

Empiribox Curriculum Map

4 year Key Stage 2 Science Curriculum			
Example of topic schedule schools might follow	Term One	Term Two	Term Three
	Skills Focus: Planning	Skills Focus: Data Capture and Analysis	Skills Focus: Evaluation
First Year	Forces and Magnets	States of Matter	Plants
Second Year	Materials and Irreversible Change	Animals Including Humans	Sound
Third Year	Living Things and Evolution	Electricity	Materials and Reversible Change
Fourth Year	Light, Earth and Space	Rocks	Living Things and Habitats

The three disciplines of Science - Physics, Chemistry and Biology - covered each year

1. **Consistent approach** to all three areas of science.
2. Each area is **embedded** and **revisited** throughout the system.
3. Teachers are able to **support** each other and share advice, strategies and outcomes.
4. **Differentiation** is achieved through development of skills as well as knowledge.

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Working Scientifically

Empiribox approaches these significant skills throughout the system, to fulfil your school's NC obligations. In each term there is a specific focus on one key area. These are revisited in subsequent terms throughout the four years.

Terms	Core Skills Focus	Specific Skills Focus
1,4,7 and 10	Planning	<p>All through the first term, the focus is on planning scientific investigations – looking specifically at independent and dependent variables; what can be changed and what can be measured in experiments. Using a variety of techniques, pupils will develop the skills of asking questions that can be tested, identifying variables to control, measure and change, in addition to making and testing predictions or hypotheses and providing justification for their prediction.</p> <p>By the end of the first term pupils should have significantly enhanced their skill at being able to plan a scientific investigation. These skills will be revisited and developed throughout subsequent suites.</p>
2,5,8 and 11	Data Collection	<p>All through the second term the focus is on recording and analysis of data from scientific investigations, looking specifically at obtaining different types of scientific information, how to record it and ultimately how to analyse it. These skills will be revisited throughout the scheme. Our key foci are twofold:</p> <p>Observing and Measuring: Observation is a really important skill for the scientist. The ability to see what is really happening rather than seeing what you expect to see can be difficult. It's a good idea to give pupils observation exercises to help them to improve this skill.</p> <p>Pupils should be able to choose and use simple scientific equipment and materials appropriately and take action to the control risks involved in their use. They need to make systematic observations and accurate measurements using appropriate equipment, including the use of ICT for data logging. In their investigations, pupils should check their observations and measurements by repeating them where appropriate to ensure that they are reliable.</p>

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		<p>Recording Data: Pupils should demonstrate their ability to use a wide range of methods, including diagrams, drawings, tables, bar charts, photographs, video clips, voice recordings, line graphs and ICT, to communicate data in an appropriate and systematic manner. Pupils will need explicit skill teaching in order to construct tables, charts and graphs well. They also need practise in choosing the most appropriate method to show their results to analyse and evaluate their evidence. Events may be recorded using video or sound recording.</p> <p>Again, these skills are not taught in isolation, and provide a basis on which to improve analytical skills later in the scheme.</p>
<p>3,6,9 and 12</p>	<p>Evaluation and Interpretation</p>	<p>The third term introduces the key skills of evaluation and interpretation of data. As previously stated, these skills will be revisited in subsequent terms, allowing children to progress and embed evaluative responses.</p> <p>Students will develop the skill of analysing data from each of their experiments and suggesting ways in which they could improve them to increase validity and reliability of the data.</p> <p>Evaluation involves critically considering the reliability of the data and discussing how it can be improved. Pupils are taught to explain whether their evidence is robust enough to support a firm conclusion. They also develop the skills to suggest ideas to enable their investigations to provide additional relevant evidence.</p> <p>Teachers are supported in their teaching of the type of questions to ask to ensure pupils are able to elaborate on prior knowledge and understanding.</p>

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Example Term 1 – Physics – Forces Suite

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Throughout KS2:

- Forces are measured in Newtons (N).
- A newton meter is the device used for measuring forces.
- Understand that a 1 kg mass on earth exerts a force of 10 n - therefore 100 exerts 1 n and 1 g exerts 0.01 n.
- Gas pressure causes force due to millions of particles colliding with the particles of the walls of the container. The more particles colliding the greater the pressure.
- Friction is a force that opposes motion between any two objects in contact. Friction is caused by the physical and chemical contact between different surfaces.
- Arrows can be used to show both size and direction of forces.
- A magnetic field is the area of force around a magnet. Magnets have two poles, a north pole and a south pole. A compass is a simple device that works by moving.
- Air resistance is caused by the action of air particles colliding with anything moving through it. The act of air or water particles resisting the movement of objects “sinking” through them is upthrust.
- Weight is a force caused by gravity acting on mass. Mass is the sum of all the atoms and molecules in every object. Newton’s 3rd law – for every action there is an equal and opposite reaction.
- Balanced forces are present when any object is either stationary or moving at a constant speed. Imbalanced forces cause objects to speed up or slow down.

In addition to Scientific knowledge on forces and magnets, children will be assessed on whether they can:

- Use and understand scientific vocabulary linked to forces and magnets
- Clearly state, draw or write a question that can be tested in class with the apparatus available to them.
- Identify at least 1 Independent Variable that directly applies to their investigation?
- Identify at least 1 Independent Variable that directly applies to their investigation that they will test?
- Identify at least 1 Dependent Variable that directly applies to their investigation?
- Identify at least 1 Dependent Variable that they will measure?
- Clearly state which variables they must control in order to ensure their data is Valid?
- State a prediction or Hypothesis they will test.?
- Clearly explain why they have made the prediction they have?
- Either verbally, pictorially or written, prepare a method they will follow to conduct their experiment?

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Term 2 – Chemistry – Particle Theory

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Throughout KS2:

- Understand that everything is made of tiny particles called atoms and molecules.
- Because these particles are small scientists use models to represent them
- Solids, liquids and gases have particles which have different separations
- Be able to draw a particle diagram for a solid, liquid and a gas.
- Explain why some materials are difficult to classify
- Learn the term thixotropic and give examples.
- Learn the simple description of a chemical reaction as REACTANTS reacting to produce PRODUCTS and use this to describe simple every day examples.
- Learn that metals react with acids to produce hydrogen gas.
- Learn the squeaky pop test for hydrogen
- Learn the test for oxygen – relights a glowing splint.
- Learn that carbon dioxide is a dense gas and ‘suffocates’ flame which is why it is used in fire extinguishers.
- Learn that chemical reactions often involve a change in temperature.
- If the temperature goes up the reaction is EXOTHERMIC and if the temperature goes down it is ENDOTHERMIC.
- Be able to state and explain a range of exothermic and endothermic reactions.
- Learn that chemical reactions occur at a range of different speeds.
- Learn that the term ‘Combustion’ – involves a reaction with oxygen.
- Learn that when things react with oxygen the products can be gases, solids or liquids.
- Mass changes in chemical reactions.
- The speed of chemical reactions is affected by ‘surface area’ – the greater the surface area the faster the reaction.

In addition to Scientific knowledge on particles, children will be assessed on whether they can:

- Use and understand scientific vocabulary linked to the particle theory
- Create a table / chart / grid or other mechanism appropriate for collecting the data they need from their experiment.
- State verbally or in written / pictorial form the scientific units for their data.
- Record a sufficient number of readings in order to be able to draw a conclusion from their data?
- Work out an average / mean of their data where this is appropriate?
- Draw a graph that is appropriate for their experimental data?

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Term 3 – Biology – Plants and Photosynthesis Suite

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Throughout KS2:

- Learn that although there are a large variety of leaves, they can be grouped according to their position, shape etc.
- Some plants do not make their own food. They are insectivorous.
- On the underside of most leaves are tiny holes called stomata. Stomata allow substances to pass in (e.g. carbon dioxide), and out (e.g. water) of the leaf.
- Learn that stomata are surrounded by two guard cells, which control the opening/closing of the stomata.
- Learn that veins are called vascular bundles that are made up of xylem and phloem.
- Learn about the internal structure of leaves.
- Learn that the movement of water through the plant is affected by temperature, wind etc.
- Learn that plants make their own food using water and carbon dioxide by photosynthesis.
- Learn that starch and oxygen are produced in photosynthesis.
- Learn that photosynthesis needs light energy.
- Learn about the huge variety of plant products and their impact on our lives.
- Know that seeds are the plant embryo and learn about their structure.
- Learn that ethylene helps fruits to ripen and that we use this knowledge to control the ripening of fruit.
- To grow healthily, plants need minerals.
- Minerals dissolve in water and are taken in by the plant roots.
- Mineral deficiencies have specific symptoms and that nitrogen, potassium and phosphorus are the most important minerals.
- To know that one set of vessels (xylem) carry water up a plant and another set (phloem) carry food down from the leaves to wherever it is needed.
- Learn about the structure of vascular bundles.
- To learn about annual growth in trees and that annual rings show how old a tree is.

In addition to Scientific knowledge on plants and photosynthesis, children can be assessed on whether they can:

- Use and understand scientific vocabulary linked to plants and photosynthesis
- Draw a conclusion that is appropriate from the pattern in their data.
- Provide a rationale behind their conclusion that clearly links the independent variable they chose to change and the dependent variable they chose to measure.
- State clearly what their experiment 'appeared' to show.
- Explain why this happened using the science known to them?

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- State whether their prediction matched their results?
- Identify if there were any unusual results?
- Attempt to explain why these unusual results may have occurred.
- State how they could avoid these unusual readings in future?
- State how they could have improved what they did to obtain better results.
- State what they could investigate next?

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