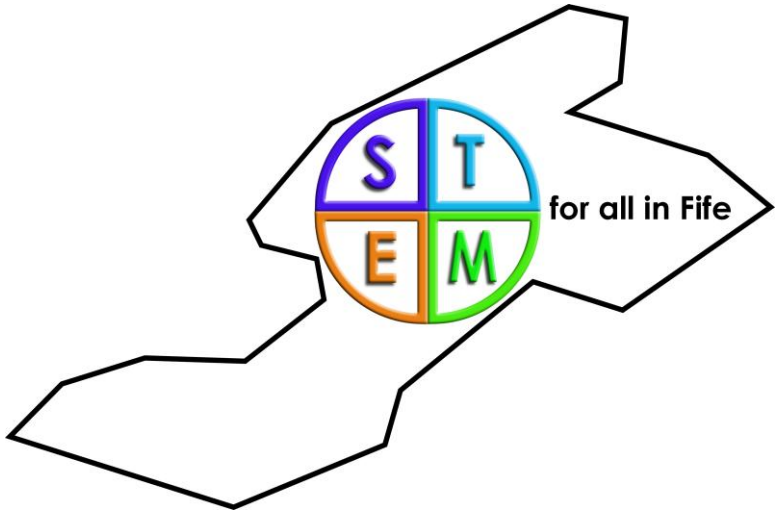
Fife Sciences Progression Pathways Version 1.1



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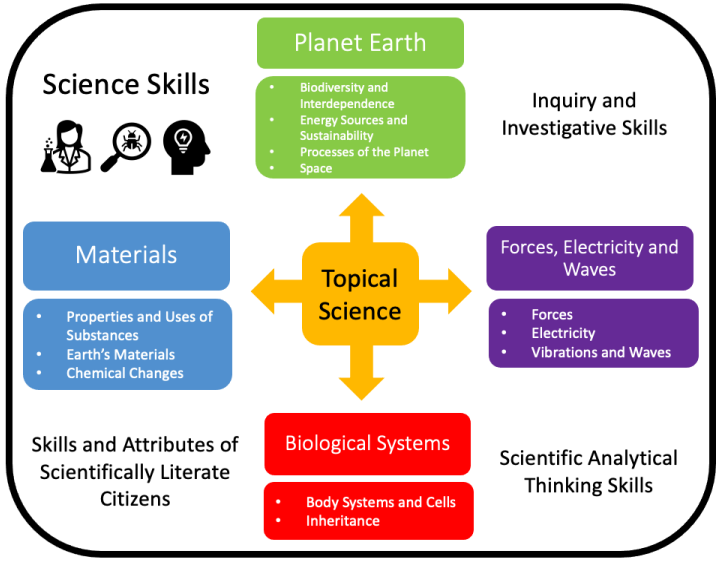


ACKNOWLEDGEMENT

This programme is extensively based on the guidance and recommendations of the Curriculum for Excellence and Benchmarks set out by Education Scotland.

These progressions allow for a fluidity of approaches that facilitate the opportunity for learners to think creatively and independently, whilst at the same time supporting practitioners to plan in a structured and coherent way. Using these shared standards and expectations within Schools, Clusters and Local Improvement Forums across Fife will ensure that all learners have an equitable experience to develop skills for their learning, life, and work.

The progression pathways align to the Science Planning Resource which has been developed through the RAiSE Programme with support from Education Scotland and Scottish Government. Raising Aspirations in Science Education (RAiSE) is a programme of The Wood Foundation, Education Scotland, Scottish Government and participating local authorities which enhances the delivery of STEM education in primary schools. This resource supports planning for science around the experiences and outcomes from early to second level. These activities and approaches should be viewed as useful starting points and suggestions, and they are in no way prescriptive.

SSERC (Scottish Schools Education Research Centre) offers a broad portfolio of services, principally in support of the STEM (Science, Technology, Engineering and Mathematics) areas of the curriculum:

- Provision of Professional Learning
- The Advisory Service
- Wider STEM engagement activities

The Advisory Service can support with risk management and health and safety legislation pertinent to areas of the science curriculum.

GUIDANCE

A suite of support documentation has been developed and is intended to assist practitioners as they plan their science curriculum responsively to meet the needs of all learners.

Within the Progression Pathways, developmental stages of learning in science are clearly outlined. These amalgamate both Experiences and Outcomes with the national Benchmarks and science skills. These are not prescribed in a hierarchical way but rather enable practitioners to be responsive and flexible in their planning of learning pathways as appropriate to the needs of their learners. Though knowledge and skills at the base are often required for further learning to be built upon, these are not aligned to any particular year group nor always the starting point for all. Learners will progress through their learning pathways within each curriculum organiser as appropriate to their developmental needs. It should be noted that there is key learning links between science curricular organisers which could be bundled and there is no intention that every outcome should be covered in a given year.

The purpose of this document is to support practitioners in identifying key science skills for development and devising a continuum of learning within and across levels to ensure personalisation and choice, coherence, relevance, challenge and enjoyment, breadth, depth and progression. Science provides an excellent context for developing skills across different curricular areas including literacy, numeracy and health and wellbeing.

The RAiSE Science Planning Resource complements the Progression Pathways for each Experience and Outcome, providing clear and concise practical ideas and guidance for teachers. The resource includes key skills and suggested learning experiences, common misconceptions, glossary of key vocabulary, key questions, IDL opportunities, suggested assessments, extended learning and Science Capital links for each E and O. Practitioners may draw on these to inform their practice when developing rich and varied learning experiences to effectively motivate, challenge and support all learners.

The national Benchmarks, which support practitioners' professional judgement of achievement of a level, are embedded within each of the Progression Pathways. These are emboldened for ease of identification.

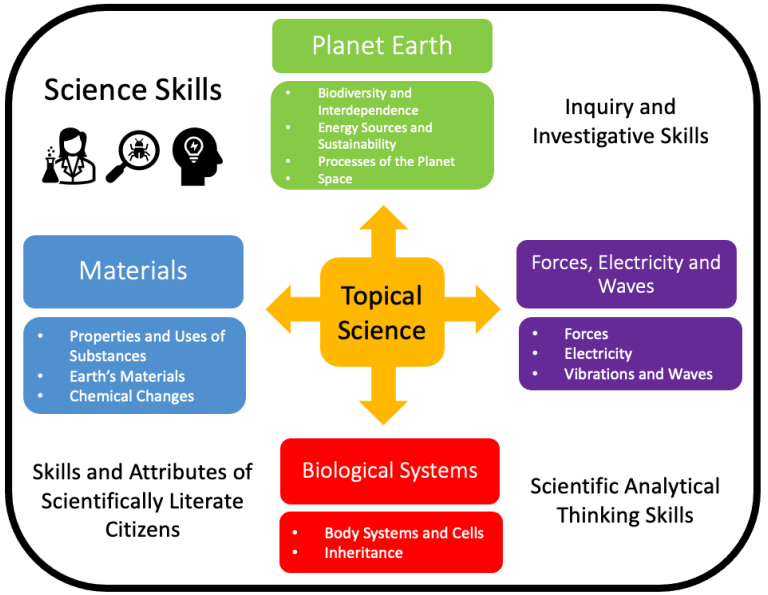
Effective and creative use of the documentation is best supported by engaging in professional learning and a collaborative, whole school agreement as to how it can be used consistently for planning and assessment purposes. Schools, on an individual basis, should also establish their own systems for evaluating learning to inform ongoing professional judgements about assessment and attainment. Through holistic approaches to assessment, and consistent use of the support documentation, practitioners should feel confident in making decisions about learners' attainment and the tracking thereof.

IMPLEMENTATION

Learning in the Sciences should be delivered through an appropriate blend of well-planned discrete and interdisciplinary learning. Schools and teachers will plan to offer different combinations of the Experiences and Outcomes to provide programmes that meet the needs of children and young people and provide a sound basis for more advanced study within the discrete sciences.

The key concepts have been clearly identified using five organisers:

- Planet Earth
- Forces, electricity and waves
- Biological systems
- Materials
- Topical science



See [Education Scotland's Concept Development in the Sciences] document for information on how these Organisers develop across the Levels.

"In the Sciences, effective learning and teaching depends upon the skilful use of varied approaches, including:

- active learning and planned, purposeful play
- development of problem-solving skills and analytical thinking skills
- development of scientific practical investigation and inquiry
- use of relevant contexts, familiar to young people's experiences
- appropriate and effective use of technology, real materials and living things
- building on the principles of Assessment is for Learning
- collaborative learning and independent thinking
- emphasis on children explaining their understanding of concepts, informed discussion and communication."

[Sciences: Principles and Practice]

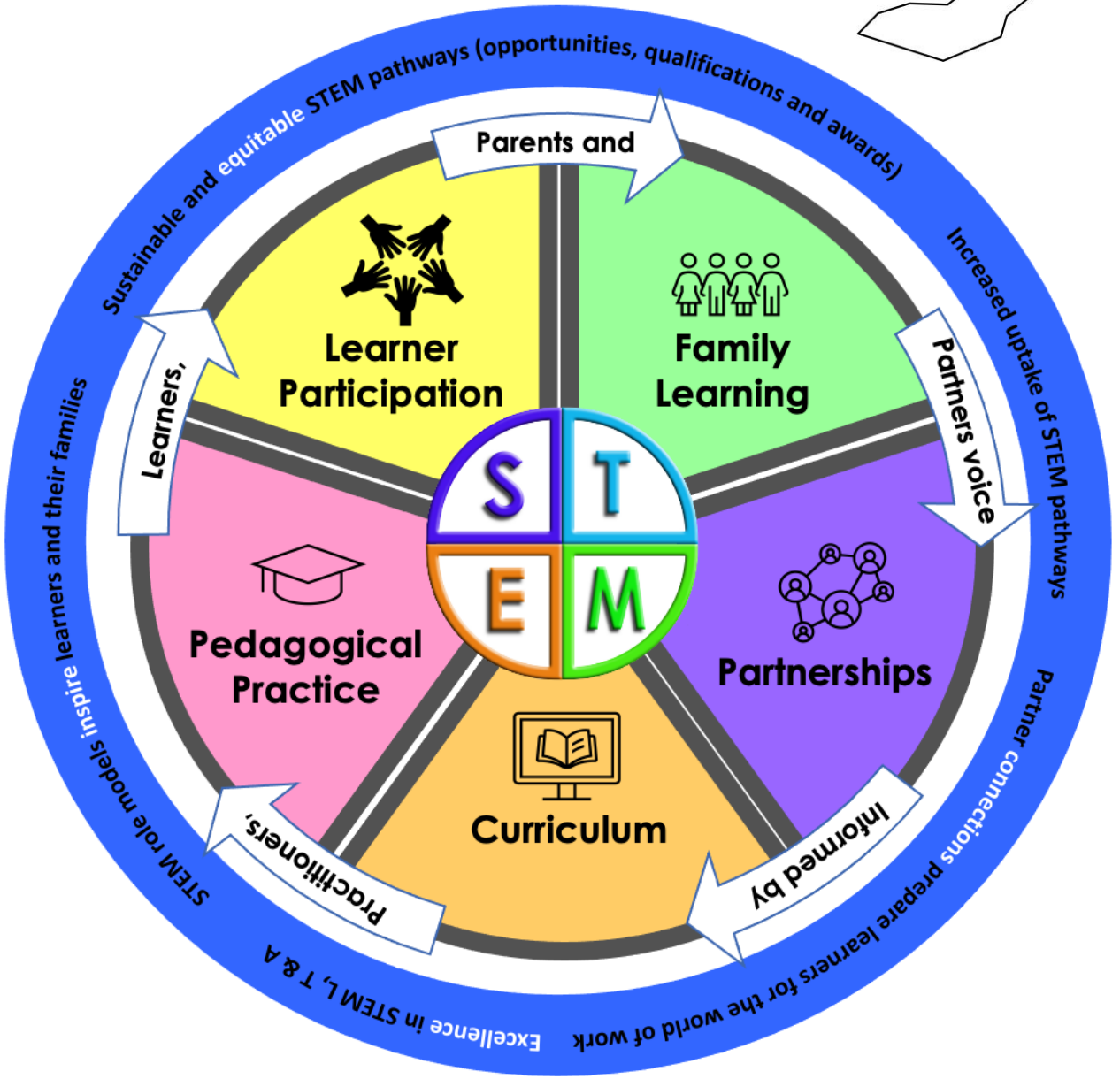
Schools may choose to specifically allocate time to the Sciences or embed within the curriculum, linking with other curricular areas, such as Social Studies, Technologies, Numeracy, Literacy, Health and Wellbeing. Schools may also link the Sciences with learning in the real world, by using Learning for Sustainability, STEM, the Sustainable Development Goals and Developing the Young Workforce as a lens to explore the Sciences.

STEM FOR ALL IN FIFE FRAMEWORK

Science is core to the foundations of STEM. Science challenges us to develop an interest, ask questions and learn about the living, material and physical world around us. Technology (including digital skills), Engineering and Mathematics allow us to apply scientific knowledge and skills to innovate, make new discoveries and find sustainable solutions to real world problems.

The STEM for all in Fife Framework outlines our vision that all Fife Learners will be supported to have equitable opportunities to participate in progressive STEM learning, inspiring and equipping our children and young people with skills for the 21st century, securing sustainable positive destinations in STEM industries now and in the future.

The Science Progression Pathways have been designed to support practitioners to develop high quality, progressive science learning experiences, integrating Technology, Engineering and Mathematics as well as other curricular areas to support positive outcomes for our children and young people.



SCIENCE SKILLS PROGRESSION

The Science Skills Progression has come from the national Benchmarks document and are presented on the next pages from Early to Fourth Level. Although the Science Progression Pathway is from Early to Third Level, Fourth Level science skills have been included to support progression from Third to Fourth Level.

"The experiences and outcomes in science provide opportunities for children and young people to develop and practise a range of inquiry and investigative skills, scientific analytical thinking skills, and develop attitudes and attributes of a scientifically literate citizen; they also support the development of a range of skills for life and skills for work, including literacy, numeracy and skills in information and communications technology (ICT).

These skills are embedded in the contexts detailed in the experiences and outcomes. The progressive development of these skills throughout the levels is supported through the increasing complexity of the scientific contexts and concepts being developed and through revisiting and reinforcing the skills. The experiences and outcomes support the development of the attributes and capabilities of the four capacities of Curriculum for Excellence by encouraging teachers to consider the purposes of learning and to plan for active learning."

Sciences: Principles and Practice

Each Science organiser lists suggested skills which can be developed. This is based on recommendations from the RAiSE Science Planning Resource.

Early Level: Planet Earth - Biodiversity and Interdependence

Experiences and Outcomes	Benchmarks
I have observed living things in the environment over time and am becoming aware of how they depend on each other. SCN 0-01a	• Explores and sorts objects as living, non-living or once living. • Describes characteristics of livings things and how they depend on each other, for example, animals which depend on plants for food.
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	• Explores, observes and discusses basic needs of plants and what they need to grow including water, heat, sunlight and soil. • Demonstrates understanding of how plants grow from seeds.

Examples of skills that can be developed:	
Inquiry and investigative skills	Plans and designs scientific investigations and enquiries • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. Carries out practical activities in a variety of learning environments • Measures using simple equipment and non-standard units. Analyses, interprets and evaluates scientific findings • Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. • Recognises similarities, patterns and differences in the findings and links these to the original question • Provides oral descriptions of what was done and what happened. • Relates findings to everyday experiences. Presents scientific findings • Communicates findings to others verbally and through drawings, photographs, displays and simple charts.
Scientific analytical thinking skills	• Demonstrates reasoning skills by explaining choices and decisions.
Skills and attributes of scientifically literate citizens	• Demonstrates a developing understanding of science in the world around them. • Demonstrates awareness of the importance of respecting living things and the environment and of managing the Earth's resources responsibly.

Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Inquiry and investigative skills Plans and designs scientific investigations and enquiries	• Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. • Makes suggestions about what to do to answer the selected question.	• Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations.	• Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards.	• Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use.	• Formulates hypotheses and predictions, in more complex and less familiar contexts, based on prior knowledge and observations. • Designs a procedure for carrying out the investigation independently. • Devises an experimental aim. • Identifies the independent, dependent and controlled variables. • Includes a control experiment in experimental design (when appropriate to do so). • Selects an appropriate method for measuring the dependent variable. • Anticipates major risks and hazards and plans for them. • Selects a suitable range of values for the independent variable.

Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Inquiry and investigative skills Carries out practical activities within a variety of learning environments	• Discusses obvious risks and takes appropriate steps to protect themselves and others. • Uses their senses to acquire information. • Measures using simple equipment and non-standard units.	• Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units.	• Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results.	• Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results.	• Applies safety measures to control major risks and hazards identified. • Collects accurate measurements of complex data using appropriate method identified. • Uses correct units for measurements. • Records data in an appropriate way, demonstrating precision in the use of terminology, units and scales.

Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Inquiry and investigative skills Analyses, interprets and evaluates scientific findings	• Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. • Provides oral descriptions of what was done and what happened. • Recognises similarities, patterns and differences in the findings and links these to the original question. • Discusses, with support, how the experiment might be improved. • Relates findings to everyday experiences. • Identifies and discusses new knowledge and understanding.	• Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained.	• Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated.	• Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated.	• Makes use of suitable graph or diagram to look for trends or patterns within the data. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Describes any trend or pattern within the data collected. • Considers alternative explanations and applies or extends conclusions to new situations and indicates additional studies. • Relates and applies findings to wider scientific knowledge and understanding. • Links the trend(s) in the results to the aim of the investigation and formulates an appropriate conclusion with supporting data. • Evaluates a range of aspects of the investigation, including the validity and reliability of evidence, giving at least two ways of improving the work if repeated, with justification.

Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Inquiry and investigative skills Presents scientific findings	• Communicates findings to others verbally and through drawings, photographs, displays and simple charts. • Responds to questions about their investigation.	• Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.	• Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.	• Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance.	• Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with no assistance. • Selects appropriate ways of presenting qualitative and quantitative findings, taking account of the audience. • Summarises data and information from at least two sources as supporting evidence, for example, quotes. • Acknowledges all sources used in an appropriate format, for example, using full URLs.

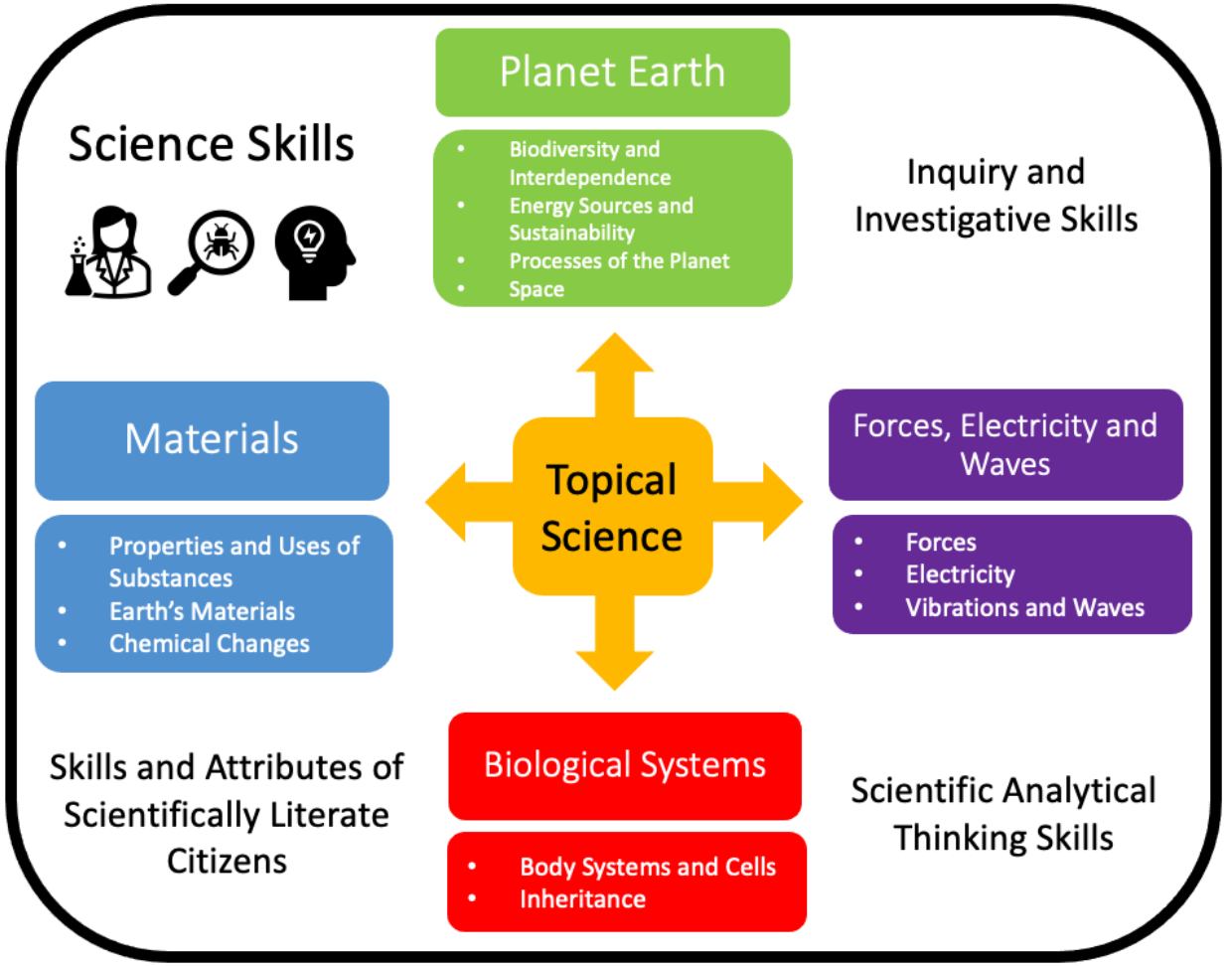
Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Scientific analytical thinking skills	• Demonstrates natural curiosity and shows development of basic skills of analysis in simple and familiar contexts, for example, through asking questions, experimenting and making predictions. • Demonstrates creative thinking by offering suggestions and solutions to everyday problems. • Demonstrates reasoning skills by explaining choices and decisions.	• Applies learning in the sciences. • Provides creative solutions to scientific issues and problems. • Contributes to the design processes and uses components to make models. • Demonstrates reasoning skills and draws on understanding of science concepts to make and test predictions. • Provides explanations which are supported by evidence.	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.	• Applies scientific thinking skills while working with unfamiliar and complex contexts. • Applies and combines knowledge and understanding from different areas of science to solve problems. • Makes use of the engineering process in practical work to design, construct a model, test and modify the design to improve the solution.

Science Skills Progression

Scientific Skills	Early Level	First Level	Second Level	Third Level	Fourth Level
Skills and attributes of scientifically literate citizens	• Talks about science, showing developing understanding of risks and benefits, and listens to the views of others. • Demonstrates awareness of the importance of respecting living things and the environment and of managing the Earth's resources responsibly. • Demonstrates a developing understanding of science in the world around them. • Explores the ways in which people use science and science skills as part of their job.	• Expresses informed views of scientific issues, both orally and in writing, and respects the views of others. • Makes connections between science and their own health and wellbeing. • Demonstrates awareness of their own impact on the world. • Demonstrates awareness of how people use science in their everyday lives and in a variety of jobs and careers. • Discusses science topics in real-life contexts including those appearing in the media.	At Second Level, it is anticipated that learners will be able to demonstrate the skills below with assistance. • Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations. • Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. • Expresses informed views about scientific and environmental issues based on evidence.	At Third Level, it is anticipated that learners will be able to achieve the Benchmarks below with limited assistance. • Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.	The skills below mirror those at Third Level but at Fourth Level it is anticipated that learners will be able to demonstrate these independently and that the content and arguments would be more complex and sophisticated. • Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Early Level


Science Skills
Planet Earth
Biodiversity and Interdependence
Energy Sources and Sustainability
Processes of the Planet
Space
Inquiry and Investigative Skills
Materials
Properties and Uses of Substances
Earth's Materials
Chemical Changes
Topical Science
Forces, Electricity and Waves
Forces
Electricity
Vibrations and Waves
Skills and Attributes of Scientifically Literate Citizens
Biological Systems
Body Systems and Cells
Inheritance
Scientific Analytical Thinking Skills

Early Level: Planet Earth - Biodiversity and Interdependence

Experiences and Outcomes	Benchmarks
I have observed living things in the environment over time and am becoming aware of how they depend on each other. SCN 0-01a	• Explores and sorts objects as living, non-living or once living. • Describes characteristics of livings things and how they depend on each other, for example, animals which depend on plants for food.
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	• Explores, observes and discusses basic needs of plants and what they need to grow including water, heat, sunlight and soil. • Demonstrates understanding of how plants grow from seeds.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. <u>Carries out practical activities in a variety of learning environments</u> • Measures using simple equipment and non-standard units. <u>Analyses, interprets and evaluates scientific findings</u> • Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. • Recognises similarities, patterns and differences in the findings and links these to the original question • Provides oral descriptions of what was done and what happened. • Relates findings to everyday experiences. <u>Presents scientific findings</u> • Communicates findings to others verbally and through drawings, photographs, displays and simple charts.
Scientific analytical thinking skills	• Demonstrates reasoning skills by explaining choices and decisions.
Skills and attributes of scientifically literate citizens	• Demonstrates a developing understanding of science in the world around them. • Demonstrates awareness of the importance of respecting living things and the environment and of managing the Earth's resources responsibly.

Early Level: Planet Earth - Biodiversity and Interdependence

See Topical Science Pathway to develop real life contexts.

See Body Systems and Cells to link learning.

Describes characteristics of livings things and how they depend on each other, for example, animals which depend on plants for food.

Explores common differences between different living things (e.g. size, what they eat, where they live, how they move).

Demonstrates understanding that different animals eat plants and other animals.

Discusses what living things need to survive (e.g. food, water, shelter).

Explores simple life cycles (e.g. butterfly, frog, dandelion).

Explores and sorts objects as living, non-living or once living.

Demonstrates understanding of how different living things change over time including death.

Demonstrates understanding that living things can make more of themselves (reproduction).

Explores, observes and discusses basic needs of plants and what they need to grow including water, heat, sunlight and soil.

Demonstrates understanding of how plants grow from seeds.

Discusses the similarities between living, non-living and once living things (e.g. movement).

Discusses the differences between living, non-living and once living things (e.g. growth).

Identifies how to care for growing plants e.g. watering, potting on.

Identifies things that plants need to grow.

Observes different living and once living things in the environment (e.g. playground, garden, local forest, park, beach).

Experiences growing plants from seeds in the classroom, playground, garden.

Early Level: Planet Earth - Energy Sources and Sustainability

Experiences and Outcomes	Benchmarks
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	• Ask questions and describes what can 'make things go', for example, batteries, wind-up toys and sunlight. • Talks about toys and common appliances and what they do when they work, for example, produce heat, light, movement or sound.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. <u>Analyses, interprets and evaluates scientific findings</u> • Relates findings to everyday experiences.
Scientific analytical thinking skills	• Demonstrates natural curiosity and shows development of basic skills of analysis in simple and familiar contexts, for example, through asking questions, experimenting and making predictions. • Demonstrates creative thinking by offering suggestions and solutions to everyday problems. • Demonstrates reasoning skills by explaining choices and decisions.
Skills and attributes of scientifically literate citizens	• Demonstrates a developing understanding of science in the world around them.

Early Level: Planet Earth - Energy Sources and Sustainability

See Topical Science Pathway to develop real life contexts.

Tinkers (plays and investigates) with toys and common appliances to inform discussions about how they work e.g. taking apart a toy.

Discusses how to stay safe around toys and common appliances.

See Electricity Pathway to link learning.

Ask questions and describes what can 'make things go', for example, batteries, wind-up toys and sunlight.

Talks about toys and common appliances and what they do when they work, for example, produce heat, light, movement or sound.

Recognises that energy is required to make toys and common appliances work.

Observes toys and common appliances when they are working and not working.

Explores the different ways that toys and appliances can be powered.

See Forces Pathway to link learning.

Plays with a wide range of toys that are powered by different sources.

Observes how different appliances are powered in different settings / environments.

Early Level: Planet Earth - Processes of the Planet

Experiences and Outcomes	Benchmarks
By investigating how water can change from one form to another, I can relate my findings to everyday experiences. SCN 0-05a	• Investigates the different properties of water and shares their findings with others. • Talks about water in nature and how it influences their everyday lives. • Identifies three main states of water (ice, water and steam) and uses scientific vocabulary such as 'melting', 'freezing' and 'boiling' to describe changes of state.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. <u>Carries out practical activities in a variety of learning environments</u> • Uses their senses to acquire information. <u>Analyses, interprets and evaluates scientific findings</u> • Relates findings to everyday experiences.
Scientific analytical thinking skills	• Demonstrates natural curiosity and shows development of basic skills of analysis in simple and familiar contexts, for example, through asking questions, experimenting and making predictions.

Early Level: Planet Earth - Processes of the Planet

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

Talks about water in nature and how it influences their everyday lives.

Investigates the different properties of water and shares their findings with others.

Identifies three main states of water (ice, water and steam) and uses scientific vocabulary such as 'melting', 'freezing' and 'boiling' to describe changes of state.

Explores how we access and use water sustainably.

Discusses observations of water through play with others.

Identifies examples of melting, freezing and boiling in their everyday lives.

Recognises that water can change state when the temperature changes.

Discusses how we use water in our everyday lives.

Demonstrates understanding that not all water is safe to drink.

Recognises that water takes the shape of the container it is in.

Explores and discovers that water at room temperature is in a liquid state.

Observes different water sources in their local environment.

Recognises that all living things need water to survive.

Plays with water safely e.g. exploring ice melting.

Observes water changing state e.g. ice melting, water freezing and water boiling to produce steam.

Early Level: Planet Earth - Space

Experiences and Outcomes	Benchmarks
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	• Describes how the rotation of the Earth in relation to the sun gives us day and night. • Talks about how the pattern of night and day changes over the course of a year.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Carries out practical activities in a variety of learning environments</u> • Uses their senses to acquire information. <u>Analyses, interprets and evaluates scientific findings</u> • Recognises similarities, patterns and differences in the findings and links these to the original question.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates a developing understanding of science in the world around them. • Explores the ways in which people use science and science skills as part of their job.

Early Level: Planet Earth - Space

See Topical Science Pathway to develop real life contexts.

Begins to discuss the relationship between the Earth and the sun and changes in daylight hours.

Describes how the rotation of the Earth in relation to the sun gives us day and night.

Recognises that daylight hours are longer in the summer months and shorter in the winter months.

Talks about how the pattern of night and day changes over the course of a year.

Compares and contrasts the seasons e.g. summer versus winter.

Discusses how to stay safe in the sun.

Explores through play how the Earth rotates and travels around the sun.

Recognises that we get light and heat from the sun.

Identify differences between day and night.

Observes the current season and discusses how seasons change over the course of a year.

Demonstrates understanding that we live on Earth and the Earth has one moon.

Demonstrates understanding that the sun is at the centre of our solar system which the Earth and moon are part of.

Observes the sky and discusses what they see.

Early Level: Forces, Electricity and Waves - Forces

Experiences and Outcomes	Benchmarks
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	• Explores and sorts toys and objects into groups according to whether they need to be pushed or pulled. • Measures, using simple equipment, how the movement of an object is affected by the size of the force or the weight of the object. • Demonstrates, through play, how a force can make an object stay still, start to move, speed up, slow down and change shape.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen.
Scientific Analytical Thinking Skills	• Demonstrates natural curiosity and shows development of basic skills of analysis in simple and familiar contexts, for example, through asking questions.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates a developing understanding of science in the world around them.

Early Level: Forces, Electricity and Waves - Forces

See Topical Science Pathway to develop real life contexts.

Demonstrates understanding that we can see the effect of a force and forces are acting on objects at all time (e.g. staying still, starting to move, speeding up, slowing down, changing shape).

Demonstrates, through play, how a force can make an object stay still, start to move, speed up, slow down and change shape.

Discusses how to play with toys and objects safely.

Plays with a wide range of toys which can be pushed or pulled.

Justifies why they have sorted toys and objects into groups (i.e. need to be pushed or pulled).

Explores and sorts toys and objects into groups according to whether they need to be pushed or pulled

Recognises that pushes and pulls are forces.

Explores pushing and pulling with magnets and discusses the effect.

Explores and identifies examples of pushing and pulling in the environment.

Shares observations from simple experiments about forces and movement.

Measures, using simple equipment, how the movement of an object is affected by the size of the force or the weight of the object.

Uses words such as faster, slower, heavier, lighter to discuss their findings from simple experiments.

Predicts how the movement of an object is affected by the size of the force or the weight of the object.

See Energy Sources and Sustainability Pathway to link learning.

Early Level: Forces, Electricity and Waves - Electricity

Experiences and Outcomes	Benchmarks
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	• Groups objects into those which get electricity either from mains electrical sockets or alternative sources, such as batteries and solar cells. • Talks about the importance of electricity in their daily lives. • Identifies the risks that can be caused by electricity and recognises how to stay safe.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. <u>Analyses, interprets and evaluates scientific findings</u> • Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. • Provides oral descriptions of what was done and what happened. <u>Presents scientific findings</u> • Communicates findings to others verbally and through drawings, photographs, displays and simple charts.
Skills and Attributes of Scientifically Literate Citizens	• Explores the ways in which people use science and science skills as part of their job.

Early Level: Forces, Electricity and Waves - Electricity

See Topical Science Pathway to develop real life contexts.

See Energy Sources and Sustainability Pathway to link learning.

Identifies the risks that can be caused by electricity and recognises how to stay safe.

Identifies common safety signs.

Identifies people who can help us stay safe.

Recognises the dangers of electricity and water.

Groups objects into those which get electricity either from mains electrical sockets or alternative sources, such as batteries and solar cells.

Recognises that electricity is useful but it can be dangerous.

Discusses how to stay safe around electricity.

Observes how to safely connect mains powered appliances.

Demonstrates understanding that electricity is a type of energy.

Demonstrates understanding that some toys and appliances need electricity to work.

Talks about the importance of electricity in their daily lives.

Identifies different sources of electricity (e.g. mains, batteries, solar cells).

Observes how toys and appliances are powered by electricity in different settings/environments.

Identifies how electricity is used in our daily lives.

Early Level: Forces, Electricity and Waves – Vibration and Waves

Experiences and Outcomes	Benchmarks
Through play, I have explored a variety of ways of making sounds. SCN 0-11a	• Predicts, then investigates, ways to make sounds louder and quieter. • Identifies different sources of sound.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play.
Scientific Analytical Thinking Skills	• Demonstrates natural curiosity and shows development of basic skills of analysis. • Demonstrates creative thinking. • Demonstrates reasoning skills by explaining choices and decisions.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates a developing understanding of science in the world around them.

Early Level: Forces, Electricity and Waves – Vibration and Waves

See Topical Science Pathway to develop real life contexts.

Shares observations from simple experiments about ways to make sounds louder and quieter.

See Properties and Uses of Substances Pathway to link learning.

Predicts, then investigates, ways to make sounds louder and quieter.

Tinkers (plays and investigates) with different objects to create their own musical instruments.

See Body Systems and Cells Pathway to link learning.

Explores how to make sounds louder and quieter.

Identifies different sources of sound.

Compares and contrasts the sounds produced by different musical instruments.

Explores different ways to make sounds using different objects and musical instruments.

Explores and experiences sounds in different settings / environment.

Early Level: Biological Systems – Body Systems and Cells

Experiences and Outcomes	Benchmarks
I can identify my senses and use them to explore the world around me. SCN 0-12a	• Identifies specific parts of the body related to each of the senses. • Uses their senses to describe the world around them, giving examples of things they see, hear, smell, taste and feel.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. <u>Carries out practical activities within a variety of learning environments</u> • Uses their senses to acquire information. <u>Analyses, interprets and evaluates scientific findings</u> • Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. <u>Presents scientific findings</u> • Communicates findings to others verbally and through drawings, photographs, displays and simple charts.
Scientific Analytical Thinking Skills	• Demonstrates natural curiosity and shows development of basic skills of analysis. • Demonstrates creative thinking. • Demonstrates reasoning skills by explaining choices and decisions.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates a developing understanding of science in the world around them.

Early Level: Biological Systems – Body Systems and Cells

See HWB 0-47b to link learning - I am aware of my growing body and I am learning the correct names for its different parts and how they work.

See Topical Science Pathway to develop real life contexts.

Compares and contrasts what we see, hear, smell, taste and feel in different settings / environments.

Discusses how we use our senses to keep us safe.

Uses their senses to describe the world around them, giving examples of things they see, hear, smell, taste and feel.

Identifies specific parts of the body related to each of the senses.

Identifies the sense organs which allow us to see, hear, smell, taste and touch/feel.

Explores how other living things use their senses.

Identifies the senses of sight, hearing, smell, taste and touch.

See Biodiversity and Interdependence to link learning.

See Vibrations and Waves Pathway to link learning.

Early Level: Materials – Properties and Uses of Substances

Experiences and Outcomes	Benchmarks
Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes. SCN 0-15a	• Explores and sorts materials into different groups depending on their properties, for example, whether they are strong, smooth, rough and if they float or sink. • Justifies the selection of appropriate materials for different uses based on their physical properties.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Explores and observes through play. • Asks questions arising from play activities. • Makes simple predictions of what might happen. • Makes suggestions about what to do to answer the selected question. <u>Carries out practical activities within a variety of learning environments</u> • Discusses obvious risks and takes appropriate steps to protect themselves and others. • Uses their senses to acquire information. • Measures using simple equipment and non-standard units. <u>Analyses, interprets and evaluates scientific findings</u> • Presents and sorts data/information, for example, using displays, photographs, simple charts and drawings. • Provides oral descriptions of what was done and what happened. • Recognises similarities, patterns and differences in the findings and links these to the original question. • Discusses, with support, how the experiment might be improved. • Relates findings to everyday experiences. • Identifies and discusses new knowledge and understanding. <u>Presents scientific findings</u> • Communicates findings to others verbally and through drawings, photographs, displays and simple charts. • Responds to questions about their investigation.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates curiosity and basic skills of analysis through asking questions, experimenting and making predictions. • Demonstrates creative thinking by offering suggestions and solutions to problems. • Demonstrates reasoning skills by explaining choices and decisions.

Early Level: Materials – Properties and Uses of Substances

See Topical Science Pathway to develop real life contexts.

See Processes of the Planet Pathway to link learning.

See Vibrations and Waves Pathway to link learning.

Justifies the selection of appropriate materials for different uses based on their physical properties.

Carries out simple investigations around the properties of common everyday materials.

Explores and sorts materials into different groups depending on their properties, for example, whether they are strong, smooth, rough and if they float or sink.

Predicts how different materials can be used e.g. if they float or sink.

Describes the properties of different materials using the terms strong, smooth, rough, and if they float or sink.

Identifies different common everyday materials e.g. stone, glass, plastic, metal, wood.

Demonstrates understanding that objects are made of different materials.

Tinkers (plays and investigates) with different materials.

Explores how we use common everyday materials.

Explores different materials in different settings / environments.

Early Level: Topical Science

Experiences and Outcomes	Benchmarks
I can talk about science stories to develop my understanding of science and the world around me. SCN 0-20a	• Talks about the science they encounter in their everyday experiences. • Explores, through role-play, how science and science skills are used in a variety of jobs.

Examples of skills that can be developed:	
Scientific analytical thinking skills	• Demonstrate reasoning skills by explaining choices and decisions.
Skills and attributes of scientifically literate citizens	• Talk about science showing developing understanding of risks and benefits. • Demonstrate developing understanding of science in the world around them including meeting or finding out about people who use science as part of their job.

Early Level: Topical Science

Talks about the science they encounter in their everyday experiences.

Shares ideas about science around us.

Participates in discussions about science around us.

Explores what science means.

Notices examples of science around us.

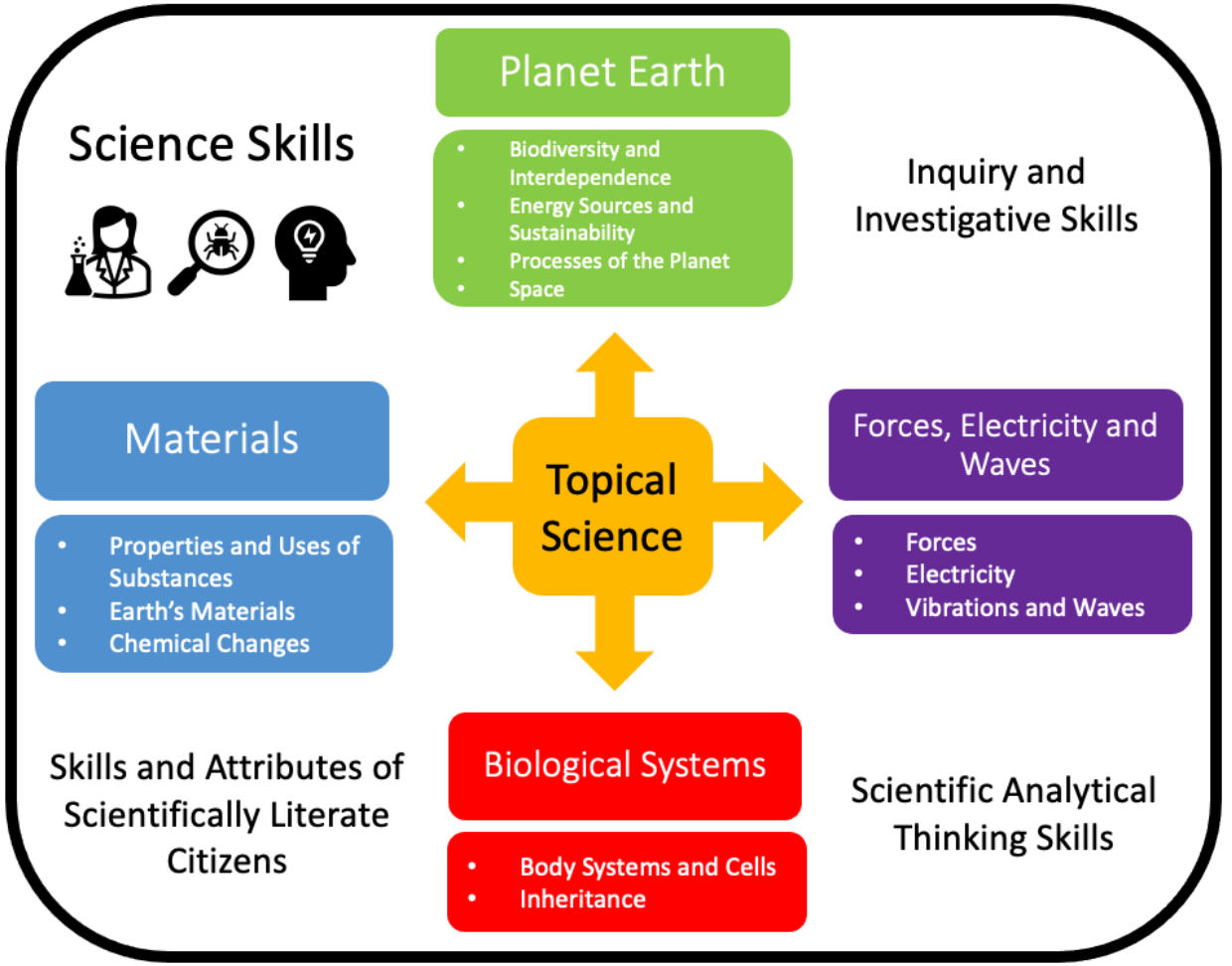
Explores, through role-play, how science and science skills are used in a variety of jobs.

Participates in discussions about science jobs and associated skills.

Experiences through role-play different jobs which involve science.

Creating rich play environments in your setting will support learners to explore, investigate and talk about the science around them.

First Level


Science Skills
Planet Earth
Biodiversity and Interdependence
Energy Sources and Sustainability
Processes of the Planet
Space
Inquiry and Investigative Skills
Materials
Properties and Uses of Substances
Earth's Materials
Chemical Changes
Topical Science
Forces, Electricity and Waves
Forces
Electricity
Vibrations and Waves
Skills and Attributes of Scientifically Literate Citizens
Biological Systems
Body Systems and Cells
Inheritance
Scientific Analytical Thinking Skills

First Level: Planet Earth - Biodiversity and Interdependence

Experiences and Outcomes	Benchmarks
I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions. SCN 1-01a	• Explains the difference between living and non-living things, taking into consideration movement, reproduction, sensitivity, growth, excretion and feeding. • Creates criteria for sorting living things and justifies decisions. • Sorts living things into plant, animal and other groups using a variety of features.
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	• Demonstrates awareness of how energy from the sun can be taken in by plants to provide the major source of food for all living things. • Interprets and constructs a simple food chain, using vocabulary such as 'producer', 'consumer', 'predator' and 'prey'.
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	• Observes, collects and measures the outcomes from growing plants in different conditions, for example, by varying levels of light, water, air, soil/nutrients and heat. • Structures a presentation or report, with support, to present findings on how plants grow.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.
Scientific analytical thinking skills	• Provides explanations which are supported by evidence.
Skills and attributes of scientifically literate citizens	• Makes connections between science and their own health and wellbeing. • Demonstrates awareness of people using science in their everyday lives in a variety of jobs roles and careers. • Discuss science topics in real – life contexts including in the media. • Demonstrates awareness of their own impact on the world.

First Level: Planet Earth - Biodiversity and Interdependence

See Topical Science Pathway to develop real life contexts.

Creates criteria for sorting living things and justifies decisions.

Creates own criteria to group living things.

Sorts living things into plant, animal and other groups using a variety of features.

Sorts living things into different groups using given criteria.

Applies knowledge of life processes to identify and sort living and non-living things.

Describes characteristics of different groups of living things.

Identifies different groups of living things.

Explains the meaning of different life processes.

Explains the difference between living and non-living things, taking into consideration movement, reproduction, sensitivity, growth, excretion and feeding.

Identifies different life processes (e.g. movement, reproduction etc.).

Identifies living and non-living things.

Recognises that both plants and animals are alive.

Demonstrates understanding that living things have a life expectancy (living things die).

Interprets and constructs a simple food chain, using vocabulary such as 'producer', 'consumer', 'predator' and 'prey'.

Identifies and labels key features of a simple food chain.

Begins to use key vocabulary ('producer', 'consumer', 'predator' and 'prey').

Demonstrates awareness of how energy from the sun can be taken in by plants to provide the major source of food for all living things.

Demonstrates understanding that each food chain begins with the sun.

Demonstrates understanding that all living things require energy to survive.

Demonstrates understanding that animals get energy from eating other living things (plants and /or animals).

Structures a presentation or report, with support, to present findings on how plants grow.

Presents findings in a logical order.

Begins to include basic components of a scientific presentation or report (e.g. uses titles / headings appropriately).

Observes, collects and measures the outcomes from growing plants in different conditions, for example, by varying levels of light, water, air, soil/nutrients and heat.

Carries out practical investigations to observe and measure plant growth in different conditions (e.g. with and without light).

Predicts what will happen to the growth of plants in different conditions.

Recognises that plants need different things to grow (sunlight, water, air, soil, nutrients and heat).

Recognises that most plants are green.

Demonstrates understanding that plants get (light) energy from the sun.

First Level: Planet Earth - Energy Sources and Sustainability

Experiences and Outcomes	Benchmarks
I am aware of different types of energy around me and can show their importance to everyday life and my survival. SCN 1-04a	• Identifies and talks about types of energy that we get from different energy sources, for example, light, sound, heat and electrical. • Uses knowledge of different energy sources, for example, sun, food, fuel, wind and waves, to discuss the importance of different types of energy for everyday life and survival.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. <u>Carries out practical activities in a variety of learning environments</u> • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.

First Level: Planet Earth - Energy Sources and Sustainability

See Topical Science Pathway to develop real life contexts.

See Electricity Pathway to link learning.

Describes how common appliances and devices receive and transfer energy e.g. radio receives electrical energy which is transformed to sound energy.

Begins to discuss ways in which we can reduce our energy use.

Explores what it means to be sustainable and why it is important for everyday life and survival.

Identifies and talks about types of energy that we get from different energy sources, for example, light, sound, heat and electrical.

Uses knowledge of different energy sources, for example, sun, food, fuel, wind and waves, to discuss the importance of different types of energy for everyday life and survival.

Identifies common appliances and devices that require energy that are important to everyday life.

Discusses the importance of different types of energy for everyday life.

Explores renewable and non-renewable energy sources e.g. sun, wind, waves, fossil fuels.

First Level: Planet Earth - Processes of the Planet

Experiences and Outcomes	Benchmarks
By investigating how water can change from one form to another, I can relate my findings to everyday experiences. SCN 1-05a	• Uses more complex vocabulary to describe changes of states of water, for example, 'condensation' and 'evaporation'. • Contributes to the design of an experiment to determine the temperature at which water boils, freezes and melts, ensuring appropriate use of units. • Knows that pure water boils at 100°C, melts at 0°C and freezes at 0°C.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.

First Level: Planet Earth - Processes of the Planet

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

Knows that pure water boils at 100°C, melts at 0°C and freezes at 0°C.

Share findings from investigations and discusses their relevance to everyday experiences.

Carries out simple practical investigations to observe and measure the temperature at which water boils, freezes and melts.

Explores how adding different substances can change the temperature at which water boils, melts and freezes (e.g. salt on the roads).

Uses more complex vocabulary to describe changes of states of water, for example, 'condensation' and 'evaporation'.

Observes and discusses examples of evaporation and condensation.

Contributes to the design of an experiment to determine the temperature at which water boils, freezes and melts, ensuring appropriate use of units.

Discusses what pure water is.

Explores terms used to describe the change in state of water e.g. evaporation describes the change from liquid to gas and condensation describes the changes from gas to liquid.

Discusses different ways to measure the temperature at which water boils, freezes and melts.

Relates change in temperature (energy) to change in state of water.

Discusses examples of the three states of water in different environments.

Describes the properties of water in the three states (e.g. shape and flow).

Explores how to measure temperature safely using different types of thermometer.

Explores how to measure temperature accurately using different types of thermometer.

Demonstrates understanding that water exists in a liquid state at room temperature (20°C).

Identifies the three states in which water can exist e.g. solid (ice), liquid and gas (steam/vapour).

Explores how temperature is measured using degrees Celsius.

Investigates different types of thermometer and their uses (e.g. liquid and digital).

First Level: Planet Earth - Space

Experiences and Outcomes	Benchmarks
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	• Describes how the Earth spins around its axis in 24 hours resulting in day and night. • Observes and records the different patterns of movement of the moon and explains why the moon appears to have different shapes and positions in the sky at different times in a lunar month. • Demonstrates understanding of how the Earth takes one year to completely orbit the sun. • Demonstrates understanding of how the tilt of the Earth on its axis as it circles the sun causes the pattern of the seasons and changes the number of daylight hours over the course of a year.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates awareness of how people use science in their everyday lives and in a variety of jobs and careers. • Discusses science topics in real-life contexts including those appearing in the media.

First Level: Planet Earth - Space

See Topical Science Pathway to develop real life contexts.

Explains the relationship between days, months and years in relation to the rotation and orbit of the Earth around the sun.

Compares and contrasts sunrise and sunset times in different part of the World at different times of the year.

Demonstrates understanding of how the tilt of the Earth on its axis as it circles the sun causes the pattern of the seasons and changes to the number of daylight hours over the course of a year.

Predicts the shape and position of the moon at different times within a lunar month.

Describes how the Earth spins around its axis in 24 hours resulting in day and night.

Demonstrates understanding of how the Earth takes one year to completely orbit the sun.

Describes the relationship between the number of daylight hours and the different seasons.

Observes and records the different patterns of movement of the moon and explains why the moon appears to have different shapes and positions in the sky at different times in a lunar month.

Explores using models the size and position of the Earth, moon and sun within our Solar System.

Discusses the relationship between time and the rotation of the Earth around its axis.

Using simple experiments and models, explores how the tilt of the Earth on its axis causes the pattern of seasons and changes in the number of daylight hours.

Safely observes the different positions of the sun throughout the course of a day.

Explores using models how the Earth spins around its axis.

Explores using models how the Earth orbits the sun.

Observes how sunrise and sunset times change over the course of the year.

Explores the different phases of the moon within a lunar month.

First Level: Forces, Electricity and Waves - Forces

Experiences and Outcomes	Benchmarks
By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects. SCN 1-07a	• Predicts and then investigates how a force can make an object change speed, direction or shape, and uses vocabulary such as pushing, pulling, stretching, squashing and twisting to describe forces. • Investigates balanced forces and explains that if a push and pull are equal in strength and opposite in direction then there is no change in movement.
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	• Reports in writing, visually, orally how magnets exert a non-contact force on each other and attract certain materials. • Demonstrates through practical activities that like poles repel and opposite poles attract. • Gives at least two examples for how magnets are used in everyday life.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. <u>Analyses, interprets and evaluates scientific findings</u> • Interprets findings and discusses links to the original question. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Reports in writing, orally or visually using a variety of media.
Scientific Analytical Thinking Skills	• Provides creative solutions to scientific issues and problems. • Demonstrates reasoning skills and draws on understanding of science concepts to make and test predictions. • Provides explanations which are supported by evidence.
Skills and Attributes of Scientifically Literate Citizens	• Expresses informed views of scientific issues, both orally and in writing, and respects the views of others. • Demonstrates awareness of how people use science in their everyday lives.

First Level: Forces, Electricity and Waves - Forces

See Energy Sources and Sustainability Pathway to link learning.

See Properties and Uses of Substances Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Discusses findings from simple experiments using vocabulary such as pushing, pulling, stretching, squashing and twisting to describe forces.

Predicts and then investigates how a force can make an object change speed, direction or shape, and uses vocabulary such as pushing, pulling, stretching, squashing and twisting to describe forces.

Carries out simple experiments to explore how a force can make an object change speed, direction or shape.

Explores stretching, squashing and twisting forces and gives examples of when these occur in the environment.

Explores why forces are important to everyday life e.g. transport, construction and sport.

Discusses findings from simple experiments to explain that if a push and pull are equal in strength and opposite in direction then there is no change in movement.

Investigates balanced forces and explains that if a push and pull are equal in strength and opposite in direction then there is no change in movement.

Carries out simple experiments to demonstrate balanced and unbalanced forces.

Explores balanced and unbalanced forces using toys and objects.

Reports in writing, visually, orally how magnets exert a non-contact force on each other and attract certain materials.

Demonstrates through practical activities that like poles repel and opposite poles attract.

Uses knowledge of magnets to create a simple game.

Demonstrates understanding that a magnet has two poles and exert a non-contact force known as magnetism.

Uses words such as pole, repel and attract to describe how magnets exert a non-contact force on each other and attract certain materials.

Gives at least two examples for how magnets are used in everyday life.

Explores uses of magnets in everyday life e.g. in the home, at school, transport and construction.

Carries out simple experiments to explore magnetic and non-magnetic materials.

Predicts whether an object or material is magnetic or non-magnetic.

First Level: Forces, Electricity and Waves - Electricity

Experiences and Outcomes	Benchmarks
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	• Builds simple circuits containing bulbs, switches, bells and batteries.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Makes predictions about the scientific investigation/enquiry being planned. • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Contributes to the design of procedures for carrying out scientific investigations. <u>Analyses, interprets and evaluates scientific findings</u> • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained.
Scientific and Analytical Thinking Skills	• Contributes to the design processes and uses components to make models. • Demonstrates reasoning skills and draws on understanding of science concepts to make and test predictions. • Provides explanations which are supported by evidence.
Skills and Attributes of Scientifically Literate Citizens	• Demonstrates awareness of how people use science in their everyday lives and in a variety of jobs and careers.

First Level: Forces, Electricity and Waves - Electricity

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

See Energy Sources and Sustainability Pathway to link learning.

Demonstrates how to stay safe when building a simple circuit.

Uses knowledge of simple circuits and components to create a game.

Explores how insulators are used for electrical safety.

Builds simple circuits containing bulbs, switches, bells and batteries.

Predicts and carries out simple experiments to determine whether a material is a conductor or insulator.

Describes the role of each component in an electrical circuit, including safety features.

Demonstrates understanding that every circuit needs an energy source and can relate this to how we access electricity in our everyday lives.

Explores the components of an electrical circuit e.g. wires, bulbs, switches, bells and batteries.

First Level: Forces, Electricity and Waves – Vibration and Waves

Experiences and Outcomes	Benchmarks
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	• Demonstrates how sounds can be made higher or lower pitch by altering tightness, length, width or thickness or other physical characteristics of the sound source. • Explains that sound is caused by a vibration in a material.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.

First Level: Forces, Electricity and Waves – Vibration and Waves

See Topical Science Pathway to develop real life contexts.

See Body Systems and Cells Pathway to link learning.

Demonstrates how sounds can be made higher or lower pitch by altering tightness, length, width or thickness or other physical characteristics of the sound source.

Explores common musical instruments and how their components are manipulated to change the pitch of the sound.

Creates simple musical instruments to explore how sounds can be made higher or lower pitch.

Identifies when a sound is high pitch or low pitch.

Begins to explore how we detect sound.

Explains that sound is caused by a vibration in a material.

Compares and contrasts the sound (pitch and volume) produced by different objects and materials.

Explores how different objects and instruments vibrate to produce a sound.

First Level: Biological Systems – Body Systems and Cells

Experiences and Outcomes	Benchmarks
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	• Uses components to make simple models of a skeleton which identify the skull, spine, ribcage and some bones of the arms and leg and which show how the skeleton gives us support and protects our organs. • Describes the position and function of major organs including the brain, heart, lungs, stomach and bladder. • Describes how skin, as an organ, provides a barrier to infection and helps to control our temperature. • Structures a presentation or report, with support, on how to have a healthy lifestyle, for example, through a balanced diet, regular exercise, sufficient sleep and by avoiding substance misuse.
I have explored my senses and can discuss their reliability and limitations in responding to the environment. SCN 1-12b	• Uses their senses to detect information and explains how they help to keep people safe. • Investigates the reliability and limitations of the senses, for example, using taste tests, limits of sound, optical illusions and blind-fold games.
I know the symptoms of some common diseases caused by germs. I can explain how they are spread and discuss how some methods of preventing and treating disease benefit society. SCN 1-13a	• Describes the symptoms of some common diseases including colds, mumps, measles, chicken pox and flu. • Provides explanations, supported by evidence, of how some diseases spread and discusses ways in which some diseases can be prevented through good hygiene and vaccination.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Collaborates to undertake investigations. <u>Analyses, interprets and evaluates scientific findings</u> • Interprets findings and discusses links to the original question. • Relates findings to their wider experiences of the world around them.
Skills and Attributes of Scientifically Literate Citizens	• Makes connections between science and their own health and wellbeing. • Discusses science topics in real-life contexts including those appearing in the media. • Expresses informed views of scientific issues, both orally and in writing, and respects the views of others. • Demonstrates awareness of their own impact on the world.

First Level: Biological Systems – Body Systems and Cells

Structures a presentation or report, with support, on how to have a healthy lifestyle, for example, through a balanced diet, regular exercise, sufficient sleep and by avoiding substance misuse.

Compares and contrasts a healthy and unhealthy lifestyle.

Researches and discusses what makes a healthy lifestyle.

Describes the position and function of major organs including the brain, heart, lungs, stomach and bladder.

Identifies and researches the function of the major organs.

Describes how skin, as an organ, provides a barrier to infection and helps to control our temperature.

Explores the importance of our skin and how to look after our skin.

Uses components to make simple models of a skeleton which identify the skull, spine, ribcage and some bones of the arms and leg and which show how the skeleton gives us support and protects our organs.

Explores the role of the human skeleton in giving us support and protecting our organs.

Explores different models and representations of the human skeleton.

Identifies the main parts of the human skeleton.

See HWB Experiences and Outcomes to link learning.

See Topical Science Pathway to develop real life contexts.

Shares and discusses findings from experiments to explore the reliability and limitations of the senses.

See Vibrations and Waves Pathway to link learning.

Investigates the reliability and limitations of the senses, for example, using taste tests, limits of sound, optical illusions and blind-fold games.

Carries out simple experiments to test the senses.

Discusses the implications of sensory impairment and how people can be supported.

Uses their senses to detect information and explains how they help to keep people safe.

Identifies the five sense organs and describes what they do e.g. eyes detect light, ears detect sound, nose detects smell, tongue detects taste, skin detects touch and temperature.

Explores how to look after the five sense organs.

Provides explanations, supported by evidence, of how some diseases spread and discusses ways in which some diseases can be prevented through good hygiene and vaccination.

Explores using simple models or experiments how some infectious diseases are spread e.g. using glitter and hand gel.

Discusses common ways to prevent the spread of infectious diseases e.g. washing hands before eating, covering mouth when you cough.

Describes the symptoms of some common diseases including colds, mumps, measles, chicken pox and flu.

Discusses own experiences of feeling unwell due to common infectious diseases.

Identifies common infectious diseases.

First Level: Biological Systems – Inheritance

Experiences and Outcomes	Benchmarks
By comparing generations of families of humans, plants and animals, I can begin to understand how characteristics are inherited. SCN 1-14a	• Uses their own experiences to illustrate how inherited characteristics are passed from one generation to the next. • Knows that genetic information determines characteristics such as colour of eyes and shape of petals. • Demonstrates understanding of the variations within family groups.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales.
Scientific and Analytical Thinking Skills	• Applies learning in the sciences. • Provides explanations which are supported by evidence.
Skills and Attributes of Scientifically Literate Citizens	• Makes connections between science and their own health and wellbeing. • Discusses science topics in real-life contexts including those appearing in the media.

First Level: Biological Systems – Inheritance

Inheritance can be explored by looking at families of humans, plants or animals. It is up to teacher discretion as to which type/s of families are used.

See Topical Science Pathway to develop real life contexts.

See HWB 1-47a to link learning - I recognise that we have similarities and differences but are all unique.

Demonstrates understanding of the variations within family groups.

Conducts a simple investigation to explore variation within a family group of humans, plants or animals e.g. leaf length.

Shares and discusses findings to explain variation within family groups.

Discusses how characteristics of humans, plants or animals are determined e.g. genetic information passed on from parents.

Knows that genetic information determines characteristics such as colour of eyes and shape of petals.

Uses their own experiences to illustrate how inherited characteristics are passed from one generation to the next.

Explores different models and representations to demonstrate how inherited characteristics are passed from one generation to the next.

Identifies common characteristics which vary in humans, plants or animals e.g. eye colour, leaf shape, number of legs.

First Level: Materials – Properties and Uses of Substances

Experiences and Outcomes	Benchmarks
Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges. SCN 1-15a	• Classifies materials into natural and human-made (synthetic). • Identifies properties of different materials, for example, rigidity, flexibility, rough, smooth and waterproof, and their uses linked to their properties.
I can make and test predictions about solids dissolving in water and can relate my findings to the world around me. SCN 1-16a	• Links new knowledge of dissolving to real-life examples of things that dissolve and things that don't dissolve. • Predicts, investigates and records how solubility is affected by heat and stirring.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Collaborates with others to identify questions to find out more about a specific scientific concept, idea or issue. • Makes predictions about the scientific investigation/enquiry being planned. • Contributes to the design of procedures for carrying out scientific investigations. <u>Carries out practical activities in a variety of learning environments</u> • Identifies risks and hazards and ensures safe use of all tools, equipment and procedures. • Collaborates to undertake investigations. • Observes and collects information and makes measurements using appropriate equipment and units. <u>Analyses, interprets and evaluates scientific findings</u> • Records and presents data/information using a range of methods including tables, charts and diagrams, using labelling and scales. • Organises data and information and identifies significant patterns and relationships. • Interprets findings and discusses links to the original question. • Reports on limitations of their investigation and possible improvements. • Relates findings to their wider experiences of the world around them. • Identifies and discusses additional knowledge or understanding gained. <u>Presents scientific findings</u> • Presents data/information using a range of methods including tables, charts and diagrams, using labels and scales. • Reports in writing, orally or visually using a variety of media. • Structures a presentation or report, with support, to present findings in a coherent and logical way.
Scientific and Analytical Thinking Skills	• Provides creative solutions to scientific issues and problems. • Contributes to the design processes. • Demonstrates reasoning skills through making and testing predictions. • Provides explanations which are supported by evidence.
Skills and Attributes of Scientifically Literate Citizens	• Discusses science topics in real-life contexts including those appearing in the media.

First Level: Materials – Properties and Uses of Substances

See Electricity and Forces Pathways to link learning.

See Topical Science Pathway to develop real life contexts.

See Processes of the Planet Pathways to link learning.

Identifies properties of different materials, for example, rigidity, flexibility, rough, smooth and waterproof, and their uses linked to their properties.

Compares and contrasts the production, properties and uses of natural and synthetic materials.

Researches the uses of natural and synthetic materials in everyday life.

Carries out simple investigations to explore the properties of different materials.

Uses vocabulary such as rigid, flexible, rough, smooth and waterproof to describe the properties of different materials.

Classifies materials into natural and human-made (synthetic).

Explores how natural and synthetic materials can be sourced, created and used sustainably.

Explores how synthetic materials are made.

Explores natural sources of materials.

Shares and discusses findings about how heat and stirring affect solubility.

Predicts, investigates and records how solubility is affected by heat and stirring.

Plans and carries out a simple experiment to investigate how solubility is affected by heat and stirring.

Links new knowledge of dissolving to real-life examples of things that dissolve and things that don't dissolve.

Plans and carries out simple experiments to investigate the solubility of different common solids in water e.g. salt, sugar, sand and flour.

Observes what happens when a solid dissolves in water and a solid that does not dissolve in water.

Discuss everyday examples of dissolving e.g. sugar in water / tea.

Sorts a range of common solids in terms of solubility in water.

First Level: Topical Science

Experiences and Outcomes	Benchmarks
I have contributed to discussions of current scientific news items to help develop my awareness of science. SCN 1-20a	• Discusses and expresses opinions about science topics in real-life contexts, including those featured in the media. • Discusses how people use science in their everyday lives. • Describes a variety of jobs and careers which require scientific knowledge and skills.

Examples of skills that can be developed:	
Skills and attributes of scientifically literate citizens	• Makes connections between science and their own health and wellbeing. • Demonstrates awareness of people using science in their everyday lives in a variety of jobs roles and careers. • Discuss science topics in real – life contexts including in the media. • Demonstrates awareness of their own impact on the world.

First Level: Topical Science

Relates and explains relevance of new science learning to their everyday lives.

Discusses and expresses opinions about science topics in real-life contexts, including those featured in the media.

Discusses how people use science in their everyday lives.

Describes a variety of jobs and careers which require scientific knowledge and skills.

Recognises how science relates to other curricular areas.

Discusses and shares opinions about science news.

Demonstrates understanding that science careers are for everyone.

Explores examples of science around us in different environments.

Discusses local examples of science around us.

Recognises important scientific skills for jobs.

Develops ideas about the world around us.

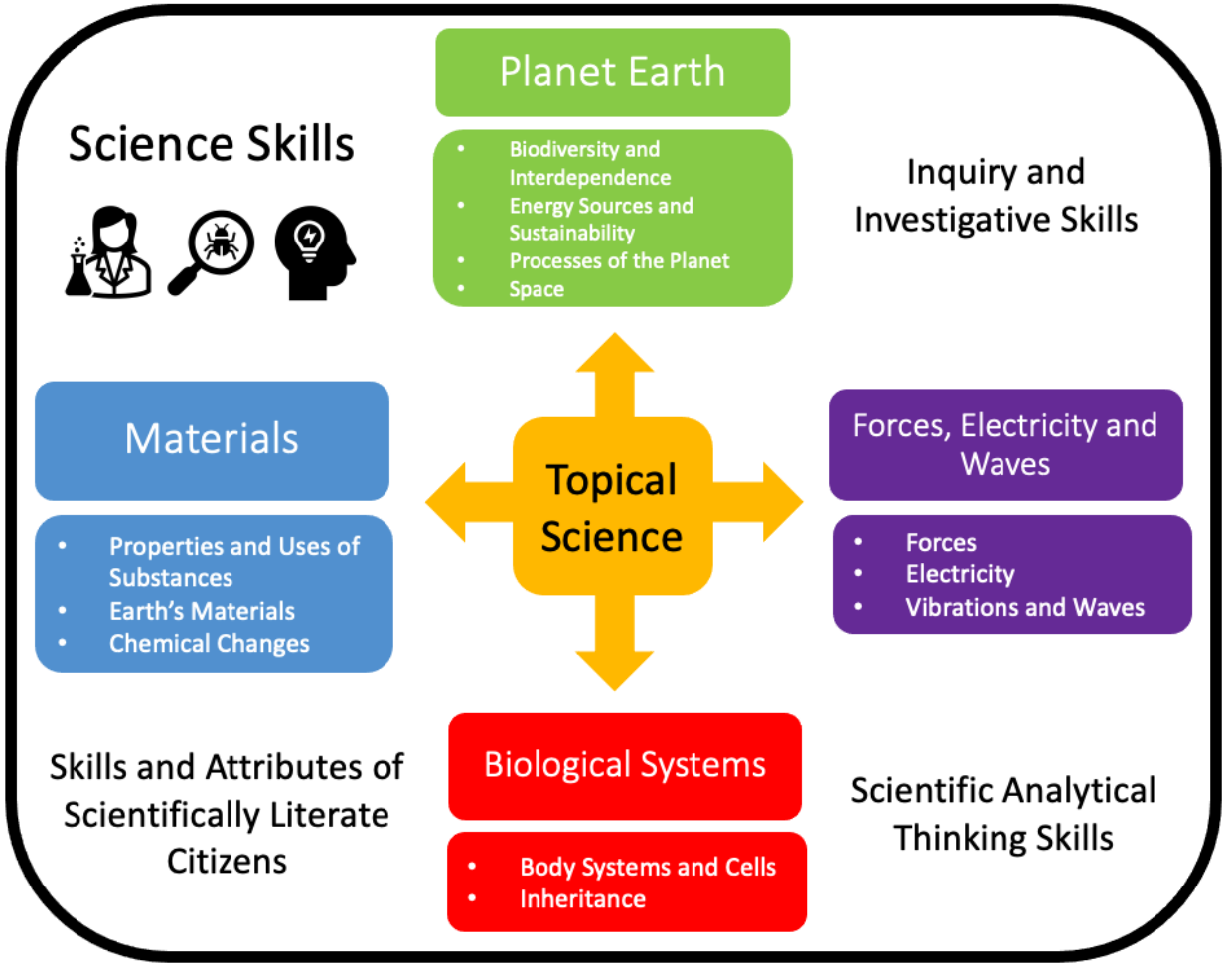
Identifies different jobs which involve science.

Asks a range of questions about the world around us.

Explores different sources of science news.

Identifies examples of science around us.

Second Level



Second Level: Planet Earth - Biodiversity and Interdependence

Experiences and Outcomes	Benchmarks
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	• Classifies living things into plants (flowering and non-flowering), animals (vertebrates and invertebrates) and other groups through knowledge of their characteristics. • Begins to construct and use simple branched keys which can be used to identify particular plants or animals. • Identifies characteristics of living things and their environment which have contributed to the survival or extinction of a species. • Describes how some plants and animals have adapted to their environment, for example, for drought or by using flight.
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	• Describes how energy flows between plants and animals in more complex food chains and webs and ecosystems, using vocabulary such as 'producers', 'consumers' and 'herbivore'.
Through carrying out practical activities and investigations, I can show how plants have benefited society. SCN 2-02b	• Relates findings from practical investigations to describe how plants have benefited society, for example, in medicine, dyes, fuels, construction, prevention of soil erosion and by influencing the balance of gases in the air.
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	• Collaborates with others to present a reasoned argument, based on evidence, of the risks and benefits of using fertilisers, demonstrating understanding of the underlying scientific concepts.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Skills and attributes of scientifically literate citizens	• Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Planet Earth - Biodiversity and Interdependence

Demonstrates understanding of the interdependence of life on earth.

See Topical Science Pathway to develop real life contexts.

Demonstrates understanding of the need to protect organisms and their habitats to conserve wildlife areas.

Formulates and expresses their opinions using research evidence.

Discusses and recognises the impact of removing or adding organisms to a simple food web (2 or 3 food chains).

Discusses how particular adaptations allow the survival of different animals and plants in different ecosystems.

Describes how some plants and animals have adapted to their environment, for example, for drought or by using flight.

Relates findings from practical investigations to describe how plants have benefited society, for example, in medicine, dyes, fuels, construction, prevention of soil erosion and by influencing the balance of gases in the air.

Collaborates with others to present a reasoned argument, based on evidence, of the risks and benefits of using fertilisers, demonstrating unders tanding of the underlying scientific concepts.

Describes how energy flows between plants and animals in more complex food chains and webs and ecosystems, using vocabulary such as 'producers', 'consumers' and 'herbivore'.

Recognises that changing environmental conditions can have an impact on plant and animal survival.

Identifies characteristics of living things and their environment which have contributed to the survival or extinction of a species.

Demonstrates understanding of how food chains are interlinked to form food webs.

Explores why some species have become extinct.

Identifies common adaptations of plants and animals living in a variety of ecosystems.

Constructs food chains of increasing complexity (3 or more organisms) from different local, national and global ecosystems (e.g. garden, pond, field, woodland, beach, forest, desert, ocean).

Begins to construct and use simple branched keys which can be used to identify particular plants or animals.

Demonstrates understanding that ecosystems are composed of habitats and different organisms (e.g. animals, plants and mirco-organisms).

Discusses the risks and benefits of using different types of fertilisers.

Identifies different types of consumer (e.g. herbivore, carnivore and omnivore) and understands their position within a food chain.

Uses a simple branched key (up to 4 branches) to identify different organisms.

Justifies how different living things have been classified.

Discusses human impact on plants and the environment.

Recognises fertilisers can be natural or artificial.

Recognises that chemical energy is stored in the bodies of organisms can be passed along a food chain.

Compares and contrasts different characteristics of different organisms.

Researches the purpose of using fertilisers.

Classifies living things into plants (flowering and non-flowering), animals (vertebrates and invertebrates) and other groups through knowledge of their characteristics.

Investigates the uses and benefits of plants in the local environment.

Explores and researches different everyday uses of plants.

Demonstrates understanding that plants absorb light energy from the sun and convert this into chemical energy which can be stored.

Identifies the direction of energy flow from producer to primary consumer then secondary consumer and so on.

Explores different groups of micro-organisms and starts to classify them (e.g. bacteria, virus and fungi).

Explores characteristics of increasing complexity ((e.g. reproduction via seeds / internal or external skeleton) to further classify plants and animals into established taxonomic groups.

Identifies how plants can be used sustainably to benefit society.

Second Level: Planet Earth - Energy Sources and Sustainability

Experiences and Outcomes	Benchmarks
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	• Demonstrates understanding of the law of conservation of energy (energy can be converted from one form to another but cannot be created or destroyed). • Identifies the common types of energy (kinetic, potential, electrical, chemical, light, sound and heat) used in energy transfers and transformations that occur in everyday appliances. • Explains that when energy transfers and transformations take place, energy is converted into 'useful' and 'wasted' energy, for example a mechanical braking system transforms kinetic energy into heat energy which is dissipated to the atmosphere as 'waste' heat.
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	• Researches non-renewable sources of energy, such as fossil fuels and nuclear, and discusses how these are used in Scotland. • Draws on increasing knowledge and understanding to suggest ways in which they can reduce their own energy use and live more sustainably.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Carries out practical activities in a variety of learning environments</u> • Makes observations and collects information and measurements using appropriate devices and units. <u>Analyses, interprets and evaluates scientific findings</u> • Relates findings to the wider world. <u>Presents scientific findings</u> • Reports collaboratively and individually using a range of methods. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Planet Earth - Energy Sources and Sustainability

See Topical Science Pathway to develop real life contexts.

See Electricity Pathway to link learning.

Explains that when energy transfers and transformations take place, energy is converted into 'useful' and 'wasted' energy, for example a mechanical braking system transforms kinetic energy into heat energy which is dissipated to the atmosphere as 'waste' heat.

Demonstrates useful and wasted energy transformations through simple experiments e.g. electrical circuits.

Discusses common examples of 'useful' and 'wasted' energy in everyday appliances e.g. light bulb converting electrical energy to light (useful) and heat (wasted) energy.

Observes simple energy transfers.

Explores how energy is measured in Joules.

Demonstrates understanding that energy is always conserved in energy transfers and transformations.

Recognises that energy remains constant in the universe.

Demonstrates understanding of the law of conservation of energy (energy can be converted from one form to another but cannot be created or destroyed).

Justifies why a type of energy is kinetic or potential.

Explores and sorts different types of energy into two main categories: kinetic and potential.

Investigates energy transfers and transformations using simple experiments and shares findings.

Identifies the common types of energy (kinetic, potential, electrical, chemical, light, sound and heat) used in energy transfers and transformations that occur in everyday appliances.

Discusses the role that we can all play in reducing energy use and living more sustainably.

Formulates and expresses their opinions using research evidence.

Draws on increasing knowledge and understanding to suggest ways in which they can reduce their own energy use and live more sustainably.

Compares and contrasts carbon footprints locally and globally.

Explores how to measure carbon footprint.

Explores the meaning of carbon footprint.

Researches non-renewable sources of energy, such as fossil fuels and nuclear, and discusses how these are used in Scotland.

Compares and contrasts the advantages and disadvantages of renewable and non-renewable sources of energy.

Investigates the history of renewable and non-renewable sources of energy used in Scotland.

Second Level: Planet Earth - Processes of the Planet

Experiences and Outcomes	Benchmarks
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	• Discusses the necessity of water for life, for example, for the growth of crops, for drinking and in river formation/flow. • Demonstrates understanding of the processes involved in the water cycle.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. • Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Planet Earth - Processes of the Planet

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

See Chemical Changes Pathway to link learning.

Researches an area of choice on how water supports life on earth.

Discusses the impact of climate change on the water cycle e.g. local, national and global water shortages.

Explores human impact on how water supports life on earth locally and globally e.g. land redevelopment and plastic pollution.

Researches water conservation and how water can be used sustainably.

Discusses the importance of the water cycle to everyday life in different settings and environments.

Discusses the necessity of water for life, for example, for the growth of crops, for drinking and in river formation/flow.

Explains the need for clean water to support the survival of life.

Demonstrates understanding of the processes involved in the water cycle.

Identifies common uses of water in everyday life in different settings / environments.

Investigates the purification of water using simple experiments and shares findings e.g. filtration and evaporation.

Investigates the water cycle using simple experiments and shares findings.

Describes the processes involved in the water cycle e.g. condensation, evaporation and precipitation.

Second Level: Planet Earth - Space

Experiences and Outcomes	Benchmarks
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	• Reports collaboratively on the key features of the planets including size, distance from the sun, length of day, length of year, temperature, materials from which they are predominantly made and the number of moons. • Uses simple models to communicate understanding of size, scale, time and relative motion within our Solar System, including how solar & lunar eclipses occur.

Examples of skills that can be developed:	
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.

Second Level: Planet Earth - Space

See Topical Science Pathway to develop real life contexts.

Reports collaboratively on the key features of the planets including size, distance from the sun, length of day, length of year, temperature, materials from which they are predominantly made and the number of moons.

Uses simple models to communicate understanding of size, scale, time and relative motion within our Solar System, including how solar & lunar eclipses occur.

Compares and contrasts the key features of the planets within our Solar System.

Using knowledge of the key features of Earth, explains how life exists on our planet.

Compares and contrasts the time taken for different planets in our Solar System to orbit the sun.

Explores our Solar System, it's planets, moons and star.

Explores other planet systems in our galaxy.

Explores using models how the planets orbit the sun.

Explores how solar and lunar eclipses occur.

Second Level: Forces, Electricity and Waves - Forces

Experiences and Outcomes	Benchmarks
By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects. SCN 2-07a	• Describes friction as a force which opposes the motion of moving objects, for example, two solid surfaces rubbing against one another or a solid surface moving through air or water. • Finds an association between air resistance (drag), the speed of the object being investigated and the surface area exposed to the air, making links to original predictions. • Demonstrates understanding of how friction and air resistance can both be useful, for example, in braking systems, and also a problem, for example, causing moving parts to wear. • Describes efficient movement as that which requires the least possible energy and suggests ways to improve efficiency in moving objects, for example, by streamlining.
I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications. SCN 2-08a	• Measures gravitational force with a force meter or newton meter and records results using appropriate units (newtons). • Explains how some objects may become electrically charged by rubbing two surfaces together and how the charges produce an electrostatic force. • Investigates and demonstrates understanding that magnetic and electrostatic forces can both repel and attract. • Describes practical applications of magnetic, electrostatic and gravitational forces, for example, magnetised needle in a compass.
By investigating floating and sinking of objects in water, I can apply my understanding of buoyancy to solve a practical challenge. SCN 2-08b	• Explores the factors which affect floating, for example, the object's shape and the density of the material that the object is made of, and collates, organises and summarises findings with assistance.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained.
Scientific analytical thinking skills	• Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations.

Second Level: Forces, Electricity and Waves - Forces

See Energy Sources and Sustainability Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Demonstrates understanding of how friction and air resistance can both be useful, for example, in braking systems, and also a problem, for example, causing moving parts to wear.

Researches how friction and air resistance are used in everyday life including useful examples and associated problems.

Describes efficient movement as that which requires the least possible energy and suggests ways to improve efficiency in moving objects, for example, by streamlining.

Researches where streamlining has been used in everyday life e.g. manufacturing of objects, sport, transport, nature.

Finds an association between air resistance (drag), the speed of the object being investigated and the surface area exposed to the air, making links to original predictions.

Investigates the relationship between air resistance, speed and surface area of the object using everyday objects e.g. parachutes, feathers, shuttlecocks.

Discusses how to reduce air resistance to improve the efficiency of moving objects.

Describes friction as a force which opposes the motion of moving objects, for example, two solid surfaces rubbing against one another or a solid surface moving through air or water.

Observes and explores the effect of friction on the movement of objects.

Compares and contrasts the effect of friction on the movement of objects using different materials/surfaces.

Describes practical applications of magnetic, electrostatic and gravitational forces, for example, magnetised needle in a compass.

Explains how some objects may become electrically charged by rubbing two surfaces together and how the charges produce an electrostatic force.

Discusses everyday examples of electrostatic force e.g. hair standing on end when jumping on a trampoline or bouncy castle.

Investigates and demonstrates understanding that magnetic and electrostatic forces can both repel and attract.

Explores different ways to electrically charge objects to create an electrostatic force e.g. rubbing a balloon, picking up paper with a plastic rod.

Measures gravitational force with a force meter or newton meter and records results using appropriate units (newtons).

Explores magnetic, electrostatic and gravitational forces using different models e.g. simulations.

Explores applications of buoyancy in everyday life.

Explores the factors which affect floating, for example, the object's shape and the density of the material that the object is made of, and collates, organises and summarises findings with assistance.

Investigates how to make objects float and sink in water (changing the buoyancy) by altering shape and density of the material the object is made of.

Recognises how density is related to the mass and volume of a material.

Predicts and begins to justify which everyday objects will float or sink in water, based on the shape and density of the object.

Second Level: Forces, Electricity and Waves - Electricity

Experiences and Outcomes	Benchmarks
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	• Designs and builds a variety of electrical circuits for differing purposes, using an increasing range of components. • Draws circuit diagrams using appropriate symbols to denote a bulb, switch, motor, bell, buzzer, wires, cell and a battery. • Describes how components in a circuit transfer energy into different forms.
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	• Applies knowledge and understanding to build simple batteries (chemical cells) and demonstrates understanding that a battery (cell) is a portable energy source which has a store of chemical energy. • Explains the process of energy transformation from battery (cell) to electrical components.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. <u>Analyses, interprets and evaluates scientific findings</u> • Makes links to original questions or predictions. • Identifies and discusses additional knowledge and understanding gained. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society.

Second Level: Forces, Electricity and Waves - Electricity

See Energy Sources and Sustainability Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Applies knowledge and understanding to build simple batteries (chemical cells) and demonstrates understanding that a battery (cell) is a portable energy source which has a store of chemical energy.

Identifies a number of devices and appliances that use different batteries.

Recognises the benefits and dangers of different batteries.

Explains the process of energy transformation from battery (cell) to electrical components.

Interprets a circuit diagram to identify circuit components and build the circuit.

Identifies everyday examples of electrical circuits and the associated energy transfers.

Draws circuit diagrams using appropriate symbols to denote a bulb, switch, motor, bell, buzzer, wires, cell and a battery.

Designs and builds a variety of electrical circuits for differing purposes, using an increasing range of components.

Describes how components in a circuit transfer energy into different forms

Draws and explains a simple energy transfer diagram.

Identifies a range of circuit components and their associated symbols.

Recognises the energy transfers associated with different circuit components e.g. bulb, electrical --> light + heat.

Identifies a range of circuit components and what they do.

Demonstrates how to stay safe when building a circuit.

Second Level: Forces, Electricity and Waves – Vibrations and Waves

Experiences and Outcomes	Benchmarks
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	• Discusses and demonstrates through experiments how sound travels differently through air, water and solids. • Explains how hearing is limited by a range of factors, for example, age, position, and flexibility (direction) of ears.
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	• Demonstrates and records, through practical investigations, that light travels in straight lines, can be reflected by highly-polished surfaces and that curved faces can distort the image. • Predicts and investigates how the position, shape and size of a shadow depend on the position of the object in relation to the light source. • Demonstrates that white light/sunlight can be dispersed to show the colours of the visible spectrum and identifies the colours and order of the rainbow as red, orange, yellow, green, blue, indigo and violet. • Explains that we see objects because they give out or reflect light rays that enter our eyes. • Draws on findings from practical investigations to describe the effect that coloured filters have on white light and how they can be used to make other colours. • Explains how we can recognise the colour of an object due the reflection and absorption of particular parts of the visible spectrum.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts.

Second Level: Forces, Electricity and Waves – Vibrations and Waves

See Topical Science Pathway to develop real life contexts.

See Body Systems and Cells Pathway to link learning.

Explains how hearing is limited by a range of factors, for example, age, position, and flexibility (direction) of ears.

Researches and compares how animals communicate using sound with one another and presents findings.

Researches and compares how the shape and position of the ears affects the hearing range of different animals.

Recognises the ear is the organ which detects sound.

Discusses and demonstrates through experiments how sound travels differently through air, water and solids.

Explores how sound vibrations are carried by waves through air, water and solids as a result of the vibration of particles using different models and simulations.

Observes the effect of changing volume and frequency (pitch) of sound on the sound waves produced using different models and simulations.

Draws on findings from practical investigations to describe the effect that coloured filters have on white light and how they can be used to make other colours.

Identifies the primary and secondary colours of light.

Explores the effect of coloured filters and how to make other colours.

Explains how we can recognise the colour of an object due the reflection and absorption of particular parts of the visible spectrum.

Explores using different models and simulations how we can recognise the colour of an object.

Predicts and investigates how the position, shape and size of a shadow depend on the position of the object in relation to the light source.

Explores how to create shadows and how to vary their position, shape and size.

Demonstrates and records, through practical investigations, that light travels in straight lines, can be reflected by highly-polished surfaces and that curved faces can distort the image.

Demonstrates that white light/sunlight can be dispersed to show the colours of the visible spectrum and identifies the colours and order of the rainbow as red, orange, yellow, green, blue, indigo and violet.

Explores how to disperse white light/sunlight to form the visible spectrum.

Discusses when and how white light/sunlight disperses to show the colours of the visible spectrum in nature e.g. rainbows.

Explains that we see objects because they give out or reflect light rays that enter our eyes.

Explores and observes how light travels from a variety of sources (natural and artificial) and is reflected and absorbed by different surfaces.

Recognises the eye is the organ which detects light.

Second Level: Biological Systems – Body Systems and Cells – 2-12a

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
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	**The expectation is that at least two of the following body systems will be studied at Second Level.** Respiratory system • Describes the function of the respiratory system (lungs, windpipe and bronchi), for example, in gas exchange. • Discusses the main preventable causes of bronchitis, lung cancer and asthma, for example, smoking. Circulatory system • Describes the function of the circulatory system (heart and blood vessels), for example, transport of food, oxygen and waste materials. • Discusses the main preventable causes of heart disease or stroke, for example, obesity, lack of exercise, smoking and high (saturated) fat diet. Digestive system • Describes the function of the digestive system (mouth, oesophagus, stomach, liver, small intestine, large intestine, rectum and anus), for example, breakdown of food and absorption of nutrients, minerals and water. • Discusses the main preventable causes of liver disease, for example, alcohol and drug misuse. Reproductive system • Describes the function of the reproductive system (penis, testes, sperm tube/duct, ovaries, egg tube/duct, uterus and vagina), for example, to make a baby. • Discusses some preventable causes of fertility problems, for example, alcohol misuse, anorexia and obesity. Skeletal system • Describes the function of the skeleton (skull, spine, ribcage some bones of the arm and leg), for example, to provide support, protection and enable movement. • Discusses some common problems of bones (for example, arthritis, osteoporosis and breaks) and how their incidence can be reduced (for example, through calcium in the diet and weight-bearing exercise).

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. <u>Carries out practical activities in a variety of learning environments</u> • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. <u>Presents scientific findings</u> • Reports collaboratively and individually using a range of methods. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts.
Skills and attributes of scientifically literate citizens	• Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society.

Second Level: Biological Systems – Body Systems and Cells – 2-12a

*Sub-organiser has been split across pages

The expectation is that at least two of the following body systems will be studied at Second Level.

See HWB Experiences and Outcomes to link learning.

See Topical Science Pathway to develop real life contexts.

Respiratory system
- **Describes the function of the respiratory system (lungs, windpipe and bronchi), for example, in gas exchange.**

Circulatory system
- **Describes the function of the circulatory system (heart and blood vessels), for example, transport of food, oxygen and waste materials.**

Digestive system
- **Describes the function of the digestive system (mouth, oesophagus, stomach, liver, small intestine, large intestine, rectum and anus), for example, breakdown of food and absorption of nutrients, minerals and water.**

Skeletal system
- **Describes the function of the skeleton (skull, spine, ribcage some bones of the arm and leg), for example, to provide support, protection and enable movement.**

Reproductive system
- **Describes the function of the reproductive system (penis, testes, sperm tube/duct, ovaries, egg tube/duct, uterus and vagina), for example, to make a baby.**

Respiratory system
- **Discusses the main preventable causes of bronchitis, lung cancer and asthma, for example, smoking.**

Circulatory system
- **Discusses the main preventable causes of heart disease or stroke, for example, obesity, lack of exercise, smoking and high (saturated) fat diet.**

Digestive system
- **Discusses the main preventable causes of liver disease, for example, alcohol and drug misuse.**

Skeletal system
- **Discusses some common problems of bones (for example, arthritis, osteoporosis and breaks) and how their incidence can be reduced (for example, through calcium in the diet and weight-bearing exercise).**

Reproductive system
- **Discusses some preventable causes of fertility problems, for example, alcohol misuse, anorexia and obesity.**

Describes the function of each organ in the chosen system(s).

Describes the position and location of the organs of the chosen system(s).

Explores different models and representations of the organs of the chosen system(s).

Identifies the organs of the chosen system(s).

Discusses essential human body functions required for survival with reference to different body systems.

Explores the different systems of the human body.

Explores how the organs work together in different body systems.

Formulates and expresses their opinions on how best to maintain the health of a chosen system(s).

Researches preventable causes of common conditions and illnesses affecting a chosen system(s).

Identifies the conditions and illnesses that can affect a chosen system(s).

Second Level: Biological Systems – Body Systems and Cells – 2-12b

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
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	• Describes how senses work individually or together to keep people safe from harm. • Demonstrates understanding of how, if one sense is impaired, it can have an effect on the other senses, either positively or negatively. • Describes how light enters the eye through the pupil and how the pupil changes size in dark/light conditions.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. <u>Carries out practical activities in a variety of learning environments</u> • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. <u>Presents scientific findings</u> • Reports collaboratively and individually using a range of methods. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts.
Skills and attributes of scientifically literate citizens	• Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society.

Second Level: Biological Systems – Body Systems and Cells – 2-12b

*Sub-organiser has been split across pages

See Topical Science Pathway to develop real life contexts.

See Vibrations and Waves Pathway to link learning.

Investigates the role of the nervous system in detecting and responding to changing environmental conditions.

Describes how senses work individually or together to keep people safe from harm.

Discusses involuntary (e.g. hair stands on end when it is cold) and voluntary (e.g. wrapping a blanket around yourself) body responses to changing environmental conditions.

Discusses how our body responds to changes detected in the environment by our senses (e.g. brightness levels – pupils dilate / constrict and wear sunglasses).

Identifies the different environment conditions detected by different senses.

Demonstrates understanding of how, if one sense is impaired, it can have an effect on the other senses, either positively or negatively.

Researches different sensory impairments and ways to support affected individuals.

Designs experiments and shares findings to test senses working individually or together.

Explores how our senses work together.

Describes how light enters the eye through the pupil and how the pupil changes size in dark/light conditions.

Observes the pupil changing size in different light conditions.

Identifies the main parts of the eye and their associated functions.

Second Level: Biological Systems – Body Systems and Cells – 2-13a

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
I have contributed to investigations into the role of microorganisms in producing and breaking down some materials. SCN 2-13a	• Demonstrates understanding of how microorganisms, including bacteria, viruses and fungi, can multiply rapidly. • Investigates and explains the action of some microorganisms used in food production, for example, yeast in bread and bacteria in yoghurt. • Describes how some micro-organisms break down food causing it to be inedible or harmful if digested, and how others exist in the gut to break down food to aid digestion. • Investigates, observes and records how microscopic organisms are necessary for the process of decomposition (the breaking down of dead material – decay).

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. <u>Carries out practical activities in a variety of learning environments</u> • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. <u>Presents scientific findings</u> • Reports collaboratively and individually using a range of methods. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts.
Skills and attributes of scientifically literate citizens	• Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society.

Second Level: Biological Systems – Body Systems and Cells – 2-13a

*Sub-organiser has been split across pages

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

Demonstrates understanding of how microorganisms, including bacteria, viruses and fungi, can multiply rapidly.

Compares and contrasts single-celled and multi-cellular organisms.

Explores different models and representations of the main types of micro-organisms.

Demonstrates understanding that all organisms are composed of cells.

Investigates and explains the action of some microorganisms used in food production, for example, yeast in bread and bacteria in yoghurt.

Researches the action of micro-organisms in food production.

Compares and contrasts the benefits and dangers of some micro-organisms.

Describes how some micro-organisms break down food causing it to be inedible or harmful if digested, and how others exist in the gut to break down food to aid digestion.

Investigates food spoilage by micro-organisms and ways to retain food freshness (e.g. fridge/freezer).

Explores how some micro-organisms can cause illness.

Investigates, observes and records how microscopic organisms are necessary for the process of decomposition (the breaking down of dead material – decay).

Explains the importance of decomposition in the environment.

Second Level: Biological Systems - Inheritance

Experiences and Outcomes	Benchmarks
By investigating the lifecycles of plants and animals, I can recognise the different stages of their development. SCN 2-14a	Plants • Describes how pollination occurs when the male cell (pollen) lands on the stigma. • Describes how fertilisation (sexual reproduction) occurs when the genetic information in the male cell fuses (joins) with the genetic information in the female cell. • Describes how the fertilised ovule develops into a seed and how the ovary ripens to form a fruit. • Investigates and explains how a seed germinates into a plant using water, oxygen, a food store and warmth. Animals • Identifies and compares the two distinct groups of animals – vertebrates and invertebrates. • Researches the lifecycles of the five main types of vertebrates including fish (spawn), birds (eggs which are rigid but fragile), amphibians (spawn and metamorphosis), reptiles (leathery shelled eggs) and mammal (live young) and communicates findings using a range of media. • Compares the lifecycles of some invertebrates, for example, ladybird and spider.
By exploring the characteristics offspring inherit when living things reproduce, I can distinguish between inherited and non-inherited characteristics. SCN 2-14b	• Knows that genetics is the study of inherited characteristics and that inherited characteristics are carried on genes and can sometime skip a generation. • Explores and categorises characteristics into inherited (eye and hair colour, height and right/left handedness) and non-inherited (native language spoken and favourite colour). • Describes how every living thing has its own DNA fingerprint.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. <u>Carries out practical activities in a variety of learning environments</u> • Makes observations and collects information and measurements using appropriate devices and units. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods.
Scientific analytical thinking skills	• Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations.

Second Level: Biological Systems - Inheritance

See Biodiversity and Interdependence Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Investigates and explains how a seed germinates into a plant using water, oxygen, a food store and warmth.

Compares and contrasts different fruits and how their seeds are dispersed.

Describes how the fertilised ovule develops into a seed and how the ovary ripens to form a fruit.

Describes how fertilisation (sexual reproduction) occurs when the genetic information in the male cell fuses (joins) with the genetic information in the female cell.

Compares and contrasts flowers pollinated in different ways.

Describes how pollination occurs when the male cell (pollen) lands on the stigma.

Identifies and describes the different stages of a flowering plant lifecycle e.g. germination, plant growth, flower production, pollination, fertilisation, fruit formation, seed dispersal.

Explores different methods of pollination e.g. wind and insects.

Investigates the different parts of a flower.

Compares the lifecycles of some invertebrates, for example, ladybird and spider.

Researches the lifecycles of the five main types of vertebrates including fish (spawn), birds (eggs which are rigid but fragile), amphibians (spawn and metamorphosis), reptiles (leathery shelled eggs) and mammal (live young) and communicates findings using a range of media.

Identifies and compares the two distinct groups of animals – vertebrates and invertebrates.

Explores and categorises characteristics into inherited (eye and hair colour, height and right/left handedness) and non-inherited (native language spoken and favourite colour).

Compares and contrasts different inherited characteristics (discrete e.g. distinct and observed such as eye colour and continuous e.g. measured and wide ranging such as height).

Demonstrates understanding that non-inherited characteristics are the result of the environment they live in.

Knows that genetics is the study of inherited characteristics and that inherited characteristics are carried on genes and can sometimes skip a generation.

Describes how every living thing has its own DNA fingerprint.

Demonstrates understanding that DNA is a chemical which carries the unique genetic code of all living things within their cells.

Demonstrates understanding that all cells including sex cells carry genetic information (DNA) organised into genes which determine a living things inherited characteristics.

Explains that when living things reproduce, genetic information (DNA) is passed on to the offspring.

Demonstrates understanding that most animals and plants produce male and female sex cells in order to reproduce.

Second Level: Materials – Properties and Uses of Substances – 2-15a

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. SCN 2-15a	• Investigates and explains physical changes to the properties of materials which are fully and partially reversible, for example, salt dissolving in water, chocolate melting and water freezing. • Uses scientific vocabulary such as 'melting', 'freezing', 'evaporating' and 'condensing' to describe changes of state. • Investigates and records chemical changes to the properties of materials which are irreversible, for example, cooking, rusting and striking a match. • Observes and identifies some of the signs of a chemical reaction, for example, production of bubbles, colour/texture change and heat given out/taken in. • Explores and describes the characteristics of solids, liquids and gases, for example, solids retain the same volume and shape, liquids keep the same volume but the shape changes to fit the container and that gases change shape and volume to fill the container.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Materials – Properties and Uses of Substances – 2-15a

*Sub-organiser has been split across pages

See Topical Science Pathway to develop real life contexts.

See Processes of the Planet Pathway to link learning.

See Chemical Changes Pathway to link learning.

Explores and describes the characteristics of solids, liquids and gases, for example, solids retain the same volume and shape, liquids keep the same volume but the shape changes to fit the container and that gases change shape and volume to fill the container.

Compares and contrasts the characteristics (properties) of solids, liquids and gases in everyday life.

Uses scientific vocabulary such as 'melting', 'freezing', 'evaporating' and 'condensing' to describe changes of state.

Investigates and explains physical changes to the properties of materials which are fully and partially reversible, for example, salt dissolving in water, chocolate melting and water freezing.

Identifies examples of physical changes in everyday life e.g. ice cream melting.

Observes and identifies some of the signs of a chemical reaction, for example, production of bubbles, colour/texture change and heat given out/taken in.

Discusses how to stay safe when observing chemical reactions e.g. inhaling gases produced.

Investigates and records chemical changes to the properties of materials which are irreversible, for example, cooking, rusting and striking a match.

Discusses the impact of chemical changes on the properties of different materials.

Identifies examples of chemical changes in everyday life e.g. bread to toast.

Second Level: Materials – Properties and Uses of Substances – 2-16a/b

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience. SCN 2-16a	• Draws on findings from practical investigations to explain how a mixture of solids of different sizes can be separated using a sieve or magnet, for example, sand and peas or salt and iron filings. • Selects the most appropriate practical technique for separating insoluble solids, for example, filtering or sieving. • Explains why a dissolved solid cannot be separated from the solvent by filtering but can be separated by evaporation. • Uses scientific vocabulary such as 'soluble', 'insoluble', 'dissolve' and 'solution' in context. • Relates findings of practical investigations about dissolving to everyday experiences, for example, recycling, salt production and water purification.
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	• Finds an association between the quantity of substance that dissolves and a range of conditions – temperature, time, particle size, stirring and quantity of solvent. • Investigates how a range of factors such as particle size and heat can affect the rate of dissolving. • Relates learning about the quantity and rate of dissolving to everyday examples such as dissolving sugar in tea or salt in water (granules or big crystals, hot or cold liquid, stirred or not stirred).

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Materials – Properties and Uses of Substances – 2-16a/b

*Sub-organiser has been split across pages

See Topical Science Pathway to develop real life contexts.

See Chemical Changes Pathway to link learning.

Relates findings of practical investigations about dissolving to everyday experiences, for example, recycling, salt production and water purification.

Researches how technology is used to separate mixtures of substances in everyday life.

Relates learning about the quantity and rate of dissolving to everyday examples such as dissolving sugar in tea or salt in water (granules or big crystals, hot or cold liquid, stirred or not stirred).

Explains why a dissolved solid cannot be separated from the solvent by filtering but can be separated by evaporation.

Uses scientific vocabulary such as 'soluble', 'insoluble', 'dissolve' and 'solution' in context.

Investigates how a range of factors such as particle size and heat can affect the rate of dissolving.

Finds an association between the quantity of substance that dissolves and a range of conditions – temperature, time, particle size, stirring and quantity of solvent.

Discusses the difference in particle size and how this relates to solubility.

Observes dissolving in action to compare soluble and insoluble solids.

Demonstrates understanding that all substances are made of particles of varying sizes.

Draws on findings from practical investigations to explain how a mixture of solids of different sizes can be separated using a sieve or magnet, for example, sand and peas or salt and iron filings.

Selects the most appropriate practical technique for separating insoluble solids, for example, filtering or sieving.

Demonstrates understanding of the need to change only one variable (factor) at a time during an investigation to ensure results are valid.

Explores different techniques used to separate a mixture of solids including insoluble solids e.g. filtering, sieving, using magnets.

Second Level: Materials – Earth's Materials

Experiences and Outcomes	Benchmarks
Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses. SCN 2-17a	• Analyses and compares samples of rocks, soil and minerals and reports their characteristics and uses, using a range of media.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Materials – Earth's Materials

See Topical Science Pathway to develop real life contexts.

See Biodiversity and Interdependence Pathway to link learning.

Discusses the sustainability of using Earth's materials.

Analyses and compares samples of rocks, soil and minerals and reports their characteristics and uses, using a range of media.

Compares and contrasts the characteristics and uses of different types of rocks, soils and minerals.

Explores how Earth's materials are excavated.

Explores different types of rocks/minerals/soil, their composition and uses in the environment.

Explores the layers of the Earth.

Second Level: Materials – Chemical Changes

Experiences and Outcomes	Benchmarks
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	• Uses knowledge of the water cycle to explain how the quantity of water on the Earth has remained approximately the same. • Investigates and discusses the methods used to purify water, for example, sedimentation, filtration, evaporation, desalination and the addition of chemicals such as chlorine. • Researches methods used to conserve water within the home, school and globally and communicates findings to others. • Discusses the many uses of water, for example, to support all living things, in preservation (ice) and to generate electricity.
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	• Collaborates with others to safely demonstrate simple chemical reactions, for example, effervescence. • Investigates examples of everyday chemical reactions, such as burning and corrosion, and names some of the new substances which are produced. • Uses prior knowledge to identify when a chemical reaction has occurred to produce a new substance.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Formulates questions and predictions (hypotheses), with assistance, based on observations and information. • Identifies the independent, dependent and controlled variables, with assistance. • Anticipates some risks and hazards. <u>Carries out practical activities in a variety of learning environments</u> • Applies appropriate safety measures. • Contributes to carrying out all the procedures. • Makes observations and collects information and measurements using appropriate devices and units. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information. • Identifies relationships between the independent and dependent variables. • Makes links to original questions or predictions. • Relates findings to the wider world. • Draws basic conclusions consistent with findings. • Identifies and discusses additional knowledge and understanding gained. • Recognises anomalous results and suggests possible sources of error. • Evaluates the investigation and suggests one way of improving it if it was to be repeated. <u>Presents scientific findings</u> • Presents data/information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. • Reports collaboratively and individually using a range of methods. • Collates, organises and summarises findings, with assistance, using headings or questions to provide structure for presentations. • Uses appropriate scientific vocabulary and acknowledges sources, with assistance.
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with assistance, working with less familiar (or familiar but more complex) contexts. • Applies understanding, and a combination of more than one science concept, to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Presents a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts, and engages with the views of others. • Expresses informed views about scientific and environmental issues based on evidence.

Second Level: Materials – Chemical Changes

See Energy Sources and Sustainability Pathway to link learning.

See Processes of the Planet Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Discusses the many uses of water, for example, to support all living things, in preservation (ice) and to generate electricity.

Investigates and discusses the methods used to purify water, for example, sedimentation, filtration, evaporation, desalination and the addition of chemicals such as chlorine.

Researches and justifies the use of different water purification methods locally and globally.

Using simple experiments and models, explores different methods of water purification.

Discusses the need and importance of water purification.

Uses knowledge of the water cycle to explain how the quantity of water on the Earth has remained approximately the same.

Researches methods used to conserve water within the home, school and globally and communicates findings to others.

Knowledge and understanding of the water cycle and water conservation is developed in the Processes of the Planet Pathway.

See Properties and Uses of Substances Pathway to link learning.

Explores the safety of chemical reactions in everyday life e.g. carbon monoxide detectors.

Researches how chemical reactions are important to everyday life e.g. cooking, heating our homes.

Investigates examples of everyday chemical reactions, such as burning and corrosion, and names some of the new substances which are produced.

Uses prior knowledge to identify when a chemical reaction has occurred to produce a new substance.

Collaborates with others to safely demonstrate simple chemical reactions, for example, effervescence.

Knowledge and understanding of chemical reactions is developed in the Properties and Uses of Substances Pathway.

Second Level: Topical Science

Experiences and Outcomes	Benchmarks
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	• Researches historic and contemporary scientists (ensuring gender balance) and their scientific discoveries and reports collaboratively to others using a range of methods. • Describes the impact of scientific discovery, creativity and invention on society past and present, for example, in design, medicine and agriculture. • Demonstrates understanding of how science impacts on every aspect of our lives. • Relates the development of scientific skills in the classroom to an increasingly wide variety of science, technology, engineering and mathematics (STEM) careers.
I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. SCN 2-20b	• Explores items of current scientific interest within the school, local community, nationally or in the global media and collates, organises and summarises findings, with assistance. • Shares opinions about a variety of topical scientific issues considering, for example, moral, ethical, societal, cultural, economic and environmental aspects.

Examples of skills that can be developed:	
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations. • Demonstrates increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. • Expresses informed views about scientific and environmental issues based on evidence

Second Level: Topical Science

Shares opinions about a variety of topical scientific issues considering, for example, moral, ethical, societal, cultural, economic and environmental aspects.

Respects different opinions around topical scientific issues.

Researches historic and contemporary scientists (ensuring gender balance) and their scientific discoveries and reports collaboratively to others using a range of methods.

Describes the impact of scientific discovery, creativity and invention on society past and present, for example, in design, medicine and agriculture.

Explores items of current scientific interest within the school, local community, nationally or in the global media and collates, organises and summarises findings with assistance.

Relates the development of scientific skills in the classroom to an increasingly wide variety of science, technology, engineering and mathematics (STEM) careers.

Finds relevant information about a range of scientists and their discoveries from more than one source, including digital media.

Identifies a range of scientific discoveries and their impact on society past and present.

Contributes to discussions about the impact of science on their everyday lives.

Demonstrates understanding of how science impacts on every aspect of our lives.

Demonstrates understanding of how scientific skill development relates to the world of work.

Recognises how the contributions of historic scientists have supported the work of contemporary scientists.

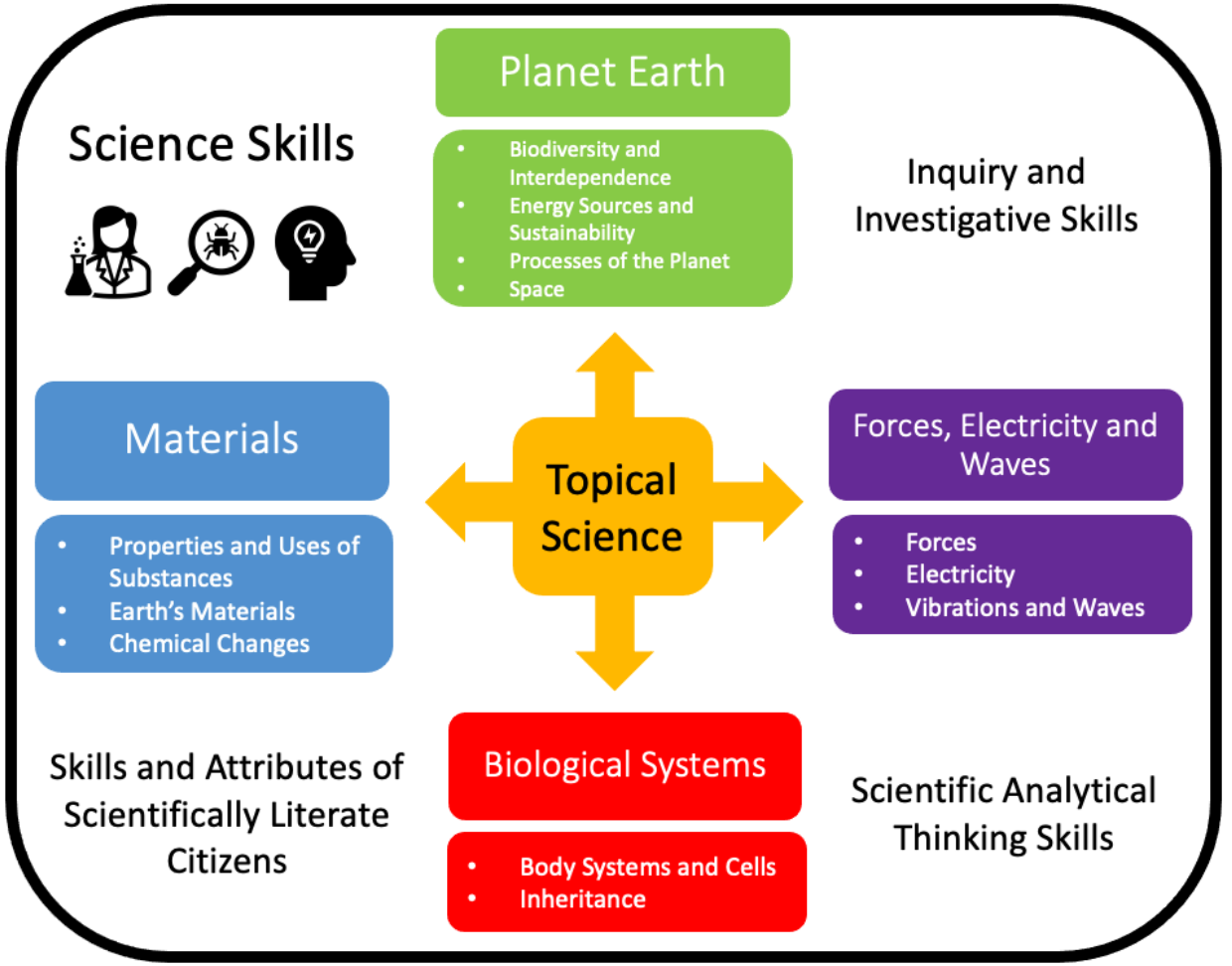
Identifies how different aspects of science are relevant to their everyday lives.

Asks questions about how science impacts on the world around us.

Identifies and discusses careers in STEM.

Identifies topical scientific issues.

Third Level


Science Skills
Planet Earth
Biodiversity and Interdependence
Energy Sources and Sustainability
Processes of the Planet
Space
Inquiry and Investigative Skills
Materials
Properties and Uses of Substances
Earth's Materials
Chemical Changes
Topical Science
Forces, Electricity and Waves
Forces
Electricity
Vibrations and Waves
Skills and Attributes of Scientifically Literate Citizens
Biological Systems
Body Systems and Cells
Inheritance
Scientific Analytical Thinking Skills

Third Level: Planet Earth - Biodiversity and Interdependence

Experiences and Outcomes	Benchmarks
I can sample and identify living things from different habitats to compare their biodiversity and can suggest reasons for their distribution. SCN 3-01a	• Identifies living things using biological keys. • Collects and analyses increasingly complex data and information, for example, temperature and light intensity, to suggest reasons for the distribution of organisms within different habitats.
I have collaborated on investigations into the process of photosynthesis and I can demonstrate my understanding of why plants are vital to sustaining life on Earth. SCN 3-02a	• Describes the process of photosynthesis (using the word equation) in terms of reactants (raw materials) and products. • Applies knowledge gained from practical investigations to explain how green plants make their own food in the form of sugars and store this as starch. • Investigates and presents information on how plants help to sustain life, for example, by providing oxygen, food, habitat, raw materials and medicines.
Through investigations and based on experimental evidence, I can explain the use of different types of chemicals in agriculture and their alternatives and can evaluate their potential impact on the world's food production. SCN 3-03a	• Interprets data and information to establish a link between the use of fertilisers and plant yield and nutrient levels in the soil. • Researches an agricultural method, for example, chemical fertilisers, herbicides, pesticides, organic methods, genetic modification (GM) and biological control and evaluates their impact on food production.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Planet Earth - Biodiversity and Interdependence

See Earth's Materials Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

See Processes of the Planet Pathway to link learning.

Collects and analyses increasingly complex data and information, for example, temperature and light intensity, to suggest reasons for the distribution of organisms within different habitats.

Uses abiotic factor data to predict and justify the distribution of organisms living within different habitats.

Investigates and presents information on how plants help to sustain life, for example, by providing oxygen, food, habitat, raw materials and medicines.

Researches an agricultural method, for example, chemical fertilisers, herbicides, pesticides, organic methods, genetic modification (GM) and biological control and evaluates their impact on food production.

Demonstrates understanding of the impact of abiotic and biotic factors (e.g. predators, disease) on the number and distribution of organisms within an ecosystem.

Applies knowledge gained from practical investigations to explain how green plants make their own food in the form of sugars and store this as starch.

Recognises the importance of plants and how they can be used innovatively to support biodiversity and sustainability.

Formulates and expresses their opinions on different agricultural methods using research evidence.

Describes some common techniques used to sample organisms (e.g. quadrat, pitfall trap, pond dipping).

Conducts experiments to test plant leaves stored in different environmental conditions for the presence of starch.

Describes the process of photosynthesis (using the word equation) in terms of reactants (raw materials) and products.

Discusses the impact on food production when using different agricultural methods.

Interprets data and information to establish a link between the use of fertilisers and plant yield and nutrient levels in the soil.

Uses different equipment to measure different abiotic factors (e.g. temperature, light intensity, soil moisture).

Constructs simple biological keys to classify a variety of living things.

Recognises that photosynthesis is a chemical reaction controlled by enzymes.

Demonstrates understanding that plants release oxygen produced during photosynthesis back into the air which is important to maintain the gas balance in our atmosphere.

Analyses data to identify trends linking the effect of fertiliser use on plant yield and soil nutrient levels.

Demonstrates understanding that plants can store the glucose (chemical energy) made during photosynthesis as starch.

Identifies the raw materials (carbon dioxide and water) and products of photosynthesis (glucose and oxygen).

Conducts simple sampling activities to estimate the number of organisms living in a particular habitat.

Identifies living things using biological keys.

Collects data about the effect of fertilisers on plant yield and nutrient levels.

Uses branching and paired-statement keys of increasing complexity to identify different living things.

Demonstrates understanding that plants contain photosynthetic pigments (e.g. chlorophyll) to absorb light energy from the sun.

Identifies uses of plants by humans and other species.

Third Level: Planet Earth - Energy Sources and Sustainability

Experiences and Outcomes	Benchmarks
I can use my knowledge of the different ways in which heat is transferred between hot and cold objects and the thermal conductivity of materials to improve energy efficiency in buildings or other systems. SCN 3-04a	• Applies knowledge from practical investigations to explain how heat is transferred by conduction, convection and radiation. • Establishes a link between heat loss in buildings and the temperature difference between the inside and outside of the building. • Applies understanding of thermal energy efficiency, conductors and insulators to explain how materials can be used in building design to reduce heat loss, for example, in double and triple glazing.
By investigating renewable energy sources and taking part in practical activities to harness them, I can discuss their benefits and potential problems. SCN 3-04b	• Presents research findings on the advantages and disadvantages associated with the use of renewable energy sources and their impact on society, demonstrating an informed view based on evidence.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Planet Earth - Energy Sources and Sustainability

See Electricity Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Applies learning from experimental findings and research to formulate and express their opinions on the use of renewable energy sources.

Justifies the use of different materials in building design to reduce heat loss.

Applies understanding of thermal energy efficiency, conductors and insulators to explain how materials can be used in building design to reduce heat loss, for example, in double and triple glazing.

Presents research findings on the advantages and disadvantages associated with the use of renewable energy sources and their impact on society, demonstrating an informed view based on evidence.

Establishes a link between heat loss in buildings and the temperature difference between the inside and outside of the building.

Investigates different surfaces reflecting and absorbing infrared radiation and relates findings to materials used in building design.

Discusses the impact of renewable energy sources on society and the environment.

Applies knowledge from practical investigations to explain how heat is transferred by conduction, convection and radiation.

Explains the difference between temperature and heat (thermal) energy.

Explores how heat (thermal) energy flows from hot to cold objects.

Identifies common ways heat (thermal) energy is lost by conduction, convection and radiation from buildings.

Researches different types of renewable energy using a range of reliable and robust sources e.g. websites, journals, books.

Plans and carries out experiments to investigate how energy is harnessed from renewable sources.

Discusses and shares findings of the transference of heat (thermal) energy by the processes of conduction, convection and radiation.

Measures and calculates temperature difference between a variety of environments.

Identifies common conductors and insulators of heat (thermal) energy.

Plans and carries out experiments to investigate how heat is transferred by conduction, convection and radiation.

Third Level: Planet Earth - Processes of the Planet

Experiences and Outcomes	Benchmarks
By contributing to experiments and investigations, I can develop my understanding of models of matter and can apply this to changes of state and the energy involved as they occur in nature. SCN 3-05a	• Describes, using particle models and diagrams, the properties of solids, liquids and gases and applies this knowledge to identify and classify unknown substances. • Applies understanding of models of matter to explain changes of state in terms of energy being gained or lost by a substance.
I can explain some of the processes which contribute to climate change and discuss the possible impact of atmospheric change on the survival of living things. SCN 3-05b	• Explains how the levels of carbon dioxide in the atmosphere have increased over time, for example, through respiration of organisms, deforestation and increased combustion of fuels. • Draws on supporting evidence, quotes and sources to demonstrate an association between carbon dioxide in the atmosphere and increasing global temperatures as a result of the greenhouse effect.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
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Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Planet Earth - Processes of the Planet

See Topical Science Pathway to develop real life contexts.

See Properties and Uses of Substances Pathway to link learning.

See Energy Sources and Sustainability Pathway to link learning.

Applies understanding of models of matter to explain changes of state in terms of energy being gained or lost by a substance.

Compares and contrasts the properties of solids, liquids and gases, relating to particle arrangements.

Explains the involvement of energy in the physical process of changing state.

Investigates change of state using simple experiments and shares findings.

Describes, using particle models and diagrams, the properties of solids, liquids and gases and applies this knowledge to identify and classify unknown substances.

Demonstrates understanding that all matter is composed of particles called atoms.

Demonstrates matter exists in three states e.g. solid, liquid, gas, using particle models / diagrams.

Identifies common everyday examples of solids, liquids and gases in different settings / environments.

Formulates and expresses their opinions on different views about climate change using research evidence.

Draws on supporting evidence, quotes and sources to demonstrate an association between carbon dioxide in the atmosphere and increasing global temperatures as a result of the greenhouse effect.

Explains how the levels of carbon dioxide in the atmosphere have increased over time, for example, through respiration of organisms, deforestation and increased combustion of fuels.

Researches the association between increasing atmospheric carbon dioxide levels and increasing global temperatures using a range of reliable and robust sources e.g. websites, journals, books.

Discusses local, national and global solutions to reducing atmospheric carbon dioxide levels.

Describes the greenhouse effect.

Explores human impact on the carbon cycle and how this relates to climate change.

Identifies and explains the processes of the carbon cycle.

Third Level: Planet Earth - Space

Experiences and Outcomes	Benchmarks
By using my knowledge of our solar system and the basic needs of living things, I can produce a reasoned argument on the likelihood of life existing elsewhere in the universe. SCN 3-06a	• Presents a reasoned argument on the likelihood of life existing elsewhere in the universe including factors such as: the distance of planets from their stars, the number of stars in the universe and the availability of liquid water, nutrients and energy.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Planet Earth - Space

See Topical Science Pathway to develop real life contexts.

Presents a reasoned argument on the likelihood of life existing elsewhere in the universe including factors such as: the distance of planets from their stars, the number of stars in the universe and the availability of liquid water, nutrients and energy.

Formulates and expresses their opinions on life existing elsewhere in the universe.

Compares and contrasts the planets in our universe based on the distance of the planets from the sun, the number of stars in the universe and the availability of liquid water, nutrients and energy.

Researches the importance of the distance of planets from their stars, the number of stars in the universe and the availability of liquid water, nutrients and energy for life existing elsewhere in the universe.

Third Level: Forces, Electricity and Waves - Forces

Experiences and Outcomes	Benchmarks
By contributing to investigations of energy loss due to friction, I can suggest ways of improving the efficiency of moving systems. SCN 3-07a	• Draws on findings from investigations to explain how lubrication, streamlining and other methods can be used to reduce friction, reducing the energy lost and improving efficiency.
I have collaborated in investigations into the effects of gravity on objects and I can predict what might happen to their weight in different situations on Earth and in space. SCN 3-08a	• Knows that weight is a force caused by the Earth's (or other planet's) gravitational pull on an object, measured in newtons (N), and uses the formula W = mg to calculate weight. • Predicts the effects on the weight of an object due to the gravitational field strength in different positions in the universe, for example, at different altitudes on Earth, on different planets and in deep space.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Forces, Electricity and Waves - Forces

See Topical Science Pathway to develop real life contexts.

Begins to explore the relationship between speed, distance and time.

Compares and contrasts methods to reduce friction in moving systems.

Draws on findings from investigations to explain how lubrication, streamlining and other methods can be used to reduce friction, reducing the energy lost and improving efficiency.

Plans and carries out investigations to explore the effects of lubrication, streamlining and other methods to reduce friction in moving systems.

Demonstrates understanding of how reducing friction improves efficiency in moving systems.

Demonstrates understanding of how friction causes energy loss.

Predicts the effects on the weight of an object due to the gravitational field strength in different positions in the universe, for example, at different altitudes on Earth, on different planets and in deep space.

Compares and contrasts the weight of an object in different situations on Earth and in space.

Knows that weight is a force caused by the Earth's (or other planet's) gravitational pull on an object, measured in newtons (N), and uses the formula W = mg to calculate weight.

Demonstrates understanding that the mass of an object remains the same in different situations on Earth and in space.

Demonstrates understanding that the weight of an object changes depending upon its mass and the gravitational field strength.

Explores the difference between weight and mass.

Third Level: Forces, Electricity and Waves - Electricity

Experiences and Outcomes	Benchmarks
Having measured the current and voltage in series and parallel circuits, I can design a circuit to show the advantages of parallel circuits in an everyday application. SCN 3-09a	• Applies knowledge from practical investigations to describe the similarities and differences between series and parallel circuits and explain the advantages of parallel circuits in an everyday application.
I can help to design simple chemical cells and use them to investigate the factors which affect the voltage produced. SCN 3-10a	• Investigates and explains how electricity can be produced when different metals are used as electrodes, with an electrolyte between them. • Investigates and discusses the relationship between a range of factors (for example, the combination of metal electrodes used, the electrolyte used, the electrolyte concentration, the distance between electrodes and surface area of electrodes) and the voltage produced by a simple chemical cell.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Forces, Electricity and Waves - Electricity

See Energy Sources and Sustainability Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

Researches the sustainability of batteries e.g. production, recycling, impact on the environment.

Investigates and discusses the relationship between a range of factors (for example, the combination of metal electrodes used, the electrolyte used, the electrolyte concentration, the distance between electrodes and surface area of electrodes) and the voltage produced by a simple chemical cell.

Explores the effect of the combination of metal electrodes used, the electrolyte used, the electrolyte concentration, the distance between electrodes and surface area of electrodes on the voltage produced.

Investigates and explains how electricity can be produced when different metals are used as electrodes, with an electrolyte between them.

Explores building simple chemical cells and the importance of using electrodes and an electrolyte to complete the circuit.

Demonstrates understanding that a battery is made up of cells and a cell converts chemical energy into electrical energy.

Applies knowledge from practical investigations to describe the similarities and differences between series and parallel circuits and explain the advantages of parallel circuits in an everyday application.

Discusses the similarities and differences between series and parallel circuits.

Researches the use of series and parallel circuits in everyday life.

Demonstrates understanding of what happens when a component fails in a series and parallel circuit.

Measures current and voltage in series and parallel circuits.

Designs and builds series and parallel circuits using an increasing range of components.

Third Level: Forces, Electricity and Waves – Vibrations and Waves

Experiences and Outcomes	Benchmarks
By exploring the refraction of light when passed through different materials, lenses and prisms, I can explain how light can be used in a variety of applications. SCN 3-11a	• Demonstrates through practical investigation how refraction can cause a change of direction of light as it passes from one material to another. • Describes the practical applications of refraction in everyday situations, for example, in corrective lenses in glasses, and in magnifying glasses and optical instruments. • Explains how a visible spectrum is produced as light passes through a prism.
By exploring radiations beyond the visible, I can describe a selected application, discussing the advantages and limitations. SCN 3-11b	• Describes the electromagnetic spectrum as a family of waves including Gamma Rays, X-Rays, Ultraviolet, Visible Light, Infrared, Microwaves, Television and Radio. • Researches at least one application of an electromagnetic wave beyond the visible in everyday life, giving advantages and limitations of that application.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Forces, Electricity and Waves – Vibrations and Waves

See Topical Science Pathway to develop real life contexts.

Researches one practical application of refraction in everyday situations e.g. the use of concave and convex lenses.

Describes the practical applications of refraction in everyday situations, for example, in corrective lenses in glasses, and in magnifying glasses and optical instruments.

Investigates the effect of different lenses (convex and concave) on the refraction of light.

Demonstrates through practical investigation how refraction can cause a change of direction of light as it passes from one material to another.

Demonstrates understanding that refraction is the change in speed of light as is passes from one material to another e.g. from air to glass.

Observes the passage of light through different materials.

Explains how a visible spectrum is produced as light passes through a prism.

Discusses how light is refracted as it passes through a prism.

Researches at least one application of an electromagnetic wave beyond the visible in everyday life, giving advantages and limitations of that application.

Compares and contrasts the common properties of the electromagnetic spectrum.

Describes the electromagnetic spectrum as a family of waves including Gamma Rays, X-Rays, Ultraviolet, Visible Light, Infrared, Microwaves, Television and Radio.

Demonstrates understanding that waves carry energy from place to another.

Demonstrates understanding that there are many types of waves including sound waves and waves in the electromagnetic spectrum.

Third Level: Biological Systems – Body Systems and Cells – 3-12a/b *Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
I have explored the structure and function of organs and organ systems and can relate this to the basic biological processes required to sustain life. SCN 3-12a	• Explores and explains the structure and function of at least three of the major organ systems, for example, Respiratory, Circulatory, Digestive, Excretory, Reproductive and Skeletal, and relates this to the basic biological processes required to sustain life.
I have explored the role of technology in monitoring health and improving the quality of life. SCN 3-12b	• Uses a variety of instruments to monitor and record aspects of health, for example, pulse rate, blood pressure and recovery rate and gives examples of other aspects of health that may be monitored, for example, cholesterol and BMI. • Researches one condition that is screened for (for example, bowel cancer, macular degeneration and diabetes) and describes the symptoms of the condition.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Biological Systems – Body Systems and Cells – 3-12a/b *Sub-organiser has been split across pages

Learning at Third Level should take account of, and extend prior learning, both in terms of breadth and depth.

See Topical Science Pathway to develop real life contexts.

See HWB Experiences and Outcomes to link learning.

Explores and explains the structure and function of at least three of the major organ systems, for example, Respiratory, Circulatory, Digestive, Excretory, Reproductive and Skeletal, and relates this to the basic biological processes required to sustain life.

Discusses the relationship between the structure and function of different organs.

Describes the position and location of the organs in the major organ systems.

Describes the function of each organ in the major organ systems.

Identifies the main parts of the major organ systems.

Demonstrates understanding of the levels of organisation in multi-cellular organisms (cells, tissues, organs, organ systems).

Explores the different systems of the human body and how they work together to sustain life.

Researches one condition that is screened for (for example, bowel cancer, macular degeneration and diabetes) and describes the symptoms of the condition.

Explores how health conditions are screened including national screening programmes.

Discusses the importance of health screening.

Uses a variety of instruments to monitor and record aspects of health, for example, pulse rate, blood pressure and recovery rate and gives examples of other aspects of health that may be monitored, for example, cholesterol and BMI.

Discusses the relationship between lifestyle choices and aspects of health.

Researches different technology used to monitor health.

Describes the optimum range of values for different aspects of health e.g. resting pulse rate.

Discusses the variability of health measurements and factors which can have an impact.

Demonstrates how to measure different aspects of health using low and high-tech equipment.

Third Level: Biological Systems – Body Systems and Cells – 3-13a/b/c *Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
Using a microscope, I have developed my understanding of the structure and variety of cells and of their functions. SCN 3-13a	• Identifies the structures found in plant and animal cells and describes their functions. • Describes the main similarities and differences between plant and animal cells. • Researches and describes the structure and function of some specialised cells, for example, nerve, root hair, red blood cell, sperm and egg.
I have contributed to investigations into the different types of microorganisms and can explain how their growth can be controlled. SCN 3-13b	• Applies knowledge from investigations to describe the essential resources that micro-organisms need to grow and reproduce, for example, food, water, warm temperature and a suitable pH. • Draws conclusions from investigations to describe how conditions and chemicals can promote and restrict growth, including temperature, antibiotics and antifungals.
I have explored how the body defends itself against disease and can describe how vaccines can provide protection. SCN 3-13c	• Describes how microbes (for example, bacteria and viruses) can cause disease and infection and how barriers to infection provide a first line of defence, for example, skin, mucus and stomach acids. • Describes how the immune system protects the body against disease if the first line of defence is breached, for example, through the action of white blood cells and production of antibodies. • Applies knowledge of body defence mechanisms to explain how vaccinations can protect individuals and populations from disease.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Biological Systems – Body Systems and Cells – 3-13a/b/c

*Sub-organiser has been split across pages

See Topical Science Pathway to develop real life contexts.

Researches and describes the structure and function of some specialised cells, for example, nerve, root hair, red blood cell, sperm and egg.

Discusses the relationship between the structure and function of a variety of specialised cells.

Compares and contrasts simple plant and animal cells.

Describes the main similarities and differences between plant and animal cells.

Identifies the structures found in plant and animal cells and describes their functions.

Observes a variety of cells and identifies their main structures.

Draws conclusions from investigations to describe how conditions and chemicals can promote and restrict growth, including temperature, antibiotics and antifungals.

Demonstrates understanding that different chemicals are needed to restrict the growth of different micro-organisms e.g. antibiotics prescribed for bacterial infections.

Observes the growth of different micro-organisms in different conditions.

Applies knowledge from investigations to describe the essential resources that micro-organisms need to grow and reproduce, for example, food, water, warm temperature and a suitable pH.

Demonstrates understanding of important safety measures when working with micro-organisms.

Plans and carries out investigations to explore the resources micro-organisms need to grow and reproduce.

Applies knowledge of body defence mechanisms to explain how vaccinations can protect individuals and populations from disease.

Researches common vaccinations and describes how they protect individuals and populations from disease.

Demonstrates understanding that vaccinations trigger an immune system response.

Describes how the immune system protects the body against disease if the first line of defence is breached, for example, through the action of white blood cells and production of antibodies.

Explores the immune systems and how it works to defend the body.

Describes how microbes (for example, bacteria and viruses) can cause disease and infection and how barriers to infection provide a first line of defence, for example, skin, mucus and stomach acids.

Researches common microbes which can disease and infection.

Identifies how microbes (micro-organisms) can enter the body to cause disease and infection.

Third Level: Biological Systems – Inheritance

Experiences and Outcomes	Benchmarks
I understand the processes of fertilisation and embryonic development and can discuss possible risks to the embryo. SCN 3-14a	• Knows that a sex cell (gamete) contains half the genetic information needed to a make a complete individual. • Explains how the nuclei of an egg and a sperm (sex cells) fuse through the process of fertilisation and how the fertilised egg divides repeatedly to form an embryo. • Identifies the main structures within the pregnant womb (for example, placenta, amniotic fluid and umbilical cord) and describes their function. • Gives examples of substances, including toxins, which can cross the placenta from the mother to the embryo and demonstrates understanding of the potential damage to the embryo.
I have extracted DNA and understand its function. I can express an informed view of the risks and benefits of DNA profiling. SCN 3-14b	• Knows that DNA is found in the nucleus of most cells and that it contains the instructions for the development and function of living things (genetic code). • Describes a gene as a piece of DNA which controls specific characteristics in an individual and demonstrates understanding that every individual has a unique combination of genes. • Describes DNA profiling as a way of using technology to analyse DNA to see a unique pattern for an individual and gives examples of practical applications (paternity tests and forensics). • Presents reasoned arguments on the ethical implications of collection, processing, storage and ownership of genetic information or DNA profiles.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Biological Systems – Inheritance

See Topical Science Pathway to develop real life contexts.

See HWB Experiences and Outcomes to link learning.

Gives examples of substances, including toxins, which can cross the placenta from the mother to the embryo and demonstrates understanding of the potential damage to the embryo.

Researches substances which can cause potential harm to an embryo during pregnancy.

Justifies the importance of maintaining good health during pregnancy.

Identifies the main structures within the pregnant womb (for example, placenta, amniotic fluid and umbilical cord) and describes their function.

Explains how the nuclei of an egg and a sperm (sex cells) fuse through the process of fertilisation and how the fertilised egg divides repeatedly to form an embryo.

Describes the stages of embryonic development.

Describes the journey of the sperm to the egg during sexual reproduction.

Demonstrates understanding that an egg and a sperm each containing 23 chromosomes fuse to form a zygote containing 46 chromosomes during fertilisation.

Explores the male and female reproductive systems, identifying the main structures and their functions.

Knows that a sex cell (gamete) contains half the genetic information needed to a make a complete individual.

Demonstrates understanding that all species of organisms have a different chromosome complement e.g. the human species has a chromosome complement of 46.

Demonstrates understanding that human body cells contain 2 sets of 23 chromosomes and sex cells contain 1 set of 23 chromosomes.

Presents reasoned arguments on the ethical implications of collection, processing, storage and ownership of genetic information or DNA profiles.

Discusses how and why DNA is collected, processed and stored.

Describes DNA profiling as a way of using technology to analyse DNA to see a unique pattern for an individual and gives examples of practical applications (paternity tests and forensics).

Using simple gel electrophoresis experiments and models, compares and contrasts DNA profiles.

Researches different practical applications of DNA profiling.

Describes a gene as a piece of DNA which controls specific characteristics in an individual and demonstrates understanding that every individual has a unique combination of genes.

Identifies characteristics that are controlled by genes e.g. eye colour, blood group, handedness.

Observes variation in different species and relates this to genetic differences amongst individuals in a species.

Knows that DNA is found in the nucleus of most cells and that it contains the instructions for the development and function of living things (genetic code).

Plans and carries out practical investigations to extract DNA from living things.

Explores different models and representations of how genetic information is stored and organised in living things e.g. cell, nucleus, chromosomes, genes, DNA.

Third Level: Materials – Properties and Uses of Substances – 3-15a/b

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
I have developed my knowledge of the Periodic Table by considering the properties and uses of a variety of elements relative to their positions. SCN 3-15a	• Investigates and describes properties of metals and non-metals, for example, appearance, conductivity of electricity, position in the Periodic Table and their uses linked to their properties. • Knows that elements are organised in the Periodic Table by atomic number, each with its own unique symbol, and that elements with similar chemical properties are placed together in vertical groups. • Identifies and names the groups 'alkali metals', 'halogens' and 'noble gases' and describes their reactivity.
Having contributed to a variety of practical activities to make and break down compounds, I can describe examples of how the properties of compounds are different from their constituent elements. SCN 3-15b	• Investigates and describes at least two examples of compounds with properties that are different from their constituent elements, for example, hydrogen explosion and electrolysis of water. • Constructs names of two-element compounds which are derived from the names of the elements, from which it is formed, with a suffix of-ide. • Constructs word equations for simple reactions, for example, carbon reacting with oxygen: carbon + oxygen → carbon dioxide.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Materials – Properties and Uses of Substances – 3-15a/b

*Sub-organiser has been split across pages

Constructs word equations for simple reactions, for example, carbon reacting with oxygen: carbon + oxygen → carbon dioxide.

Identifies the reactants and products in word equations.

Demonstrates understanding of simple compound naming rules.

See Topical Science Pathway to develop real life contexts.

See Chemical Changes Pathway to link learning.

The use of a Data Booklet will support the acquisition of knowledge and skills in accessing the Periodic Table and associated information.

Investigates and describes at least two examples of compounds with properties that are different from their constituent elements, for example, hydrogen explosion and electrolysis of water.

Constructs names of two-element compounds which are derived from the names of the elements, from which it is formed, with a suffix of-ide.

Demonstrates understanding that compounds are substances that are made from two or more elements that are chemically combined.

Explores the differences between the properties of common compounds and their constituent elements.

Plans and carries out investigations to make and breakdown common compounds.

Identifies and names the groups 'alkali metals', 'halogens' and 'noble gases' and describes their reactivity.

Safely observes the reactivity of different elements from different groups.

Identifies the names, atomic numbers and symbols of common elements.

Knows that elements are organised in the Periodic Table by atomic number, each with its own unique symbol, and that elements with similar chemical properties are placed together in vertical groups.

Identifies common hazard symbols linked to chemicals in the lab and observes safety measures during practical activities.

Compares and contrasts the different properties and uses of common metals and non-metals.

Investigates and describes properties of metals and non-metals, for example, appearance, conductivity of electricity, position in the Periodic Table and their uses linked to their properties.

Identifies metal and non-metal elements in the Periodic Table.

Demonstrates understanding that elements are the simplest substances that contain only one type of atom.

Identifies different elements which exist as a solid, liquid or gas at room temperature in the Periodic Table.

Explores the Periodic Table and demonstrates how to locate different elements.

Third Level: Materials – Properties and Uses of Substances – 3-16a/b

*Sub-organiser has been split across pages

Experiences and Outcomes	Benchmarks
I can differentiate between pure substances and mixtures in common use and can select appropriate physical methods for separating mixtures into their components. SCN 3-16a	• Identifies elements present from simple molecular formulae. • Gives examples of pure substances and mixtures from everyday life. • Selects appropriate physical methods to separate mixtures into their components, for example, distillation, filtration and chromatography and justifies their choices.
I have taken part in practical investigations into solubility using different solvents and can apply what I have learned to solve everyday practical problems. SCN 3-16b	• Investigates and describes the solubility of substances in different solvents, for example, water and acetone/propanone. • Explains the link between the relative quantity of solute or solvent and changes in the concentration of a solution.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Materials – Properties and Uses of Substances – 3-16a/b

*Sub-organiser has been split across pages

The use of a Data Booklet will support the acquisition of knowledge and skills in accessing the Periodic Table and associated information.

See Topical Science Pathway to develop real life contexts.

See Chemical Changes Pathway to link learning.

Selects appropriate physical methods to separate mixtures into their components, for example, distillation, filtration and chromatography and justifies their choices.

Plans and carries out investigations to separate a variety of mixtures.

Explores the uses of different physical methods to separate mixtures into their components.

Compares and contrasts the properties of different components of a mixture to inform choice of separation method.

Gives examples of pure substances and mixtures from everyday life.

Demonstrates understanding that mixtures consist of two or more different substances which are not chemically combined.

Identifies a pure substance as consisting of only one element or one compound.

Identifies elements present from simple molecular formulae.

See 3-15a/b Pathway for prior learning.

Explores reading and writing simple molecular formulae using knowledge of the periodic table.

Explains the link between the relative quantity of solute or solvent and changes in the concentration of a solution.

Defines concentration in its simplest form.

Uses everyday examples to explore the relationship between changing solute and solvent quantities and the concentration of a solution e.g. diluting juice, sugar in tea.

Plans and carries practical activities to prepare solutions of different concentrations.

Investigates and describes the solubility of substances in different solvents, for example, water and acetone/propanone.

Compares and contrasts the solubility of different solutes in different solvents.

Demonstrates understanding of the relationship between solute, solvent and solution.

Third Level: Materials – Earth's Materials

Experiences and Outcomes	Benchmarks
Through evaluation of a range of data, I can describe the formation, characteristics and uses of soils, minerals and basic types of rocks. SCN 3-17a	• Applies knowledge of the rock cycle to describe the formation and characteristics of sedimentary, igneous and metamorphic rocks and gives at least one example of how each is used. • Describes the formation and characteristics of loam, sand and clay soil types, providing examples of their uses, for example, in agriculture, building and beauty products. • Researches the formation, characteristics and uses of at least two common minerals, for example, quartz or gypsum and communicates their findings to others using a range of media.
I can participate in practical activities to extract useful substances from natural resources. SCN 3-17b	• Investigates and describes how at least two useful substances can be extracted from natural resources, for example, metal from mineral ores, dyes from plants and oils from plants.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Materials – Earth's Materials

See Chemical Changes Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

See Biodiversity and Interdependence Pathway to link learning.

Researches and shares opinions around the sustainability of using soils, minerals and basic types of rocks in all aspects of life.

Investigates and describes how at least two useful substances can be extracted from natural resources, for example, metal from mineral ores, dyes from plants and oils from plants.

Plans and carries out investigations to extract useful substances from natural resources using a variety of methods.

Demonstrates understanding of how and why the formation and recycling of Earth's materials is so important.

Applies knowledge of the rock cycle to describe the formation and characteristics of sedimentary, igneous and metamorphic rocks and gives at least one example of how each is used.

Explores different nutrient cycles and the role of living things within them.

Describes the formation and characteristics of loam, sand and clay soil types, providing examples of their uses, for example, in agriculture, building and beauty products.

Compares and contrasts the characteristics of sedimentary, igneous and metamorphic rocks.

Explores the different processes in the rock cycle leading to the formation of sedimentary, igneous and metamorphic rocks.

Explores and identifies the different types of soil.

Researches the formation, characteristics and uses of at least two common minerals, for example, quartz or gypsum and communicates their findings to others using a range of media.

Third Level: Materials – Chemical Changes

Experiences and Outcomes	Benchmarks
Having taken part in practical activities to compare the properties of acids and bases, I have demonstrated ways of measuring and adjusting pH and can describe the significance of pH in everyday life. SCN 3-18a	• Knows that indicators, such as universal indicator, are chemicals which produce different colours when placed in acid and alkali/bases. • Investigates and describes the colour changes of indicators when added to acid/bases. • Investigates and describes the pH of some everyday substances. • Identifies substances as acidic (pH of less than 7), alkaline/basic (pH greater than 7) or neutral (equal to 7). • Investigates and describes what happens to the pH when an acid is added to an alkali/basic.
Through experimentation, I can identify indicators of chemical reactions having occurred. I can describe ways of controlling the rate of reactions and can relate my findings to the world around me. SCN 3-19a	• Identifies indicators of chemical reactions such as colour change, precipitate formation, release of gas, and/or a detectable energy change. • Finds the relationship between particle size, concentration, temperature and catalysts and the rate of a reaction. • Explains how catalysts, including enzymes, can be used to speed up chemical reactions, and provides at least two everyday examples of reactions involving a catalyst.
I have helped to design and carry out practical activities to develop my understanding of chemical reactions involving the Earth's materials. I can explain how we apply knowledge of these reactions in practical ways. SCN 3-19b	• Describes chemical reactions involving the Earth's materials, for example, combustion of fossil fuels, carbonate rocks reacting with acid and the formation and impact of acid rain.

Examples of skills that can be developed:	
Inquiry and investigative skills	<u>Plans and designs scientific investigations and enquiries</u> • Demonstrates initiative and increasing independence in identifying a number of key questions and in formulating aims, predictions and hypotheses based on information, observations and knowledge. • Designs procedures to test a hypothesis and identifies the independent, dependent and controlled variables, with limited assistance. • Anticipates most risks and hazards. • Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use. <u>Carries out practical activities within a variety of learning environments</u> • Applies safety measures to control all risks and hazards identified. • Collects increasingly complex data and information using a range of methods and equipment, for example, data and software analysis tools (where available). • Includes a control experiment when appropriate in experimental design. • Manages identified controlled variables to ensure validity of results. <u>Analyses, interprets and evaluates scientific findings</u> • Selects appropriate methods to record data/information and demonstrates increased precision in use of terminology, units and scales. • Interprets and analyses data and information to establish relationships between the independent and dependent variables and links to the original hypothesis. • Establishes links between the findings, aim and hypothesis. • Relates findings to scientific knowledge and understanding. • Draws a conclusion based on results gathered and in relation to the aim. • Begins to consider alternative explanations and applies or extends conclusions to new situations or to identify further studies. • Evaluates a range of aspects of the inquiry/investigation, including the relevance and reliability of evidence, and suggests at least two ways of improving the methodology, if repeated. <u>Presents scientific findings</u> • Presents data/information using an increasing range of tables, charts, diagrams and graphs and using suitable scales, with limited assistance. • Communicates effectively in a range of ways, for example, orally and through scientific report writing. • Presents findings using appropriate formats for different audiences. • Provides supporting evidence and quotes and acknowledges sources with limited assistance
Scientific analytical thinking skills	• Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts. • Applies understanding of an increasing range of science concepts to solve problems and provide solutions. • Demonstrates further development of creative thinking including through the engineering processes of design, construction, testing and modification.
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Materials – Chemical Changes

See Properties and Uses of Substances Pathway to link learning.

See Topical Science Pathway to develop real life contexts.

See Earth's Materials Pathway to link learning.

See Body Systems and Cells Pathway to link learning.

Discusses the relevance of acids and alkalis to everyday life.

Investigates and describes what happens to the pH when an acid is added to an alkali/basic.

Investigates and describes the pH of some everyday substances.

Identifies substances as acidic (pH of less than 7), alkaline/basic (pH greater than 7) or neutral (equal to 7).

Explores the pH scale and demonstrates understanding of how to read the pH of a substance using the scale.

Knows that indicators, such as universal indicator, are chemicals which produce different colours when placed in acid and alkali/bases.

Investigates and describes the colour changes of indicators when added to acid/bases.

Carries out simple experiments using different indicators to detect whether chemicals are acidic or alkaline.

Describes chemical reactions involving the Earth's materials, for example, combustion of fossil fuels, carbonate rocks reacting with acid and the formation and impact of acid rain.

Applies learning from experimental findings and research to formulate and express their opinions on the impact of chemical reactions involving Earth's materials.

Researches how chemical reactions are required to support everyday life.

Finds the relationship between particle size, concentration, temperature and catalysts and the rate of a reaction.

Plans and carries out investigations into factors which effect the rate of a chemical reaction.

Identifies indicators of chemical reactions such as colour change, precipitate formation, release of gas, and/or a detectable energy change.

Carries out simple experiments to observe a range of chemical reaction indicators e.g. observing gas formation, detecting a temperature change.

Explains how catalysts, including enzymes, can be used to speed up chemical reactions, and provides at least two everyday examples of reactions involving a catalyst.

Researches the role of catalysts in everyday life.

Defines catalysts and enzymes, recognising their role in speeding up chemical reactions.

Third Level: Topical Science

Experiences and Outcomes	Benchmarks
I have collaborated with others to find and present information on how scientists from Scotland and beyond have contributed to innovative research and development. SCN 3-20a	• Collaborates with others to research how scientists, and those who use science in their jobs, have contributed to the development of scientific ideas. • Communicates findings in a suitable way to give an example of how scientists contribute to innovative research and development. • Gives examples of how skills developed through science are used in a wide variety of jobs and careers including science, technology, engineering and mathematics (STEM) careers.
Through research and discussion, I have contributed to evaluations of media items with regard to scientific content and ethical implications. SCN 3-20b	• Demonstrates understanding of bias and separates fact from opinion taking into account a range of reasons for bias, for example, selective sampling and political views. • Analyses the scientific content in media items and presents a reasoned argument on the ethical implications of the scientific issue being explored.

Examples of skills that can be developed:	
Skills and attributes of scientifically literate citizens	• Demonstrates understanding of the impact of science on society and debates and discusses the moral and ethical implications of some scientific developments, demonstrating respect for the views of others. • Expresses informed views about topical scientific issues, including those featured in the media, based on evidence and demonstrating understanding of underlying scientific concepts. • Demonstrates increased awareness of creativity and inventiveness in science and the use of technologies in the development of sciences. • Demonstrates understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations, including science, technology, engineering and mathematics (STEM) careers.

Third Level: Topical Science

Accesses increasingly complex scientific literature.

Begins to understand the importance of referencing sources of information.

Begins to understand how to navigate scientific literature (use of abstract, results, conclusions, references).

Collaborates with others to research how scientists, and those who use science in their jobs, have contributed to the development of scientific ideas.

Communicates findings in a suitable way to give an example of how scientists contribute to innovative research and development.

Identifies relevant and reliable sources of scientific information.

Explores how scientists contribute to innovative research and development.

Begins to formulate and justify their own opinions about a variety of scientific issues.

Demonstrates understanding of bias and separates fact from opinion taking into account a range of reasons for bias, for example, selective sampling and political views.

Through research and discussion, can identify fact from opinion linked to scientific issues.

Identifies and considers bias across a variety of scientific issues.

Analyses the scientific content in media items and presents a reasoned argument on the ethical implications of the scientific issue being explored.

Compare and contrast opinions around scientific issues.

Discusses and demonstrates understanding of the ethical implications of scientific issues.

Explores the reasons for bias (selective sampling and political views).

Gives examples of how skills developed through science are used in a wide variety of jobs and careers including science, technology, engineering and mathematics (STEM) careers.

Accesses information about STEM careers to inform future pathways.