

# Progression in Substantive Knowledge

(from EYFS Framework, Development Matters and NC aims)

	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
<b>Biology: Plants</b>	<p>Plant seeds and care for growing plants.</p> <p>Understand the key features of the life cycle of a plant, including growth and decay</p> <p>Observe changes in plants, flowers, fruits and vegetables as they grow/change</p> <p>Describe ways to show respect and care for the natural environment and all living things</p>	<p>Explain plants are living things.</p> <p>Name and describe common plants they see in their familiar world, daffodil, grape hyacinth, buttercup, cherry blossom, sunflower</p> <p>Make observational drawings of plants</p>	<p>Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees</p> <p>Identify and describe the basic structure of a variety of common flowering plants, including trees.</p>	<p>Observe and describe how seeds and bulbs grow into mature plants</p> <p>Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.</p>	<p>Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.</p> <p>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.</p> <p>Investigate the way in which water is transported within plants.</p> <p>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</p>			

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<b>Biology: Animals, including humans</b>	<p>Make healthy choices about food, drink, activity and tooth brushing.</p> <p>Understand the key features of the life cycle of an animal.</p> <p>Describe ways to show respect and care for the natural environment and all living things</p>	<p>Talk about the different factors that support their overall health and wellbeing:</p> <p>regular physical activity</p> <p>healthy eating</p> <p>tooth brushing</p> <p>Name/match adult/baby animals</p>	<p>Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.</p> <p>Identify and name a variety of common animals that are carnivores, herbivores and omnivores.</p>	<p>Notice that animals, including humans, have offspring which grow into adults.</p> <p>Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).</p> <p>Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.</p>	<p>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.</p> <p>Identify that humans and some other animals have skeletons and muscles for support, protection and movement.</p>	<p>Describe the simple functions of the basic parts of the digestive system in humans.</p> <p>Identify the different types of teeth in humans and their simple functions.</p> <p>Construct and interpret a variety of food chains, identifying producers, predators and prey</p>	<p>Describe the changes as humans develop to old age.</p>	<p>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.</p> <p>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.</p> <p>Describe the ways in which nutrients and water are transported within animals, including humans.</p>

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Biology: Living things and their habitats		Sort and classify baby animals by habitat		<p>Explore and compare the differences between things that are living, dead, and things that have never been alive.</p> <p>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.</p> <p>Identify and name a variety of plants and animals in their habitats, including microhabitats.</p> <p>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.</p>		<p>Recognise that living things can be grouped in a variety of ways.</p> <p>Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.</p> <p>Recognise that environments can change and that this can sometimes pose dangers to living things.</p> <p>Construct and interpret a variety of food chains, identifying producers, predators and prey.</p>	<p>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</p> <p>Describe the life process of reproduction in some plants and animals.</p>	<p>Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals.</p> <p>Give reasons for classifying plants and animals based on specific characteristics.</p>

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Biology: Evolution and inheritance								<p><b>Evolution and inheritance</b></p> <p>Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.</p> <p>Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.</p> <p>Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</p>

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Chemistry: Materials	Describe objects with similar and different properties, e.g. hard, cold, soft, by colour	Name some common materials, water, wood, plastic, paper, card, glass Describe similarities and differences in relation to familiar objects and materials Describe changing states of materials, e.g. ice melting, making cakes/soup	<b>Everyday materials</b> Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties.	<b>Uses of everyday materials</b> Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.		<b>States of matter</b> Compare and group materials together, according to whether they are solids, liquids or gases. 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). Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	<b>Properties and changes of materials</b> 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. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate that dissolving, mixing and changes of state are reversible changes. 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.	

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Chemistry: Rocks					Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter.			

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
<b>Physics: Seasons, Earth and Space</b>	Explain that It gets colder in the summer and warmer in the winter	Describe the effect of changing seasons on the natural world around them	<p><b>Seasonal changes</b> Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies.</p>				<p><b>Earth and Space</b> Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. Describe the Sun, Earth and Moon as approximately spherical bodies. Use the idea of the Earth’s rotation to explain day and night and the apparent movement of the sun across the sky.</p>	

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Physics: Light					<p>Recognise that they need light in order to see things and that dark is the absence of light.</p> <p>Notice that light is reflected from surfaces</p> <p>Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</p> <p>Recognise that shadows are formed when the light from a light source is blocked by an opaque object.</p> <p>Find patterns in the way that the size of shadows change.</p>			<p>Recognise that light appears to travel in straight lines.</p> <p>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. 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.</p> <p>Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</p>



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<b>Physics: Forces</b>	Describe that if you push something that it moves				<p><b>Forces and magnets</b></p> <p>Compare how things move on different surfaces notice that some forces need contact between two objects, but magnetic forces can act at a distance.</p> <p>Observe how magnets attract or repel each other and attract some materials and not others.</p> <p>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.</p> <p>Describe magnets as having two poles.</p> <p>Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p>		<p><b>Forces</b></p> <p>Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</p> <p>Identify the effects of air resistance, water resistance and friction that act between moving surfaces.</p> <p>Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</p>	

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Physics: Sound						<p><b>Sound</b></p> <p>Identify how sounds are made, associating some of them with something vibrating</p> <p>recognise that vibrations from sounds travel through a medium to the ear</p> <p>find patterns between the pitch of a sound and features of the object that produced it.</p> <p>Find patterns between the volume of a sound and the strength of the vibrations that produced it.</p> <p>Recognise that sounds get fainter as the distance from the sound source increases.</p>		

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Physics: Electricity						<p><b>Electricity</b></p> <p>Identify common appliances that run on electricity.</p> <p>Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</p> <p>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.</p> <p>Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.</p> <p>Recognise some common conductors and insulators, and associate metals with being good conductors.</p>		<p><b>Electricity</b></p> <p>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. 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.</p> <p>Use recognised symbols when representing a simple circuit in a diagram.</p>

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## Explanatory note

A **comparative test** is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome.

A **fair test** is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.

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Using the 5 enquiry types			<p>Begin to learn about the 5 enquiry types used to answer a question. Children are told which enquiry type they are doing when carrying out a test.</p> <p>Enquiry logos displayed on the science working wall.</p>	<p>Begin to identify the 5 enquiry types and understand that scientists use these to answer questions.</p> <p>Enquiry logos displayed on the science working wall.</p>	<p>Name the 5 scientific enquiry types and are supported to make decisions about which scientific enquiries will help them answer the specific questions they raise.</p> <p>Enquiry logos displayed on the science working wall.</p>	<p>Begin to make decisions about which of the 5 scientific enquiry types will help them answer the specific questions they raise.</p> <p>Enquiry logos displayed on the science working wall.</p>	<p>Independently choose the scientific enquiry they will use to answer the questions they raise.</p> <p>Enquiry logos displayed on the science working wall.</p>	<p>Independently choose the scientific enquiry they will use to answer the questions they raise and evaluate their decisions.</p> <p>Enquiry logos displayed on the science working wall.</p>

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Asking scientific questions	Show curiosity and begins to ask some of their own questions.	Show curiosity and ask questions stimulated by their explorations of the world.	Ask simple questions that can be tested, e.g. about plants growing in their habitat, what is the best material for an umbrella.	Ask simple questions and recognise that they can be answered in different ways including use of scientific language, e.g. is a deciduous tree dead in winter	With support, develop relevant, testable questions, e.g. what happens to shadows when the light source moves, how far things move on different surfaces.  Independently use a range of question stems.  Answer questions posed by the teacher, e.g. about how soils are formed.	Use prior knowledge when asking questions, e.g. to identify and study plants and animals in their habitat using their prior knowledge of living things and their habitats.  Recognise when secondary sources can be used to answer questions that cannot be answered through practical work.  Identify the type of enquiry that they have chosen to answer their question.	Independently ask scientific questions, e.g. 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'  Choose a type of enquiry to carry out.  This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.	Independently ask scientific questions, e.g. about local animals and how they are adapted to their environment.  Choose a type of enquiry to carry out and justify their choice.  Recognise when secondary sources need to be used to answer questions that cannot be answered through practical work, e.g. how giraffes' necks got longer, or the development of insulating fur on the arctic fox.

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Planning an enquiry		Makes simple suggestions about what to do to find the answer to teacher's questions.	Offer ways of gathering evidence to answer a question, e.g. by deciding on the best material to use for a particular application.  Contributes to planning an investigation, e.g. suggests something to change or use	Recognise ways in which they might answer scientific questions, e.g. testing the suitability of materials for different purposes.	Pupil can plan enquiry, such as comparative or fair test, e.g. comparing the effect of different factors on plant growth.	Plan investigations using different types of scientific enquiry, e.g. exploring various materials by observing change over time, running comparative tests and conducting surveys.  Set up comparative and fair tests, e.g. finding patterns in the sounds made by elastic bands of different thicknesses.	Plan different types of scientific enquiries to answer questions.  Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question.	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.  Select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long.

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Observing closely	<p>Uses all of their senses to explore natural materials.</p>	<p>Use their senses to explore natural materials and describe what they observe, e.g. “a heavy log” “wet leaves”.</p> <p>Make more careful observations (e.g. “The ice has melted; look it’s a puddle now”) and use an increasingly mature vocabulary when discussing the natural world, e.g. soil, roots, stem, temperature, melt.</p> <p>Explore the natural world around them, making observations and drawing pictures of animals and plants.</p>	<p>Explore the world around them, using their senses.</p> <p>Observing closely, using simple equipment, e.g. mirror to look at faces, use of magnifying glass to look at parts of plants or materials</p> <p>Observe changes over time, e.g. how a tree changes during the year.</p>	<p>Make careful observations to support identification, comparison and noticing change, e.g. observing similar plants at different stages of growth.</p> <p>Use appropriate senses, aided by equipment such as magnifying glasses or rulers, to make their observations.</p> <p>Observing, through video or first-hand observation and measurement, e.g. how different animals, including humans, grow.</p>	<p>Make careful observations using various equipment as instructed, e.g. magnifying glasses to explore rocks.</p> <p>Observe the different stages of plant life cycles over a period of time.</p> <p>Observe how water travels up the stem to the flower.</p> <p>Record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing.</p>	<p>Make systematic and careful observations and, where appropriate, take measurements.</p> <p>Observing patterns, e.g. that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.</p>	<p>Observe life-cycle changes in a variety of living things, e.g. plants in the vegetable garden or flower border, and animals in the local environment.</p> <p>Observe changes in an animal over a period of time, e.g. by hatching and rearing chicks</p> <p>Observe that some conductors will produce a brighter bulb in a circuit than others.</p>	<p>Observe and raise questions, e.g. about local animals and how they are adapted to their environment.</p>

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	Nursery	Reception	Y1	Y2	Y3	Y4	Y5	Y6
Taking measurements	Indicates the before and after of changes, e.g. ice melting to water	Make simple measurements by comparison.	<p>Perform simple tests, e.g. waterproof materials</p> <p>Use simple equipment, e.g. cubes for measuring</p> <p>Make simple measurements, e.g. by comparison or non-standard units</p>	<p>Use simple measurements and equipment, e.g. egg timers</p> <p>Make simple measurements, e.g. using standard units.</p>	Use standard units when taking measurements, e.g. measuring distances between a light source and an object, look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.	Take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers, e.g. measure the temperature at which materials change state	<p>Make decisions about what observations to make, what measurements to use and how long to make them for.</p> <p>Decide when to take repeat readings (fair testing) or check further secondary sources (researching) to get accurate data.</p> <p>Choose the most appropriate equipment to make measurements and explain how to use it accurately.</p>	<p>Make decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them.</p> <p>Decide when to take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).</p> <p>Select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.</p>



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Gathering and recording results	Records using the objects provided, e.g. sorts objects into 2 groups	Make simple drawings of natural objects, e.g. leaf. Drawings show closer observation of details they have observed, e.g. an attempt to represent the veins on a leaf. Take photographs.	Identify what might usefully be recorded, e.g. drawing structures of plants or recording changing day length.  Record results using writing, photographs, drawings and simple pre-drawn tables.	Pupil can, with prompting, gather and display evidence in various ways, e.g. about the ways that magnets behave in relation to each other.  Record results using notes, tally charts and simple tables.	Pupil can use various ways to record, group and display evidence, e.g. grouping and classifying various materials.  Record results using drawings and notes.	Use notes and diagrams to record results, e.g. how habitats change during the year  Use various ways to record evidence, e.g. comparing the teeth of herbivores and carnivores, record evaporation over a period of time in a puddle in the playground or washing on a line.	With support, choose appropriate ways to record evidence, including annotated photographs, videos, labelled diagrams, observational drawing, labelled scientific diagrams or writing.	Choose appropriate ways to record evidence, including annotated photographs, videos, labelled diagrams, observational drawing, labelled scientific diagrams or writing.

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Presenting results	Makes simple recordings of their findings, e.g. photographs, audio recordings or draw pictures	Use modelled, topical vocabulary in discussion. Make simple recordings of results, e.g. photographs, drawings, audio or video recordings	Present results in a range of ways, e.g. a pre-drawn table, pre-drawn pictogram, drawings, photographs, recordings.	Present results in pictograms, tally charts, block diagrams and simple tables, e.g. the growth of plants over time (if pictograms have been taught in maths)  Identify and group key outcomes from enquiry, e.g. describing conditions in different habitats and how these affect the numbers and types of organisms.	Present results using scientific language, drawings, labelled diagrams, keys, charts, pictograms and two-way tables (if two-way tables have been taught in maths)  Templates can be used if needed to which they can add headings.	Present results using simple scientific language, drawings, labelled diagrams including Venn diagrams, classification keys, branching databases, bar charts, and tables reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.	Use various ways to present complex evidence, e.g. tables, tally charts, bar charts.  Start to use labelled diagrams to show more complex outcomes, e.g. comparing the time of day at different places on the earth.	Use various ways, as appropriate, to record complex evidence, e.g. tables, tally charts, bar charts, line graphs  Use labelled diagrams to show complex outcomes, e.g. relating specific adaptations of organisms to environmental factors.  Use line graphs to display complex data, e.g. size of object in relation to the size of the shadow it casts.  Present the same data in different ways in order to help with answering the question.

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Interpreting results	<p>Identify where changes have taken place, e.g. when a plant has grown or materials have changed shape</p> <p>Talk about what they see, using a wide vocabulary.</p>	<p>Offer simple, logical explanations for what they have observed, e.g. “Maybe it melted because the weather is warmer” or “It is light so I think that helps it float”.</p>	<p>Begin to notice patterns and relationships</p> <p>Identify key findings from an enquiry, e.g. how plants have changed over time.</p>	<p>Answer enquiry questions using data and ideas, to help decide how the properties of certain materials make them suitable for certain applications</p> <p>Use simple secondary sources to find answers</p>	<p>Indicate findings from an enquiry that could be reported, e.g. answering questions about how rocks are formed.</p>	<p>Recognise patterns that relate to scientific ideas, e.g. finding out which materials make better earmuffs.</p>	<p>With support, display and present key findings from enquiries orally and in writing, e.g. suggesting reasons for similarities and differences between various animals.</p> <p>Begin to talk about how their scientific ideas change due to new evidence that they have gathered.</p> <p>Identify results that do not fit the overall pattern.</p>	<p>Display and present key findings from enquiries orally and in writing, e.g. deciding how well classifications fit unfamiliar animals and plants.</p> <p>Talk about how their scientific ideas change due to new evidence that they have gathered.</p> <p>Talk about how new discoveries change scientific understanding.</p>

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Drawing conclusions (KS2 only)					With support, use evidence to produce a simple conclusion, e.g. the changes that occur when rocks are in water.	Use evidence to produce a simple conclusion, e.g. the effect of temperature on various substances	With prompting, write a conclusion using evidence and identifying causal links, e.g. investigating what makes a parachute fall quicker.  Show how evidence supports a conclusion, e.g. researching gestation periods of various mammals and relating them to adult mass.	Write a conclusion using evidence and identifying causal links, e.g. in the design of a periscope.  Identify how an idea is supported or refuted by evidence, e.g. selective breeding to produce animals or plants with desirable characteristics.
Making predictions (KS2 only)					With support, use their evidence to make predictions for different items tested using the same method e.g. the distance travelled by a car on an additional surface.	Use their evidence to make predictions for different items tested using the same method.	Use test results to make predictions to set up further comparative and fair tests.	Use test results to make predictions to set up further comparative and fair tests including, where necessary, presenting predictions as line graphs

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Evaluating an enquiry (KS2 only)					<p>Identify ways in which they adapted their method as they progressed.</p> <p>Suggest how an investigation could be extended, e.g. suggesting creative uses for different magnets.</p>	<p>Identify how they would do their investigation differently if they repeated the enquiry.</p> <p>Use evidence to suggest further relevant investigations, e.g. making own Instruments, using ideas about pitch and volume.</p>	<p>With support, indicate why some results may not be entirely trustworthy, e.g. when timing falling objects.</p> <p>Suggest further relevant comparative or fair tests, e.g. when testing materials for various properties to determine their suitability for an application.</p>	<p>In conclusions, indicate how trustworthy they are, e.g. in relating brightness of bulb to voltage supplied.</p> <p>Evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used.</p> <p>Use evidence to suggest further comparative or fair tests that would develop the investigation, e.g. in the design of rear view mirrors for cars.</p>