Article 28: **You have the right to a good quality education.**
Article 29: **Your education should help you to use and develop your talents and abilities.**

Science Skills Progression Map (to be used in conjunction with Science Knowledge Progression Map)

Vision: To nurture the natural curiosity of pupils through practical science rooted in exploration and explanation. Teaching and learning is underpinned by the Penwortham 5 key principles for science: ask questions, take risks, explore, explain, reflect.

Key Principles: Ask Questions, Take Risks, Explore, Explain, Reflect (these to be on displays, in books, on slides)

Year groups	Classifying This involves sorting and grouping according to similarities and differences	Observing changes over time This is when observations or measurements are made at regular intervals)	Comparative and fair test This involves exploring cause and effect 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.	Pattern Seeking	Researching This involves using secondary sources to find answers to questions	Schema – connections Vocabulary	Mastery Trips and experiences

EYFS The World	Be curious about similarities and differences. With help, ask questions about similarities and differences. Talk about ideas for sorting or matching. Use senses to sort and match. Match things that are the same. Find things that are similar or different. Sort or group in own way. Use simple equipment to help sort (e.g. boxes, hoops). Talk about how things have been sorted or matched.	Be curious about things that change. With help, ask questions about things changing. Talk about ideas for finding out how things change. Use senses to observe changes. Look closely at how things change. Make simple records of how things change (with help where necessary). Use simple equipment to observe and record changes. Talk about what has been done and noticed.	Be curious about how things behave. With help, ask questions about things that can be tested. Talk about ideas for testing how things behave. Use senses to look closely at how things behave. Carry out simple tests. Make simple records (with help where necessary). Use simple equipment to observe and record. Talk about whether something makes a difference.	Be curious about patterns. With help, ask questions about patterns. Talk about ideas for finding out about patterns. Use senses to look closely for patterns. Observe more than one thing at a time. Make simple records (with help where necessary). Use simple equipment to observe and record patterns. Talk about what has been done and noticed.	Be curious about surroundings. With help, ask questions that can be answered using secondary sources. Listen carefully. Know that information in books and electronic media can be used to answer questions. Find pictures of things. Talk to people about what they do and how things work. I Talk about things found out.	**Geography – Understanding the World** Make observations of animals and plants to answer why some things occur and talk about changes. **History – Our locality** How can we classify looking at similarities and differences between ourselves and others, and among families, communities and traditions? **Vocabulary** same, different, match, group, true, false, world, planet, space, country, local, animal, adult, baby	Are extremely interested in finding out more about themselves and things around them **Trips and Experiences:** A local specialist brings in butterflies. Chicks brought into school to hatch. Trip to Battersea Park Zoo Local area walks. Visit the shops. People who help us - lots of visitors into school including GP and a dental nurse. Space topic - mobile planetarium comes to visit. Trip to Bocketts farm to learn about animals.
Y1 **Plants** **Animals, inc humans** **Everyday Materials** **Seasonal Changes**	Ask questions about how and why things are similar or different. Make comparisons between simple features of objects, materials or living things. Sort objects by observable and behavioural features. Identify	Ask questions about how and why things change. Use non-standard units and simple equipment to record changes. Identify simple changes and talk about them. Sequence changes.	Ask questions about why and how. With help, notice links between cause and effect. Use non-standard units and simple equipment to record data. Begin to use simple scien,identify and describe simple causal relationships.	Ask questions about why and how things are linked. Use non-standard units and simple equipment to record events that might be related. Identify simple patterns and talk about them. Make links between two sets of observations.	Ask questions about how things are and the way they work. Use simple books and electronic media to find things out. Ask questions to find out what people do and how things work. With help, give an opinion about some things found out.	**Geography – Weather** How do changes in the weather impact plants and animals? **History – Great Fire of London** How did housing materials help the spread of the fire? **Vocabulary** Transparent, Opaque, Materials, Bendy, Stretchy,	Uses rich vocabulary to discuss the effect that a material's properties would have on its usefulness. Reasons well to justify their answer. A keen observer and can compare and contrast in more detail e.g.

	similarities and differences and talk about them.					Absorbent, Rough, Stiff, Spring , Summer, Autumn, Winter, Hail, Fog, Snow, Sleet, Amphibians, Reptiles, Mammals, Herbivore, Omnivore, Carnivore	looking at the structure of leaves (shape, colour, vein patterns). Think logically, providing plausible explanations for phenomena (they may be methodical in their thinking, but not in their recording) **<u>Trips and Experiences:</u>** Nature walk to support 'Seasons' topic. Reptile Show visit school. Cross-curricular science and geography local environment walks.
Year 1 and 2 Working Scientifically NC objectives	• **asking simple questions and recognising that they can be answered in different ways** • **observing closely, using simple equipment** • **performing simple tests** • **identifying and classifying** • **using their observations and ideas to suggest answers to questions** • **gathering and recording data to help in answering questions**						

Y2 **Living things and their habitats** **Plants** **Animals inc humans** **Uses of everyday materials**	**Embed Year 1 skills plus:** Decide what to observe to identify or sort things. Record observations in words or pictures or simple tables. Record sorting in sorting circles or tables. I Begin to use scientific language to talk about how things are similar or different. Try to use records to help sort or identify other things.	**Embed Year 1 skills plus:** With help, identify changes to observe and measure and suggest how to do it. Record in words or pictures, or in simple prepared formats such as tables and charts. Begin to use scientific language to talk about changes. Talk about whether the change was as expected.	**Embed Year 1 skills plus:** With help, identify simple variables to change and measure. Plan simple comparative tests. Record in word or pictures, or in simple prepared formats such as tables and tally charts. Interpret and talk about data. With help, say if a test was fair. Say if the relationship was as expected.	**Embed Year 1 skills plus:** With help, decide what patterns to observe and measure and suggest how to do it. Record in words or pictures, or in simple prepared formats such as tables, tally charts and maps. Begin to use scientific language to talk about patterns. Talk about whether the pattern was as expected.	**Embed Year 1 skills plus:** With help, make suggestions about how to find things out. Record in words and pictures. Begin to use scientific language to talk about what has been found out. Talk about whether an information source is useful. Give an opinion about some things found out.	**Geography - Our World** How do natural habitats around the equator differ from those elsewhere and what sorts of organisms thrive in these environments? **History – Mary Seacole** What changes to human health did Mary Seacole bring about? **Vocabulary** Fruit, Vegetable, Deciduous, Evergreen, Bulb, Seed, Suitable, Trunk, Branches, Leaves, Root, Stem, Wood, Metal, Plastic, Glass, Leather, Metal, Rock, Offspring, Human, Hygiene, Exercise, Nutrition, Survival, Habitat, Micro-Habitat, Food Source, Grow, Mature, Suitable, Healthy	Learn quickly about the relationship between diet and exercise. Can compare and discuss different meal choices including vegetarian and vegan diets. Shows curiosity when using secondary sources of information and is always accurate. Justifies their answers. **Trips and Experiences:** Visit the garden centre then plant seeds. Nature Walk. Visiting family members come in to talk about offspring.

Y3 **Plants** **Animals inc humans** **Rocks** **Light** **Forces and magnets**	Talk about what criteria to use to sort and classify. Carry out simple tests to sort and classify according to properties or behaviour. Use Carroll diagrams and Venn diagrams to sort. Talk about similarities and differences identified using some scientific language. Draw simple conclusions about things sorted and classified.	Talk about things changing and recognise when questions can be answered by observing over time. Use a range of equipment to collect data using standard measures. Begin to use and interpret graphs. Draw simple conclusions from observed changes.	Talk about the links between cause and effect and (with help) pose a fair test question. Help to plan a fair test. Use a range of equipment to collect data using standard measures. Draw simple conclusions from fair tests.	Talk about where patterns might be found and recognise when questions can be investigated by pattern seeking. Use a range of equipment to collect data using standard measures. Draw conclusions about simple patterns between two sets of data.	Talk about how things are and the way they work and recognise when questions can be answered by research using secondary sources. Use someone else's data. Record findings in words. Draw conclusions from information gathered from different sources.	**Geography - Natural Resources (Food, farming and forests)** How does trade impact the foods we grow and consume? **History – Stone Age/Iron Age** How do historians and scientists work together to date artefacts particularly when made of stone? **Vocabulary** Appearance, Sedimentary, Organic matter, Grains, Crystals, fossils, soil, Properties, Physical, Natural, Artificial, Reflect, Surface, Shadow, Pollination, Dispersal, Nutrition, Vitamins, Minerals, Fat, Protein, Carbohydrates, fibre, muscles, relax, contract	Shows curiosity when using multiple sources of evidence to support or refute a theory. Uses extensive vocabulary to explain the difference between 3D and 2D shapes when looking at shadows. Reasons well and can explain how a compass works after researching the Earth's magnetic pole. Makes keen observations when investigating muscles and skeletons. Strive for maximum accuracy as possible (sometimes beyond the accuracy of the instrument) **Trips and Experiences:** Trip to Kew Gardens. Planting flowers in the school playground working with gardeners. Nature Walk.

Year 3 and 4 Working Scientifically NC objectives	• **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.**						
Y4 **Living things and their habitats** **Animals inc humans** **States of matter** **Sound** **Electricity**	**Embed Year 3 skills plus:** Decide what equipment to use to identify and classify. Talk about what can be grouped and recognise when questions can be answered by sorting and classifying. Use Carroll diagrams, Venn diagrams and more complex tables to sort. Use simple keys and branching databases to identify things. Make simple branching databases for things with clear differences. Suggest improvements to the ways of sorting and identifying.	**Embed Year 3 skills plus:** Decide what observations to make, how often and what equipment to use. Make records using tables and bar charts. Begin to use and interpret graphs produced by data loggers. Talk about changes using some scientific language. Suggest improvements to the ways to observe.	**Embed Year 3 skills plus:** Decide what data to collect. Decide what equipment to use and how to make observations. Make records using tables and bar charts. Begin to use and interpret data collected through data loggers. Talk about, and explain, simple causal relationships using some scientific language. Suggest ways in which fair tests can be improved.	**Embed Year 3 skills plus:** Decide on which sets of data to collect, what observations to make and what equipment to use. Make records using tables, bar charts or simple scatter graphs. Begin to use and interpret data collected through data loggers. Talk about patterns using some scientific language. Suggest improvements to the way patterns are sought.	**Embed Year 3 skills plus:** Use information sources to find the information required. Present information in different ways. Draw conclusions from information gathered from different sources. Talk about what the information and data means using some scientific language. Suggest ways to improve how information can be sought and used.	**Geography - Active Planet (Earthquakes, Volcanoes and Tsunami)** Can geographers and scientists predict where and when volcanoes will erupt? How could this benefit society? **History – Ancient Greece** How was the construction of amphitheatres informed by the understanding of how sound travels? **Vocabulary** Appliance, Electricity, Construct, Series circuit, Cell, Conductor, Insulator, Vibration, Medium, Pitch, Volume, Faint, Material, Solid, Liquid, Gas,	Shows curiosity when investigating the digestive systems of different animals e.g. humans compared to cows. Why do cows have 4 stomachs? Reasons well to justify their answer using multiple sources. Ask many questions, suggesting that they are willing to hypothesise and speculate. Can construct a range of switches and explain how they function in different ways e.g. pressure switch, push on/push off, two-way etc.

						State, Degrees Celsius, Evaporation, Condensation, Water Cycle, Incisors, Canines, Molars, Digestive System, Oesophagus, Prey, Predator, Environment, Vertebrate, Invertebrate, Deforestation	**Trips and Experiences:** Musician visit with a variety of instruments Community speaker from Thames water- talking about the water cycle. Nature walk to local rec to see the local wildflower meadow
Y5 **Forces** **Properties and changes of materials** **Earth and Space** **Living things and their habitats** **Animals inc humans**	Deciding when identifying and classifying will be helpful to answer questions. Use a series of tests to sort and classify materials. Use secondary sources to identify and classify things. Draw valid conclusions when sorting and classifying. Recognise the significance of sorting and classifying.	Deciding when observing changes over time will help to answer questions. Use equipment accurately without support. Record data appropriately. Draw valid conclusions from data about changes. Recognise the significance of things changing over time.	Plan a fair test, selecting the most suitable variables to measure, change and keep the same. Decide what equipment to use to make measurements as accurate as possible. Use equipment accurately to collect observations. Record data appropriately and accurately. Draw valid conclusions based on data. Recognise the significance of the results of fair tests.	Recognise when variables cannot be controlled and decide when pattern seeking will help to answer a question. Use equipment accurately to collect observations. Record data appropriately and accurately. Draw valid conclusions from data about patterns.	Decide when research using secondary sources will help to answer questions. Use relevant information and data from a range of secondary sources. Recognise how data has been obtained. Draw valid conclusions from research. Talk about and explain research using scientific knowledge and understanding.	**Geography - Rivers** How does river pollution impact the natural habitat of river dwelling organisms? What are the main human threats to river wildlife thriving? **History – Anglo Saxons and Vikings** Which materials were successfully used to make tools and weapons? **Vocabulary** Rotate, Orbit, Axis, Celestial body, Solar system, Eclipse, Satellite, Universe, Durable, Reversible, Irreversible, Dissolving, Substance,	Uses extensive vocabulary to design a leaflet to help children with the emotional side of puberty. Design their own experiment to investigate the life cycles of flowering and non-flowering plants. Reasons well to explain how parachutes have changed overtime? Are able to sustain their interest and go beyond an obvious answer to underlying mechanisms and greater depth **Trips and Experiences:**

						Solution, Sexual, Asexual, Friction, Gravity, Air Resistance, Water Resistance, Force, Load, Effort, Mechanism, Accelerate, Decelerate, Variable	The Science Museum - Wonder lab Cross-curricular science and geography trip to Creekside Discovery Centre in Deptford. Visit to a secondary school's science lab.
Year 5 and 6 Working Scientifically NC objectives	• **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**						
Y6 **Light** **Electricity** **Living things and their habitats** **Animals inc humans** **Evolution and inheritance**	**Embed Year 5 skills plus:** Decide what equipment, tests and secondary sources of information to use to identify and classify things. Make keys and branching databases with four or more items. Use more than one piece of scientific evidence to identify and classify things. Talk about and explain tasks using scientific	**Embed Year 5 skills plus:** Decide how detailed any observations need to be, and what equipment to use, to make measurements as accurate as possible. Present data in line graphs. Interpret changes in data. Recognise the effect of changing the time and number of observations. Talk about and explain changes using scientific	**Embed Year 5 skills plus:** Recognise when variables need to be controlled and decide when a fair test is the best way to answer a question. Present data in line graphs. Identify causal relationships. Talk about and explain causal relationships using scientific knowledge and understanding. Evaluate the effectiveness of fair testing,	**Embed Year 5 skills plus:** Decide how detailed data needs to be, and which equipment to use, to make measurements as accurate as possible or required. Present data in scatter graphs and frequency charts. Recognise patterns in results. Recognise the effect of sample size on reliability. Draw valid conclusions from	**Embed Year 5 skills plus:** Decide which sources of information might answer questions. Start to notice when information or data is biased or based on opinions rather than facts. Present findings in suitable formats. Evaluate how well research has answered questions. Recognise that some scientific questions may	**Geography - Comparing Biomes** Do we inherit the same biomes with each generation? How have these biomes evolved? Which changes are positive, which are negative and which could be perceived as both? **History – WW2** How have attitudes to war evolved and what world views have people inherited from those who fought for their country? **Vocabulary**	Shows curiosity and uses multiple sources of evidence to investigate e.g. who invented a traffic light? Why? Reason well about why women were not credited with their inventions and reflect on how this has changed. Reason about what caused the dodo to become extinct and why the toucan is being threatened with extinction? (archive website) Which life is worth saving? How do we decide?

	knowledge. Evaluate how well keys worked.	knowledge and understanding. Evaluate the effectiveness of observations.	recognising variables that were difficult to control.	data about patterns and recognise their limitations.	not have been answered definitively.	Filter, Periscope, Reflect, Reflection, Voltage, Series Circuit, Classification, Micro-Organism, Characteristics, Adaptation, Extinction, Endangered, Evolution, Inheritance, Internal Organs, Circulatory System, Muscular, Digestive, Nutrients, Blood Vessels, Lifestyle	Use extensive vocabulary to create an Explain Everything video about light for Yr. 3 children reflecting on what knowledge and understanding they will need for the Yr. 6 topic. **Trips and Experiences:** **DT link-** making an electrical wire loop game Natural History Museum Trip – Evolution Workshop Dr Emma – heart and blood workshop
KS3	In KS3 science is taught as a discrete subject. Pupils will have opportunities, through various contexts, to: • develop skills in scientific methods of enquiry to further scientific knowledge and understanding: • plan for investigations, • obtain evidence, • present and interpret results; • develop creative and critical thinking in their approach to solving scientific problems; • research scientific information from a range of sources; • develop a range of practical skills, including the safe use of science						

	Food tests – carbohydrates containing sugar or starch. Indicators to classify household chemicals (acids/alkalis). Endothermic and exothermic reactions. Properties of elements –melting point; boiling point, density etc. Reactivity series – comparing reactions of metals with water or acid.	Effect of amylase on breakdown of carbohydrates. Effect of insulation on the cooling of hot water. Osmosis - this is usually KS4. Evaporation of water from a solution to leave crystals. Growth of bacteria on plates. Cooling curve – stearic acid.	Reactivity of metals with water and dilute acid. Hooke's law. Changing angle of reflection – independent & dependent variable. Ohm's law. Effect of insulation on cooling of water. Energy content of different food. Resistance of a wire. Strength of an electromagnet.	Secondary learning moves into modelling as well as extending understanding of pattern seeking. Abstract scientific models such as the particle model or force diagrams	Carbon cycle. Composition of atmosphere. Indicator species. Pollution. Waves. Planets. Drugs & their effects on the body. Ceramics, polymers & composites. Indicator species – what lives where including pond life and lichens Pond dipping - keys to identify organisms.		