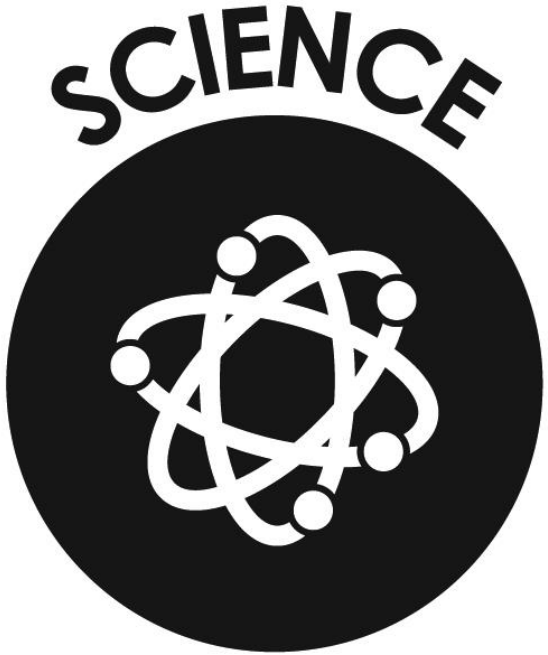
The Learning Challenge CURRICULUM

Science Progression



Substantive Knowledge: Year 1				
Biology			**Chemistry**	**Physics**
Animals, including Humans	**Animals, including Humans**	**Plants**	**Everyday Materials**	**Seasonal Change**
• *Name common animals* • *Carnivores, etc*	• *Human body and senses*	• *Common plants* • *Plant structure*	• *Properties of materials* • *Grouping materials*	• *The four seasons* • *Seasonal weather*
• Know how to classify a range of animals by amphibian, reptile, mammal, fish and birds • Know and classify animals by what they eat (carnivore, herbivore and omnivore) • Know how to sort by living and non living things	• Know the name of parts of the human body that can be seen • Know which part of the body associated with each of the five senses.	• Know and name a variety of common wild and garden plants • Know and name the petals, stem, leaves and root of a plant • Know and name the roots, trunk, branches and leaves of a tree	• Know the name of the materials an object is made from • Know about the properties of everyday materials	• Name the seasons and know about the type of weather associated with each season • Know the main months associated with each season

Substantive Knowledge: Year 2

Biology			Chemistry	
All living things and their habitats	**Animals, including Humans**	**Plants**	**Everyday Materials**	
• *Alive or dead* • *Habitats* • *Adaptations* • *Food chains*	• *Animal reproduction* • *Healthy living* • *Basic needs*	• *Plant and seed growth* • *Plant reproduction* • *Keeping plants healthy*	• *Identify different materials* • *Name everyday materials* • *Properties of materials*	• *Compare the use of different materials* • *Compare movement on different surfaces*
• Classify things by living, dead or never lived • Know how a specific habitat provides for the basic needs of things living there (plants and animals) • Match living things to their habitat • Name some different sources of food for animals • Know about and explain a simple food chain	• Know the basic stages in a life cycle for animals, (including humans) • Know why exercise, a balanced diet and good hygiene are important for humans	• Know and explain how seeds and bulbs grow into plants • Know what plants need in order to grow and stay healthy (water, light & suitable temperature)	• Know how materials can be changed by squashing, bending, twisting and stretching	• Know why a material might or might not be used for a specific job

Substantive Knowledge: Year 3

Biology			Chemistry	Physics	
Animals, including humans	**Plants**	**Plants**	**Rocks**	**Forces**	**Light**
• *Skeleton and muscles* • *Nutrition* • *Exercise and health*	• *Plant life* • *Basic structure and functions*	• *Life cycle* • *Water transportation*	• *Fossil formation* • *Compare and group rocks* • *Soil*	• *Different Forces* • *Magnets*	• *Reflections* • *Shadows*
• Know about the importance of a nutritious, balanced diet • Know how nutrients, water and oxygen are transported within animals and humans • Know about the skeletal and muscular system of a human	• Know the function of different parts of flowing plants and trees	• Know how water is transported within plants • Know the plant life cycle, especially the importance of flowers	• Compare and group rocks based on their appearance and physical properties, giving reasons • Know how soil is made and how fossils are formed • Know about and explain the difference between sedimentary, metamorphic and igneous rock	• Know about and describe how objects move on different surfaces • Know how a simple pulley works and use to on to lift an object • Know how some forces require contact and some do not, giving examples • Know about and explain how magnets attract and repel Predict whether magnets will attract or repel and give a reason	• Know that dark is the absence of light • Know that light is needed in order to see and is reflected from a surface • Know and demonstrate how a shadow is formed and explain how a shadow changes shape • Know about the danger of direct sunlight and describe how to keep protected

Substantive Knowledge: Year 4

Biology		Chemistry	Physics	
Animals, including humans	**All living things and their habitats**	**States of Matter**	**Electricity**	**Sound**
• *Digestive system* • *Teeth* • *Food chains*	• *Grouping living things* • *Classification keys* • *Adaptation of living things*	• *Compare and group materials* • *Solids, liquids and gases* • *Changing state* • *Water cycle*	• *Uses of electricity* • *Simple circuits and switches* • *Conductors and insulators*	• *How sounds are made* • *Sound vibrations* • *Pitch and Volume*
• Identify and name the parts of the human digestive system • Know the functions of the organs in the human digestive system • Identify and know the different types of human teeth • Know the functions of different human teeth • Use and construct food chains to identify producers, predators and prey	• Use classification keys to group, identify and name living things • Know how changes to an environment could endanger living things • Group materials based on their state of matter (solid, liquid or gas)	• Know the temperature at which materials change state • Know about and explore how some materials can change state • Know the part played by evaporation and condensation in the water cycle	• Identify and name appliances that require electricity to function • Construct a series circuit • Identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers) • Predict and test whether a lamp will light within a circuit • Know the function of a switch • Know the difference between a conductor and an insulator; giving examples of each	• Know how sound is made, associating some of them with vibrating • Know how sound travels from a source to our ears • Know the correlation between pitch and the object producing a sound • Know the correlation between the volume of a sound and the strength of the vibrations that produced it • Know what happens to a sound as it travels away from its source

Substantive Knowledge: Year 5

Biology		Chemistry	Physics	
All living things and their habitats	**Animals, including humans**	**Properties and changes in materials**	**Forces**	**Earth and Space**
• *Life cycles – plants and animals* • *Reproductive processes* • *Famous naturalists*	• *Changes as humans develop from birth to old age*	• *Compare properties of everyday materials* • *Soluble/ dissolving* • *Reversible and irreversible substances*	• *Gravity* • *Friction* • *Forces and motion of mechanical devices*	• *Movement of the Earth and the planets* • *Movement of the Moon* • *Night and day*
• Know the life cycle of different living things e.g. mammal, amphibian, insect and bird • Know the differences between different life cycles • Know the process of reproduction in plants • Know the process of reproduction in animals	• Create a timeline to indicate stages of growth in humans	• Compare and group materials based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets • Know and explain how a material dissolves to form a solution • Know and show how to recover a substance from a solution • Know and demonstrate how some materials can be separated (e.g. through filtering, sieving and evaporating) • Know and demonstrate that some changes are reversible and some are not • Know how some changes result in the formation of a new material and that this is usually irreversible	• Know what gravity is and its impact on our lives • Identify and know the effect of air and water resistance • Identify and know the effect of friction • Explain how levers, pulleys and gears allow a smaller force to have a greater effect	• Know about and explain the movement of the Earth and other planets relative to the Sun • Know about and explain the movement of the Moon relative to the Earth • Know and demonstrate how night and day are created • Describe the Sun, Earth and Moon (using the term spherical)

Substantive Knowledge: Year 6

Biology			Physics	
Animals, including humans	**All living things and their habitats**	**Evolution and Inheritance**	**Electricity**	**Light**
• *The circulatory system* • *Water transportation* • *Impact of exercise on body*	• *Classification of living things and the reasons for it*	• *Identical and non identical off-spring* • *Fossil evidence and evolution* • *Adaptation and evolution*	• *Electrical components* • *Simple circuits* • *Fuses and voltage*	• *How light travels* • *Reflection* • *Ray models of light*
• Identify and name the main parts of the human circulatory system • Know the function of the heart, blood vessels and blood • Know the impact of diet, exercise, drugs and lifestyle on health • Know the ways in which nutrients and water are transported in animals, including humans	• Classify living things into broad groups according to observable characteristics and based on similarities and differences • Know how living things have been classified • Give reasons for classifying plants and animals in a specific way	• Know how the Earth and living things have changed over time • Know how fossils can be used to find out about the past • Know about reproduction and offspring (recognising that offspring normally vary and are not identical to their parents) • Know how animals and plants are adapted to suit their environment • Link adaptation over time to evolution • Know about evolution and can explain what it is	• Compare and give reasons for why components work and do not work in a circuit • Draw circuit diagrams using correct symbols • Know how the number and voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer	• Know how light travels • Know and demonstrate how we see objects • Know why shadows have the same shape as the object that casts them • Know how simple optical instruments work e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.

Disciplinary Knowledge				
Key Concepts	Variables	Something in an enquiry that can be changed or controlled.	Enquiry Types	Comparative and Fair Testing
	Validity	How accurate or correct the results of an enquiry are.		Pattern Seeking
	Design	How a scientific question was investigated		Grouping and Classifying
	Reporting	How the findings of an enquiry are communicated to others		Observations Over Time
				Research using Secondary Sources

Disciplinary Knowledge			
Years 1 & 2			
Know that we can ask questions about the world and that when we observe the world to answer these questions, this is science.			
Variables	**Validity**	**Design**	**Reporting**
		Appreciate that objects can be identified or sorted into groups based on their observable properties. Understand that we can use magnifying glasses to observe objects closely. Appreciate that we can test our questions to see if they are true.	Appreciate that we can write down numbers and words or draw pictures to record what we find.

Disciplinary Knowledge

Years 3 & 4

Know that we can ask questions and answer them by setting up scientific enquiries
Know how to make relevant predictions that will be tested in a scientific enquiry

Variables	Validity	Design	Reporting
Appreciate that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same.	Appreciate that scientific enquiries can suggest relationships, but that they do not prove whether a prediction is true. Appreciate that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even. Appreciate that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry.	Understand how to use a range of equipment to measure accurately, including thermometers, data loggers, rulers and stopwatches. Appreciate that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts. Appreciate that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry.	Understand when to draw bar charts, a neat table or a classification key. Label a diagram using lines to connect information to the diagram and how to use a coloured key. Show the relationship between an independent variable in a two-way table; and how to label specific results in a two-way table. With structured guidance – know how to write a simple scientific enquiry write-up including an introduction, a list of equipment, a numbered method, a detailing of results and a conclusion. Draw conclusions from the findings of other scientists. Shorten a scientific enquiry write-up into a brief oral discussion of what was found in a scientific enquiry.

Disciplinary Knowledge

Years 5 & 6

- **Know that we can ask questions and answer them by setting up scientific enquiries**
- **Know how to make relevant predictions that will be tested in a scientific enquiry**

Variables	Validity	Design	Reporting
Choose appropriate variables to test a hypothesis (e.g., plant height as a dependent variable when measuring effect of light on plant growth).	Identify conditions that were imperfectly controlled and can explain how these might affect results. Accurately use further measuring devices, including digital and analogue scales, measuring cylinders and beakers, recognizing the relative accuracy of each device. Evaluate the validity of the data collected and suggest improvements for future enquiries.	Appreciate how and when to repeat measurements, how to find an average of a set of measurements and how to recognize and remove outliers from a set of data, justifying the removal as a potential mis-measurement.	Independently write up a simple scientific enquiry, including an introduction, a list of equipment, a numbered method, a detailing of results and a conclusion. Present brief oral findings from an enquiry, speaking clearly and with confidence and using notes where necessary. Appreciate instances where scientific evidence has been used to support or refute ideas or arguments (e.g., fossil records as evidence of natural selection).

Opportunities for using Disciplinary Knowledge

Year 1

	Comparative and Fair Testing	Observations over time	Research using Secondary Sources	Grouping and Classifying	Pattern Seeking
Seasonal Changes		Observe changes in temperature throughout the year			Identify length of daylight throughout the year
Animals, including humans			Research animals that live in a particular habitat	Group or classify animals according to what they eat	
Body parts and senses	Set up a test to notice the difference in our ability to hear the further away we are from the source				Note height changes as we get older
Plants		Observe changes to plants or trees as they grow or in different seasons		Identify local trees and plants	
Everyday Materials	Compare the suitability of everyday materials for a specific job, e.g., building a bridge			Identify different materials based on their properties	

Opportunities for using Disciplinary Knowledge					
Year 2					
	Comparative and Fair Testing	**Observations over time**	**Research using Secondary Sources**	**Grouping and Classifying**	**Pattern Seeking**
Uses of everyday materials	Compare materials to see which is the most waterproof			Group different materials based on their properties	
Animals, including humans			Research different food groups and design a balanced menu	Identify the off-spring of different animals	
Living things and their habitats			Research animals and how they adapt to their environment	Group animals based on their natural habitats	
Plants	Investigate which conditions plants need to grow	Change in plant growth over time		Identify parts of a plant	
Forces (Introduction)	Investigate the effect of force on the speed an object moves			Group materials based on how they react to a force (e.g., stretchy)	

Opportunities for using Disciplinary Knowledge					
Year 3					
	Comparative and Fair Testing	**Observations over time**	**Research using Secondary Sources**	**Grouping and Classifying**	**Pattern Seeking**
Rocks and soil			Research how fossils and different types of rocks are formed	Identify different rocks and the group they belong to	
Animals, including humans		Observe the effect of excess sugar over time (based on egg shells)	Research animals to identify their animal group and habitat	Group/ classify and animal based on its group and species	
Plants		Observe how water travels up the stem	Research different types of seed dispersal		
Light	Compare materials based on reflectiveness	Shadow length throughout the day		Group materials based on their opacity and transparency	Object size compared to shadow
Forces and magnets	Compare materials based on the amount of friction they generate			Group magnetic and non-magnetic materials	

Opportunities for using Disciplinary Knowledge

Year 4

	Comparative and Fair Testing	Observations over time	Research using Secondary Sources	Grouping and Classifying	Pattern Seeking
Electricity	Determine which materials are electrical conductors or insulators			Classify/ group materials into electrical conductors or insulators	
Animals, including humans			Research the different body parts involved in digestion	Classify plants/ animals into either producer, consumer or predator	
Living things and their habitats			Research the effect of climate change on animals around the world	Classify animals based on their observable characteristics	
States of Matter		Measure temperature changes in water over time	Research the water cycle and how it works	Identify solids, liquids or gases	
Sound	The affect of distance from the source on volume				Compare how length and width of tubes affect pitch

Opportunities for using Disciplinary Knowledge

Year 5

	Comparative and Fair Testing	Observations over time	Research using Secondary Sources	Grouping and Classifying	Pattern Seeking
Earth and Space			Research the plants in our solar system, including length of orbit		Compare the distance a planet is from the Sun and its temperature
Animals, including humans			Research changes in humans at different stages in our lives		Compare height with physical task e.g., distance a ball is thrown
Forces	Shape of an object and the time it takes to travel through water				Surface material on a ramp and the distance/ speed it travels
Properties and changes of materials	Factors that affect the speed a solute dissolves in water, e.g., temperature	Observe over time the separation of a solute and solvent via evaporation		Classify/ group materials as either soluble or insoluble	
Living things and their habitats			Research the life cycle of different animal groups	Classify/ group and animal based on its group and species	

Opportunities for using Disciplinary Knowledge

Year 6

	Comparative and Fair Testing	Observations over time	Research using Secondary Sources	Grouping and Classifying	Pattern Seeking
Electricity	Effect of increasing voltage on the brightness of a bulb				Compare brightness of bulb in series and parallel circuits
Animals, including humans	Impact of exercise on the heart rate		Research how drugs affect the body		Compare resting heart rate of different people
Living things and their habitats		Conditions needed for bread to go mouldy	Research the different types of micro-organisms	Classify different types of arthropod	
Evolution and Inheritance			Research Charles Darwin and his work		Compare sculls/ body parts of animals as they have evolved
Light				Group materials based on transparency	Compare distance from light source and shadow