Progression of Knowledge and Skills: Science

Version 2: Updated April 2023 following Ofsted subject review.

1. This is the overarching knowledge that underpins our whole curriculum. Substantive knowledge and disciplinary (broken into 'working scientifically' and 'science in action'.

2. These three key domains of **scientific knowledge and understanding**, **working scientifically** and **science in action** are separate sets of skills. However within each unit of learning, all 3 will work together, ensuring pupils can practise all 3 sets of skills.

Science in action will sometimes be a separate unit, usually as a 'scientist study'.

3. Finally, this is our Alveley Science curriculum. Some units are taught only once (like evolution), most are taught several times and build progressively.

Substantive Knowledge	Disciplinary Knowledge	
Scientific Knowledge and Understanding	**Working Scientifically**	**Science in Action**
The 'facts and figures' of science. For example, how many planets there are, the parts of a plant, the processes of changing states of matter. Often, 'learning' this knowledge comes through investigations (see the next box).	The 'doing' of science. This involves carrying out different types of investigations to find the answers to questions. The investigations are: • Comparative tests • Identification and classification • Observations over time • Pattern Seeking • Research	Understanding how science is 'done'. This involves recognising how scientists can change their opinion over time, as well as how individual scientists can change scientific consensus. This strand also gives the opportunity to study a diverse range of famous scientists to recognise and understand their contributions.

Alveley's Science Curriculum

Biology				Physics						Chemistry				
Plants	Animals including humans	Living things & their habitats	Evolution and inheritance	Seasonal changes	Light	Forces and magnets	Sound	Electricity	Earth and space	Everyday materials	Uses of everyday materials	Properties and changes of materials	States of matter	Rocks

Plants

Year 1	Year 2	Year 3
- I can identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. - I can identify and describe the basic structure of a variety of common flowering plants, including trees.	- I can observe and describe how seeds and bulbs grow into mature plants. - I can find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	- I can identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. - I can explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. - I can investigate the way in which water is transported within plants. - I can explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Animals including humans

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
- I can identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. - I can identify and name a variety of common animals that are carnivores, herbivores and omnivores. - I can describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets). - I can identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	- I can notice that animals, including humans, have offspring which grow into adults. - I can find out about and describe the basic needs of animals, including humans, for survival (water, food and air). - I can describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	- I can identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. - I can identify that humans and some other animals have skeletons and muscles for support, protection and movement.	- I can describe the simple functions of the basic parts of the digestive system in humans. - I can identify the different types of teeth in humans and their simple functions. - I can construct and interpret a variety of food chains, identifying producers, predators and prey.	- I can describe the changes as humans develop to old age.	- I can identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. - I can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. - I can describe the ways in which nutrients and water are transported within animals, including humans.

Living things and their habitats

Year 2	Year 4	Year 5	Year 6
- I can explore and compare the differences between things that are living, dead, and things that have never been alive. - I can identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. - I can identify and name a variety of plants and animals in their habitats, including microhabitats. - I can describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	- I can recognise that living things can be grouped in a variety of ways. - I can explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. - I can recognise that environments can change and that this can sometimes pose dangers to living things.	- I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. - I can describe the life process of reproduction in some plants and animals.	- I can describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro- organisms, plants and animals. - I can give reasons for classifying plants and animals based on specific characteristics.

Evolution and inheritance

Year 6
- I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. - I can recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. - I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Seasonal Changes

Year 1
- I can observe changes across the 4 seasons. - I can observe and describe weather associated with the seasons and how day length varies.

Light

Year 3	Year 6
- I can recognise that they need light in order to see things and that dark is the absence of light. - I can notice that light is reflected from surfaces. - I can recognise that light from the sun can be dangerous and that there are ways to protect their eyes. - I can recognise that shadows are formed when the light from a light source is blocked by an opaque object. - I can find patterns in the way that the size of shadows change.	- I can recognise that light appears to travel in straight lines. - I can use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. - I can explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. - I can use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Forces and magnets

Year 3	Year 5
- I can compare how things move on different surfaces. - I can notice that some forces need contact between 2 objects, but magnetic forces can act at a distance. - I can observe how magnets attract or repel each other and attract some materials and not others. - I can compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. - I can describe magnets as having 2 poles. - I can predict whether 2 magnets will attract or repel each other, depending on which poles are facing.	- I can explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. - I can identify the effects of air resistance, water resistance and friction that act between moving surfaces. - I can recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.

Sound

Year 4
-I can identify how sounds are made, associating some of them with something vibrating. -I can recognise that vibrations from sounds travel through a medium to the ear. - I can find patterns between the pitch of a sound and features of the object that produced it. - I can find patterns between the volume of a sound and the strength of the vibrations that produced it. - I can recognise that sounds get fainter as the distance from the sound source increases.

Electricity

Year 4	Year 6
- I can identify common appliances that run on electricity. - I can construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. - I can identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. - I can recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. - I can recognise some common conductors and insulators, and associate metals with being good conductors.	- I can associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. - I can compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. - I can use recognised symbols when representing a simple circuit in a diagram.

Earth and Space

Year 5
- I can describe the movement of the Earth and other planets relative to the sun in the solar system. - I can describe the movement of the moon relative to the Earth. - I can describe the sun, Earth and moon as approximately spherical bodies. - I can use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Materials

Year 1 Everyday materials	Year 2 Uses of everyday materials	Year 4 States of matter	Year 5 Properties and changes of materials
- I can distinguish between an object and the material from which it is made. - I can identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. - I can describe the simple physical properties of a variety of everyday materials. - I can compare and group together a variety of everyday materials on the basis of their simple physical properties.	- I can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. - I can find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	- I can compare and group materials together, according to whether they are solids, liquids or gases - I can observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) - I can identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	- I can compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. - I can know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. - I can use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. - I can give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. - I can demonstrate that dissolving, mixing and changes of state are reversible changes. - I can explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Rocks and soils

Year 3
- I can compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. - I can describe in simple terms how fossils are formed when things that have lived are trapped within rock. - I can recognise that soils are made from rocks and organic matter.

Working Scientifically

	Years 1/2	Years 3/4	Years 5/6
Posing questions	-Exploring the world around them and raising their own simple questions. -Recognising there are different types of enquiry (ways to answer a question). -Responding to suggestions of how to answer their questions.	-Beginning to raise further questions during the enquiry process. -Considering what makes a testable question. -Beginning to recognise that there are different types of enquiry and that they are suitable for different questions. -Beginning to make suggestions about how different questions could be answered	-Raising questions throughout the enquiry process. -Identifying testable questions. -Selecting the most appropriate enquiry method to answer questions and give justification.
Planning	-Beginning to recognise whether a test is fair. -With support, deciding if suggested observations are suitable. -Ordering a simple method.	-Beginning to select from options which variables will be changed, measured and controlled. -Suggesting what observations to make and how long to make them for. -Planning a simple method, verbally and in writing. -Beginning to write a simple method in numbered steps. -Selecting and beginning to decide what simple equipment might be used to aid observations and measurements.	-Suggesting which variables will be changed, measured and controlled. -Making and explaining decisions about what observations to make and how long to make them for. -Writing a method including detail about how to ensure control variables are kept the same -Writing a method that considers reliability by planning repeated readings. -Suggesting the most appropriate equipment to make observations and measurements and justifying their choices
Predicting	-Suggesting what might happen, often justifying with personal experience.	-Making predictions about what they think will happen by: ● Using scientific knowledge and/or personal experience to explain their prediction (because…) ● Beginning to consider cause and effect when making predictions, where appropriate. ● Predicting a trend by considering how the changing variable will affect the measured variable. (The smoother the surface, the longer the distance the car will travel)	-Making increasingly scientific predictions by: ● Using previous scientific knowledge and evidence to inform their predictions. ● Using scientific language to describe a potential outcome or explain why they think something will happen. ● Making links between topics to evidence a prediction.
Observing (qualitative data)	-Using their senses to describe, in simple terms, what they notice or what has changed.	-Using their senses to describe, in more detail and with simple scientific vocabulary, what they notice or what has changed.	-Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.
Measuring (quantitative data)	-Using non-standard units to measure and compare. -Beginning to use standard units to measure and compare. -Beginning to use simple measuring equipment to make approximate measurements. -Reading simple numbered scales	-Using standard units to measure and compare. -Using measuring equipment with increasing accuracy. -Reading scales with unmarked intervals between numbers.	-Using standard units to measure and compare with increasing precision (decimals). -Reading a wider variety of scales with unmarked intervals between numbers.
Researching	-Gathering specific information from one simplified, specified source.	-Gathering specific information from a variety of sources.	-Gathering answers to open-ended questions from a variety of sources.
Recording (diagrams)	-Drawing and labelling simple diagrams.	-Beginning to draw more scientific diagrams by: ● Using some standard symbols. ● Drawing in 2D to produce simple line diagrams. ● Labelling with more scientific vocabulary.	-Drawing scientific diagrams by: ● Using a wider range of standard symbols. ● Drawing with increasing accuracy. ● Labelling with a broader range of scientific vocabulary. ● Annotating diagrams to explain concepts and convey opinions.

Recording (tables)	-Using a prepared table to record results including: ● Numbers. ● Simple observations. ● Tally frequency.	-Using a prepared table to record results including more detailed observations. -Using tables with more than two columns. -Identifying and adding headings to tables. -Beginning to design simple results tables.	-Using tables with columns that allow for repeat readings. -Suggesting headings to tables, including units. -Designing results tables with increasing independence with consideration of variables where applicable. -Calculating the mean average.
Grouping and classifying	-Grouping based on visible characteristics. -Organising questions to create a simple classification key.	-Grouping based on visible characteristics and measurable properties. -Populating a pre-prepared branching and number key. -Choosing appropriate questions for classification keys	-Grouping in a broader range of contexts. -Organising the layout of number and branching keys. -Formulating appropriate questions for classification keys.
Graphing	-Representing data using pictograms and block charts.	-Representing data using bar charts. -Drawing bars with greater accuracy. -Reading the value of bars with greater accuracy.	-Representing data by using line graphs and scatter graphs. -Plotting points with greater accuracy. -Reading the value of plotted points with greater accuracy.
Analysing and drawing conclusions	-Using their results to answer simple questions. -Beginning to recognise when results or observations do not match their predictions.	-Writing a conclusion to summarise findings using simple scientific vocabulary. -Beginning to suggest how one variable may have affected another. -Beginning to quote results as evidence of relationships. -Identifying data that does not fit a pattern (anomalous data). -Recognising when results or observations do not match their predictions. -Beginning to use identified patterns to predict new values or trends.	-Writing a conclusion to summarise findings using increasingly complex scientific vocabulary. -Suggesting with increasing independence how one variable may have affected another. -Quoting relevant data as evidence of relationships. -Identifying anomalies in repeat data and excluding results where appropriate. -Comparing individual, class and/or model data to the prediction and recognising when they do not match. -Using identified patterns to predict new values or trends.
Evaluating	-Beginning to recognise whether a test is fair or not.	-Beginning to identify steps in the method that need changing and suggest improvements. -Beginning to identify which variables were difficult to control and suggesting how to better control them. -Commenting on the degree of trust by reflecting on: ● Results that do not fit a pattern (anomalies). ● The quality of results (accurate measurements and maintaining control variables). -Beginning to identify new questions that would further the enquiry.	-Identifying steps in the method that need changing and suggesting improvements. -Identifying which variables were difficult to control and suggesting how to better control them. -Commenting on the degree of trust by also reflecting on: ● Accuracy (human error with equipment). ● Reliability (repeating results). ● Sources of information (e.g. websites, books). -Posing new questions in response to the data, that would extend the enquiry. -Deciding what data to collect to further test direct relationships.

Science in action

Years 1/2	Years 3/4	Years 5/6
-To know about famous scientists throughout history. -To know about a range of jobs and careers that use scientific knowledge and methods. -To know about the work of modern day scientists. -To know about science in the news and recent discoveries. -To explore spiritual, moral, social and cultural links with Science		
	-The know about the methods and equipment used by scientists throughout history and how these have led to modern methods. -To understand how scientific knowledge has changed over time, leading to the current understanding of Science. -To know about current scientific research and what it aims to achieve in the future. -To understand that mistakes can lead to new discoveries. -To know that collaboration and peer reviewing is essential for effective scientific progress.	
		-Understand how scientific evidence is used to support or refute ideas or arguments.