Science Programme & Policy

In the Science Principles and Practice paper, it is stated that:

"Through learning in the sciences, children and young people develop their interest in, and understanding of, the living, material and physical world. They engage in a wide range of collaborative investigative tasks, which allows them to develop important skills to become creative, inventive and enterprising adults in a world where the skills and knowledge of the sciences are needed across all sectors of the economy."

Development of Skills

Inquiry and investigative skills

Through experimenting and carrying out practical scientific investigations and other research to solve problems and challenges, children and young people:

- ask questions or hypothesise
- plan and design procedures and experiments
- select appropriate samples, equipment and other resources
- carry out experiments
- use practical analytical techniques
- observe, collect, measure and record evidence, taking account of safety and controlling risk and hazards
- present, analyse and interpret data to draw conclusions
- review and evaluate results to identify limitations and improvements
- present and report on findings.

The main approaches to science inquiry are:

- observing and exploring – careful observation of how something behaves, looking for changes over time and exploring 'what happens if...?' and 'how could I...?' questions
- classifying – through identifying key characteristics
- fair testing – through identifying all possible variables and then changing only one while controlling all others
- finding an association – linking two variables to determine relationships.

Scientific analytical thinking skills

Children and young people develop a range of analytical thinking skills in order to make sense of scientific evidence and concepts. This involves them:

- being open to new ideas and linking and applying learning
- thinking creatively and critically
- developing skills of reasoning to provide explanations and evaluations supported by evidence or justifications
- making predictions, generalisations and deductions
- drawing conclusions based on reliable scientific evidence.

Significant aspects of learning in Science

Significant aspects of learning in the sciences

There are eight significant aspects of learning within the sciences:

- **Planet Earth**
- **Forces, electricity and waves**
- **Biological systems**
- **Materials**
- **Topical science**
- **Inquiry and investigative skills**
- **Scientific analytical thinking skills**
- **Skills and attributes of scientifically literate citizens**

These have been drawn from the five main organisers of the sciences curriculum and the scientific skills detailed in the Principles and Practice Paper. These are summarised below.

Knowledge and understanding of scientific ideas, principles and concepts of Planet Earth, Forces, electricity and waves, Biological systems, Materials and Topical science

Using the Significant Aspects of Learning, the Progression Framework and the skills listed in the Principles and Practice paper, the following framework has been drawn up to show the development of skills from Early to Second Level.

By looking at the development of skills and the Experiences and Outcomes for Science, a programme has been drawn up to ensure coverage of all areas across Early, First and Second Level.

How to use this programme:
In order to ensure pupils achieve the significant aspects of learning in Science, experiences and outcomes have been bundled together to ensure there is coverage across all areas and levels. As our school has composite classes, the programme has been designed to follow a two year rolling programme format. All classes should be working on the same year (Year 1 or Year 2) at the same time, in order to ensure continuity and progression. Once a significant aspect and a bundle of outcomes has been chosen, teachers then choose a topic – either of their own choice or the suggested topics given in the programme, which may be adapted to suit the needs and interests of a class.

Monitoring, Tracking & Assessment:
Teachers from similar stages plan together and meet throughout the year to discuss learning and teaching strategies. There are transition processes in place between Nursery and P1, and also between stages. This includes a formal meeting between teachers and the completion of a hand-on sheet. This informs teachers of levels achieved, work covered and next steps. This information is used for the next stage in planning. Moderation occurs through specific moderation topics, as part of LQAG work, and ongoing moderation discussions where standards are shared and agreed. Assessment is carried out through: teacher observations; self and peer assessments; end of topic assessments.

The Principles & Practice Paper states that:
"Approaches to assessment should identify the extent to which children and young people can apply these skills in their learning and their daily lives and in preparing for the world of work. For example:
• How well do they contribute to investigations and experiments?

• Are they developing the capacity to engage with and complete tasks and assignments?

• To what extent do they recognise the impact the sciences make on their lives, on the lives of others, on the environment and on society?

Progression in knowledge and understanding can be demonstrated, for example, through children and young people:

• providing more detailed descriptions and explanations of increasingly complex scientific contexts and concepts
• using a wider range of scientific language, formulae and equations
• presenting, analysing and interpreting more complex evidence to draw conclusions and make sense of scientific ideas."

Sgoil nan Loch Programme for Science – Curriculum for Excellence

Year 1 **Year 2** **Ongoing**

	Early Level (Nursery-P1)	First Level (P2-P3)	First/Second Level (P4-5)	Second Level (P6-P7)
Planet Earth	Observing living things through the seasons Growing plants and naming their parts Day and Night	Living and Non-living things Growing Healthy Plants Mini beasts – food chains Changing States of Water Different types of energy: light, heat, sound	Sun and Moon: Day and night, months and years Vertebrates Water cycle Survival and extinction Design or conservation of a wildlife area	Energy conservation Producing electricity from renewable and non-renewable sources Solar system Useful plants Fertilisers and the growth of plants
Forces, Electricity & Waves	Everyday electrical appliances and safe use of electricity What makes my toys go Making sounds through play Pushing and pulling toys	Electrical circuits and magnets – make a game Forces and their effects Sound: Vibration and pitch changes	Electricity – circuits, components, transfer of energy How batteries work and practical application	Floating and sinking Friction and air resistance Electrostatic, magnetic and gravitational forces and their practical application Light and sound
Biological Systems	Seasons and observing living things Using senses to explore the environment	Senses – their reliability and limitations Germs and prevention of disease	Organs of the human body The skeleton – link to staying healthy Inherited similarities and differences	Digestive System Lifecycles in plants and animals Inheritance in living things
Materials	Playing with different materials and exploring their properties Choosing materials to make things	Care for the environment – recycling Dissolving in water and applications in the world around me	Materials and their properties – Solids, Liquids and Gases Changes in substances to make new substances Separation – filtering and evaporation Dissolving and conditions that affect the rate	Useful materials in the Earth's surface – coal, oil and gas Every day chemicals and reactions to make different materials
Topical Science	Science stories: fiction and non-fiction	Discussion about topical science	Discussion about topical science Scientific discovery and invention	Scientific discovery and invention Understanding current scientific news items

	Early Level (Nursery-P1)	First Level (P2-P3)	First/Second Level (P4-5)	Second Level (P6-P7)
Development of Skills	Simple investigations leading to observations and recording in visual ways Oral reports given and questions answered	Plan simple, fair investigation with suggestions of what might happen Write short reports on investigations Answering questions on findings Recognise simple relationships and draw conclusions	Suggest a question for investigation and decide how to find an answer Make predictions about the outcome Suggest some ways to make a test fair Select appropriate measuring devices or make appropriate observations Record findings in a range of ways Write short reports on investigations – making key points clear Explain what happened using scientific knowledge Make links to original predictions	Identifying 2 or 3 questions to be investigate and plan a fair test changing one variable Make a series of accurate measurements Select an appropriate way to record findings Write an organised report using appropriate illustrations Make explanations and draw conclusions from findings using scientific knowledge Suggest improvements to method used
Suggested Topics Year 1 Year 2	Growing Plants Electricity Senses Space – Day and Night Seasons Toys	Classification and Food Chains – Mini beasts Classifying Materials for Purpose and Soluble and Insoluble Growing Plants Forces and Magnets Making and Changing Sound Energy The Senses & Germs	Space – Night and Day The Water Cycle Classification of Materials – Solids, Liquids and Gases Filtration/Dissolving and Changing Properties of materials Food Chains and Survival and Extinction Electricity – Circuits and Batteries My Body, The Senses and Family (Inheritance of characteristics) Vertebrates and Wildlife	Space – Solar System Components of Planet Earth Energy Conservation and Electricity and Ecosystems/Conservation and Renewable Energy Transport (Forces, Floating, Air resistance) Light and Sound My Body and Senses Chemical Changes Life Cycles Forces

Topic	Outcomes Covered
Nursery – P1	
Growing Plants	**BUNDLE E1** I have observed living things in the environment over time and am becoming aware of how they depend on each other. **SCN 0-01a** I have helped to grow plants and can name their basic parts. I can talk about how they grow and what I need to do to look after them. **SCN 0-03a**
Electricity	**BUNDLE E2** I know how to stay safe when using electricity. I have helped to make a display to show the importance of electricity in our daily lives. **SCN 0-09a**
Senses	**BUNDLE E3** Through play, I have explored a variety of ways of making sounds. **SCN 0-11a** I can identify my senses and use them to explore the world around me. **SCN 0-12a**
Space	**BUNDLE E4** I have experienced the wonder of looking at the vastness of the sky, and can recognise the sun, moon and stars and link them to daily patterns of life. **SCN 0-06a**
Seasons	**BUNDLE E5** I have experienced the wonder of looking at the vastness of the sky, and can recognise the sun, moon and stars and link them to daily patterns of life. **SCN 0-06a**
Toys	**BUNDLE E6** I have experienced, used and described a wide range of toys and common appliances. I can say 'what makes it go' and say what they do when they work. **SCN 0-04a** Through everyday experiences and play with a variety of toys and other objects, I can recognise simple types of forces and describe their effects. **SCN 0-07a**
Materials	**BUNDLE E7** By investigating how water can change from one form to another, I can relate my findings to everyday experiences. **SCN 0-05a** Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes. **SCN 0-15a**
Topical Science	**BUNDLE E8** I can talk about science stories to develop my understanding of science and the world around me. **SCN 0-20a**

Topic	Outcomes Covered
P2-3	
Classification and Food Chains; Mini-beasts	**BUNDLE F1** I can distinguish between living and non living things. I can sort living things into groups and explain my decisions. **SCN 1-01a** I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food. **SCN 1-02a**
Classifying Materials and Soluble/Insoluble	**BUNDLE F2** Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. **SCN 1-15a** I can make and test predictions about solids dissolving in water and can relate my findings to the world around me. **SCN 1-16a**
Growing Plants	**BUNDLE F3** I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school. **SCN 1-03a**
Forces and Magnets	**BUNDLE F4** By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects. **SCN 1-07a** By exploring the forces exerted by magnets on other magnets and magnetic materials, I can contribute to the design of a game. **SCN 1-08a**
Making and Changing Sound	**BUNDLE F5** By collaborating in experiments on different ways of producing sound from vibrations, I can demonstrate how to change the pitch of the sound. **SCN 1-11a**
Energy	**BUNDLE F6** I am aware of different types of energy around me and can show their importance to everyday life and my survival. **SCN 1-04a**
The Senses & Germs	**BUNDLE F7** I have explored my senses and can discuss their reliability and limitations responding to the environment. **SCN 1-12b** I know the symptoms of some common diseases caused by germs. I can e they are spread and discuss how some methods of preventing and treating benefit society. **SCN 1-13a**
Topical Science	**BUNDLE F8** I have contributed to discussions of current scientific news items to help develop my awareness of science. **SCN 1-20a**

Topic	Outcomes Covered
P4-5	
Space – Night and Day	**BUNDLE F9** By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year. **SCN 1-06a**
The Water Cycle	**BUNDLE F10/S1** By investigating how water can change from one form to another, I can relate my findings to everyday experiences. **SCN 1-05a** I can apply my knowledge of how water changes state to help me understand the processes involved in the water cycle in nature over time. **SCN 2-05a**
Solids, Liquids and Gases	**BUNDLE S2** By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. **SCN 2-15a**
Filtration/Dissolving and Changing Properties of Materials	**BUNDLE F11/S3** I can make and test predictions about solids dissolving in water and can relate my findings to the world around me. **SCN 1-16a** I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience. **SCN 2-16a** By investigating common conditions that increase the amount of substance that will dissolve or the speed of dissolving, I can relate my findings to the world around me. **SCN 2-16b**
Food Chains and Survival & Extinction	**BUNDLE F12/S4** I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food. **SCN 1-02a** I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction. **SCN 2-01a**
Electricity – Circuits and Batteries	**BUNDLE F13/S5** I can describe an electrical circuit as a continuous loop of conducting materials. I can combine simple components in a series circuit to make a game or model. **SCN 1-09a** I have used a range of electrical components to help to make a variety of circuits for differing purposes. I can represent my circuit using symbols and describe the transfer of energy around the circuit. **SCN 2-09a** To begin to understand how batteries work, I can help to build simple chemical cells using readily-available materials which can be used to make an appliance work. **SCN 2-10a**
My Body – The Senses and Family	**BUNDLE F14** By researching, I can describe the position and function of the skeleton and major organs of the human body and discuss what I need to do to keep them healthy. **SCN 1-12a** By comparing generations of families of humans, plants and animals, I can begin to understand how characteristics are inherited. **SCN 1-14a** By exploring the characteristics offspring inherit when living things reproduce, I can distinguish between inherited and non-inherited characteristics. **SCN 2-14b**
Vertebrates and Wildlife	**BUNDLE S6** I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area. **SCN 2-02a**
Topical Science	**BUNDLE F15/S7** I have contributed to discussions of current scientific news items to help develop my awareness of science. **SCN 1-20a** I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. **SCN 2-20b**

Topic	Outcomes Covered
P6-7	
Space – Solar System	**BUNDLE S8** By observing and researching features of our solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it. **SCN 2-06a**
Light and Sound	**BUNDLE S9** Through research on how animals communicate, I can explain how sound vibrations are carried by waves through air, water and other media. **SCN 2-11a** By exploring reflections, the formation of shadows and the mixing of coloured lights, I can use my knowledge of the properties of light to show how it can be used in a creative way. **SCN 2-11b**
Components of Planet Earth	**BUNDLE S10** Through exploring non-renewable energy sources, I can describe how they are used in Scotland today and express an informed view on the implications for their future use. **SCN 2-04b** Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses. **SCN 2-17a**
Energy Conservation and Electricity Ecosystems and Renewable Energy	**BUNDLE S11** By considering examples where energy is conserved, I can identify the energy source, how it is transferred and ways of reducing wasted energy. **SCN 2-04a** I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area. **SCN 2-02a** I have collaborated in the design of an investigation into the effects of fertilisers on the growth of plants. I can express an informed view of the risks and benefits of their use. **SCN 2-03a**
Transport (Forces, Floating, Air Resistance)	**BUNDLE S12** By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects. **SCN 2-07a** By investigating floating and sinking of objects in water, I can apply my understanding of buoyancy to solve a practical challenge. **SCN 2-08b**
My Body and Senses	**BUNDLE S13** By investigating some body systems and potential problems which they may develop, I can make informed decisions to help me to maintain my health and wellbeing. **SCN 2-12a** I have explored the structure and function of sensory organs to develop my understanding of body actions in response to outside conditions. **SCN 2-12b**
Chemical Changes	**BUNDLE S14** I have investigated different water samples from the environment and explored methods that can be used to clean and conserve water and I am aware of the properties and uses of water. **SCN 2-18a** I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made. **SCN 2-19a**
Life Cycles	**BUNDLE S15** I have contributed to investigations into the role of microorganisms in producing and breaking down some materials. **SCN 2-13a** By investigating the lifecycles of plants and animals, I can recognise the different stages of their development. **SCN 2-14a**
Forces	**BUNDLE S16** I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications. **SCN 2-08a**
Topical Science	**BUNDLE S17** Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society. **SCN 2-20a** I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. **SCN 2-20**