Colmore Junior School Curriculum

Science Substantive & Disciplinary Knowledge Progression

Curriculum Design/ Aims:

Our approach to teaching science provides the foundations for understanding the **world through the specific disciplines of biology, chemistry, and physics**. We teach the children that science has changed our lives and is vital to the world's future prosperity and do so by teaching the essential aspects of the knowledge, methods, processes, and uses of science. By building upon the substantive (subject) knowledge and concepts, we encouraged our children to recognise the power of **rational explanation** and develop a **sense of excitement and curiosity about natural phenomena**. Learning to be able understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes is the focus for how we interweave the disciplinary (expert) knowledge & skills into our curriculum. The chart below identifies the substantive & disciplinary concepts & knowledge as separate progression documents but it is important to outline that these aspects are not taught separately. Science is interlinked to other subjects in the curriculum such as Design Technology, Computing and Maths (STEM).

Science Subject Leads: Eleanor Hopkins **Assistant Head for Curriculum**: Ruth Bond.

Substantive Knowledge Progression

Aspect	Year 3	Year 4	Year 5	Year 6
Biology	Human Body • Functions of skeletons and muscles. • Human skeletons are internal and grow. • Functions of teeth and importance of dental health. • Effect of substances on the body. • Make recommendations about healthy and unhealthy lifestyle choices. Plants • Parts of a flowering plant. • Requirements for plants and seeds to live and grow. • Lifecycle of a flowering plant. • Transportation of water around plants. • Conditions for plant growth.	Habitats • Group living/non-living things • Classify animals. • Classify trees. • Food chains. • Impact of humans on the environment.	Human Body • Parts and functions of the circulatory system. • Impact of exercise on the way the body functions. • Parts and functions of the digestive system • Nutrition and water transportation in humans. • Similarities and differences: human and animal skeletons • Impact of diet and drugs on the way the body functions. • Changes: Gestation – infancy – childhood -adulthood - old age • Comparison between the changes that occur in humans and other animals. Plants • Sexual and asexual reproduction in plants, including seed dispersal and cuttings. • Transpiration and Photosynthesis • Classification of living things including micro-organisms, plants and animals. RSHE Puberty (changes from childhood to adulthood)	Evolution • Formation of fossils. • Fossils providing information about the past. • How living things have changed over time. • Adaptation: plants and animals. • Darwin's theory of evolution and natural selection. • How small variations lead to dramatic evolutionary changes. • How traits are passed from parents to offspring, dominant and recessive genes. • Selective breeding. • Extinction. RSHE • Puberty (changes from childhood to adulthood) • Sexual reproduction in humans.
Chemistry	Materials: Rocks • Properties of materials, how and why they are used for specific purposes. • Features of the three main types of rocks. • How the three main types of rocks are made. • Relative hardness of rock types. • How soil is made from rocks. • Relative absorbency of different soils. • Different layers in the soil profile.	Materials: Hot and Cold • Classify solids, liquids and gasses • Observe and measure changing states • Effects of temperature on evaporation • Water Cycle • Thermal conductivity: objects • Reversible changes of state	Materials: changes • How substances in materials can be identified by chemical reactions. • Reversible and irreversible changes • Formation of new materials. • Separation, filtration, sieving, evaporation • Recovering a substance from a solution .	Investigation Transition Topic: Materials • Forensic science enquiry investigation • Classify solids based on a crime scene investigation • Make careful and systematic investigations • Ask specific scientific questions to deduce • Research and draw conclusions based on evidence found
Physics	Electricity • Explain examples of simple circuits. • Draw circuit diagrams with symbols. • Predict and test circuits. • Conductors and insulators • How is Electricity generated? • Practical example of electricity at work. Magnets • Everyday uses of magnets. • Poles- predict attract/ repel. • Magnetic/non-magnetic materials. • Strength of different magnets. • Understanding that magnets can work at a distance. Light • Why we need light. • Primary and secondary sources of light. • Light travels in straight lines • Formation of shadows. • Change in size of shadows. • Light reflected on surfaces	Sound • Classify sounds • How sound enters the ear • How sounds are made: vibrations • Patterns in pitch • Relationship between volume and strength of vibrations • Features of object that create sound Forces • Forces of gravity, Isaac Newton and theory of gravity. • Effects of air resistance, water resistance, friction and upthrust. • Aerodynamic features of objects. • Investigate gravity and air resistance. • Alter the effects of friction Earth and Beyond • Shapes and relative sizes of earth, sun, and moon. • Rotation of Earth creating day/night • Movements of sun, earth and moon leading to days, years, and months. • How gravity affects objects in space. • Planets in our solar system.	Electricity • Link brightness of bulb with cells used in a circuit. • Effects of different components in a circuit. • Design, label and construct a circuit for purpose • Generation and transmission of electricity • Sustainable energy sources.	Light • How the eye works (reflected light/light entering the eye). • Parts of the eye and their functions. • Link between light travelling in straight lines and the shape of an object's shadow. Investigation Topic: Sound • Children build on their knowledge and understanding of sound (Y4) through child-led investigation. • Investigative skill focus: Taking measurements with increasing accuracy. Investigation Topic : Earth and space • Children build on their knowledge and understanding of Earth and space (Y4) through child-led investigation. • Investigative skill focus: Interpreting and analysing data from secondary sources.

Disciplinary Knowledge Progression				
Skills	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Asking Scientific Questions	Suggesting simple scientific questions with some support	Suggesting simple scientific questions more independently	Asking specific scientific questions in a range of contexts	Asking specific scientific questions in more challenging contexts
Planning an enquiry	Planning simple enquiries and tests with some support	Planning simple enquiries and tests with more independence	Planning different types of scientific enquiries	Planning different types of scientific enquiries, controlling variables
Making predictions	Suggesting outcomes of simple enquiries and tests with some support	Suggesting outcomes of simple enquiries and tests more independently	Making predictions about the outcomes of tests including our own	Making and justifying predictions about tests including our own
Observing closely	Making careful observations with some support	Making careful observations more independently	Making systematic and careful observations	Making systematic and careful observations; suggesting what/how
Taking measurements	Taking accurate measurements with some support	Taking accurate measurements more independently	Taking increasingly precise measurements with a range of equipment	Taking precise and repeated measurements with a range of equipment
Recording results	Recording data with support, using simple scientific language and notation	Recording data more independently, using scientific language and notation	Recording more complex data using a variety of scientific language and notation	Recording more complex data using a wide variety of scientific language and notation
Presenting results	Presenting data with some support, using simple scientific language, drawings and diagrams	Presenting data more independently, using scientific language, drawings and diagrams	Presenting more complex data using a variety of scientific language, drawings and diagrams	Presenting more complex data using a wide variety of scientific language, drawings and diagrams
Analysing results & Drawing conclusions	Using findings to suggest answers to simple scientific questions, with some support	Using findings to suggest answers to simple scientific questions, more independently	Using findings to draw conclusions about specific scientific questions in a range of contexts	Using findings to draw conclusions about specific scientific questions and to suggest further enquiries
Researching; **Finding evidence to support or refute scientific ideas**	Researching straightforward scientific information to support our own ideas and findings, with some support	Researching straightforward scientific information to support our own ideas and findings, more independently	Researching evidence used to support or refute scientific ideas or arguments, from a range of sources	Researching evidence used to support or refute scientific ideas or arguments from a wider range of sources