Avonwood Primary School

Science Curriculum Policy

2023-2024

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Avonwood Primary School
The best in everyone™
Part of United Learning

Contents

1.0 Our School Vision

At Avonwood we see it as our moral imperative for all children, regardless of background, to achieve their very best. Our children all read classic literature, study modern foreign languages, experience the science of dissecting organs and even learn a new musical instrument every year as a right, not a privilege. These high expectations enable us to develop and deliver a curriculum rich in carefully sequenced and embedded powerful knowledge. We expect teachers to deliver lessons with that fulfil this expectation whilst living up to our ambition of inspiring wonder and intellectual curiosity.

Our curriculum is at the centre of every education decision we take at Avonwood. We do not see the curriculum as a finished product, far from it. On a weekly, termly and annual basis we review plans, consider our intent and make sure we deliver the very best academic and enrichment diet to our children. All curriculum areas have a subject lead that is responsible for the design, implementation and ongoing monitoring and evaluation of this area.

Avonwood has moved away from tokenistic topics towards knowledge rich experiences in discrete subjects, with deliberate cross curricular links only when appropriate. For example, in Year 2 we teach the Great Fire of London when children have already learnt in Geography where London is and its status within the United Kingdom. The awe and wonder of learning continues to characterise the Avonwood curriculum but in a purposeful, sequenced and deliberate manner.

If 'powerful knowledge' is the head of our school, then reading for pleasure and progress is its heart. Our school environment and curriculum crystallises reading for pleasure as a valued and purposeful part of our curriculum. We agree with the view of Thompson (2020) when she states the importance of becoming a reader who teachers and a teacher who reads is a pedagogy with far reaching consequences. Reading progression is carefully mapped to provide opportunities for exposure to a wide variety of genres, authors of different backgrounds and a mixture of classic and contemporary texts. Every afternoon we 'Drop Everything and Read' to end our school day with a high quality whole class reading session. We wholeheartedly believe reading is the golden key to unlocking the potential of every child's success.

We are honoured to be the only United Nations Earth Charter Primary School in Europe. We believe it is vital that all children have an understanding of their responsibility as global citizens and our eight Earth Charter principals are referenced throughout our curriculum and daily life. From the importance of peace and respect for all living creatures through to the consideration of the past and future of our planet, this ethos gives our Avonwood curriculum a very current and relevant perspective that all stakeholders within our community hold strong. This runs deep within our "Avonwood DNA" and is optimised by our school mantra... it starts with one!

1.1 How our whole school vision links with Science

The Avonwood Curriculum for science provides all pupils, regardless of their background, with a set of core ideas that will enable all students to experience a personal sense of awe and wonder when describing and explaining the world around them. Our curriculum ensures that pupils will master core content through the development of key concepts and timely revisiting of key knowledge. The curriculum has been sequenced and specific knowledge selected to allow for gradual development of vertical concepts – the 'big ideas' in science – to provide firm foundations for KS3 and KS4. At Avonwood we purposefully teach appropriate knowledge that goes beyond the KS1 and KS2 national curriculum, to aid current and future understanding, and to smooth the transition to KS3. We encourage pupils to apply and make connections between the disciplines of science, the wider curriculum and the wider world.

Throughout our curriculum we have selected examples and applications of science that **inspires pupils' curiosity** about the world and natural phenomena. In addition, we have supplemented our curriculum with a key scientist overview to ensure that all pupils **can see themselves reflected** in the science curriculum, by highlighting present-day role models and the contributions of scientists from a wide range of backgrounds; and considering social and cultural values around scientific ideas.

2.0 Subject Intent, Implementation & Impact

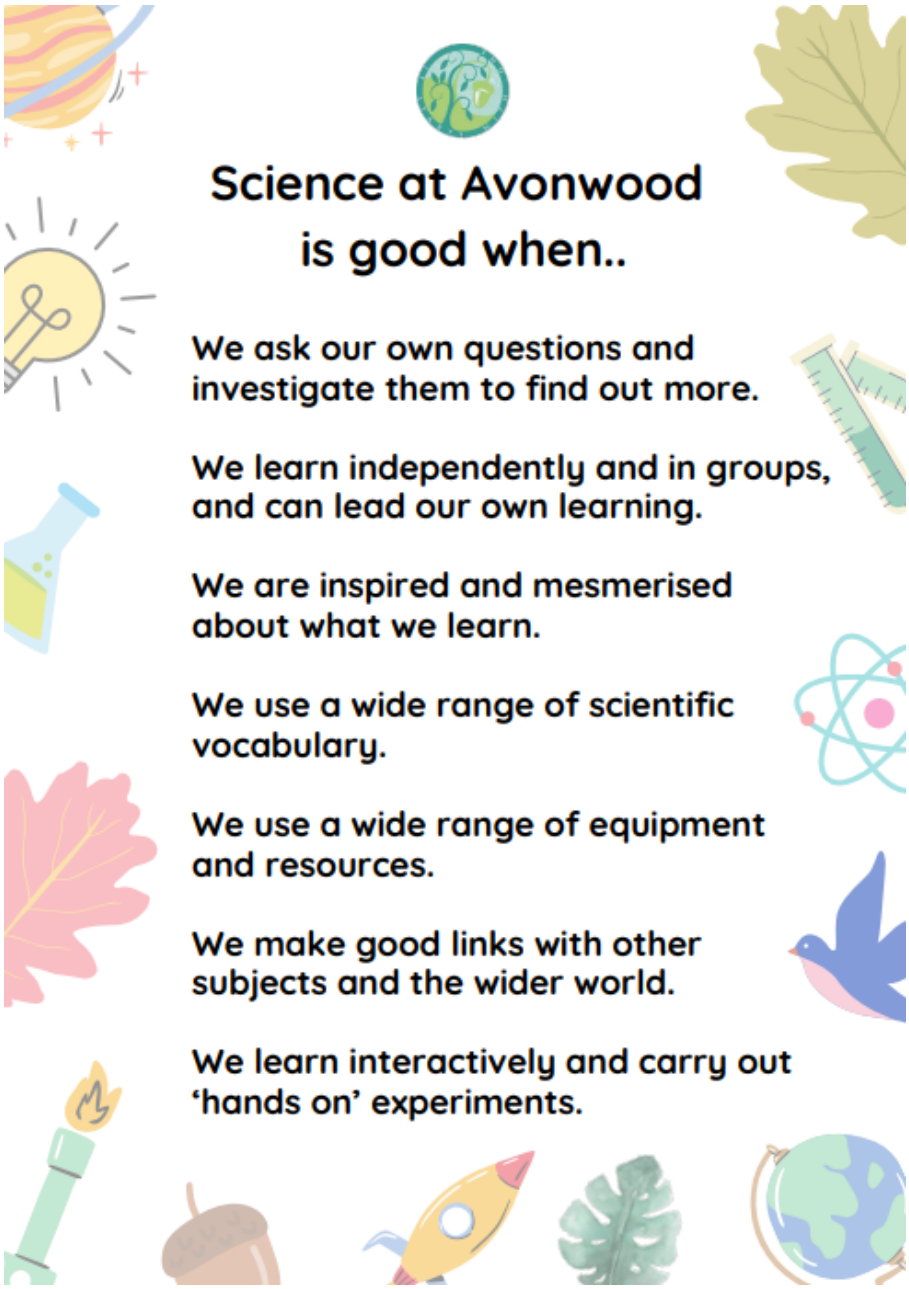
2.1 Subject Intent

Science teaching at Avonwood Primary School aims to teach a set of core ideas that will enable all students to experience a personal sense of **awe and wonder** when describing and explaining the world around them.

At Avonwood, we aim to give children an understanding of the world around them whilst acquiring specific skills and knowledge to help them to think scientifically, to gain an understanding of scientific processes and also an understanding of the uses and implications of Science, today and for the future.

All children are encouraged to develop and use a range of skills including observations, planning and investigations, as well as being encouraged to question the world around them and become independent learners in exploring possible answers for their scientific based questions.

Specialist vocabulary for topics is taught and built up, and effective questioning to communicate ideas is encouraged. Concepts taught should be reinforced by focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions.



2.2 Subject Implementation

The Avonwood science curriculum is adapted from the United Learning curriculum and is aligned to the National Curriculum 2014 and Programmes of Study for KS1 and KS2 and 'Understanding of the World' in the Early Years Foundation Stage.

The Avonwood science curriculum sets out the units that should be covered in each year. Within each year, the units have been sequenced in such a way that the substantive knowledge and skills progresses from one to the next and there is gradual understanding of 'vertical concepts', taken from the Association for Science Education's 'big ideas' in science.

All lesson plans are based on Rosenshine principles and reflect best practice. Teachers use assessment for learning to tailor lessons around our children and help plan for subsequent sequences of lessons. All units include:

- A low stakes pre and post learning quiz
- A knowledge organiser which outlines knowledge (including vocabulary) all children must master
- A cycle of lessons for each subject, which carefully plans for progression and depth
- Continuous formative assessment to identify misconceptions and fill gaps in knowledge
- Opportunities to apply ideas and knowledge for example, trips and visits from experts

In KS1 science may be taught as part of a broader topic at KS1. In KS2, science is taught consistently, at least once a week for up to two hours, but can be discretely taught in many different contexts throughout all areas of the curriculum. For example, through English, i.e. writing a letter to a local politician regarding the closure of a park/biography of a famous scientist's life, etc.

2.3 Subject Impact

Our Science Curriculum is high quality, well thought out and is planned to demonstrate progression. However, our science curriculum goes beyond National Curriculum expectations to deepen pupils' knowledge and understanding, particularly of chemistry. If children are keeping up with the curriculum, they are deemed to be making good or better progress.

We measure the impact of our curriculum through the following methods:

Formative assessment in lessons

There are opportunities for formative assessment in the lessons provided, and teachers should continually adapt their lesson delivery to address misconceptions and ensure that pupils are keeping up with the content. Teachers reflect on standards achieved against the planned outcomes and moderated with ASE PLAN documents.

Low-stakes summative assessment

A pre and post-learning quiz is provided for every unit. These questions usually take the form of multiple-choice questions, and aim to assess whether pupils have learned the core knowledge for that unit. These should also be used formatively, and teachers should plan to fill gaps and address misconceptions before moving on.

Books and pupil-conferencing

Talking to pupils about their books allows teachers to assess how much of the curriculum content is secure. These conversations are used most effectively to determine whether pupils have a good understanding of the vertical concepts, and if they can link recently taught content to learning from previous units.

3.0 Sequencing of the Avonwood Science Curriculum

3.1 Whole School Overview – Long Term Planning

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn 1	**Biology** Plants *Identifying and naming common plants and describing basic structures*	**Biology** Plant growth *Plants grow from seeds, and require water, light and a suitable temperature*	**Chemistry** Rocks *Comparisons of types of rocks and how fossils are formed*	**Biology** Classifying organisms *Introduction to classifying animals and their environment*	**Chemistry** Separating mixtures *Identifying and separating mixtures; difference between reversible and non-reversible changes*	**Physics** Electricity *Investigating variations in series and parallel circuits, and how electricity is generated*
Autumn 2	**Biology / Physics** Seasonal changes *Observing changes across four seasons and describing associated weather*	**Biology** Needs of animals *Animals need water, food and air to survive and to have offspring*	**Physics** Light *Relationship between light and how we see; the formation of shadows*	**Biology** Food & digestion *The human digestive system and simple food chains*	**Biology, Chemistry, Physics** Energy *Introducing the concept of energy stores and energy transfers, and relating this to prior knowledge*	**Biology** Evolution *Fossils; introduction to the idea that adaptation may lead to evolution*
Spring 1	**Chemistry** Everyday materials *Distinguishing objects from the material it's made from, and describing simple properties*	**Chemistry** Uses of everyday materials *Comparisons of an object's material with its use; impact of bending, twisting on solid objects*	**Biology** Living organisms *The role of muscles and skeletons; the importance of nutrients*	**Chemistry** Particle model and states of matter *States of matter in relation to particle arrangement*	**Biology** Life cycles *Life cycles of a mammal, amphibian, insect and bird, and some reproduction processes*	**Physics** Light *How light travels and is reflected, and how this allows us to see*
Spring 2	**Consolidation and review**	**Biology** Living things & their habitats *Basic introduction to habitats and micro-habitats, and simple food chains*	**Biology** Plants *The key features of flowering plants and what they need to survive*	**Physics** Sounds *Relationship between strength of vibrations and volume of sound*	**Biology** Human development *Human development to old age*	**Biology** Further classification *Further classification of living organisms based on characteristics*
Summer 1	**Biology** Animals *Identifying and naming fish, amphibians, reptiles, birds and mammals; carnivores, herbivores and omnivores*	**Chemistry** Solids, liquids and gases *Understanding how the same substances can exist as solids, liquids and gases*	**Physics** Forces & motion *Introducing pushes and pulls; opposing forces, and balanced forces*	**Physics** Electricity *Simple series circuits*	**Physics** Forces *Gravity, air and water resistance and friction; introduction to pulleys*	**Biology** Functions of the human body *Human circulatory system; transport of nutrients within the body*
Summer 2	**Biology** Humans *Human body parts and senses*	**Consolidation and review**	**Physics** Friction & magnetism *Contact and non-contact forces, including friction and magnetism*	**Chemistry** Properties of materials *Considering physical and chemical properties*	**Physics** Earth and space *Movements of planets and the Moon, and relationship to day and night*	**Chemistry** Physical and chemical changes *Identifying physical and chemical changes*

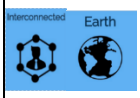
	Three additional units purposefully take pupils beyond the Programmes of Study: • **Year 2: Solids, liquids and gases**. This introduces pupils to the idea that familiar substances (like water or chocolate) can exist as solids, liquids or gases. It will support understanding of states of matter and the particle model in Year 4, and preempts the misconception that substances only ever exist in one state. • **Year 5: Energy**. **T**his introduces pupils to energy stores and transfers at a very basic level, and has been designed to preempt misconceptions that need to be unpicked at secondary. It also allows pupils to review content from previous topics across biology, chemistry and physics (like food webs, electricity, and states of matter), and consider them through the lens of energy. • **Year 6: Physical & chemical changes**. This unit gives pupils the opportunity to run more sophisticated practical investigations. It provides a good transition to Year 7.
	The statutory content in some topics in the curriculum is substantial. Where this is the case, more time has been dedicated to it and the content is split into two complementary units. This allows sufficient time for mastery.
Consolidation and review	There are opportunities for pupils to consolidate or review knowledge in KS1, to ensure that these early concepts are fully mastered before KS2. They also allow time for pupils to revisit ideas in different seasons (e.g. observing changes in spring from autumn).

3.2 Science Overview – EYFS

The new EYFS Framework makes some specific links to science learning, as Early Learning Goal 15 is named 'The Natural World'. Children at the expected level of development will: Explore the natural world around them, making observations and drawing pictures of animals and plants; know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

There are also links to science in ELG4 'Managing Self', specifically healthy food choices; and ELG 6 9 Gross Motor Skills', specifically being physically active. The children will need to have opportunities to explore and experience the world around them and places they have found out about in stories and books, as well as considering what they eat and how they exercise. To help frame these opportunities, here are the six EYFS Key Objectives for science:

1. To observe and draw the animals and plants in the local environment.
2. To explore and observe the natural world around them and link it to their own experiences and what has been read in class.
3. To learn about contrasting environments to the natural world around them, recognising some similarities and differences.
4. To begin to understand the natural changes observed in the seasons: weather, leaf colour and temperature, for example.
5. To experience and discuss the changes of melting and freezing of water, chocolate and ice cream, for example.
6. Begin to explore what makes healthy food choices, the importance of being active and the affect that activity will have on our bodies.

Foundation Stage		
Understanding the World **The Natural World (Early Learning Goal)** • Explore the natural world around them, making observations and drawing pictures of animals and plants; • Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. **Development Matters (Reception)** • Explore the natural world around them; • Describe what they see, hear and feel whilst outside; • Recognise some environments that are different from the one in which they live; • Understand the effect of changing seasons on the natural world around them.		
Term & Focus	**Knowledge and understanding**	**Skills**
Autumn 1 All About Me My Heroes **Autumn 2** Amazing Autumn Let's Celebrate 	**I know …** • Basic body parts (self-portraits) • My 5 senses • About seasonal changes - autumn • About hibernation • About day/night; light/dark	**I can…** • Identify parts of my body • Name the 5 senses • Talk about autumn and the changes • Identify changes in the weather and environment linked to seasons • Talk about hibernation and name some animals • Talk about the difference between day/night
Vocabulary	Face, eyes, nose, mouth, hair, eyebrows/lashes, ears, senses (sight, hear, taste, smell, touch) Seasons – autumn, hibernation, weather, cold, damp, wet, dark	
Spring 1 Where We Live Chinese New Year **Spring 2** Spring in our Step 	**I know …** • About seasonal changes – spring • Lifecycle of some animals (butterfly, chicken, frog, plant) • Basic parts of a plant • The name of some different plants/flowers • How to plant a seed and look after it • The names of some minibeasts and where to find them	**I can…** • Talk about spring and the changes • Identify changes in the weather and environment linked to seasons • Talk about lifecycles and the different stages • Name some parts of a plant • Talk about how to plant seeds • Identify some minibeasts
Vocabulary	Seasons, spring, warmer, sunny, rainbow Lifecycle, stages (of different lifecycles) Plants, flowers, leaf, stem, root, seed Minibeast, insect (names of)	
Summer 1 Once There Were Dragons Naughty Bus **Summer 2** Science Detectives 	**I know …** • What reflection is • What science/scientist is • Different animals/bugs and their habitats • Different dinosaurs • Some different materials and changing states of matter • Some different forces • The 3 R's • Basic body parts and functions • How I change as I grow up • About space	**I can…** • Talk about science and my scientific interests • Identify and talk about different animals/bugs/dinosaurs • Explore and investigate with different materials and talk about some changes e.g. melting • Explore and investigate different forces e.g. floating/sinking • Identify parts of my body and talk about what they do • Talk about environmental science (Earth Charter link to rubbish and recycling)
Vocabulary	Science, scientist, invent, investigate, explore, experiment Names of different animals and dinosaurs, herbivore, omnivore, carnivore Materials and their names, melting, freezing Forces, floating, sinking, upthrust, magnet(ic), push, pull, gravity, friction Parts of body Space, solar system, planets, galaxy	

3.3 Working Scientifically

The below tables outlines where disciplinary knowledge – the working scientifically elements – is first taught and deliberately practised in KS1 or KS2. The curriculum has been sequenced so that the content is also reviewed in subsequent units (and may also be reviewed in other subject areas like geography and history), but to keep the table readable, we have only set out where it is first taught. The Mathematics Programmes of Study have been considered so that pupils never need to apply mathematical skills (e.g. calculating mean, rounding to an appropriate degree, constructing graphs) until they have first been taught in mathematics lessons.

	Scientific Attitudes & Planning (A&P)	**Measuring & Observing** (M&O)	**Recording & Presenting** (R&P)	**Analysing & Evaluating** (A&E)
EYFS	Make predictions about what might happen when I try something	Measure/observe using senses Observe using a magnifying glass safely	Use hoops to classify objects based on simple criteria	Notice patterns in the world around me
Y1	Scientists look for patterns in the world around them Scientists group objects or living things based on their properties Scientists conduct secondary research to learn from what other scientists have already learned	Gather information from text/ books/ images	Record numerical or descriptive observations in a table Draw a diagram, a simple scientific drawing that explains or informs Use a table to classify items based on properties Use a Carroll diagram to classify items based on properties Use a Venn diagram to classify items into two or three sets based on properties	Make simple statements about the results of an enquiry
Y2	It is important that we keep as much as we can the same, apart from the one thing we measure and the one thing we change Make a prediction based on substantive knowledge There are four main stages of enquiry (A&P, M&O, R&P, A&E) Scientists identify potential hazards in their experiments and plan ways to reduce them Scientists conduct investigations to identify whether a pattern they think they've seen is really there	Make systematic observations of an object	Use a pair of axes to classify items based on the extent it displays two properties	Ask further questions that could be explored to extend findings
Y3	Select most appropriate equipment to measure (the variables) that will give you the best chance of an accurate result A dependent variable is what you measure; an independent variable is what you change; controlled variables are things that stay the same Scientists identify factors in an investigation that should be controlled, and try to find ways to control them Write an appropriate method Science is studied as three disciplines: biology (study of organisms), chemistry (study of materials) and physics (study of energy)	Gather information from the internet Anomalous results should be discarded and rerecorded Data is repeatable if the same person repeats the investigation and gets the same results; data is reproducible if the investigation is repeated by a different person and the results are the same Taking multiple readings allows you to see if your data is repeatable, and helps identify outliers	Design a table to collect data with the appropriate number of rows and columns and correct headings	Draw conclusions (e.g. 'the greater the… , the greater the…') Use scientific understanding to explain their findings Suggest ways to improve practical procedures to obtain more accurate measurements Use findings of investigation to make further predictions

Y4	Set a hypothesis to test Draw diagram of the investigation Scientists use models to help explain their ideas	Gather information using a data logger (e.g. sound meter app; heart rate app)	Use a classification key to identify an object Draw a dichotomous classification key to help others identify an object Present information orally using a prop or demonstration Present information in a written format	Identify scientific evidence that has been used to support or refute ideas
Y5	Science is studied as three disciplines: biology (study of organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) Scientists look for patterns in data to try to identify correlations Scientists must work out if the factor is the cause of the outcome in a correlation	Measure force using a Newtonmeter	Scatter graphs can help you decide if there is a relationship between two variables Interpret and construct climate graph Line graphs can be used when data is continuous; bar charts can be used when data is discrete	Make judgements on the reliability of the data Some people may agree or disagree with the use of some scientific discoveries Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations
Y6		Taking multiple readings allows you to see if your data is repeatable, helps identify outliers and allows a mean to be calculated	Decide which graph is most appropriate for the enquiry	Calculating the mean can be used as a method of analysing data
KS3	Evaluate risks	Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility Use a wider range of apparatus and techniques Apply sampling techniques Evaluate data, showing awareness of potential sources of random and systematic error	Use a range of graph types to display data, including pie charts, scatter graphs and line graphs	The difference between correlation and causation, and suggesting ways to test for both Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

3.4 Vertical Concepts

The 'big ideas of science education' were first published by Wynne Harlen and a group of experts in science education in 2010. These ideas set out key concepts that, when understood together, allow pupils to understand the world around them.

The ideas are expressed in the form of narrative descriptions that builds the understanding of key ideas from primary to secondary education. They cannot be understood in single units or lessons; we need to build concepts by attending to them in small steps within the curriculum.

Ten ideas are **ideas of science**, and span the disciplines of chemistry, biology and physics. Four are **ideas about science**, and contribute to pupils' disciplinary understanding of how scientists work today.

1. All material in the Universe is made of very small particles
2. Objects can affect each other at a distance
3. Changing the movement of an object requires a net force acting on it
4. The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen
5. The composition of Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate
6. The solar system is a very small part of one of millions of galaxies in the Universe
7. Organisms are organised on a cellular basis
8. Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms
9. Genetic information is passed down from one generation of organisms to another
10. The diversity of organisms, living and extinct, is the result of evolution

The medium term planning outlines the relevant building blocks that pupils will learn in each unit, and how the idea is developed in previous and subsequent units or at KS3-4.

3.5 Scientists Across the Curriculum

At Avonwood we are committed to increasing children's science capitol by increasing opportunities to learn about key scientists which children can identify with. We have chosen key scientists who:

- Are relevant to topics
- Illustrate how scientific knowledge has developed over time
- Children can identify with and whose work they can relate to

For each topic, where possible we have attempted to meet three different criteria:

- Historical figures who illustrate the development of scientific knowledge over time
- Scientists from under-represented groups
- Modern scientists whose work is relevant to children and who reflect their world and backgrounds

Key scientist overviews and resources can be found within our "Avonwood Scientists Across the Curriculum" planning document.

3. 6 Science unit structure

Pre-Unit - **1. Define the learning**	• Teachers should have expert knowledge of the subjects that they teach. If they do not, they must address gaps in their knowledge so that pupils are not disadvantaged by ineffective teaching by using the provided materials. • Teachers are aware of children's previous learning and vertical concepts in science and are aware of content taught and not taught in their year groups through the science overview and PLAN documents.
Pre-Unit - **2. Formative Assessment**	**Prior to planning a unit teachers will provide children with a practical experience to aid assessment for learning, this will result in:** • Identifying misconceptions • Find out gaps and identify lost learning due to COVID-19 • Highlight relevant vocabulary and misunderstandings of words used or not used **It gives the children opportunities to:** • Practice memory recall and knowledge retrieval, increase their engagement with the learning and allow children to ask relevant questions
Pre-Unit and during - **3. Planning with assessment in mind and adressing misconceptions**	• Teachers use UL planning as a minimum requirement to support teaching and adapt resources to suit the needs and misconceptions of the children. • Teachers use the ASE PLAN/TAPS documents to inform science planning and focussed recording of NC objectives • Teachers may choose to use optional end of unit assessments provided by UL but there must be clear evidence of misconceptions being addresssed and re-taught.
Post Unit - **4. Further Assessment**	• Teachers use the ASE PLAN and TAPS documents to moderate scientific knowledge between classes • Teachers use ASE PLAN and TAPS resources to modetate and assess working scientifically • Teachers record end of unit assessment grades on relevant tracker

3.7 Science lesson structure

  **Discuss**	• At Avonwood science lessons start with a thinking prompt • We believe that children need time to recall prior knowledge and this activity will develop essential skills for scientific enquiry. • Teachers check pupils' understanding effectively, and identify and correct misunderstandings. Resources for thinking prompts: https://explorify.wellcome.ac.uk/ Suggested activities; Odd one out, Zoom in zoom out, What's going on (video prompt) or a practical prompt for thinking, picture reveal
	• At Avonwood teachers will introduce new knowledge in smalls steps alongside visual models and practical equipment • New vocabulary will be explicitly taught at the start of each lesson and will be displayed on science working wall
	• At Avonwood all children will have the opportunity to handle equipment whilst being supervised by an adult • We believe that children should have the opportnity to answer their own scientific questions through pupil led enquiry • Working scientifically is fully embedded in planning and not taught seperatley
  **Focussed recording**	• At Avonwood teachers will plan focussed recording with assessment in mind. • Children will record in a variety of ways such as; labelled diagrams, tables of results, venn diagrams, caroll diagrams, explanations • Not all lessons will require formal recording due to the practical nature of the subject and thus pictures and thought bubbles will be recorded in the class floor book. ***We believe that using floorbooks in science promotes the development of children's ideas, thinking and reasoning skills, models the collaborative nature of science and supports effective teacher assessment***
  **Think**	• At Avonwood science lessons finish with an open ended discussion to extend learning. We believe that children should have the opportunity to wonder and ask questions and relate their learning to the wider contect. • Teachers use assessment to check pupils' understanding in order to inform teaching, and to help pupils embed and use knowledge fluently and develop their understanding • This results in children knowing more, remembering more and being able to do more. Resources for end of lesson discussions: https://explorify.wellcome.ac.uk/ Suggested activities; What if? Big Questions, Positive Minus Interesting.

4.0 Science Curriculum Resources

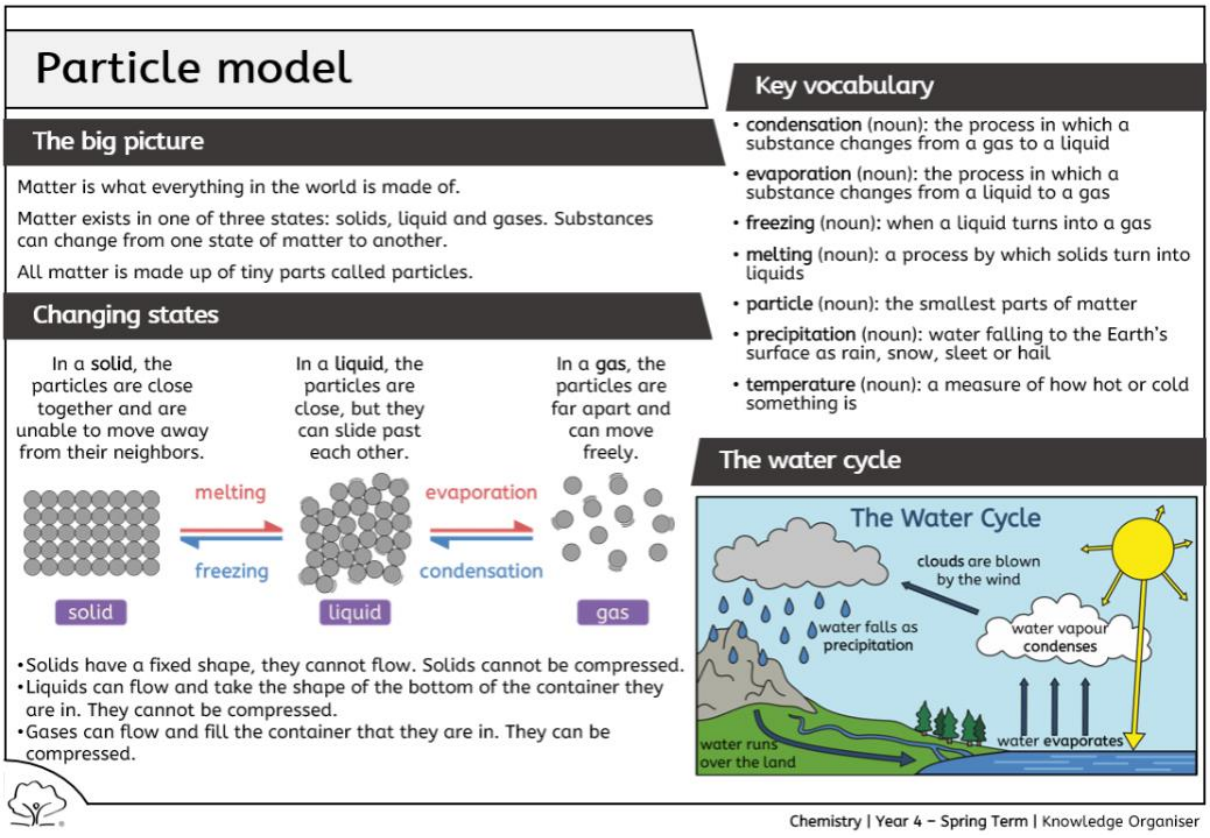
4.1 Example Medium Term Plan

Here is an example of the Science medium term planning grid: **Year 3, Autumn 1 – Chemistry - Rocks**

	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	• **Geography**: We live on the Earth (Y1 Aut) • Materials have physical properties that make them better or worse for certain uses, such as waterproof, absorbent, windproof, heatproof, malleable (Y2 Spr) • Materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties to different extents (Y2 Spr) • Living things are called organisms (Y2 Spr) • Everything in the world is either living (or used to be living) or not-living (Y2 Sum)	• A rock is a naturally occurring material which is made up of different minerals. • The Earth's crust is it's the outermost layer of our planet. It is made of rocks and minerals. • Natural rocks are either **igneous**, **sedimentary** or **metamorphic** • Man-made rocks, like concrete, are called **anthropic** rocks • **Igneous** rock is formed when **magma** cools down • **Sedimentary** rock is formed when layers of small **sediments** are **compressed** over a long period of time. Igneous rock can become sedimentary rock if it breaks down into small pieces and forms layers • **Metamorphic** rock is formed when igneous or sedimentary rock is put under lots of **pressure** • Different rocks have different properties, including **permeable/impermeable** • A **fossil** is physical evidence of an ancient plant or animal , this could be their **preserved** remains or other **traces** that they made when they were alive. • **Trace fossils** are not physical remains of living things they are indirect evidence of life, examples include imprints of, or a mark left by an organism such as a footprint, imprint of a feather or poo • Fossils are formed when a living thing or trace is buried under sediment. The remains break down slowly and as layers of sediment build up the layers are squashed, turning them into sedimentary rock • Fossils can form when dead organisms are frozen in ice or preserved in amber • **Soil** is a mixture of tiny pieces of rock, dead plants and animals, air and water. Different soils have different properties	• **History:** Rocks that build historical monuments including Stonehenge and the Great Pyramid in Egypt (Y3) • **History:** Importance of fossils in archaeology (Y6) • **Geography:** Beneath the Earth's solid crust is a hot later called the mantle (Y3) • **Geography:** Volcanic eruptions release magma (Y3 Spr) • Fossils provide evidence for evolution, because they show how organisms have changed over time (Y6 Aut) • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks (KS3) • The composition of the Earth (KS3) • The structure of the Earth (KS3) • Earth as a source of limited resources and the efficacy of recycling (KS3)
Disciplinary	• A&P: A&P: Scientists group objects or living things based on their properties (Y1 Spr) • M&O: Observe using a magnifying glass safely (Y2 Spr) • M&O: Make systematic observations of an object (Y2 Aut) • R&P: Use a pair of axes to classify items based on the extent to which it displays two properties (Y2 Spr)	***Make observations about rocks using senses and magnifying glass, and classify them in a Carroll diagram/pair of axes***	
VCs		• 5: Much of the solid surface of the Earth is covered in soil, which is a mixture of pieces of rock of various sizes and the remains of organisms. Some soil also contains air, water and some nutrients • 5: There are many different kinds of rock with different composition and properties. • 10: Fossils are the preserved remains or traces of living things	• 5: The action of water wears down rock gradually into smaller pieces (see **Geography, Year 5 : Investigating water**) • 5: Beneath the Earth's solid crust is a hot layer called the mantle. The Earth's crust consists of a number of solid plates which move relative to each other, carried along by movements of the mantle. The formation of mountains, earthquakes and volcanic activity are likely to occur at these cracks (see **Geography Year 3 Spring: Mountains and Volcanoes and Year 4 Summer: Earthquakes**)

4.2 Example Knowledge Organiser

Here is an example of our Knowledge Organisers: **Year 4 – Spring 1 – Chemistry – Particle Model**



4.3 Use of floor books

We use science floor books to provide children with the opportunity to ask questions in science. Children can write their questions within the book and their peers can conduct research in books or online to answer their questions.

Any additional learning outside the classroom in the form of trips, visits or homework. In addition whole school events such as the RSPB Big School Birdwatch, British Science Week and STEAM week activities and pictures are recorded in the floor book.

4.4 Assessment

Teacher assessment in science should consider a large body of evidence of the child's knowledge, their conceptual understanding of scientific processes and their independent practical science skills. To assess Science successfully, teachers need to consider assessment when they start their planning for each topic.

This is done through:

Formative assessment in lessons

During lessons, teachers should be continuously watching, questioning, listening to and reviewing any recorded work of their pupils to build up a picture of each individual's knowledge, vocabulary and working scientifically skills, so any gaps in knowledge or skills, or misconceptions, can be identified and addressed. This information is recorded on the individual pupil trackers and in class floor books.

To support teachers with these judgements, the PLAN primary science resources include Examples of work from one pupil that meet the expectations of the knowledge statements for each topic from each year of the science National Curriculum in England. Teachers can review the PLAN Examples of work for the topic they have just taught to get a clear understanding of what meeting the expectations looks like and can use this to identify any pupils in their class that are not meeting them. These pupils can then be provided with additional opportunities to demonstrate that they meet them. The tracking document should be updated as pupils become secure and should be passed on to the pupils' next teacher so that they can address any gaps that remain.

Low-stakes summative assessment

A post-learning quiz is provided for every unit. These questions usually take the form of multiple-choice questions, and aim to assess whether pupils have learned the core knowledge for that unit. These should also be used formatively, and teachers should plan to fill gaps and address misconceptions before moving on.

Pupil Books, Class Floorbooks and Pupil-Conferencing

Talking to pupils about their books allows teachers to assess how much of the curriculum content is secure. These conversations are used most effectively to determine whether pupils have a good understanding of the vertical concepts, and if they can link recently taught content to learning from previous units. (They should not be used to assess whether pupils can recall information, as low-stakes quizzes can gather this information more efficiently).

Statutory assessment

Assessment is only statutory in Year 2 and Year 6, with judgements made against the Teacher Assessment Frameworks at the end of key stage 1 and key stage 2. The guidance states that:

"At the end of the key stage, teachers should make a judgement against the frameworks based on their own assessments of pupils' work. The standard in this framework contains a number of 'pupil can' statements. To judge that a pupil is working at the standard in science, teachers need to have evidence which demonstrates that the pupil meets all the 'working scientifically' statements and all of the 'science content' taught in the final year of the key stage. There is no requirement to have evidence from the classroom that pupils have met statements relating to

science content taught before the final year of the key stage. Where possible, teachers should draw on assessments that have been made earlier in the key stage to make their judgement against this framework. Teachers need to base their judgement on a broad range of evidence, which will come from day to-day work in the classroom. This should include work in curriculum subjects other than the one being assessed, although a pupil's work in that subject alone may provide sufficient evidence to support the judgement. Teachers may also consider a single example of a pupil's work to provide evidence for multiple statements."

The Frameworks should only be used for this end of key stage assessment.

Working at greater depth

In Science, there is only one standard specified in the Teacher Assessment Frameworks at the end of key stage 1 and key stage 2 which is 'working at the expected standard', whereas in Maths and English there are three: 'working towards the expected standard'; 'working at the expected standard'; and 'working at greater depth (within the expected standard)'. It is, therefore, sufficient for teachers to simply make judgements about whether pupils are meeting the statements or not. There is no requirement to assess if pupils are 'working at greater depth', as there are no statements against which to judge this. However, this does not mean that teachers do not need to plan activities that will stretch and challenge pupils that have met the statements. Our rapid graspers have the opportunity to extend their learning by answering peers questions in the floor book and conducting research.

5.0 Roles and Responsibilities

5.1 Class Teacher

It is the teachers' role to be aware of and follow the guidance contained within this policy. They should seek advice from the subject leader if they are unsure of knowledge content or how best to tackle a unit of work.

5.2 Subject Leader

The roles of the subject leader are to:

- Plan a progressive Long Term Plan using the National Curriculum as a base and using the School Curriculum Intents to tailor their subject provision to suit our pupils, which is chunked into units for each year group.
- Produce Medium Term Plans to frame the teaching and learning for each unit. - Promote their subject through signposting staff to up-to-date resources and subject specific evidence-based research.
- Support staff through planned CPD events and ad-hoc requests for assistance with knowledge or planning.
- Oversee the delivery of the subject through:
    - learning walks
    - book looks
    - pupil voice
    - subject audits
- Meet with their SLT link to update them with current developments in research and thinking.
- Create an annual action plan.
- Ensure there are sufficient resources for the subject to be taught effectively and efficiently.
- Ensure this policy is up to date.

5.3 Senior Leadership Team

Each subject will have an SLT link/ Their roles are to:

- Support the subject leader to:
    - Be an advocate for the subject
    - Oversee the delivery of their subject through assisting with learning walks, book looks and pupil voice
    - Enable their subject leader to have sufficient CPD opportunities to develop staff knowledge.
    - Implement their action plan. - Work together so that school priorities can be identified, and prevent all subjects from being promoted and developed at the same time