St. Bernadette's Scientific Enquiry Skills Map

N	**Animals inc. Humans** Sort images of humans according to their age. Sort using different senses. Which do you like/not like? Observe how a baby changes over time. Research using secondary sources the human life-cycle from an expectant mother, parent with a baby and an eldeey person.	**Materials** Classify by sorting materials using simple properties. Observe how does chocolate change when heated? How does fruit jusice change when put in the freezer? How does fruit change when it is blended?	**Forces** Observe the forces used for different toys (from baby toys to toys that they use now). Compare the path of different wind-up toys. Compare how far different wind-up toys move. Compare how easy or hard it is to lift an object with or without a pullet. Compare how easy or hard it is to ride a scooter or bike on different surfaces. Classify and sort objects to see whether they float or sink. Sort aand group object and materials according to whether their shape can be changed.	**Animals Inc. Humans** Observe how does the...change over time? Research using secondary resources the lifecycles of the animals observed. Classify by matching the animals and their young.
R	**Seasonal Changes** Classify which clothes are suitable for each season? Observe over time how our oak tree changes over time? How does a snowman change as it melts? How does the natural world change with the seasons? Research using secondary sources how animals behave in different seasons. Find out about the weather and seasons.	**Materials** Comparative testing - How quickly do ice cubes melt in different areas of the playground? How does a loaf look different if cooked in different tins? Observe over time how a block of ice/snowman changes? How does bread dough change as it is cooked?	**Plants** Name and describe plants and animals that they find in the school grounds. Look for minibeasts/plants in different areas of the school grounds. Observe how a plant changes as it grows? Researching secondary sources by looking at seed and bulb packets to learn how to plant and care for therm.	**Forces** Observe how object float and sink and group. Comparative testing - how many cubes/small plastic animals can fit in different boats? Compare how different objects fall with and without parachutes. Compare how different balls bounce. Compare how things move when blown. Compare how paper aeroplanes fly.

1	**Plants** Grouping plants based on features. Most common British plants/Where can we find them? What conditions affect a sunflowers growth?	**Animals Inc. Humans** How does height change over time? Identifying body parts and their functions Can we smell better when we can't see? Is there a link between sizes of body parts and height?	**Everyday Materials** Which material is the most absorbent? Which materials will float and which will sink? Is there a pattern in the materials used o make objects in school?	**Seasonal Changes** Observe how weather/day length, life ie. Our oak tree changes over the seasons. Grouping objects on which season used.	
2	**Plants** Do plants with bigger seeds grow taller? What do plants need to grow well What happens to seeds as they grow. Do bigger seeds grow into bigger plants.	**Animals Inc. Humans** How sugar affects a tooth (egg). Healthy and unhealthy food. How to sneezes spread germs.	**Uses of Everyday Materials** Identifying and classifying uses of different materials. Which materials can be changed - squashing, bending,stretching. Best materials to protect a falling egg.	**Living things and their habitats** Research into animals' diets to create simple food chains. Dead, never been alive, alive. Characteristics of carnivores and herbivores.	
3	**Plants** Which conditions help seeds germinate faster? What are the different ways that seeds disperse? Investigating transport in plants. Observe coloured water travelling up plants stem.	**Animals Inc. Humans** Identifying and grouping different types of nutrients. Sort and classify different types of skeleton. Food diary over time. How does exercise affect my heart rate.	**Light** Investigate relationship between size of shadow and distance of object to the light source. How shadows change over a day. What materials are best for blocking light.	**Rocks** Research how fossils are formed. Using identifying key to name different types of rock. How does soil composition affect how quickly water drains through it.	**Forces & Magnets** Investigating friction with different ramps. How the mass of an object relates to the force needed to move it. Pushes, pulls. Magnetic and non magnetic materials
4	**Electricity** Investigate which materials are conductors and which are insulators. How does a light bulb work? What happens to a circuit as more components are added. Mains, battery or both - electrical appliances.	**Animals Inc. Humans** How the teeth of different animals are related to their function. Tooth decay - How does an egg shell change when its left in cola? Model passage of food to research digestion - banana.	**States of Matter** How does the mass of an ice cube change over time? Can we separate materials using their properties? How does the surface area affect how quickly water evaporates?	**Living things and their habitats** Using and making simple guides or keys to explore and identify local plants and animals - Leaf key. 5 types of Invertebrate classification. Global dangers to the environment.	**Sound** When is our classroom quietest? Is there a link between amounts of sound in different areas of the school- sound survey? How does the length of the vibration affect the pitch of a sound?
5	**Earth & Space** Observing the phases of the Moon over time. Group planets based on their size/atmosphere/orbit time/ rotational period etc. Is there a relationship between size of a planet and its orbit around the Sun?	**Animals Inc. Humans** Who grows the quickest Boys or Girls?Is there a relationship between animal size and gestation period. What are the different stages of the human life cycle?	**Properties & Changes of Materials** What happens to a sugar lump placed in water over time? Which type of sugar dissolves the quickest? Can we separate materials based on their properties?	**Living things and their habitats** How does a bean change as it germinates? Observe butterflies hatching from chrysalis. What are the differences between life cycles of insects and mammals?	**Forces** Is there a relationship between the size of a parachute/wing and the time it takes for the object to fall? Labelling the types of forces acting on objects. Do all objects fall through water in the same way?
6	**Electricity** Does the voltage of cells affect the volume of a buzzer? Does the temp of a light bulb go up the longer it is on? How has our understanding of electricity changed over time?	**Animals Inc. Humans** How does your pulse rate change after exercise? Heart and healthy circulation. Does different types of exercise affect your heart rate?	**Light** How do shadows change over the day? IS there a pattern between the angle that a light ray hits a mirror and the angle of reflection? What colours can a light ray be split into?	**Living things and their habitats** Use classification systems and keys to identify some animals based on their structure. How does temperature affect how much gas is produced by yeast?	**Evolution & Inheritance** Research into palaeontologists such as Charles Darwin. Is there a pattern between the shape of a bird's beak and the food it eats? How has the human skeleton evolved over time?

Observing over time Comparative & Fair Test Grouping & Classifying Researching Pattern Seeking

This part of our St. Bernadette's Science Curriculum document shows how the working scientifically statements from the science National Curriculum for England are linked and built on across the three phases in Key Stage 1 and 2. To highlight the links, the working scientifically skills statements are grouped under the following broader skills definitions.

- Asking questions and recognising that they can be answered in different ways
- Making observations and taking measurements
- Engaging in practical enquiry to answer questions
- Recording and presenting evidence
- Answering questions and concluding
- Evaluating and raising further questions and predictions
- Communicating their findings.

The working scientifically statements from the science National Curriculum for England are presented in bold. The bullet points that follow each statement are additional guidance that clarifies the expectations.

Working scientifically statements that feature in more than one of the broader skills definitions are shown in italics.

In the EYFS, the characteristics of effective learning from the Statutory Framework for the Early Years Foundation Stage are the foundations on which the working scientifically skills build in Key Stage 1. While children are playing and exploring, teachers should be modelling, encouraging and supporting them to do the following:

- show curiosity and ask questions
- make observations using their senses and simple equipment
- make direct comparisons
- use equipment to measure
- record their observations by drawing, taking photographs, using sorting rings or boxes.

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Progression in Working Scientifically Statements

EYFS (Characteristics of Effective Learning)	Year 1 & 2	Year 3 & 4	Year 5 & 6
Pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of theprogramme of study content:			
• show curiosity and ask questions • make observations using their senses and simple equipment • make direct comparisons • use equipment to measure • record their observations by drawing, taking photographs, using sorting rings or boxes and, in Reception, on simple tick sheets • use their observations to help them to answer their questions • talk about what they are doing and have found out • identify, sort and group.	• asking simple questions and recognising that they can be answered in different ways • observing closely, using simple equipment • performing simple tests • identifying and classifying • using their observations and ideas to suggest answers to questions • gathering and recording data to help in answering questions	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments

Progression in working scientifically skills

NB - The National Curriculum statements in italics in these tables indicate that they feature more than once.

Year 1 & 2	Year 3 & 4	Year 5 & 6
Asking questions and recognising that they can be answered in different ways		
Asking simple questions and recognising that they can be answered in different ways • While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions. • The children answer questions developed with the teacher often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.	**Asking relevant questions and using different types of scientific enquiries to answer them** • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.	***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary*** • Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. • Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.

Making observations and taking measurements		
Observing closely, using simple equipment • Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units.	**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers** • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate** • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • During an enquiry, they make decisions 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).

Engaging in practical enquiry to answer questions		
Performing simple tests • The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. **Identifying and classifying** • Children use their observations and testing to compare objects, materials and living	**Setting up simple practical enquiries, comparative and fair tests** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.	***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary*** • The children 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. They look for patterns and relationships using a suitable sample.

things. They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing.	**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.	

Recording and presenting evidence		
Gathering and recording data to help in answering questions • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings.	**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions** **Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables** • The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications	**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs** • The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys.

	e.g. using tables, Venn diagrams, Carroll diagrams. • Children are supported to present the same data in different ways in order to help with answering the question.	• Children present the same data in different ways in order to help with answering the question.

Answering questions and concluding		
Using their observations and ideas to suggest answers to questions • Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.	**Using straightforward scientific evidence to answer questions or to support their findings.** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.	**Identifying scientific evidence that has been used to support or refute ideas or arguments** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding.
Using their observations and ideas to suggest answers to questions • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	**Identifying differences, similarities or changes related to simple scientific ideas and processes** • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify

	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • They draw conclusions based on their evidence and current subject knowledge.	results that do not fit the overall pattern; and explain their findings using their subject knowledge.

Evaluating and raising further questions and predictions		
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • They 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. • They identify any limitations that reduce the trust they have in their data.

	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.	**Using test results to make predictions to set up further comparative and fair tests** • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

Communicating their findings		
	Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.	***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations*** • They communicate their findings to an audience using relevant scientific language and illustrations.