Progression in Science

Vale Academy Trust
BUILDING BRILLIANT FUTURES TOGETHER

MILLBROOK PRIMARY SCHOOL
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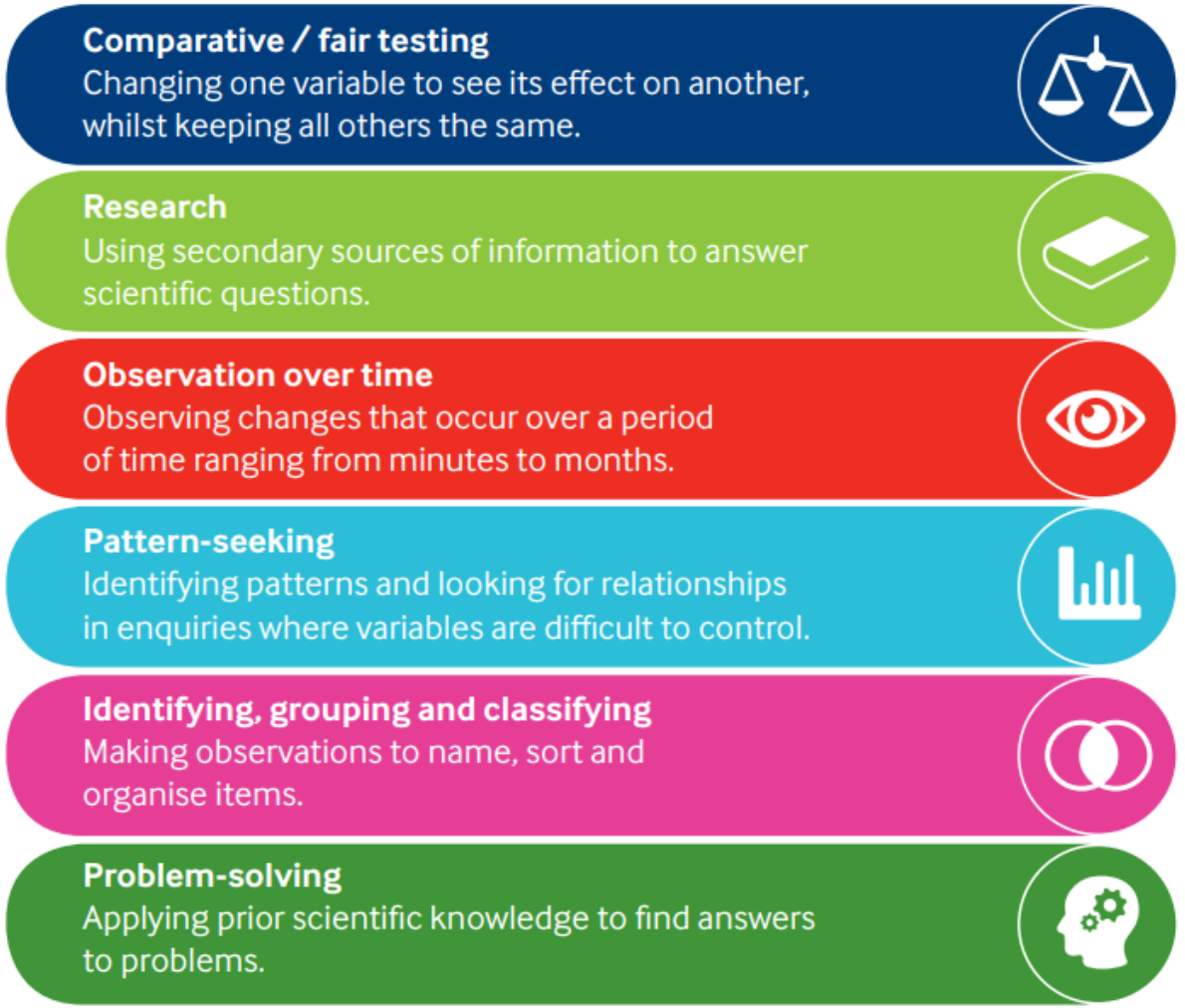
Using Enquiry types and Science skills to learn science through Science

Science
Enquiry types

These are the key science enquiry types that the children undertake to gain their scientific knowledge. In science, we want children to discover their scientific knowledge by using scientific enquiries rather than just being told. The following sheets show the progression of knowledge throughout the school and enquiry type.



Progression in Plants and lifecycles

EYFS	Lifecycle of butterflies Planting seeds	Name and find 5 common plants				
Year 1	Determining whether trees die when they loose their leaves Compare flower numbers through the seasons Planting bulbs	Identify bubs and common plants through comparison. Differentiate between deciduous and evergreen trees			E.g. Do yellow flowers prefer to grow in the sun?	Know that we eat plants and relating the food we eat to parts of plants (e.g. stem, leaves)
Year 2	Human lifecycle – different stages and measuring how much we grow in Y2 Lifecycle of a frog. Watch the steps of a seed germinating		How plants benefit our world. Some animals have babies that don't look like the adult	What do seeds need to germinate? (water and correct temperature).	e.g. Do bigger seeds grow bigger plants?	Find seeds in fruits and from trees and plant them.
Year 3		Identifying roots, stem, leaves and flowers of plants and their purpose	How plants grow in diverse habitats (e.g. extreme temperatures)	Do all **plants** (not from seed) need the same conditions to grow healthily?	e.g. Do plants with bigger leaves prefer warmer weather?	
Year 5			Compare the lifecycles of vertebrates Dissect flower and name the parts Puberty in humans		e.g. does the colour of the petals affect how many pollinators visit the plant?	Using cuttings to grow plants Lifecycles of plants – pollination, fertilisation, seed dispersal

Progression in Human Body and Health (KS2)

EYFS	Will I be the same height at the end of Foundation as the start?	We can identify foods using our senses – which body part linked to which sense				
Year 1		Classify foods by what part of the plant they come from or whether they are from animals.				How we use our senses to help us explore the world – how they keep us safe.
Year 2	Spread of germs if we don't wash	Classify carbohydrates, proteins, dairy	Eatwell plate – balance of carbs, proteins, fats, sugars, fruit and veg		What might affect our growth (e.g. hair colour, playing sports)?	
Year 3	That our bones grow. How our bones change throughout our life.	Classify foods that contain vitamins and minerals Match the skeleton to the animal	Native foods/seasonal foods			
Year 4	Impact of sugar/acid on our teeth over time	Match the jaw to the animal – relate to diet Classify human teeth	That different people need different diets (e.g. diabetic).			Model how the digestive system works
Year 5	Puberty and sexual reproduction in humans (PSHCE link)					
Year 6			How smoking affects our bodies.	Find a link between exercise and heart rate. Understand that lung capacity can be increased.		

Progression in Living things and their Habitats (KS2)

EYFS	Make a home for mini-beasts – what conditions do they like?	Which animals come from eggs? Identify minibeasts using pictures.	Mammals and birds that live on farms. How do we care for minibeasts?			Which animals are native to the UK.
Year 1	Compare number of animals in the locality in winter and summer.	Mammals and birds that live in native woodland Vertebrates that live in rainforests – by type and by what they eat (omnivore etc)	Name parts of the human body Different ways animals survive winter.			
Year 2		Animals by microhabitat – forest school and pond Identify pond life using simple keys Dead, alive, never living objects Predator, producer, prey By diet.	Different animals need different conditions to stay healthy – relate to pets vs humans.		e.g. Where do most woodlice live? Characteristics of plants that live in extreme temperatures.	What does a polar bear need to be safe from climate change?
Year 4	Variety of invertebrates in Letcombe Brook over the year.	Create/use branching database to identify ocean animals Sort ocean animals by vertebrates, arachnids, crustaceans and insects	Food web in different water habitats			What would happen if sharks became extinct? – impact of removing an apex predator. How can we maintain Letcombe Brook?
Year 6		How all living things are classified		Temperature vs gas production from yeast. What affects mould production on bread?		

Evolution

EYFS	That our appearance changed over time		Children usually look like their parents		We are not all the same but we have similarities	
Year 6	Living things have evolved over time to adapt to their surroundings – Fossil record	People can be classified by their hereditary traits	The history of life evolving Theory means proved as much as it can be in science Scientists use evolution to help fight bacterial diseases.		Comparing bird beaks, habitats and food helped Darwin to develop his theory of evolution	That bones can inform on how quickly evolution takes.

Progression in chemistry/materials (KS2)

EYFS	Cooking – foods can change with heat	Materials can be sorted for recycling by what they are made from.			Materials have similarities and differences that can be observed.	Exploring different textures (vocab and experience of touch). Some materials float and some sink.
Year 1		Sorting objects by how they feel, their properties and what they are made from		Best material for: strength, floating, reflectiveness, flexibility, keeping warm in winter		Which is the most common material in our classroom?
Year 2	Melting chocolate	Properties of different plastics and rubber	There are different types of plastic. Impact of plastic use on the environment. Charles Macintosh inventor.	Best material for: insulating heat, absorbency, waterproof, transparency, stretchiness		Why do scientists look for new ways to make things? Design the best picnic blanket
Year 3		Magnetic materials, Why some materials create more friction than others. Identifying rocks by their properties	Formation of different rock types.	Materials let through different amount of light. Materials can insulate heat – relate to animal adaptations.		What fossils are and how they are formed.
Year 4	Evaporating liquids in different conditions	Electrical conductors/insulators Solid, liquids or gasses		Sound insulators	Temperature vs evaporation speed	Determine the melting points of different materials Freezing different liquids.
Year 5		Which materials dissolve in water? Identifying fabrics by burning them. Identifying materials by their properties.		The different factors affecting the speed at which solids dissolve. Heat insulators can stop things melting. Best material for solar protection.		Separate a mixture of materials using sieving, filtering, magnets, evaporation. Reversible and irreversible reactions.
Year 6					Colour of material vs reflectiveness. Texture of material vs reflectiveness.	How pH affects reactions

Progression in Seasons, Light and Space (KS2)

EYFS	How trees and plants change over the year. How the weather changes throughout the year.		Safety – looking into torches.	Comparing light sources to see they give out different amounts of light.		We need light to see. Some objects reflect light
Year 1	Shadow lengths vary with season. Relationship between temperature and season.		Observe that the day length is different in summer and winter Safety – the sun and fire.			Sometimes we can't see our shadow Our shadows can be different sizes Shiny objects aren't always light sources.
Year 3		Artificial and natural light sources		Which is the brightest light source?	Size of shadow vs position of object. Where a shadow is formed in relation to position of light source and object	
Year 5	Position and size of shadows change throughout the day		Model why we have day and night. Name and order of planets in our solar system. The Earth is spherical.			That the solar system is too big to model in our school grounds. Relative movement of the Earth, sun and moon.
Year 6			How have humans made light over time?			Create a device using reflection. Light travels in straight lines. Light is reflected into our eyes. Know shadows are formed because light travels in straight lines

Progression in Forces

EYFS		Which materials/shapes float or sink?				How to build the tallest tower.
Year 1		Ranking materials by their buoyancy.				How to help an egg fall more safely That objects fall to the ground
Year 2		Objects can be pushed, pulled, stretched or twisted.				Rocket mice – air can be used as a push Objects move in different ways over different surfaces.
Year 3		Not all materials (including metals) are magnetic.	How friction is used in the real world (e.g. bullet trains, opening bottles). Magnets are used in many everyday items and some can be turned on and off.	Friction between a surface and object can change the speed or distance that the object travels. Magnets apply force over a distance		Magnets can attract or repel.
Year 5			How buildings are designed to withstand earthquakes	Friction can help us move objects.	Relationship between surface area and air resistance Relationship between mass and distance from fulcrum in a lever	Explain that gravity pulls items to the centre How levers, pulleys and gears can be used to move objects using less force Hollow shapes are more likely to float. How to build a strong structure.

Progression in Electricity

EYFS		Items which use electricity (battery or main).	Safety: electrical sockets, water and electricity			
Year 1			Safety – electrical safety at home.			
Year 4	Different items use different amounts of electricity to work.	Electrical conductors/insulators – using to make a switch	There is a financial and climate cost to using electricity – the source of the electricity is important.		Switches need to be closed to make a circuit. Batteries need to face the correct direction. Wires need to be correctly attached.	Electricity is a way of transferring energy. It only gives power when a circuit is complete. Basic understanding of electrons moving in a circuit. How to correctly install batteries.
Year 6			Draw a circuit using recognised symbols for bulbs, cells, buzzers, motors and switches.	Changing the number of cells/voltage affects the brightness of bulbs in a circuit		

Progression in Sound

Year 4					That different amounts of water in a bottle produces a different note.	That sound is produced through vibrations Sound needs to travel through a medium The longer the instrument, the lower the note. The thicker the string, the lower the note.

Working scientifically - Skills

Plan

Asking questions
Asking questions that can be answered using a scientific enquiry.

Setting up tests
Deciding on the method and equipment to use to carry out an enquiry.

Do

Observing and measuring
Using senses and measuring equipment to make observations about the enquiry.

Carrying out an enquiry
Skills to complete a task

Record

Recording data
Using tables, drawings and other means to note observations and measurements.

Review

Interpreting and communicating results
Using information from the data to say what you found out.

Evaluating
Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

PLAN

Asking questions
Asking questions that can be answered using a scientific enquiry.

Setting up tests
Deciding on the method and equipment to use to carry out an enquiry.

- Children ask questions about the world around them
- Children can suggest ways of answering a question with a given selection of equipment
- Children develop questions based on a context with a teacher or peers
- Children can plan for health and safety issues in their science work
- Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?
- Children can suggest more than one way to answer a question or build on the ideas of others
- Children are able to select appropriate equipment for their investigation
- Children identify control variables in a comparative/fair test
- Children can break a 'big question' into smaller parts, understanding that the parts may be answered in different ways
- Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)
- Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use
- Children can choose the independent variable for their question
- Children can identify possible dependant variables and justify their choice of measurement
- Children choose what to measure and how long for and at what intervals
- Children ask further questions based on the findings of their original question
- Children can plan an investigation, choosing which scientific enquiry method to use, which equipment and how to record and report their results.

DO

Observing and measuring

Using senses and measuring equipment to make observations about the enquiry.

Children use their senses to compare items

Children can use magnifying glasses to make observations

Children make measurements through comparisons (this is bigger, more flexible…)

Children use real objects for identification purposes (i.e. this is a oak leaf – can you find another one?)

Children can classify items in different ways, justifying their choices

Children can research using images and videos

Children measure using non-standard units of measurement

Children can use short, relevant pictorial identification sheets to classify living things

Children follow methods planned as a class and understand the purpose of the investigation

Children can research using pre-prepared resources specific to their task

Children can use a stop watch, ruler, pipette and digital thermometer correctly

Children can use branching databases to identify items/ living animals

Children can use long tape measures and trundle wheels to measure longer distances.

Children can use measuring cylinders and beakers to measure volume accurately.

Children can follow method to undertake an enquiry

Children can record light and volume on a data logger

Children can research using a limited number of given websites/resources

Children can choose the appropriate measuring equipment to give the most accurate results

Children can use an analogue thermometer and force meter accurately.

Children can use filter paper correctly.

Children can use a dichotomous key to identify living things

Children make decisions during an enquiry e.g. whether they need 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).

RECORD

Recording data
Using tables, drawings and other means to note observations and measurements.

Children can record 3 sets of data and suggest why they might be different. They would keep the median result.

Children can record results in a pre-made chart. This may include a tally.

Children can suggest the best way to record their results

Children can use more than one way to represent data (e.g. graph and chart)

Children can make Venn diagrams and Carroll tables to represent data

Children can plot data on a line graph (axes and scale can be given)

Children can choose which type of graph to use to represent data and explain the advantages of this choice

Children use photographs and/or videos to record their results

Children can draw labelled diagrams of their results

Children can use technology to create a bar chart

Children can complete a prepared bar chart outline adding headings

Children can make a digital branching database

Children can make a branching database manually

Children can make a scatter graph.

Children classify objects using sorting rings or prepared charts

Children can use sorting rings to make Venn diagrams to show their results

Children can write about their results or record on video

Children draw detailed and labelled observational drawings

Children can make a bar chart manually

Children can record 3 sets of data and calculate the mean. They recognise and disregard any outlying results.

REVIEW

Interpreting and communicating results
Using information from the data to say what you found out.

Evaluating
Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

- Children can show their understanding through models, art, drama, video or written work
- Children use their life experiences to help draw conclusions from their results
- Children start to see how their results relate to answering their question
- Children recognise the 'best' or 'worst' from their results (e.g. the brick was the worst material for a blanket)
- Children can give a response (written or verbal) to a given context (e.g. letter to Father Christmas on the best material for wrapping paper).
- Children create leaflets, e-books and dioramas to demonstrate their understanding
- Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.
- Children can analyse how accurate their measurements are and highlight any data that should be disregarded
- Children can interpret their data to make comparative statements.
- Children identify if and how they adapted their method and how that benefited their investigation
- Children can identify any gaps in their results where further investigation or research would be required
- Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).
- Children can suggest results for elements not tested (e.g. result for a temperature not tested)
- Children choose the best way to communicate their results to a given audience (poster, Sway, presentation, comic, video, letter…)
- Children compare their results to that of others and determine whether they need more information to answer their questions
- Children understand that science understanding often changes due to new evidence being found
- Children use their results to make predictions for further investigations
- Children recognise erroneous data and suggest how that could have happened
- Children can critically evaluate their control of variables, accuracy of measurements and trustworthiness of secondary sources.

Working Scientifically skills – Year 1

Children ask questions about the world around them

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children develop questions based on a context with a teacher or peers

Children can suggest ways of answering a question with a given selection of equipment

Children can plan for health and safety issues in their science work

Children use their senses to compare items

Children can use magnifying glasses to make observations

Children make measurements through comparisons (this is bigger, more flexible…)

Children can classify items in different ways, justifying their choices

Children can research using images and videos

Children use real objects for identification purposes (i.e. this is a oak leaf – can you find another one?)

Children follow methods planned as a class and understand the purpose of the investigation

Children can record results in a pre-made chart. This may include a tally.

Children can draw labelled diagrams of their results

Children can use sorting rings to make Venn diagrams to show their results

Children use photographs and/or videos to record their results

Children classify objects using sorting rings or prepared charts

Children can show their understanding through models, art, drama, video or written work

Children recognise the 'best' or 'worst' from their results (e.g. the brick was the worst material for a blanket)

Children use their life experiences to help draw conclusions from their results

Children start to see how their results relate to answering their question

Children can give a response (written or verbal) to a given context (e.g. letter to Father Christmas on the best material for wrapping paper).

Children create leaflets, e-books and dioramas to demonstrate their understanding

Working Scientifically skills – Year 2

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children can suggest more than one way to answer a question or build on the ideas of others

Children are able to select appropriate equipment for their investigation

Children can plan for health and safety issues in their science work

Children can use a stop watch, ruler, pipette and digital thermometer correctly

Children measure using non-standard units of measurement

Children can classify items in different ways, justifying their choices

Children can research using pre-prepared resources specific to their task

Children can research using images and videos

Children can use short, relevant pictorial identification sheets to classify living things

Children follow methods planned as a class and understand the purpose of the investigation

Children can record results in a pre-made chart. This may include a tally.

Children can draw labelled diagrams of their results

Children can use sorting rings to make Venn diagrams to show their results

Children use photographs and/or videos to record their results

Children can use technology to create a bar chart

Children can suggest the best way to record their results

Children recognise the 'best' or 'worst' from their results (e.g. the brick was the worst material for a blanket)

Children can give a response (written or verbal) to a given context (e.g. letter to Father Christmas on the best material for wrapping paper).

Children use their life experiences to help draw conclusions from their results

Children create leaflets, e-books and dioramas to demonstrate their understanding

Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.

Working Scientifically skills – Year 3

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children can suggest more than one way to answer a question or build on the ideas of others

Children identify control variables in a comparative/fair test

Children are able to select appropriate equipment for their investigation

Children can plan for health and safety issues in their science work

Children can use long tape measures and trundle wheels to measure longer distances.

Children can use measuring cylinders and beakers to measure volume accurately.

Children can use a stop watch, ruler, pipette and digital thermometer correctly

Children can record light and volume on a data logger

Children can use branching databases to identify items/ living animals

Children can research using pre-prepared resources specific to their task

Children follow methods planned as a class and understand the purpose of the investigation

Children can suggest the best way to record their results

Children can use technology to create a bar chart

Children can use more than one way to represent data (e.g. graph and chart)

Children can write about their results or record on video

Children create leaflets, e-books and dioramas to demonstrate their understanding

Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.

Children can interpret their data to make comparative statements.

Children identify if and how they adapted their method and how that benefited their investigation

Working Scientifically skills – Year 4

- Children can suggest more than one way to answer a question or build on the ideas of others
- Children identify control variables in a comparative/fair test
- Children can break a 'big question' into smaller parts, understanding that the parts may be answered in different ways
- Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)
- Children can plan for health and safety issues in their science work
- Children are able to select appropriate equipment for their investigation
- Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use
- Children can use a stop watch, ruler, pipette and digital thermometer correctly
- Children can use long tape measures and trundle wheels to measure longer distances.
- Children can use measuring cylinders and beakers to measure volume accurately.
- Children can record light and volume on a data logger
- Children can research using images and videos
- Children can research using pre-prepared resources specific to their task
- Children can use branching databases to identify items/ living animals
- Children can follow a method to undertake an enquiry
- Children can suggest the best way to record their results
- Children can use more than one way to represent data (e.g. graph and chart)
- Children can complete a prepared bar chart outline adding headings
- Children can write about their results or record on video
- Children can record 3 sets of data and suggest why they might be different. They would keep the median result.
- Children draw detailed and labelled observational drawings
- Children can make Venn diagrams and Carroll tables to represent data
- Children can make a digital branching database
- Children create leaflets, e-books and dioramas to demonstrate their understanding
- Children can interpret their data to make comparative statements.
- Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).
- Children can analyse how accurate their measurements are and highlight any data that should be disregarded
- Children identify if and how they adapted their method and how that benefited their investigation
- Children can identify any gaps in their results where further investigation or research would be required

Working Scientifically skills – Year 5

- Children identify control variables in a comparative/fair test
- Children can break a 'big question' into smaller parts, understanding that the parts may be answered in different ways
- Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)
- Children can choose the independent variable for their question
- Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use
- Children can identify possible dependant variables and justify their choice of measurement
- Children choose what to measure and how long for and at what intervals
- Children can use measuring cylinders and beakers to measure volume accurately.
- Children can choose the appropriate measuring equipment to give the most accurate results
- Children can use an analogue thermometer and force meter accurately.
- Children can use filter paper correctly.
- Children can research using pre-prepared resources specific to their task
- Children can research using a limited number of given websites/resources
- Children can use more than one way to represent data (e.g. graph and chart)
- Children can record 3 sets of data and suggest why they might be different. They would keep the median result.
- Children draw detailed and labelled observational drawings
- Children can make a bar chart manually
- Children can plot data on a line graph (axes and scale can be given)
- Children can choose which type of graph to use to represent data and explain the advantages of this choice
- Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.
- Children can interpret their data to make comparative statements.
- Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).
- Children compare their results to that of others and determine whether they need more information to answer their questions
- Children choose the best way to communicate their results to a given audience (poster, Sway, presentation, comic, video, letter…)
- Children can analyse how accurate their measurements are and highlight any data that should be disregarded
- Children identify if and how they adapted their method and how that benefited their investigation
- Children can identify any gaps in their results where further investigation or research would be required
- Children can suggest results for elements not tested (e.g. result for a temperature not tested)
- Children understand that science understanding often changes due to new evidence being found

Working Scientifically skills – Year 6

Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)

Children can choose the independent variable for their question

Children ask further questions based on the findings of their original question

Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use

Children can identify possible dependant variables and justify their choice of measurement

Children choose what to measure and how long for and at what intervals

Children can plan an investigation, choosing which scientific enquiry method to use, which equipment and how to record and report their results.

Children can record light and volume on a data logger

Children can choose the appropriate measuring equipment to give the most accurate results

Children can use an analogue thermometer and force meter accurately.

Children can research using a limited number of given websites/resources

Children can use a dichotomous key to identify living things

Children make decisions during an enquiry e.g. whether they need 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).

Children can plot data on a line graph (axes and scale can be given)

Children can make a branching database manually

Children can make a bar chart manually

Children can choose which type of graph to use to represent data and explain the advantages of this choice

Children can make a scatter graph.

Children can record 3 sets of data and calculate the mean. They recognise and disregard any outlying results.

Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).

Children choose the best way to communicate their results to a given audience (poster, Sway, presentation, comic, video, letter…)

Children compare their results to that of others and determine whether they need more information to answer their questions

Children can identify any gaps in their results where further investigation or research would be required

Children can suggest results for elements not tested (e.g. result for a temperature not tested)

Children understand that science understanding often changes due to new evidence being found

Children use their results to make predictions for further investigations

Children can critically evaluate their control of variables, accuracy of measurements and trustworthiness of secondary sources.

Children recognise erroneous data and suggest how that could have happened