the vocabulary to describe variables, conclusions and predictions.</p> <p>Year 4: Children are given a question as the starting point for their investigation. They are then given opportunities to choose how to set up this investigation.</p> <p><i>Appendix SUT 1 Y3 Eddie - Exploring fair tests</i></p>	<p>Year 5: Children are given the question and method of testing.</p> <p>Year 6: Children choose how to set up microorganisms' investigation.</p> <p><i>Appendix SUT 7 Y5 Elsie - Floating investigation - repeating results</i></p> <p><i>Appendix SUT 8 Y5 Elsie - Friction Investigation</i></p> <p><i>Appendix SUT 9 Y5 Elsie - levers investigation</i></p> <p><i>Appendix SUT 10 Y5 Elsie - Parachute Investigation</i></p> <p><i>Appendix SUT 11 Y5 Elsie - Upthrust investigation</i></p>

	<p>Appendix SUT 2 Y3 Eddie - patterns in shadows</p> <p>Appendix SUT 3 Y3 Eddie - Materials investigation plan</p> <p>Appendix SUT 4 Y3 Eddie - Variables 2</p> <p>Appendix SUT 5 Y3 Eddie - Variables explanation</p> <p>Appendix SUT 6 Y4 Lucie - Freezing rate of liquids test plan</p> <p>Appendix SUT 6a Y4 Lucie - air in chocolate investigation method</p> <p>Appendix SUT 6b Y4 Lucie - air in chocolate investigation pictures of test</p>	<p>Appendix SUT 12 Y5 Elsie - waterproofing investigation</p> <p>Appendix SUT 13 Group - Microorganisms investigation</p>
Monitoring next steps		<p>Y5: Need opportunities to design own method to investigate a question.</p> <p>Y6: Children should be guided to create a question and then choose how to set up an investigation.</p>
Teaching and Learning notes	<p>Give SC1 planning sheet as trialled in Y4 to Y3 to begin to use. Create an adapted version for 5 and 6 to use, with repeat results etc.</p> <p>The different types of scientific enquiry Appendix T&L 2.2 <i>The five key practices every good primary science teacher should know</i></p> <p>1. Fair testing. 2. Observations over time. Eg: What happens to a seed when it germinates? 3. Pattern seeking. Eg: Is it always cold when it's raining? 4. Identifying and classifying. Eg: What do different animals eat? 5. Research: Eg: What's the strongest magnet in the world?</p>	
Identifying and classifying	<ul style="list-style-type: none"> ★ Begin to create appropriate groups for grouping, sorting and classifying. ★ Create and use simple keys. 	<ul style="list-style-type: none"> ★ 1 group & sub-group by fine observation (create criteria) ★ Use and develop keys to identify, classify and describe living things and materials.
Examples	<p>Year 3: Children choose items to sort into different food groups.</p> <p>Year 4: Children sort items into solids, liquids and gases at the start of the topic. They choose how to sort animals when looking at classification keys.</p> <p>Appendix IQ 1a Y3 Noah – Sorting foods</p> <p>Appendix IQ 1 Y4 Harvey - Classifying SL and G</p> <p>Appendix IQ 2 Y4 Molly - keys classifying</p>	<p>Year 5: Children compare items according to their properties. They sort materials into those according to whether changes are reversible or irreversible.</p> <p>Year 6: Children create keys using Linnaean system – clear progress from Y4</p> <p>Appendix IQ 3 Y5 Molly Comparing using properties of materials</p> <p>Appendix IQ 4 Y5 Molly sorting materials reversible change</p> <p>Appendix IQ 5 Y6 Gabby - classification key</p> <p>Appendix IQ 6 Y6 Gabby - classification table of leaves</p> <p>Appendix IQ 7 Jessica Linnaean classification</p> <p>Appendix IQ 8 Jessica Linnaean classification</p>
Monitoring	<p>Y4 examples of sorting in classification lesson Other opportunities to sort: Solids liquids and gases – could they come up with these criteria independently?</p>	
Research	<ul style="list-style-type: none"> ★ Recognise when and how secondary sources might help me to answer questions that cannot be answered through practical investigations. 	<ul style="list-style-type: none"> ★ Recognise which secondary sources will be most useful to research my ideas. ★ Begin to separate opinion from fact.
	<p>Year 4: Children research how different animals have different diets – relating these to teeth and the digestive system.</p>	<p>Appendix R 1 Y5 Molly Egg laying animal research</p> <p>Appendix R 2 Y5 Molly life cycles research</p> <p>Appendix R 3 Y6 Gabby - Adaptations research</p> <p>Appendix R 4 Y6 Gabby - Extinction research</p> <p>Appendix R 5 Y6 Gabby - Scientist research - Charles Darwin</p>
Monitoring next steps	<p>Examples from year 4 – year 3 – do they do any research?</p>	<p>Good examples of research.</p>
Observing and Measuring	<ul style="list-style-type: none"> ★ Make systematic and careful observations. ★ Take accurate measurements using standard units. 	<ul style="list-style-type: none"> ★ Take measurements, using a range of scientific equipment, with increasing accuracy and precision. ★ Take repeat readings when appropriate.

	<ul style="list-style-type: none"> ★ Convert values in standard units (inc. time in minutes and seconds and temperature in degrees centigrade) ★ Use a range of equipment including thermometers and data loggers. 	<ul style="list-style-type: none"> ★ Y5 Measure capacity, mass and area. Newtons; grammes; mm and cm; cm²; ★ Y6 Take measurements and use ratio and proportion. V; Km/hr; M per sec; m/sec;
Examples	<p>Year 3: Use of observation and counting simple numerical data (Number of paper clips attracted by a magnet). Careful and systematic observations, including those over time.</p> <p>Year 4: Children use data loggers to measure sound. Measurements of time in minutes and seconds, cm.</p> <p><i>Appendix OM 1 Y3 Lucie - Observation plants and seeds</i> <i>Appendix OM 2 Y3 Lucie - Observation rocks</i> <i>Appendix OM 3 Y3 Lucie - Observations over time Plants</i> <i>Appendix OM 3a Eva – simple numerical data</i> <i>Appendix OM 4 Y4 Harvey - Observation friction</i> <i>Appendix OM 5 Y4 Harvey - observation over time freezing</i> <i>Appendix OM 6 Y4 Harvey - Observation over time viscosity</i></p>	<p>Year 5: Children repeat results regularly (<i>Eg: Upthrust, parachutes, friction</i>) and HA mathematicians calculate the mean from a set of data.</p> <p>Year 6 Measure heart rate for 15 seconds and multiply by 4 to get BPM. They use multiple results to get reliable data.</p> <p><i>Appendix OM 7 Y5 Elsie - Measuring calculating mean</i> <i>Appendix OM 8 Y5 Elsie - Measuring in hundredths of seconds</i> <i>Appendix OM 9 Y5 Elsie - Measuring in Newtons x 3 repeated results</i> <i>Appendix OM 10 Y6 Gabby - data table of heart beats in 15 secs multiply by 4 to get BPM</i> <i>Appendix OM 11 Y6 Group - multiple results</i></p>
Monitoring		NS – Y6 repeat results.
Recording data	<ul style="list-style-type: none"> ★ Record data and results using simple scientific language drawings, and labelled diagrams. ★ Record data using bar charts, and tables. ★ Construct a simple table to compare cause & effect. ★ Construct bar charts correctly (inc. numerical axis) ★ Suggest a data range & interval for a variable 	<ul style="list-style-type: none"> ★ Record data and results of increasing complexity using scientific diagrams and labels. ★ Record data using scatter graphs, bar and line graphs. ★ Construct a complex table to show repeated data ★ Construct graphs and scale at least one axis independently
Examples	<p>Year 3: Children label axis independently – simple values, eg, number of paper clips, teaspoons of sugar.</p> <p>Year 4: Children label axis and suggest intervals and range in a graph to show volume in decibels.</p> <p><i>Appendix RD 1 Y3 Eddie bar chart</i> <i>Appendix RD 2 Y3 Harvey Bar chart – magnets</i> <i>Appendix RD 3 Y4 Harvey - Viscosity table</i> <i>Appendix RD 4 Y4 Harvey - Freezing table</i> <i>Appendix RD 5 Y4 Nina – line graph to show decreasing volume over distance.</i></p>	<p>Year 5: data of increasing complexity is recorded. Tables of repeated data.</p> <p>Year 6: Children use comparative line graphs with 4+ data sets plotted. They label their axis independently.</p> <p><i>Appendix RD 5 Y5 Elsie - Using mean value in data</i> <i>Appendix RD 6 Y5 Molly - Data in a table</i> <i>Appendix RD 7 Y5 Elsie Measurements in G and N</i> <i>Appendix RD 8 Y6 Gabby - data table of heart beats in 15 secs multiply by 4 to get BPM</i> <i>Appendix RD 9 Y6 James – weight and height of babies' graph</i> <i>Appendix RD 10 Y6 James - investigation linking gestation period and life expectancy</i> <i>Appendix RD 11 Y6 James – scatter graph to show the effect of penicillin on bacteria</i> <i>Appendix RD 12 Y6 Group - comparative line graph</i></p>
Monitoring next steps		Check consistency in Y6
Interpreting and Communicating Results	<ul style="list-style-type: none"> ★ Use straightforward scientific evidence to answer questions. ★ Use results to draw simple conclusions. ★ Report on findings using oral and written explanations, displays or presentations of results and conclusions. 	<ul style="list-style-type: none"> ★ Use the underpinning science to explain results. ★ Use data in my conclusions. ★ Explain and evaluate the level of reliability of results. (degree of trust)

		<ul style="list-style-type: none"> ★ Relate the findings of investigations to other enquiries where appropriate. ★ Report on the above using oral and written explanations, displays or presentations of results and conclusions.
Examples	<p>Year 3: Children write conclusions and explain their findings linked to what they have seen. HAPs begin to link the results of their investigations to the underpinning science.</p> <p>Year 4: Children give reasons to explain their findings and these are linked to what they have seen. They begin to link the results of their investigations to the underpinning science.</p> <p><i>Appendix ICR 1 Y3 Eddie - Causal conclusion</i> <i>Appendix ICR 2 Y3 Eddie - Causal conclusion 2</i> <i>Appendix ICR 2A Y3 causal conclusion magnetism</i> <i>Appendix ICR 3 Y4 Harvey - bulbs conclusion</i> <i>Appendix ICR 5 Y4 Lucie - Freezing conclusion</i> <i>Appendix ICR 6 Y4 Violet - Teeth investigation write up 1</i> <i>Appendix ICR 7 Y4 Violet - Teeth investigation write up 2</i></p>	<p>Year 5 children write conclusions and evidence a confident use of appropriate scientific vocabulary. They begin to link their findings to underpinning scientific concepts.</p> <p>Year 6 conclusions are simple and based on what they have observed.</p> <p><i>Appendix ICR 8 Y5 Elsie - Conclusion vocab</i> <i>Appendix ICR 9 Y5 Elsie - Parachute conclusion - air resistance</i></p>
Monitoring next steps	<p>Y3 – ch to refer to scientific concepts and big idea in conclusions. Swifts have evidence of this but not the other two classes.</p>	<p>NS Y5 and 6 – need to refer to scientific concepts and big idea in conclusions.</p>
Evaluating	<ul style="list-style-type: none"> ★ Make predictions for new values, ★ Suggest sensible improvements to what I have done. ★ Raise further questions prompted by the investigation. ★ Make predictions for new values within or beyond the data. 	<ul style="list-style-type: none"> ★ Use test results to make predictions to set up further comparative and fair tests. ★ Identify when further observations, comparative and fair tests might be needed.
Examples	<p>Year 3 and 4: Children suggest sensible improvements to investigations.</p> <p><i>Appendix EV 1 Y3 Lucie - Evaluation - flowers taking up liquid</i> <i>Appendix EV 2 Y4 Harvey - Evaluation of Ice melting</i> <i>Appendix EV 3 Y4 Harvey - Evaluation redo investigation teeth</i></p>	<p>Year 5 and 6: Children suggest sensible improvements to investigations completed.</p> <p><i>Appendix EV 4 Y5 Elsie - Chocolate change of state - suggest next investigation</i> <i>Appendix EV 6 Y6 Group - evaluation pulse rate</i> <i>Appendix EV 7 Y6 Group evaluation pulse rate</i></p>
Monitoring next steps	<p>NS: Inconsistent use of evaluations across classes – put into planning.</p>	<p>NS: Inconsistent use of evaluations across classes – put into planning. Higher level of evaluation - begin to draw on scientific knowledge to frame these.</p>