Fundamental Knowledge Map: Science

EDALE RISE
Primary & Nursery School

Fundamental Knowledge Map: Science

This document captures the fundamental knowledge, both substantive and disciplinary, taught in science at Edale Rise. The units taught at Edale Rise explore more material than this document demonstrates; however, this document states the most fundamental knowledge a child will be able to demonstrate if they are secure in the unit taught.

The purpose of this document is to ensure that:

A. Teachers know exactly what children should be know or be able to do by the end of the unit
B. Teachers know what knowledge should be prioritised for retrieval within and between units and years
C. Teachers know what prior-knowledge should be assessed for before proceeding with subsequent units
D. Leaders know exactly what knowledge children should be able to articulate during monitoring exercises

In science, there is a 'making connections' unit in each year group, meaning there is a total of 6 units per year group. However, the 'making connections' revisits and connects learning previously visited in other units so there is no separate summary for this unt.
For more information regarding the content covered in each unit, please see the **long-term plan** available on the school website or request a meeting with a member of the curriculum team.

Knowledge and Understanding: Y1

Seasonal Changes

Pupils who are **secure** will be able to:
- Name the four seasons in order and describe the typical weather in each.
- Name some activities and events in the four seasons.
- Describe the appearance of a tree's leaves in each season.
- Recall that summer has the most daylight hours and winter has the least daylight hours.
- Record data about the temperature across the four seasons.
- Label a map of the UK with capital cities and seasonal weather symbols.

When working scientifically, pupils who are **secure** will be able to:
- Complete a pictogram and use it to answer simple questions.
- Record data about the temperature across the four seasons.

Plants

Pupils who are **secure** will be able to:
- Identify plants and their features.
- Recall some of the roles that flowering plant parts have.
- Name some trees and their parts.
- Identify similarities and differences between deciduous and evergreen leaves.
- Recall that seeds and bulbs come from plants.
- Recognise that seeds need water for growth.

When working scientifically, pupils who are **secure** will be able to:
- Raise questions about and investigate plants
- Draw and label a diagram of a flowering plant.
- Use an identification chart to name flowering plants.
- Sort plants into groups based on specific criteria.
- Use non-standard units to measure leaf length.
- Recognise similarities and differences in seeds
- Recognise that predictions do not always match observations.
- Recognise that scientific research into plants leads to important discoveries.

Sensitive Bodies

Pupils who are secure will be able to:
- Name the four seasons in order and describe the typical weather in each.
- Name some activities and events in the four seasons.
- Describe the appearance of a tree's leaves in each season.
- Recall that summer has the most daylight hours and winter has the least daylight hours.
- Record data about the temperature across the four seasons.
- Label a map of the UK with capital cities and seasonal weather symbols.

When working scientifically, pupils who are secure will be able to:
- Complete a pictogram and use it to answer simple questions.
- Record data about the temperature across the four seasons.

Comparing Animals

Pupils who are **secure** will be able to:
- Name and describe the physical features of a range of animals.
- Sort animals into groups based on their similarities and differences.
- Identify characteristics specific to mammals, birds, reptiles, amphibians and fish.
- Recall the diets of carnivores, herbivores and omnivores.

When working scientifically, pupils who are **secure** will be able to:
- Use a non-fiction text to find out about specific animals' diets.
- Recognise that there are different ways to gather data.
- Record data in a block graph and use this to answer questions.
- Recognise what the scientist Jane Goodall was known for.
- Recall some of Jane Goodall's key findings.

Everyday Materials

Pupils who are **secure** will be able to:
- Name objects and identify the materials they are made from.
- Recognise that objects are made from materials that suit their purpose.
- Recall that a property is how a material can be described.

When working scientifically, pupils who are **secure** will be able to:
- Sort objects based on the materials they are made from.
- Group objects based on their properties.
- Suggest ways to test materials for their properties.
- Make predictions and recognise whether they were accurate.
- Use their observations to answer questions.
- Begin to recognise if a test is fair.

Knowledge and Understanding: Y2

Habitats	Microhabitats	Use of Everyday Materials
Pupils who are **secure** will be able to: • Recall some life processes, giving examples of how they apply to plants and animals. • Match different plants and animals to their habitats. • Give examples of how animals use their habitat for food and shelter. • Recall that plants produce their own food for energy. • Name living things that are producers and place a producer at the beginning of a food chain. • Use arrows to show the order in a food chain. When working scientifically, pupils who are **secure** will be able to: • Classify objects into alive, never been alive and was once alive, giving reasons for their choices. • Carry out research to find answers to questions.	. Pupils who are secure will be able to: • Identify stages in the life cycles of different animals, including humans. • Describe the basic survival needs of animals. • Explain how to take care of personal hygiene. • Describe some positive effects of exercise. • Identify foods in different food groups. When working scientifically, pupils who are secure will be able to: • Measure using simple equipment. • Record results in a table. • Use data to answer a simple question. • Research using secondary sources.	Pupils who are **secure** will be able to: • Name objects with the same use that are made from different materials. • Name materials that are used to make objects with different uses. • Recognise that stretching, twisting, bending and squashing can cause some solid objects to change shape. • Name properties that make materials suitable for their use. When working scientifically, pupils who are **secure** will be able to: • Measure using non-standard units. • Recording results in a table. • Use data to answer a simple question. • Record results in a block graph.

Life Cycles and Health	Plant Growth
Pupils who are **secure** will be able to: • Identify and name a variety of plants and animals. • Recall that minibeasts live in microhabitats. • Describe microhabitats and their conditions. • Describe how microhabitats provide for the basic needs of animals and plants. • Describe the job role of a botanist. When working scientifically, pupils who are **secure** will be able to: • Group minibeasts and create simple classification keys. • Ask questions and recognise that they can be answered in different ways. • Gather and record data and use it to answer questions. • Plan what observations to make in an experiment. • Order the steps of a method. • Describe the appearance of flowering plants. • Use an identification chart to name flowering plants	Pupils who are **secure** will be able to: • Recall that seeds have all the necessary parts inside for plants to grow. • Recall that seeds need water and warmth to germinate. • Recognise that light is required for healthy plant growth. • Sequence the stages of a plant's life cycle. • Recognise the importance of healthy plant growth. • Describe the influences humans have on plants in the environment. When working scientifically, pupils who are **secure** will be able to: • Set up comparative tests. • Plan observations and measurements. • Use rulers to measure and record stem height. • Record plant growth data in a table. • Compare plant growth in different test conditions. • Use a magnifying glass to observe and compare plants. • Draw diagrams to represent stages of a plant's life cycle.

Knowledge and Understanding: Y3

Plant Reproduction	Forces and Magnets	Rocks and Soil
Pupils who are **secure** will be able to: • Identify what plants need Describe the structure and function of the parts of flowering plants. • Describe the life cycle of a flowering plant. • Explain seed dispersal methods. When working scientifically, pupils who are **secure** will be able to: • Pose relevant questions. • Design and record in results tables. • Plan a simple enquiry. • Complete, read and interpret data in a bar chart. • Identify and suggest changes to an enquiry. • Use results to draw conclusions.	Pupils who are **secure** will be able to: • Identify examples of pushes, pulls and twists. • Define a force, including describing, naming and classifying contact and non-contact forces. • Describe the relationship between friction and the roughness of a surface. • Identify examples of friction being useful or not. • Predict attraction and repulsion between like and opposite poles. • Identify examples of magnetic and non-magnetic materials. • Name some examples of types of magnets and compare their strengths. • Describe some examples of the uses of magnets. When working scientifically, pupils who are **secure** will be able to: • Use arrows and scientific vocabulary to show the direction of a contact force. • Use evidence to support conclusions. • Identify the variables to change, measure and control. • Write a method to explain how to use a magnet to sort and classify materials as magnetic or non-magnetic. • Identify key information from a source.	Pupils who are **secure** will be able to: • Define the term rock. • Describe the appearance of different rocks, identifying both crystals and grains. • Group rocks by their absorbency, hardness and reaction to acid rain (vinegar). • List the different factors that break down rocks. • Describe fossil formation and identify fossils in rocks. • Describe the work of a palaeontologist. • Name, describe and compare some different categories of soil. • List some of the benefits of earthworms to the soil. • Identify and describe the comparative size and weight of the layers in a sedimentation jar. When working scientifically, pupils who are **secure** will be able to: • Use a magnifying glass correctly to observe the appearance of a rock in detail. • Use results to choose the appropriate rock type for a specific use, suggest a better choice of rock for a specific use and predict how a rock will be affected by the weather. • Research and present information on fossil formation using a single source. • Use a model of the fossil record to determine the relative age of a fossil, to suggest how a living thing has changed over time and to suggest what living things were around in a certain era. • Draw and label the bars on a bar chart. • Accurately draw and label the layers of sediment in a sedimentation jar.

Knowledge and Understanding: Y3

Light and Shadows	Movement and Nutrition
Pupils who are **secure** will be able to: • Recall examples of light sources, objects that do not give out light and that darkness is the absence of light. • Describe ways to protect eyes from harm. • Describe what happens when light reflects, give examples of reflective surfaces or materials and describe factors that may affect the quality of a reflected image. • Describe how shadows form and identify patterns between groups of materials and the shadows produced. • Recall factors that affect the way a shadow appears, including what causes shadows to change throughout the day and factors that change the size of a shadow • Describe the pattern of changing shadows throughout the day. • Describe how the light source's distance affects the shadow's size. • Explain why a particular material is appropriate to make a shadow puppet and use knowledge of shadows to animate it. When working scientifically, pupils who are **secure** will be able to: • Recall what information needs recording to decide the number of columns in a results table and suggest suitable headings for the results table. • Record information in the correct columns. • Identify if a question is testable, explain why and plan ways to answer a testable question. • Identify and explain why something is an advantage or disadvantage of a method and suggest an improvement to the experiment. • I can describe patterns in data and quote values as evidence of patterns in data. • I can identify odd results that do not fit the pattern. • I can use patterns to make predictions for missing data.	Pupils who are **secure** will be able to: • Recall the three key functions of the skeleton (movement, support and protection). • Describe a vertebrate, invertebrate, endoskeleton and exoskeleton. • Identify and name the skull, spine, ribs and pelvis on a diagram. • Recall that muscles cause movements in the body, some of which we control by choice and that they cause a movement by shortening and pulling on a bone. • Recall that animals, including humans, need to eat food to survive. • Describe some examples of how energy is used by the body and make comparisons about the energy demands between people. • List some of the seven nutrient groups, name foods that are good sources of them and describe what they are needed for in the body. • Compare two different meals and explain which is more balanced by naming the nutrient groups and commenting on the relevant proportions. When working scientifically, pupils who are **secure** will be able to: • Use information about skeletons to group animals. • Record measurements of different bones and use the data to sort them into size order. • Describe some ways scientific research has improved the field of bionics/prosthetics, such as the choice of materials or linking their movement to muscles in the arm. • Find relevant data on food packaging and make numerical comparisons. • Summarise key information using secondary sources. • Describe some changes to scientific knowledge and jobs that require this information.

Knowledge and Understanding: Y4

Digestion and Food	Sound and Vibrations	States of Matter
Pupils who are **secure** will be able to: • Label key organs found in the digestive system and describe each of their functions. • Describe the functions of the four different types of adult human teeth using key vocabulary. • Know that good dental care involves brushing their teeth twice a day with toothpaste and a soft toothbrush. • Produce a food chain that begins with a plant and has arrows that move up the food chain. • Define a producer, predator and prey and identify examples in food chains. • Describe digestion, teeth and diets when talking about the observed poo clues. • Write a letter that uses a range of scientific vocabulary from the unit. When working scientifically, pupils who are **secure** will be able to: • Evaluate a strength or weakness of the digestive system model. • Describe an example of evidence that can be used to study teeth. • Evaluate a method by considering its limitations. • Recall that scientific research needs repeated results before being used in society. • Identify trends in predators and prey. • Draw a results table that has space for observations about different poo samples.	Pupils who are **secure** will be able to: • Describe how sounds are made. • Describe how sounds are heard through different mediums. • Explain the relationship between vibration strength and volume. • Describe the relationship between volume and distance. • Describe pitch and how to change it. • Explain how insulating materials can be used to muffle sound. When working scientifically, pupils who are **secure** will be able to: • To observe closely how different instruments create a sound. • Research how whales and dolphins communicate underwater. • Present results using a bar chart. • Suggest which variables to measure and for how long. • Design simple results tables. • Identify when results or observations do not match predictions.	Pupils who are **secure** will be able to: • Identify solids, liquids and gases using their properties. • Describe melting, freezing, condensing and evaporating. • Describe the different stages of the water cycle. • Describe how temperature affects the rate of evaporation and, therefore, the water cycle. When working scientifically, pupils who are **secure** will be able to: • Ask relevant questions. • Use results to draw simple conclusions. • Use thermometers to take accurate measurements. • Make predictions for new values. • Record findings using labelled diagrams. • Research using more than one source.

Knowledge and Understanding: Y4

Electricity and Circuits	Classification and Changing Habitats
Pupils who are **secure** will be able to: • Recall a range of electrical appliances, classify them as mains or battery-powered and explain why. • Explain how to test if a circuit works and identify when simple electric circuits will work. • Identify symbols for open and closed switches and give examples of how switches are useful. • Predict whether a circuit will work based on whether the switch is open or closed and explain that it works by breaking and completing a circuit. • Describe that a material is a good electrical conductor when it is added to an electric circuit and the bulb lights and that a material is a good electrical insulator when it is added to an electric circuit and the bulb does not light. • Recall that metals, for example, are good electrical conductors and plastics, for example, are good electrical insulators. • Describe that the more bulbs added to a series circuit, the dimmer the bulbs will be and explain that they will be dimmer when more are added to a circuit, as less energy is transferred to each of them. • Describe precautions for working safely with electricity and explain some precautions using knowledge of circuit diagrams, electrical components, conductors or insulators. When working scientifically, pupils who are **secure** will be able to: • Draw a results table and record a range of appliances under the correct headings 'Mains' or 'Batteries'. • Identify and draw simplified electric circuit symbols and use these to draw a simplified circuit diagram. • Write a method for the investigation that considers appropriate equipment, orders clearly written steps and considers safety. • Pose questions relating to bulbs in an electrical circuit. • Explain why a selected question is testable. • Suggest that new inventions will change safety advice.	Pupils who are **secure** will be able to: • Group animals in various ways, including vertebrates (mammals, birds, reptiles, amphibians, fish) and invertebrates. • Group plants in various ways, including flowering and non-flowering plants. • Recognise and describe different habitats and their inhabitants. • Recognise the impact humans can have on habitats. • Recognise the impact of natural disasters on habitats. When working scientifically, pupils who are **secure** will be able to: • Record data in different ways. • Apply and create classification keys. • Make careful observations. • Make and use classification keys. • Present information in different ways. • Research using an information sheet.

Knowledge and Understanding: Y5

Mixtures and Separations	Properties and Changes	Earth and Space
Pupils who are **secure** will be able to: • Define the term mixture and name some common examples. • Define the term sieving and explain how sieving separates mixtures. • Define the term filtering and explain how filtering separates mixtures. • Define the terms solution and dissolve and name some common examples of solutions. • Recall some factors that affect the time taken to dissolve. • Describe the effect of temperature on the time taken to dissolve. • Define the term evaporating and explain how evaporating separates solutions. • Identify when sieving, filtering and evaporating should be used. When working scientifically pupils who are **secure** will be able to: • Research a mixture to find out what substances it is made from. • Draw and annotate a diagram to explain how sieving separates a solid-solid mixture. • Identify and justify which type of enquiry to use to answer my testable question. • Identify solutions by observing and describing their appearance. • Suggest which variables to change, measure and control when investigating how temperature affects the time taken to dissolve. • Choose which measurements to take and how long to take them for.	Pupils who are **secure** will be able to: • Determine the hardness of different materials and link this to their uses. • Determine the transparency of different materials and link this to their uses. • Determine the thermal and electrical conductivity of different materials and link this to their uses. • Demonstrate, identify and describe reversible and irreversible changes. When working scientifically pupils who are **secure** will be able to: • Evaluate the hardness test to determine the degree of trust in the results. • Plan and draw a table of results. • Write a detailed, organised and easy to follow method. • Write a prediction using prior knowledge of the states of matter. • Analyse observations about rusting and use them to support a conclusion. • Measure accurately in centimetres.	Pupils who are **secure** will be able to: • Describe the geocentric and heliocentric models. • Name and describe the shape of celestial bodies. • Describe the orbits of celestial bodies in the Solar System and name the force that keeps them in their orbits. • Describe the orbit of the Moon around the Earth and its phases. • Explain how day and night occur. • Explain how the seasons occur. • Explain how a sundial works. • List some of the uses of satellites and explain why space junk poses a problem to them. When working scientifically, pupils who are **secure** will be able to: • Pose and identify testable questions about the movement of the celestial bodies in our Solar System. • Use a model to represent the Solar System. • Design and draw a table to record data on moons. • Accurately draw day and night and seasons diagrams. • Calibrate a sundial using a compass and torch and use it to measure time. • Analyse patterns in temperature data for the Earth and use them to predict temperature values for the Earth in the future.

Knowledge and Understanding: Y5

Life Cycles and Reproduction	Unbalanced Forces	Human Timeline
Pupils who are **secure** will be able to: • Describe the life cycle of a plant, including the reproductive stage. • Describe the life cycle of a mammal. • Describe the life cycle of a bird and compare it with that of a mammal. • Describe the life cycle of an amphibian. • Describe the life cycle of an insect and compare it with that of an amphibian. • Describe asexual reproduction in plants. When working scientifically, pupils who are **secure** will be able to: • Observe and compare equivalent parts in different flowers. • Research the life cycles of different mammals. • Pose questions to compare the life cycles of different birds. • Suggest how one temperature may affect egg hatching. • Use data to describe a relationship and make predictions. • Represent root growth over time on a line graph.	Pupils who are **secure** will be able to: • Describe gravity and its effects. • Describe the relationship between mass and gravity. • Describe air resistance and its effects. • Describe friction and its effects. • Describe water resistance and its effects. • Describe the relationship between surface area and air and water resistance. • Explain how to make an object aerodynamic or streamlined. • Describe the effects of levers, pulleys and simple machines on movement. When working scientifically, pupils who are **secure** will be able to: • Analyse predictions, data and anomalies to write a conclusion. • Plan a fair test to investigate air resistance. • Write a method. • Evaluate a method and judge the degree of trust. • Design a results table. • Calculate the mean average from repeat data. • Draw and annotate a diagram. • To draw an accurate line graph.	Pupils who are **secure** will be able to: • Order the stages in growth and development from birth to old age. • Describe physical and developmental changes from a baby through to old age. • Describe changes that occur in males and females during puberty. • Suggest ways to manage the changes that occur during puberty. • Recall what is meant by a gestation period. • Describe how gestation varies across animals and compare this to humans. When working scientifically, pupils who are **secure** will be able to: • Use data to describe growth from baby to adult. • Identify where on the graph the rate of growth changes. • Use a line graph to make predictions about height. • Choose a suitable title and axes labels for the scatter graph and plot data on the scatter graph.

Knowledge and Understanding: Y6

Classifying Big and Small	Light and Reflection	Evolution and Inheritance
Pupils who are **secure** will be able to: • Define the term 'organism' and name the seven life processes of all living things. • Describe the work of Carl Linnaeus. • Define the term 'vertebrate' and name the vertebrate groups. • Describe the characteristics of fish, amphibians, reptiles, birds and mammals. • Compare the characteristics of the vertebrate groups. • Define the term 'invertebrate'. • Describe the characteristics of worms, snails, spiders and insects. • Compare the characteristics of the invertebrate groups. • Name the plant groups. • Describe the characteristics of flowering plants, ferns, mosses and conifers. • Define the term 'micro-organism' and name some examples. When working scientifically pupils who are **secure** will be able to: • Use a classification key to group and identify organisms. • Make a simple classification key.	Pupils who are **secure** will be able to: • Compare sources of light and explain how the eye is protected from light. • Describe how light travels and how we see luminous and non-luminous objects. • Recall factors that affect the size of a shadow and describe how the distance between an object and the surface its shadow is cast on affects the size of the shadow. • Use ray diagrams to explain why shadows change size and why the shape of a shadow matches the object that was cast. • Recall what happens to light when it reaches a smooth mirror surface. • Identify the incoming and reflected rays and describe the relationship between their angles. • Use mirrors to make a working periscope and explain how a periscope works using ray diagrams. • Recall a range of uses of mirrors and reflection, describe how a mirror reflects light in different situations and explain how light is reflected using knowledge of light and reflection. When working scientifically, pupils who are **secure** will be able to: • Make observations about the properties of light. • Use my observations as evidence to support conclusions about light. • Draw ray diagrams. • Pose testable questions in response to observations. • Record my measurements as a line graph. • Use my line graph to extrapolate data and make predictions about missing values. • Recall various jobs or inventions that use mirrors and reflection.	Pupils who are **secure** will be able to: • Define and identify variation in organisms and recall that it is caused by inherited and environmental factors. • Recall that living things produce offspring of the same kind but are not normally identical to their parents. • Describe patterns of inheritance from parent to offspring in a given example or family tree. • Describe what an adaptation is; it cannot be chosen and is usually inherited. • Describe key characteristics that would help an organism to survive and explain how an adaptation helps the organism to survive. • Explain how variation may affect survival within a population and recall what natural selection means. • Recall what evolution is, identify differences between a living thing and its ancestor and describe key steps in the evolution of a species. • Recall different types of evidence that can be used to explain evolution and describe methods that make scientists' results or conclusions more trustworthy. When working scientifically, pupils who are **secure** will be able to: • Sort variation as environmental, inherited or a mixture of both. • Evaluate a method by recalling variables that were effectively kept the same and those that were harder to control. • Comment on the reliability of the results and the degree of trust. • Consider how evidence is used to form theories and the degree of trust the evidence offers.

Knowledge and Understanding: Y6

Circuits, Batteries and Switches	Circulation and Health
Pupils who are **secure** will be able to: • Describe the function of key electrical components and explain how the models used in the lesson represent these. • Correctly predict if an electrical circuit will work or not, explaining why using their knowledge of complete loops, power sources and presence of components. • Describe the relationship between the number of bulbs in a circuit, the bulb brightness and the amount of resistance. • Explain that increasing the number of components increases the resistance, affecting the flow of current and energy transferred. • Identify that batteries are a voltage source; they come in different voltages, affecting bulb brightness. • Describe that voltage can be changed using different numbers of cells in a circuit and that more cells or a higher voltage causes brighter bulbs. • Use the relationship between voltage and bulbs to predict what will happen with buzzers and motors. • Build an electrical circuit with a switch to control its function, explain how the switch and the electrical circuit solve the problem and recall different examples of problems that can be solved using an electrical circuit. When working scientifically, pupils who are **secure** will be able to: • Draw circuit diagrams with straight lines and using standard circuit symbols. • Design a results table with an appropriate number of columns and headings with units. • Identify the changed, measured and control variables in an enquiry to plan a method.	Pupils who are **secure** will be able to: • Recall factors that improve someone's health and those that impact health negatively and suggest improvements to someone's health. • Describe the circulatory system as the heart and blood vessels transporting blood around the body and recall that the heart is a pump that pushes blood through the circulatory system. • Describe the pathway of blood through the circulatory system, including passing through the heart twice in a complete circuit through the body. • Describe some of the functions of blood, including transporting substances like oxygen, water and nutrients around the body. • Recall what is meant by heart rate and research using multiple websites to find reliable animal masses. • Identify the pattern between animals' size and heart rate and quote values as evidence. • Describe how different exercises affect heart rate and explain why heart rate changes during exercise. • Describe what happens to heart rate during and after exercise and compare two sets of heart data to identify a link between heart rate and fitness. When working scientifically, pupils who are **secure** will be able to: • Evaluate the trustworthiness of secondary sources that provide health advice. • Evaluate the model blood by considering a strength and a weakness when representing blood and suggesting improvements. • Compare class values and recognise when they do not match. • Use identified patterns to predict new values. • Write a method for an enquiry with consideration of equipment, the different versions of the changed variable and how to complete the measured variable. • Choose a suitable title and axis labels with units for the line graph and plot points on the line graph.