**Aberdeenshire**

**Progression Framework**

**Sciences**

**INTERIM December 2015**

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**Aberdeenshire**

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**Section 1 Guidance**

**INTERIM December 2015**

**INTRODUCTION**

The ***Aberdeenshire Progression Framework for Sciences***sets out a clear progression for knowledge and understanding and related skills from the Curriculum for Excellence and associated significant aspects of learning which are:

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

The progression framework sets out a continuum of learning through CfE Early Level to the end of the Broad General Education (Third/Fourth Levels). The progression framework is intended to assist teachers in their learning and teaching approaches as they plan the curriculum and assess evidence of learning.

It is necessary to have a coherent approach to planning the curriculum, learning, teaching and assessment in which teachers’ practice embraces the following.

**Seven design principles**

* Challenge and enjoyment
* Breadth
* Progression
* Depth
* Personalisation and choice
* Coherence
* Relevance

**Four contexts**

* Ethos and life of the school
* Curricular areas and subjects
* IDL
* Opportunities for personal achievement

**Four capacities**

* Successful learners
* Confident individuals
* Effective contributors
* Responsible citizens

The aims of the framework are to:

* support and enhance planning and assessment, based on skills, knowledge and understanding;
* provide staff with a structured progression for learning and teaching;
* enable the sharing of standards within schools, clusters and across Aberdeenshire;
* enable the developing of skills for learning, life and work;
* facilitate the process of monitoring learners’ progress and achievement.

**CONTEXT**

Within Curriculum for Excellence, Science is defined as:

The development of interest in, and understanding of, the living, material and physical world.

The development of scientific skills are important as they allow individuals to become creative, inventive and enterprising adults in a world where the skills and knowledge of the sciences are needed across all sectors of the economy.

Furthermore, the Sciences***:*** *principles and practice*paper outlines the importance of Sciences:

Science is an important part of our heritage and we use its applications every day in our lives at work, at leisure and in the home. Science and the application of science are central to our economic future and to our health and wellbeing as individuals and as a society.

**The Main Purposes of Learning in Science**

Children and young people participating in the experiences and outcomes in the sciences will:

* develop a curiosity and understanding of their environment and their place in the living, material and physical world;
* demonstrate a secure knowledge and understanding of the big ideas and concepts of the sciences;
* develop skills for learning, life and work;
* develop skills of scientific inquiry and investigation using practical techniques;
* develop skills in the accurate use of scientific language, formulae and equations;
* recognise the role of creativity and inventiveness in the development of the sciences;
* apply safety measures and take necessary actions to control risk and hazards;
* recognise the impact the sciences make on their lives, the lives of others, the environment and on society;
* develop an understanding of the Earth’s resources and the need for responsible use of them;
* express opinions and make decisions on social, moral, ethical, economic and environmental issues based upon sound understanding;
* develop as scientifically literate citizens with a lifelong interest in the sciences;
* establish the foundation for more advanced learning and, for some, future careers in the sciences and the technologies.

At all levels, teachers will plan to enable learners to develop their skills with increasing depth over a range of contexts. This will be especially important at early level for those young people who may require additional support.

**SKILLS FOR LEARNING, LIFE AND WORK**

All of our young people from the early stages onwards in schools are entitled to opportunities to develop their skills in learning, life and work. The development of these skills is essential to life-long learning. This will enable young people to become flexible and adaptable as they progress into adulthood. Furthermore, this will enhance the development of resilience, self-esteem and confidence that they will require to flourish in the future.

**EFFECTIVE LEARNING AND TEACHING**

Although the content of the curriculum is important, the high aspirations of the sciences curriculum within *Curriculum for Excellence* will only be achieved through high quality learning and teaching. The sciences experiences and outcomes are designed to stimulate the interest and motivation of children and young people and to support staff in planning challenging, engaging and enjoyable learning and teaching activities. They allow flexibility and choice for both teachers and learners to meet individual learning needs.

Effective learning and teaching approaches extend experiential learning from the early years into primary school and beyond. As children and young people progress in their learning of the sciences, teachers can take advantage of opportunities for study in the local, natural and built environments, as an opportunity to deepen their knowledge and understanding of the big ideas of the sciences. Teaching and learning approaches should promote thinking as well as provide opportunities to consolidate and apply learning.

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;
* an emphasis on children explaining their understanding of concepts, informed discussion and communication.

Through involvement in a wide range of open-ended experiences, challenges and investigations, including those related to the applications of science in areas such as engineering, medicine and forensics, children and young people develop skills of critical thinking and appreciate the key role of the scientific process both in generating new knowledge and in applying this to addressing the needs of society.

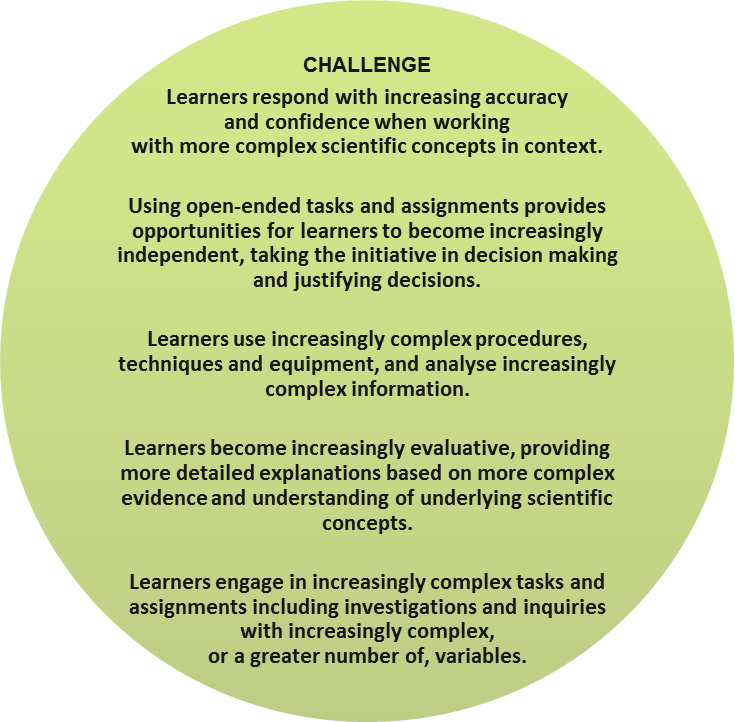
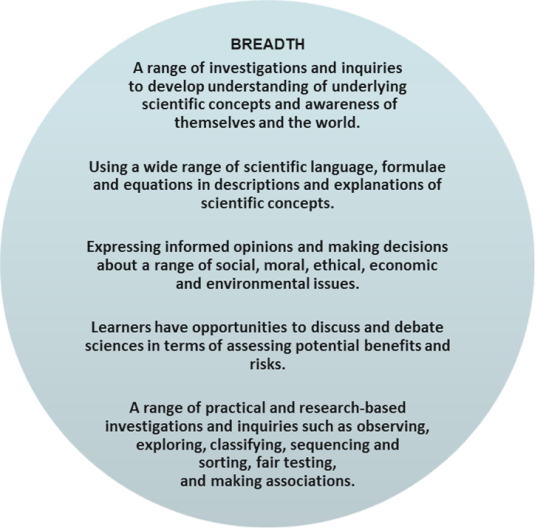
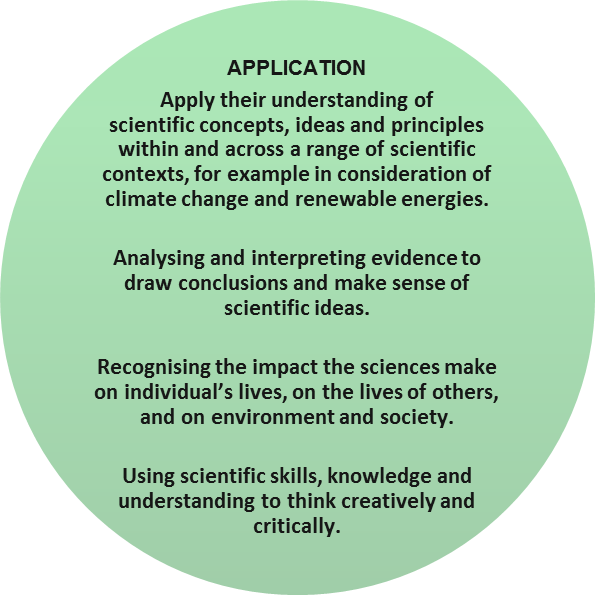
In Aberdeenshire, we endorse Co-operative Learning as one of the research based approaches which has a positive impact on learning.

**Co-operative Learning**

Research has shown that co-operative learning provides a rich context for learners to develop personal and social interaction in reaching learning goals and in nurturing personal confidence. For co-operative learning to take place there requires to be:

* Positive Interdependence
* Individual Accountability
* Social Skills
* Face to Face Interactions
* Group Processing

The context of a co-operative learning task sets a core learning goal together with a social goal to allow young people not only to know when they are succeeding in their learning but also how their contribution has helped the group reach their goal. Co-operative learning has shown to be an effective tool in supporting the delivery of many aspects of Sciences.

Well planned learning, teaching and assessment provide opportunities for learners to experience breadth, challenge and application across the significant aspects of the sciences.

When teaching for effective learning, reference should be made to Aberdeenshire’s***Learning Teaching and Assessment: Professional Curriculum Tool***which outlines guidance for teachers in supporting the principles of ‘Assessment is for Learning’.

(Section 3)

***Clear, relevan*t and measurable definitions of *success criteria.* *Learners involved in creating them in pupil language.***

**The Learner**

**Learning Intentions**

***Standards and expectations for***

***planned learning***

***Planning together***

**for learning, teaching and assessment**

**Success Criteria**

**Key**

**Professional Practice**

*Features of effective professional practice*

**Learning Experiences**

**Evidence**

***Rich experiences planned to take account of the Es and Os and the design principles***

***A range of appropriate evidence***

**The Learner**

**Professional Action**

*Professional actions for improvement*

**Feedback and Next Steps**

***Assess: Progress***

***Assess: Breadth, challenge, application***

***Collaborative approaches to evaluate the evidence of learning***

***Timely and effective feedback supports the planning of pupils’ next steps in learning***

**Assessment Approaches**

**Evaluate Learning**

***Learning Teaching and Assessment: Professional Curriculum Tool***

**This tool can be used**

* to provide an opportunity to reflect on effective practice in learning, teaching and assessment in the context of Aberdeenshire’s progression frameworks.
* to allow practitioners to ‘dip into’ aspects of the learning, teaching and assessment process in order to reflect on their practice
* to inform planning for learning, teaching, moderation and assessment
* to support professional learning and/or moderation activities within a school or cluster

**Key references used in this resource**

* ***Taking a Closer Look at the National Assessment Resource*** (Education Scotland 2013)
* ***The Learning Set*** (Learning Unlimited 2000

**MONITORING PROGRESS AND ACHIEVEMENT**

Assessment in the sciences will focus on children and young people’s knowledge and understanding of key scientific concepts in:

* the living, material and physical world;
* inquiry and investigative skills;
* scientific analytical and thinking skills;
* scientific literacy and general attributes.

Evidence of progress in the sciences should be gathered as part of day-to-day learning as well as across the curriculum and it should complement the evidence gathered in discrete science lessons. To achieve this, a shared understanding of expectations in the Sciences across all curriculum areas is essential. This will ensure consistency of approach in sharing standards.

Learners’ progress should be defined in terms of breadth and depth of achievement. Emphasis should be placed not just on how much, but *how well* they learn.

**BENCHMARKS**

The benchmarks which accompany this framework outline the standards and expectations which will enable schools to identify how their learners are performing at each stage. In other words, the benchmarks for the Sciences set out what can reasonably be expected of most pupils by the end of each year of schooling.

Effective benchmarking of standards and expectations for the Sciences needs to be a systematic and rigorous process which:

* starts with the identification of benchmark measures that define the “good standard” against which comparison can be made;
* involves some investigation and/or analysis of the processes and practices that underlie that good performance;
* identifies and/or shares good or excellent practice that school(s) can learn from and use to drive improvement.

By specifying the essential indicators of “good” performance, the benchmarks for the Sciences which accompany this framework will enable schools to:

* indicate how their learners are performing;
* understand how they and their learners perform in comparison to other learners;
* compare performance across schools and year-on-year.

**Benchmarking for Improvement**

The purposes of the benchmarks for the Sciences are to:

* promote quality teaching and learning in the classroom;
* nurture success for all students;
* assist teachers and schools in monitoring and tracking student progress;
* evaluate the success of teaching and learning programmes;
* inform next steps for learners and their learning;
* target/identify students who need additional support;
* report to pupils and families;
* identify appropriate professional development

**Aberdeenshire**

**Progression Framework**

**Sciences**

**Section 2**

**INTERIM DECEMBER 2015**

**GUIDELINES FOR USING THE PROGRESSION FRAMEWORK**

This framework sets out a clear progression for skills, knowledge and understanding from the following Curriculum for Excellence Sciences ***Significant Aspects of Learning:***

Planet Earth Forces, Electricity and Waves Biological Systems Materials Topical Science

Inquiry and Investigative Skills Scientific Analytical Thinking Skills Skills and Attributes of Scientifically Literate Citizens

The purpose of this document is to offer a continuum of learning through to the end of the Broad General Education (CfE Early – Third/Fourth Levels). The progression is intended to assist teachers as they plan their science curriculum and assess evidence of learning.

|  |  |
| --- | --- |
| **Level** | **Stage** |
| **Early** | The pre-school years and P1, or later for some. |
| **First** | To the end of P4, but earlier or later for some. |
| **Second** | To the end of P7, but earlier or later for some. |
| **Third and Fourth** | S1 to S3, but earlier for some. The fourth level broadly equates to Scottish Credit and Qualifications Framework level 4. The fourth level experiences and outcomes are intended to provide possibilities for choice. Young people's programmes will not include all of the fourth level outcomes. |

**The aims of the Progression are to:**

* ***enhance planning and assessment***
* ***provide staff with a framework to promote progression in learning and teaching***
* ***enable the sharing of standards within schools and across school clusters***

The document is structured using each of the Sciences significant aspects of learning. These are then sub-divided further using Curriculum levels and the CfE Experiences and Outcomes. The document details the learner’s progression within and through each of the Levels.

**Significant Aspects of Learning (SALs) Knowledge and Understanding**

**Materials**

**Planet Earth**

**Forces, electricity and waves**

**Topical science**

**Biological systems**

**Drawing on their learning across the Experiences and Outcomes, learners:**

* ***demonstrate a secure knowledge and understanding of the big ideas and concepts of the sciences***
* ***develop a curiosity and understanding of their environment and their place in the living, material and physical world***
* ***develop skills in the accurate use of scientific language, formulae and equations***
* ***develop an understanding* *of the Earth’s resources and the need for responsible use of them***

**Significant Aspects of Learning  
(SALs)**

**Skills and attributes of scientifically literate citizens**

**Scientific analytical thinking skills**

**Inquiry and investigative skills**

***As they experiment and carry out practical scientific investigations and other research to solve problems and challenges, learners:***

* *plan and design scientific investigations and inquiries*
* *carry out practical activities*
* *analyse, interpret and evaluate scientific findings*
* *present scientific findings.*

***Children and young people develop as scientifically literate citizens with a lifelong interest in science by:***

* *recognising the impact the sciences make on their lives, the lives of others, the environment and on society*
* *expressing opinions and making decisions on social, moral, ethical, economic and environmental issues based upon sound understanding*
* *developing scientific literacy skills.*

***In order to make sense of scientific evidence and concepts learners:***

* *develop a range of analytical thinking skills.*

**Science Step Process**

The Science progression has a two or three step process depending upon the Stage, i.e. early, First or Second.

This was devised to enable teachers of composite classes or classes with a wide range of ability to teach a whole block or topic based upon the Knowledge, Significant Aspects of Learning, (SALs). This would be preferable to trying to teach different content to classes of children over a three year period. The Skills SALs could still be taught at a level appropriate to the children.

For example:

A teacher would cover all of the ‘I Can’ statements for the second stage in “Planet Earth – Processes of the planet,” ( 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**.)as a block but differentiate the skills level SALs appropriately for the composite class or range of ability.

**Planet Earth**

**Progression**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Planet Earth – Biodiversity and Interdependence*** | | | | |
| **Biodiversity and interdependence**  *Learners explore the rich and changing diversity of living things and develop their understanding of how organisms are interrelated at local and global levels. By exploring interactions and energy flow between plants and animals (including humans) learners develop their understanding of how species depend on one another and on the environment for survival. Learners investigate the factors affecting plant growth and develop their understanding of the positive and negative impact of the human population on the environment.* ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| I have observed living things in the environment over time and am becoming aware of how they depend on each other.  **SCN 0-01a**  **Key Words and Phrases**  living, no longer living, never been alive, breathing, drinking, moving, feeding, habitat, names of common animals, names of animal parts e.g. paws etc. names of animal babies, vet, receptionist, surgery, x-ray, names of human body parts, living things grow and change. | Step 1   * I have observed living things (animals and plants) in the environment and can talk about them. * I can identify plants and animals including humans as being living things. * I can show how animals change (offspring/baby to adult) over time. * I can show/tell what a tree looks like for each season. | | Step 2   * I can observe/discuss some characteristics of living things e.g. growth, movement, feeding and simple life cycles. * I can describe how some living things depend on each other. * I can say why some animals live where they do- food, water, heat. * I can describe what happens to a tree in each season. | |
| 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** | Step 1   * I have helped to grow and care for plants. * I have observed the main parts of a plant. * I can talk about how plants grow e.g. plants get taller, grow more leaves, produce flowers etc. * I can talk about how to look after plants (water, sun, soil). * I can identify some living things as being plants (trees, flowers, vegetables, fruit). | | Step 2   * I can explain that plants require water, warmth / sunlight to make food and soil in order to grow. * I can name the basic structures of plants (roots, leaves, stems, flowers/blossom/bud, trunk, petals). * I can describe how plants grow from seeds to plant (seed, seedling, plant). * I can identify and name some trees, flowers, vegetables and fruit. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| I can distinguish between living and non- living things. I can sort living things into groups and explain my decisions.  **SCN 1-01a**  **Key Words and Phrases**  living, non-living, vertebrates, invertebrates, mammals, amphibians, reptiles, Freshwater fish, birds, insects, environment, man-made, natural, solids, liquids, gases, flowering, non-flowering, vegetables, trees and plants. | Step 1   * I can describe the characteristics of living and non-living things e.g. growth, movement and feeding, life cycle. * I can sort living things based on my own criteria and explain my decisions. | Step 2   * I can distinguish the characteristics of living and non-living things e.g. growth, movement and feeding, life cycle. * I can sort living things (plants and animals) based on agreed criteria. | | Step 3   * I can distinguish and explain the differences between non – living and living things e.g. growth, movement and feeding, reproduction life cycle. * I can accurately sort living things (plants and animals) and justify my reasons by using simple classifications e.g. mammal, amphibian, insect, bird, reptile etc. |
| ***Planet Earth – Biodiversity and Interdependence (continued)*** | | | | |
| **First Level** | | | | |
| 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**  **Key Words and Phrases**  animal, plant, food chain, interdependent, energy, consumers, producers, leaves, light, water, habitat. | Step 1   * I can explore examples of simple food chains showing relationships between the sun, plants and animals for energy. | Step 2   * I can construct a variety of food chains and show the relationships between the sun, plants and animals for energy. | | Step 3   * I can sequence and describe food chains showing relationships between the sun, plants and animals for energy e.g. using a flowchart, pyramid etc. |
| 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**  **Key Words and Phrases**  branch, flower, leaf, root, soil, stem, similarities, differences, bulb, growth, sprout, light, water, conditions, healthy, germinate, food colouring. Plants, flowering, non-flowering, stem, roots, leaves, seeds, light, water, growth, environment, life-cycle, swell, shoots, processed, raw, cooked, dark. | Step 1   * I can take part in experiments to find out what plants need to grow, I can record my observations. * I can then talk about what plants need to grow. | Step 2   * I can contribute to the design of an experiment to investigate what plants need to grow and develop healthily. * I can discuss and evaluate my observations. | | Step 3   * I can design an experiment to find out what plants need to grow (including germination) and develop healthily. * I can record and present my findings in a clear way. * I can draw conclusions and apply my knowledge/findings to grow healthy plants. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Planet Earth – Biodiversity and Interdependence (continued)*** | | | |
| **Second Level** | | | |
| 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**  **Key Words and Phrases**  vertebrates, invertebrates, mammals, fish, reptiles, amphibians, birds, molluscs, arthropods, echinoderms, protozoa, annelids, flowering plants, annual, biennials, perennials, non-flowering plants, mosses, conifers, ferns, extinct, endangered, threatened, habitat, environment, adaptation, survival, predator, prey, destruction, ecotourism, climate change, rainforests. | Step 1   * I can explain that living things can be classified into animals and plants. * I can explain that plants can be classified into flowering and non-flowering plants. * I can explain the difference between an extinct species and an endangered species. * I can understand how species depend on the environment for survival. | Step 2   * I can state that animals can be classified into vertebrates and invertebrates. * I can name some examples of plants and plant groups e.g. deciduous and non-deciduous, flowering and non-flowering (ferns, algae, lichen) etc. * I can name some examples of extinct species and endangered species. * I can suggest reasons why plants and animals are becoming endangered as a result of human behaviour. | Step 3   * I can identify and classify living things into vertebrate and invertebrate groups. * I can identify features which are common to each of the 5 vertebrate groups e.g. Mammals have hair/fur. * I can classify invertebrates into smaller groups and give examples of invertebrates which belong to the 5 main groups e.g. Arthropods - Insects – ant, butterfly. * I can classify flowering and non-flowering plants. * I can explain that extinction occurs through a variety of reasons e.g. loss of habitat, loss of food source, predator increase, climate change. * I can explain that animals and plants which adapt to their changing environment have a better chance of survival. * I can debate the advantages and disadvantages of eco-tourism to the surrounding wildlife. |
| 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**  **Key Words and Phrases**  herbivore, carnivore, omnivore, producer, consumer, predators, prey, decomposers, food chain, food web, photosynthesis. | Step 1   * I can explain that the sun is the ultimate source of energy and that green plants use light from the sun and carbon dioxide and water to make food. * I can talk about how some animals depend on plants and others animals to survive. * I can assist in the planning/creation and/or maintenance/further development of an area that can attract local wildlife at school/home/local community. | Step 2   * **I can explain the difference between a food chain and a food web.** * I can show that feeding relationships between living things are represented as food chains or food webs. * I can give examples of predators and explain that a predator is an animal that eats other animals. * I can identify animals that predators eat and I know that they are called prey. | Step 3   * I understand that food chains connect all organisms and will investigate and explain that if a creature's food source is changed in any way, the creature's life changes too. * I can explain how species depend on one another. * I can contribute to the planning/creation and/or maintenance of an area that can attract local wildlife at school/home/local community. |
| ***Planet Earth – Biodiversity and Interdependence (continued)*** | | | |
| **Second Level** | | | |
| Through carrying out practical activities and investigations, I can show how plants have benefited society.  **SCN 2-02b**  **Key Words and Phrases**  food chains, producers, photosynthesis, seed dispersal, wind dispersal, animal dispersal, water dispersal, carnivores, interdependent, climatic benefit, air pollution, Greenhouse Effect. | Step 1   * I can give examples of the many ways in which plants have benefited society e.g. food, medicine, paper, fuel. | Step 2   * I can contribute to a fair test/experiment or investigation as to how plants have been used to benefit society. | Step 3   * I can plan and carry out a fair test/experiment or investigation to show how a plants benefit our society and draw conclusions from my results e.g. use plant material as a dye, making food, making paper, soil erosion. * I can explain the climatic and social impact of plants on society e.g. oxygen production, green spaces etc. |
| 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**  **Key Words and Phrases**  oxygen, light, warmth, soil, fertilisers, inorganic, organic, chemical, plant growth, crop production, flowering, experiment, fair test, living conditions, discuss, observe, analyse, record, phosphorous, nitrogen, nutrients, potassium, crop rotation, plant growth. | Step 1   * I can state that fertilisers can be added to soil to provide plants with extra nutrients. * I can contribute to planning and carrying out a fair test into the effects of fertilisers on the growth of plants. | Step 2   * I can explain the risks and benefits of using fertilisers e.g. produce larger/healthier crops or pollute water, kill wildlife etc. * I can contribute to planning and carrying out an investigation, hypothesising and testing out the effects of fertilisers on the growth of plants. * I can describe that fertilisers come in two categories (organic and inorganic) and understand the benefits of using fertilisers on crops and the implications to the farmer/grower. | Step 3   * I can plan and carry out a fair test into the effects offertilisers on the growth of plants and draw conclusions from my results. * I can explain why fertilisers can provide plants with extra nutrients and describe the impact they have on plant growth. * I can research environmental issues involving inorganic fertilisers. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | |

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| --- | --- | --- | --- | --- |
| ***Planet Earth – Energy Sources and Sustainability*** | | | | |
| **Energy sources and sustainability**  Learners explore types, sources and uses of energy and develop their understanding of how energy is transferred and conserved. They consider the relevance of these concepts to everyday life. They explore the nature and sustainability of energy sources and discuss benefits and assess possible risks to form an informed view of responsible energy use. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| 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**  **Key Words and Phrases**  batteries, appliances, toys, rechargeable, mains operated | Step 1   * I can talk and show about the different ways of making things (toys/appliances) work (push, pull, twist, electricity). * I can explain what makes a manual toy go i.e. push, pull, twist and what happens. * I can explore what makes some toys and appliances work (wind, water. machinery etc. | | Step 2   * I can explain that some toys and some appliances produce light, heat, sounds and movement. * I can name sources of energy for common toys and appliances – e.g. electrical, battery. * I can predict what will make a toy/appliance work and test it. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| I am aware of different types of energy around me and can show their importance to everyday life and my survival.  **SCN 1-04a**  **Key Words and Phrases**  energy, renewable, non-renewable, electricity, solar, wind, hydro, turbines, batteries, sun, stored power, eco-friendly, electrocution, pylons, power stations, sound energy, dangerous, circuit, battery holder, wires, bulb, buzzer, energy source, sustainable, hydroelectric, fossil fuels, pollution, solar panels, wind turbines, atmosphere, coal, electricity, global warming | Step 1   * I can describe different types of energy: heat, light, chemical, electrical and sound. * I can identify the importance of the sun as our major source of energy which supplies us with heat and light energy. | Step 2   * I can identify different sources of energy - solar, wind, food and water. * I can identify how different forms of energy are used. * I can explain why we need energy to survive giving examples to support this * I can explain how we should use energy to survive safely. | | Step 3   * I can explain how different sources of energy are used to make a toy or appliance work. * I can give examples of the effects and impact of energy to everyday life. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  renewable energy, non-renewable energy, kinetic energy, gravitational energy, hydro-electric power, conservation, conversion, tidal power, wave power, solar power, electrical energy, fossil fuels, coals, power station, energy efficiency, kinetic energy, chemical energy, heat and light energy, natural energy, energy conversion. | Step 1   * I can describe the different forms of energy we use in our houses and schools. * I can investigate how energy can be stored and saved. * I can identify renewable and non-renewable sources of energy. * I can discuss different household items and how these can potentially waste energy. | Step 2   * I can explain the issues associated with finite energy resources and pollution. * I can investigate different methods of saving and storing energy in school and at home. | | Step 3   * I can explain energy efficiency and have an informed view of responsible energy use. * I can describe what energy is and identify energy sources. * I can identify devices within my household which transfer energy from one form into another. * I can research and investigate alternative household items which can reduce wasted energy. |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  non-renewable energy source, renewable energy source, coal, oil, natural gas, fossil fuels, electricity. | Step 1   * I can describe the difference between ‘non-renewable’ energy and ‘renewable’ energy sources. * I can research where non-renewable energy sources come from and how we use them in our everyday life. | Step 2   * I can investigate and identify ways in which Scotland can use renewable energy sources. | | Step 3   * I can explain the difference between renewable and non- renewable sources of energy. * I can explain energy loss. * I can explain the issues associated with finite energy resources and pollution. |
| I can investigate the use and development of renewable and sustainable energy to gain an awareness of their growing importance in Scotland or beyond.  **TCH 2-02b** | Step 1   * I can identify the types of renewable and sustainable energy used beyond Scotland, e.g. geo-thermal in Iceland. | Step 2   * I can explain why a variety of forms of renewable and sustainable energy are being developed and used across the world. | | Step 3   * I can analyse how the Earth’s resources are impacted upon by our lifestyle. * I can contribute to a sustainable lifestyle. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

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| ***Planet Earth – Processes of the planet*** | | | | |
| **Processes of the planet**  Learners explore the changing states of matter and the physical and chemical processes which influence Earth’s atmosphere and oceans. They learn about climate change as a natural process in time as well as the result of human activity. Through connections with collaborative studies of landscape, weather and climate in social studies they build up an integrated picture of the dynamic nature of Earth. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| By investigating how water can change from one form to another, I can relate my findings to everyday experiences.  **SCN 0-05a**  Key Words and Phrases  Water, ice, snow, snowflakes, icebergs, ice lollies, names of animals living in a cold climate, equipment, liquid, solid, melting, freezing, pour. | Step 1   * I can identify the different states of water – ice, water and steam. | | Step 2   * I can identify a number of ways to use water. * I can identify the different forms of water (ice, water and steam) and give examples of when/where they occur. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| By investigating how water can change from one form to another, I can relate my findings to everyday experiences.  **SCN 1-05a**  **Key Words and Phrases**  water, ice, snow, snowflakes, icebergs, ice lollies, names of animals living in a cold climate, equipment, liquid, solid, melting, freezing, pour, steam, evaporation. | Step 1   * I can demonstrate an awareness of how the changing state of water relates to everyday experiences e.g. kettle boiling, ice to cool drinks, ice formation, snow, washing and drying, puddles drying up, lollipops and ice-creams melting etc. * I can use simple words to describe water as it changes form/state. | Step 2   * I can investigate how water changes from one state to another. * I can make predictions about how water might change from one state to another. | | Step 3   * I can explain that water is the same substance but it exists in 3 different states can identify the different states of water as being solid, liquid or gas. * I can explain everyday experiences such as why washing dries, puddles dry up, window frost, etc., using the terms freezing / melting / boiling / evaporating / condensing. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  evaporation, change, measure, condition, volume, condensation, water vapour, higher, cooler, water droplets, clouds, river, rainfall, water cycle, drought, melting, boiling, freezing, solidifying, gas, liquid, solid. | Step1   * I can explain each stage of nature’s water cycle. * I can explain that water can exist as a solid, liquid or gas at each stage of the water cycle. | Step 2.   * I can understand what can make water change from one state to another through the processes of melting/freezing, boiling/condensing and evaporation. | | Step 3   * I can explain the water cycle using appropriate scientific terms. * I can classify the states of water into solid, liquid and gas and explain why I have made my choice. * I can explain how particles are organised in solids, liquids and gases. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

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| ***Planet Earth – Space*** | | | | |
| ***Space*** - Learners develop their understanding of the Earth’s position within the universe while developing a sense of time and scale. They develop their understanding of how our knowledge of the universe has changed over time and explore ideas of future space exploration and the likelihood of life beyond planet Earth. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| 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**  **Key Words and Phrases**  sun, sphere of burning gases, heat and light, harmful rays, dangerous, sunscreen protection, sunglasses, the Sun is our nearest star, rotates, orbits, the Moon reflects light from the Sun, distant stars, daytime and night time animals, nocturnal. | Step 1   * I can look at the sky and point out the Sun, Moon and the stars. * I can link the presence of the sun with day and the moon with night. * I can talk about daily time sequences e.g. morning, snack time etc. | | Step 2   * I can name the Sun, Moon and stars. * I can describe the presence and absence of the Sun gives us day and night. * I can describe the presence of some of the objects in the night sky e.g. Moon and stars. * I can sequence daily routines. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| 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**  **Key Words and Phrases**  Earth, sun, moon, hemisphere, northern hemisphere, southern hemisphere, orbit, axis, spin, revolve, rotate, season, spring, summer, autumn, winter, light, shadow, reflects, lunar month, crescent moon, phases of the Moon, planet, satellite, sphere, sunrise, sunset. | Step 1   * I can explain why it is dangerous to look at the Sun. * I can describe how the sun moves across the sky during the day. | Step 2   * I can describe the relative position of the Earth, Moon and Sun. * I can observe how the Moon changes shape and moves across the sky. | | Step 3   * I can describe the relative movements of the Sun, Moon and Earth. * I can link these to: day, month and year. * I can record the sequence of the changes in the Moon. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  planets, dwarf planets, Earth, Moon, Sun, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, Eris, asteroid Ceres, orbit, gravity, revolves, rotates, lunar, Solar System, attraction, distance, diameters, axis, characteristics, features. | Step 1   * I can explain how the orbit of the Earth and its rotation about its axis relates to the seasons. * I can explain that the sun is at the centre of the solar system. * I can describe the order of the planets system in terms of their distance of the Sun in the solar system. | Step 2   * I can describe the rotation of the planets. * I can state that there are 8 planets and 3 dwarf planets that orbit the Sun and these make up our solar system. * By using different objects and making models, I can show that each planet is a different size and distance from the Sun. | | Step 3   * I can explain that the Sun is a star and that it gives us light and heat and is not made of rock. * With use of a model or display, I can explain that each planet orbits the Sun on a different path due to gravitational pull. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

**Planet Earth**

**Core Learning and Benchmarks**

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| **Core Learning for Significant Aspects of Learning: Planet Earth: Biodiversity and interdependence** | | | | |
| Early | First | Second | Third | Fourth |
| |  | | --- | | Living things and how they depend on each other. | | |  | | --- | | Living and non-living things; sorting living things into groups. | | |  | | --- | | Identification and classification of living things; diversity of living things. | | |  | | --- | | Sampling and identifying living things from habitats; distribution and diversity in habitats. | | |  | | --- | | The interdependence of living things; how they adapt and survive. The impact of population growth and natural hazards on biodiversity. | |
|  |  | |  | | --- | | Physical and behavioural characteristics of living things leading to survival or extinction. | |  |  |
|  | |  | | --- | | The sun as a provider of energy for plants. Simple food chains showing relationships between plants and animals for energy. | | |  | | --- | | Interactions and energy transfer in food chains and webs and ecosystems. Benefits of plants to society. Oxygen production by plants. | | |  | | --- | | Photosynthesis and the production of oxygen and carbohydrate; importance of plants in sustaining life on Earth. | | |  | | --- | | Aerobic respiration and factors affecting its rate  Plant propagation in nature; commercial propagation methods. | |
| |  | | --- | | Names of parts of plants. Growing plants. | | |  | | --- | | Plant requirements for healthy growth and development. | | |  | | --- | | The effects of fertilisers on plant growth. Risks and benefits of fertilisers. | | |  | | --- | | The benefits, risks and impact of a variety of production processes and chemicals in agriculture and their alternatives on global food production. | | |  | | --- | | Composition of fertilisers. Nitrogen cycle and the impact of fertilisers on the environment. | |
| **Core Learning for Significant Aspect of Learning: Planet Earth: Energy sources and sustainability** | | | | |
| Early | First | Second | Third | Fourth |
| Forces and energy to make a variety of toys and appliances move. | Types of energy and their sources; the importance of energy for everyday life and for survival. | Energy conversions and conservation. Reduction of energy transferred to the environment as heat. | Heat transfer between hot and cold objects. Transfer of heat energy by conduction, convection, and radiation. Use of materials with low thermal conductivity to promote energy efficiency. | Benefits and risks of different energy sources in meeting needs for energy. Risks and benefits of energy sources. |
|  |  | Non-renewable and sustainable energy sources and their use in Scotland today and in the future | Renewable energy sources; benefits and potential problems. | Formation of fossil fuels; use and conservation of finite energy resources. |
| **Significant Aspect of Learning: Planet Earth: Processes of the planet** | | | | |
| Early | First | Second | Third | Fourth |
| Forms of water in everyday contexts. Water changing form. | Water changing form; melting, freezing and boiling. Processes of evaporation and condensation. | The water cycle. Changes of state; evaporation and condensation processes. | Models of matter, energy and changes of state as they occur in nature. | Kinetic model of gases; relationships between pressure, volume and temperature. |
|  |  |  | Main components of air. Impact of carbon dioxide from burning of fossil fuels on climate change processes. | The Carbon Cycle and the maintenance of the balance of gases in the air. Causes and implications of changes. |
| **Significant Aspect of Learning: Planet Earth: Space** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| The sky, Sun, Moon and stars and patterns of daily occurrence. | The Sun, Moon and Earth; patterns of movement and changes over time  Length of a day, a month and a year. Seasons. | Our place in the solar system; size, scale, time and relative motion. | The needs of living things, the solar system and the likelihood of life existing elsewhere. | Exploration and observations of the Universe leading to increasing knowledge and understanding of the Universe. |

**Forces, Electricity and**

**Waves**

**Progression**

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| **Forces, Electricity and Waves - Forces** | | | | | | | | |
| **Forces**  Learners first develop an understanding of how forces can change the shape or motion of an object, considering both forces in contact with objects and those which act over a distance. They investigate the effects of friction on motion and explore ways of improving efficiency in moving objects and systems. Study of speed and acceleration of an object leads to an understanding of the relationship between its motion and the forces acting on it. This is linked to transport safety. Learners develop their understanding of the concept of buoyancy force and density. ***(Also refer to Topical Science)*** | | | | | | | | |
| **Early Level** | | | | | | | | |
| 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**  **Key Words and Phrases**  What makes them go? pull, push, stretch, twist, turn, squash, battery, wind-up, energy, forces, direction. | Step 1   * I can identify that many toys and objects need to be pushed or pulled to make them move. | | | | Step 2   * I can describe a force as a push or a pull and give examples. * I can describe how a force can make an object move. | | | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |
| **First Level** | | | | | | | | |
| By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects.  **SCN 1-07a**  **Key Words and Phrases**  push, pull, force, movement, friction, acceleration, deceleration, material, direction, shape, speed, distance, air, gravity. | Step 1   * I can identify when I use pushing and pulling forces when playing with toys or other objects. * I can sort toys and objects accordingly to pushes and pulls. * I can explain that a push and a pull are both forces. | | Step 2   * I can explain that pushing harder or pulling harder increases the force. * I can explore how pushes and pulls can move objects. * I can recognise that a push or pull changes the speed of an object. * I can explain how twisting, turning, bending and stretching are forces which can cause change of shape e.g. elastic band. | | | | Step 3   * I can predict how a force can change an object’s shape e.g. play dough. * I can explain that different sizes of forces produce different changes in speed and/or direction e.g. hitting a ball. * I can explain that different sizes of forces stop a moving object. * I can explain that if forces are equal (balanced) there is no movement. * I can explain that the size of force required to move an object depends on the size, shape and mass of the object. | |
| 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**  **Key Words and Phrases**  magnet, magnetic, non-magnetic, push, pull, force, attract, repel, pole, strength. | Step 1   * I can observe magnets attracting magnetic materials. * I can use a magnet to identify magnetic and non-magnetic materials. | | Step 2   * I can demonstrate that magnets have north and south poles. * I can explain that not all metals are magnetic and can give examples. | | | | Step 3   * I can describe how magnets exert a force that can attract or repel. * I can explain that this force does not require contact between the magnet and the metal. * I can contribute to a design of a game involving magnets. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |
| **Second Level** | | | | | | | | |
| By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects.  **SCN 2-07a**  **Key Words and Phrases**  spring, force, stretch, push, pull, measure, amount, distance, travel, weight, heavier, mass, pushing, pulling, floating, sinking, surface area, direction, speed, friction, rate of descent, time of descent, air resistance, streamlining. | Step 1   * I can state that the force between two moving surfaces is called friction. * I can demonstrate how friction can oppose movement. * Through investigation I can explain why a streamlined shape allows easy movement through air and water. | | Step 2   * I can demonstrate that a moving object has to push through air particles and as they rub against the object they cause friction. * I can explain how the shape of an object affects its rate of fall through a liquid or air. * I can give examples of streamlining and explain how this lowers air resistance. * I can give examples and demonstrate how friction can be useful citing everyday examples. | | | | Step 3   * I can describe ways in which friction forces, including air resistance, can be reduced or increased. * I can explain air resistance and water resistance. * I can categorise everyday examples of friction into ‘high friction’ and ‘low friction’. * I can plan a fair test to show how the degree of friction can be altered e.g. between two surfaces. * I can plan a fair test to show the effects of water resistance on a moving object. * I can list factors that improve the aerodynamics of an object and give examples of designs that use this to improve their performance. | |
| I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications.  **SCN 2-08a**  **Key Words and Phrases**  attraction, effects, magnet, pole, repulsion, acceleration, force, gravity, matter, pull, charge, static electricity, positive, negative, electrons, electric force, positive, negative, charge, attract, repel, static electricity, electrostatic charge. | Step 1   * Through investigations I have collaborated in, I can explain the terms magnetic, electrostatic and gravitational force. | | Step 2   * I can investigate, plan and carry out a fair test to show that gravitational force exists around us. * I can investigate, plan and carry out a fair test to show that magnetic force exists around us. | | | | Step 3   * I can show that magnetic and electrostatic forces can attract or repel, while gravitational forces always attract. * I can investigate; plan and carry out a fair test to show that electrostatic force exists around us. * Through research and discussion I can give examples of how magnetic, electrostatic and gravitational forces occur in everyday life. | |
| By investigating floating and sinking of objects in water, I can apply my understanding of buoyancy to solve a practical challenge.  **SCN 2-08b**  Key Words and Phrases  floating, sinking, buoyancy, water displacement, mass, density, weight, surface area, float, sink, density, liquid, size, volume, mass, viscosity, Plimsoll line, buoyancy. | Step 1   * I understand that when an object is placed in water, the water is displaced and the water line rises. * I can investigate whether an object floats or sinks based on my knowledge and experience. | | Step 2   * Through practical activities, I can explain the factors which affect floating and sinking and relate the importance of these to maritime safety. * I can investigate how buoyancy is affected by several different factors such as size, shape and density. | | | | Step 3   * I can apply my understanding of the factors which affect floating and sinking to solve a practical challenge e.g. plasticine boats, how many marbles can your boat hold? * I can demonstrate the term buoyancy based on practical investigations. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |
| **Forces, Electricity and Waves - Electricity** | | | | | | | | |
| **Electricity**  The learners’ knowledge about electricity begins with knowing how to use it safely and this aspect is reinforced throughout their learning. They develop their understanding of electricity as a means of transferring energy by investigating circuits and building chemical cells. Learners develop their understanding of series and parallel circuits and of electrical and electronic components and apply their knowledge to the process of designing, constructing, testing and modifying. ***(Also refer to Topical Science)*** | | | | | | | | |
| **Early Level** | | | | | | | | |
| 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**  **Key Words and Phrases**  electricity, electrical appliance, plug, flex, socket, switch, mains, names of common electrical appliances, safety, danger, keep out, care, battery, bulb, light, heat, sound. | | Step 1   * I can describe electricity as a form of energy that makes something work. * I can identify a number of appliances that work by electricity. * I am aware that electricity can be dangerous. | | | | Step 2   * I can explain why electricity is important in our daily lives. * I can describe why electricity is dangerous and know/ show how to stay safe. * I can describe how electrical appliances use electrical energy and transform it into other forms of energy – e.g. light, heat, sound. * I can contribute to a display showing why electricity is important in our daily lives. | | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |
| **First Level** | | | | | | | | |
| 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**  **Key Words and Phrases**  battery, bulb, buzzer, circuit, conductor, connector, current, wire, dangerous, electrical safety, electricity, energy, generate, insulator, material, metal, motor, non-metal, switch. | | Step 1   * I can identify a battery or the mains socket as being sources of electricity, which are used to make electrical devices work. * I can create a simple working electrical circuit. * I can draw a simple picture to represent my circuit. | | Step 2   * I can identify simple circuit components such as a switch, battery, lamp, motor, leads, crocodile clips and buzzer. * I can describe how an electrical circuit must be complete. * I can describe the conducting components of an electrical circuit. * I can represent a simple series circuit diagram. | | | | Step 3   * I can explain the difference between a conductor and insulator. * I can understand and use the terms mains, pylons, sub-station and supply. * I can incorporate a simple series circuit into a game or model. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |
| **Second Level** | | | | | | | | |
| 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**  Key Words and Phrases  electricity, electrons, circuit, power source, electric current, safety, dangerous, components, bulbs, buzzers, motors, wires, switches, battery, cells, conventional symbols, volts, amps. | | Step 1   * I can explain the dangers of electricity and can provide advice on how to stay safe around electricity, indoors and outdoors. * I can make simple circuits using different components for a variety of purposes. * I can use/read simple meters in circuits. | | Step2   * I can make and draw simple circuits using standard symbols to represent the basic components of an electrical circuit. * I can describe circuits using appropriate languages, (volts, amps). * I can explain that in order for electricity to flow a complete circuit and a power source is needed. | | | | Step 3   * I can construct more complex circuits, interpreting diagrams using conventional symbols. * I can explain how electrical energy transfers around a circuit. * I can describe the transfer of energy e.g. heat and light in a bulb. * I can demonstrate and explain, by setting up a circuit, the effect of changing the number of components in a series circuit. |
| **Second Level** | | | | | | | | |
| 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**  **Key Words and Phrases**  battery, portable, power source, chemical energy, transfer of energy, powerful, weak, chemical reaction, generate electricity, electrical inventions, acid, metals. | | Step 1   * I can explain that a battery is a portable power source which has a store of chemical energy. * I can be used as a store of chemical energy (a weak battery). | | Step 2   * I can set up an experiment to show that readily available materials e.g. orange, lemons etc. can be used to make a simple battery/cell. * I can describe why batteries must be disposed of properly (because of the chemicals in them). | | | | Step 3   * I can describe how chemicals are brought together in a battery to produce electricity. * Using my knowledge of electricity I can use a range of materials to create an electrical source to power an appliance. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | | | | | |

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| **Forces, Electricity and Waves – Vibrations and Waves** | | | | |
| **Vibrations and Waves**  Learners explore the nature of sound, light and radiations in the electromagnetic spectrum. They use musical instruments to explore the relationship between vibrations and sounds produced. They develop their understanding of the properties of light and other forms of electromagnetic radiations. They explore how different waves relate to the environment and how we make use of them in health, medicine and communications. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| Through play, I have explored a variety of ways of making sounds.  **SCN 0-11a** | Step 1   * I can demonstrate, through using a variety of materials/instruments etc. a number of different ways of making sounds – e.g. hitting, blowing, plucking, shaking, etc. | | Step 2   * I can demonstrate that there are many different ways to describe sounds e.g. high, low, loud, quiet I can identify the source of a sound. * I can share my likes and dislikes of specific sounds. * I can demonstrate how volume can be changed. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| 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**  **Key Words and Phrases**  vibrations, echoes, ear canal, ear drum, pitch, high pitch, low pitch, volume, communicate, frequency, musical, tuned, percussion instruments, string instruments, wind instruments, brass instruments, sound waves. | Step 1   * I can describe and demonstrate how a sound is produced by vibration. * I can use the terms high/ low, loud/ quiet and pitch to describe differences in sounds. | Step 2   * Through investigation in practical activities, I can discuss and demonstrate how sounds can travel through different materials. | | Step 3   * I can explain what will happen to the pitch when I change the sound source properties, e.g. larger and longer strings or other physical characteristics of the source. * I can describe and demonstrate how the pitch (high or low) is related to the frequency of the vibration. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  vibrations, echoes, ear canal, ear drum, hammer, anvil, stirrup, cochlea, pitch, amplitude, communicate, frequency, sound waves, ultrasound, oscilloscope. | Step 1   * I can explain how the amplitude and pitch of sounds can be changed. * I can show how sound is carried through waves. * I can explore how animals make sounds to communicate. | Step 2   * I can discuss and demonstrate through experiments how sound vibrations travel differently through air, water and solids. | | Step 3   * I can provide examples of how animals communicate in their environment (vocal, echolocation, etc.). * I can explain how sound vibrations travel differently through air, water and other media. |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  sun, light, source, daytime, shadows, blocked, direction, length, shape, reflected, mirror, prism, lenses, convex, concave opaque, eye, focus, lens, cast, reflection, sight, seeing, concave, convex, source of light, light beam/ray, shiny objects, bounces off, straight lines, invert, mirrors, angles, transparent, opaque, translucent, cyan, magenta. | Step 1   * I can give different examples of a light source and explain how light travels from that source enabling us to see. * I can investigate the properties of light. * I can investigate the mixing of coloured lights. * I can explain how shadows are formed and can give examples of materials that block light. * I can state the factors which affect the size of shadows. * I can explain how humans and animals can detect light. | Step 2   * I can explore how lenses affect the direction of light. * I can state that light is a form of energy that travels in a straight line. * I can explain that light changes direction when it is reflected. | | Step 3   * I can demonstrate how white light can be split into the colours of the visible spectrum. * I can explore how a variety of materials reflect light differently. * I can apply my knowledge of the properties of light to demonstrate how it can be used creatively e.g. light show, lasers, shadow puppets. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

**Forces, Electricity and**

**Waves**

**Core Learning and Benchmarks**

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| **Core learning for Significant Aspects of Learning: Forces Electricity and Waves: Forces** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Simple forces and their effects on toys and other objects. | The effect of forces on the shape and motion of objects. | Friction as a force and its effect on moving objects; air resistance. Ways of reducing or increasing friction between surfaces. | Reduction of energy losses due to friction; improving efficiency of movement. | Methods for measuring speed. Balanced and unbalanced forces acting on an object; constant speed and acceleration of objects. |
|  |  |  |  | The effects of forces acting on an object in the context of transport safety. |
|  | Forces between magnets and magnetic materials. | Magnetic, electrostatic and gravitational forces and their applications. | The effects of gravitational forces on objects; mass and weight. Weight of an object on Earth and on other planets. | Strength of magnets and electromagnets. Properties, uses and commercial applications of electromagnets and super-magnets. |
|  |  | Floating and sinking; buoyancy. |  | Density: floating and sinking. |
| **Core learning for Significant aspects of learning: Forces Electricity and Waves: Electricity** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Everyday uses of electricity and safety. | A circuit as a continuous loop of conducting materials; simple components linked in series circuits. | Components used in electrical circuits. Circuit diagrams and symbols. Energy transfer in components in electrical circuits. | Measurement of voltage and current in circuits; advantages of parallel circuits over series circuits in everyday applications. | Relationship between voltage, current and resistance. |
|  |  |  |  | Properties of electronic components; use as input and output devices in practical circuits. |
|  |  | Simple chemical cells; chemical reactions can produce electrical current. | Design of chemical cells; factors which affect the voltage produced. | Metals in electrochemical series. Use and value of metals in chemical cell technology. |
|  |  |  |  | Developments in chemical cell technology and impact on society. |
| **Core learning for Significant Aspects of Learning: Forces Electricity and Waves; Vibrations and waves** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Sources of sound; ways of making sounds. | Sound originates from vibrations; vibrations and pitch of sound. | Sound as a longitudinal wave; transmission through air, water and other media. Use of sound to for communication. |  | Sound wave patterns; pitch, volume and tone of sounds. Communication in animals. Use of sound signals in sound engineering. |
|  |  | Light; reflection, shadow formation and colour mixing. | Light; refraction when passing through materials, lenses and prisms. Practical applications of the use of lenses to bend light rays. |  |
|  |  |  | The electromagnetic spectrum and radiations beyond the visible. Advantages and limitations of applications of these radiations. | The electromagnetic spectrum and comparisons of radiations beyond the visible. Impact on society of the use of such radiations. |

**Biological Systems**

**Progression**

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| **Biological Systems - Body systems and cells** | | | | |
| **Body systems and cells**  Learners develop their knowledge and understanding of the structure and function of organs of the body, including the senses. They learn about cells as the basic units of life, and their organisation to form familiar body systems. Through observation, research and practical investigation learners explore the risk and impact of microorganisms in relation to health, and then in industrial processes. They experience the use of technology in monitoring health and improving the quality of life and develop informed views on the moral and ethical implications of controversial biological procedures. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| I am aware of my growing body and I am learning the correct names for its different parts and how they work.  **HWB 0-47b** | Step 1   * I can tell others that I was a baby and that I’ve grown. * I can tell others that babies grow. * I can point to some named body parts. * I can show and name some body parts. | | Step 2   * I can describe how my body has grown since I was a baby. * I can locate and name simple body parts and describe how I use them. | |
| I can identify my senses and use them to explore the world around me.  **SCN 0-12a**  **Key Words and Phrases**  sight, hearing, touch, taste, smell. | Step 1   * I can discuss the five senses and use related vocabulary e.g. eye, sight/ hear, ear / nose, smell etc. | | Step 2   * I can identify the 5 senses and explain which part of the body I used. * I can identify which senses I am using to explore my world, e.g. on a senses journey. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| 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**  **Key Words and Phrases**  skeleton, bones, skull, spine, rib cage, hip, shoulder, femur, tibia, fibula, radius, ulna, humerus, brain, heart, lungs, kidneys, stomach, liver, x-ray, skin. | Step 1   * I can identify the skeleton as the combination of bones inside the body. * I can name some of the major organs inside the body e.g. brain, heart, lungs, stomach etc. | Step 2   * I can describe ways to prevent the catching and spreading of diseases. * I can describe how a healthy lifestyle keeps a body healthy e.g. sleep, exercise, balanced diet. | | Step 3   * I can describe the function of the human skeleton and name the main bones. * I can describe the position and function of the major organs. * I can describe healthy choices for my future. |
| I have explored my senses and can discuss their reliability and limitations in responding to the environment.  **SCN 1-12b**  **Key Words and Phrases**  sense, hearing, touch, smell, sight, taste, sweet, sour, salty, bitter, temperature, sensory impairment, braille. | Step 1   * I can discuss different situations which affect the reliability of my senses and the impact e.g. light levels, noise etc. | Step 2   * I can identify how it would feel to have a sensory disability and report back, based on my participation in practical activities. E.g. wearing blindfolds, headphones etc. | | Step 3   * I can discuss the impact of a sense impairment on day to day life. * I can plan and carry out investigations to explore sensory impairment. * I can discuss ways in which people with a sensory impairment can be supported, e.g. Braille, guide dogs, hearing aids. |
| **First Level** | | | | |
| 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**  **Key Words and Phrases**  germs, common cold, flu, chicken pox, measles, mumps, tonsillitis, nausea fever, headache, appetite, ache, hygiene, wash, clean, symptom, prevention, healthy, treatment. | Step 1   * I can describe and understand how disease and germs are linked. * I can name the symptoms of common illnesses/ diseases and can talk about my own experiences. * I can explain how germs can be transferred. | Step 2   * I can describe some different ways of preventing the spread of diseases e.g. hand washing, good hygiene, face-masks. * I can explain the symptoms of illnesses and diseases. | | Step 3   * I can inform others of good hygiene procedures in order to prevent disease and explain their importance. * I can explain how medication, vaccination and isolation can prevent / limit the spread of disease. * I am aware that prevention and treatment benefits society by stopping the spread of infection. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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**  **Key Words and Phrases**  heart, lungs, stomach, digestive system, nervous system, kidneys, liver, brain, cell membrane, nucleus. | Step 1   * I can identify and locate some different body systems within a human being. | Step 2   * I can discuss the role of the different body systems within a human e.g. breathing system, digestive system, nervous system and give examples of organs within each system. * I can identify some factors which can damage the human body i.e. avoidable, accidental and natural e.g. falling. | | Step 3   * I can investigate factors which can cause damage to human body systems e.g. smoking. * I can make informed decisions to help me to maintain my health and wellbeing e.g. what to eat to keep my body healthy. |
| 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**  **Key Words and Phrases**  sense, hearing, touch, smell, sight, taste, sweet, sour, salty, bitter, , retina, iris, cornea, optic nerve, illusions, perception, Braille, lenses, hearing aids, eardrum, vibrates, communicate, hammer, anvil, stirrup, ear canal, balance, olfactory cells, frontal lobe, limbic system, memories, reflexes, Goosebumps, sensory receptors, pressure, pain, temperature. | Step 1   * I can explain the role each of my senses play in keeping me safe by giving specific examples- touch protects us. * I can label a diagram to show the structure of the human eye and ear. | Step 2   * I can create a flow diagram to show how sound travels through our ears. * I can discuss how parts of the eye help us to see. | | Step 3   * I can carry out experiments which show how important each of our senses are in helping us understand conditions outside our body. * I can provide examples of how our senses work better when they work together e.g. taste and smell. * Through research I can provide examples of animal senses which are more highly developed than human senses. * I can identify ways in which our senses can be damaged by our actions e.g. listening to loud music, over exposure to screens. |
| **Second Level** | | | | |
| I have contributed to investigations into the role of microorganisms in producing and breaking down some materials.  **SCN 2-13a**  **Key Words and Phrases**  biodegradable, non-biodegradable, landfill site, rot, break down, recycle, micro-organisms, microbes, germs, viruses, bacteria, fungi, microscope, vaccine, vaccination, antibody, immunisation, pus, decay, hygiene, mould. | Step 1   * I can explain that microorganisms are living things found all around us that cannot be seen by the naked eye. * I can describe how micro-organisms contribute to the decay of some of our waste materials. | Step 2   * I can provide examples of microorganisms that are beneficial e.g. the use of yeast in bread making, the role of bacteria in yoghurt. * I can give examples of harmful micro-organisms and give reasons why they can cause problems. | | Step 3   * I can plan and carry out an investigation to explore the role of microorganisms e.g. bread making, the breakdown of waste in compost. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

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| **Biological Systems - Inheritance** | | | | |
| **Inheritance**  Starting with observations of similarities and differences between individuals, learners develop their understanding of how organisms develop and pass on genetic information to the next generation. They begin to develop their knowledge of genetics and of the role of DNA and examine moral and ethical questions which arise from technological developments. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| I recognise that we have similarities and differences but are all unique.  **HWB 0-47a** | Step 1   * I can sort, match and compare by appearance. * I can find similarities and differences between myself and others. | | Step 2   * I can explain how I am the same or different from others. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| By comparing generations of families of humans, plants and animals, I can begin to understand how characteristics are inherited.  **SCN 1-14a**  **Key Words and Phrases**  evolution, species, adaptation, variation, inherited, environmental, generations, parents, characteristics, common, different, genetics, genes, DNA, life cycle, childhood, adult, old age, gestation time, mammals, reptiles, birds, amphibians, fish, extinction, extinct, reintroduction, reproduction. | Step 1   * I can identify some characteristics of living things that can be passed on from parents to young, i.e. hair colour in kitten and cat. * I can identify some characteristics of animals and plants which are similar and some which are not, i.e. deciduous and evergreen trees linked to seasons. | Step 2   * I can investigate some family characteristics of plants and animals and describe how some of these may be inherited and some be due to the environment. | | Step 3   * I can use the terms, ‘inherited’ and ‘non-inherited’ appropriately. * I can create a display to show how characteristics can be inherited through several generations. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| By investigating the lifecycles of plants and animals, I can recognise the different steps of their development.  **SCN 2-14a**  **Key Words and Phrases**  sepal, stamen, petals, dispersal, seeds, germination, pollination, flowers, fruit, seeds, reproduction, cycle of birth, life cycle, extinction, conservation, pollen, stigma, baby, toddler, adolescence, adulthood, old age, ovum, fertilise. | Step 1   * Through observation I can describe and explain the step changes in the life of a plant or animal. * I can demonstrate that I understand that all animals and plants have a life cycle. | Step 2   * I can discuss and understand the importance of reproduction for the survival of a species. * I can research and identify animals which are currently under the threat of extinction in Scotland. * I can explain how pollination occurs. * I can research the life cycle of one animal using including technologies to create a presentation/project. | | Step 3   * I can describe the conditions needed for germination to take place. * I can describe that plants produce flowers which have male and female organs, seeds are formed when pollen from the male organ fertilises the ovum (female). * I can compare the different stages of the life cycle of plants, humans and animals. |
| **Second Level** | | | | |
| By exploring the characteristics offspring inherit when living things reproduce, I can distinguish between inherited and non-inherited characteristics.  **SCN 2-14b**  **Key Words and Phrases**  evolution, species, adaptation, variation, inherited, environmental, generations, genetics, DNA, genes, chromosomes, dominant, recessive, continuous variation, discontinuous variation. | Step 1   * I can explain how some inherited characteristics are passed on through generations. * I can state that we possess similarities and differences which make us all unique and give some examples. | Step 2   * I can identify and classify examples of living things to help me appreciate their variety. | | Step 3   * I can explain that variation between different members of the same species of living things can be caused by either inheritance or environmental factors. * I can explain that human characteristics are determined by genes and that these genes are passed down from each parent; half from the mother and half from the father. * I can discuss/describe the probability of offspring inheriting certain characteristics. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

**Biological Systems**

**Core Learning and Benchmarks**

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| **Core learning for Significant Aspects of Learning: Biological Systems: Body systems and cells** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Names of parts of the body and what they do. | The main bones of the skeleton; major organs of the body; position, name and functions. | Body systems; structure and function, causes and prevention of potential problems. | Organ structures and systems; functions and processes to sustain life. | Body responses to external and internal stimuli to maintain stable conditions. |
| Senses and their use in exploring surroundings. | The reliability and limitations of senses in responding to the environment. | The structure and function of sensory organs; responses to external stimuli. Role of sense organs in survival. | Use of technology to monitor health and improve quality of life. | Changes in learned behaviour due to stimuli contribute to the survival of the species. Behavioural adaptations in animals. |
|  | Common diseases caused by microorganisms. Microorganisms and the spread and prevention of disease. | Microorganisms in the production of and breaking down of materials. Beneficial and harmful microorganisms. | Cells; variety, structure and functions of cell components. | Cell division; role in growth and repair. Therapeutic use of cells. |
|  |  |  | Different types of microorganisms; controlling growth of microorganisms  Body defences against disease. Protection by vaccination. | Microorganisms and enzymes; properties and industrial uses. |
|  |  |  |  | Controversial biological procedures; moral and ethical issues. |
| **Core learning for Significant Aspects of Learning: Biological Systems: Inheritance** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| |  | | --- | | Humans: similarities, differences and uniqueness of an individual. | | Differences; the characteristics of individuals in different generations of plant and animal families. Inheritance of characteristics. | Life cycles and stages of development in plants and animals.  Inherited and non-inherited characteristics. | Fertilisation, embryonic development and risks to the embryo  DNA; extraction and function. Benefits and risks of DNA profiling. | Sexual and asexual reproduction. Comparison and importance for survival of species. |
|  |  |  |  | Inherited characteristics; DNA, genes and chromosomes. |

**Materials**

**Progression**

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| **Materials - Properties and uses of substances** | | | | |
| **Properties and uses of substances**  By exploring the properties of different substances and how they can be changed, learners gradually develop their understanding of the connection between structure and properties. They explore the development of new substances which have useful properties, and begin to relate physical and chemical properties to models of atomic structure. Learners begin to use symbols and chemical formulae as a way of communicating information about elements and compounds. ***(Also refer to Topical Science)*** | | | | |
| **Early Level** | | | | |
| Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes.  **SCN 0-15a**  **Key Words and Phrases**  materials, hard, soft, weak, strong. | Step 1   * I can explore and talk about the properties of a variety of materials and sort them according to strength, hardness, resistance to water. * I can discuss the materials that common objects are made from using appropriate vocabulary. * I can explore and talk about the fact properties of materials can change in some circumstances e.g. gloop, cooking. | | Step 2   * I can select a suitable material for a particular purpose and to give reasons for the choice e.g. waterproof. * I can sort different materials/objects into groups by properties. * I can name what some common objects are made from. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges.  **SCN 1-15a**  **Key Words and Phrases**  materials, metal, wood, concrete, plastic, paper, glass, fabric, rubber, ceramics, strong, weak, flexible, hard, rigid, rough, smooth waterproof, absorbent, transparent, translucent, opaque, similarities, differences, properties, classification, dissolve, soluble, insoluble, solution, melting, heating, cooling, freezing, solidifying, gas, liquid, solid, reversible. | Step 1   * I can explore and describe basic properties of materials e.g. hard, soft shiny bendy, colour, hardness texture, smell, shape, weight/mass. | Step 2   * I can classify materials into categories e.g. metals and non –metals, conduct heat and electricity, hardness, shiny appearance, can be moulded, flexible, rigid. * I can identify some common materials as being natural (e.g. wood/ stone/ soil/water/minerals/fuels and metals) or man-made (e.g. glass /plastic), their uses and similarities and differences. | | Step 3   * I can describe the properties of a wide range of materials and their origin. * I can select materials for use in particular situations based on their properties to solve a challenge e.g. design ear muffs for the winter, boat that will hold 12 marbles, find the best waterproof material for a coat etc. |
| I can make and test predictions about solids dissolving in water and can relate my findings to the world around me.  **SCN 1-16a**  **Key Words and Phrases**  solid, liquid, gas, solution, solubility, dissolve, soluble, insoluble, absorption, temperature, melting, shape, movement, substance, prediction. | Step 1   * I can talk about some things that dissolve in water and some that do not. | Step 2   * I can show that when a solid dissolves in water, a clear (sometimes coloured) liquid is formed. * I can make predictions about solids dissolving in water and test my predictions. | | Step 3   * I can correctly use the terms soluble and insoluble. * I can investigate and classify materials using the terms soluble and insoluble. * I can describe situations where this occurs in everyday life. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. **SCN 2-15a**  **Key Words and Phrases**  reversible, irreversible, heating, cooling, burning, freezing, boiling, melting, dissolving, bicarbonate of soda, vinegar, water vapour, condensing, Solids, liquids, gas, materials, substances, chemical reactions, properties, evaporated, melted, heated, solidifying, reversible, irreversible, carbon dioxide, oxygen. | Step 1   * I can carry out experiments which show that materials can be changed from one form to another and discuss the observed changes e.g. decaying of animal or plant matter, burning, cooking, rusting. * I can explain the difference between materials melting and materials dissolving. | Step 2   * I can observe and discuss the similarities and difference between the properties of gas, liquid, solid. * I can give examples of substances which change when heated. * I can explain how some substances change when cooled. * I can observe and know that when some substances change a chemical reaction is produced and sometimes we cannot get the original substance back. | | Step 3   * I can explain that materials exist in different forms: solids, liquids and gases and can give examples of each. * I can identify the processes which change a solid into a liquid and explain how it can be reversed. * I can explain that when substances change due to a chemical reaction we cannot get the original substance back e.g. baking is irreversible, freezing and melting are reversible because it does not involve a chemical reaction. * I can identify some features which show a chemical reaction has taken place e.g. heat is produced, a colour change, light produced or a gas can be produced. |
| I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience.  **SCN 2-16a**  **Key Words and Phrases**  dissolving, soluble, insoluble, solutions, solvent, solute, mixtures, filtering, evaporation, filtrate, residue, magnets, chromatography, reversible, irreversible., suspension, saturation. | Step 1   * I can explore mixtures of substances and observe their properties e.g. size, shape, magnetic attraction etc. * I can state that solids can be mixed and that it is possible to get the original materials back. * I can explain that evaporation can be used to separate materials from liquids. | Step 2   * I can choose appropriate apparatus for separating a mixture of solids or solids and liquid. * I can set up an experiment to show that solids which dissolve in water can be separated from the water by evaporation. | | Step 3   * I can set up an experiment to show that solids which do not dissolve or react with water can be separated from the water by filtering. * I can separate mixtures through filtration, evaporation and by using magnets. * I can use chromatography to show that the ink in a felt pen is made up of a several different colours. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

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| **Materials – Earth’s Materials** | | | | |
| **Earth’s materials**  Learners develop their knowledge and understanding of substances that make up the Earth’s surface. Properties, uses and methods of extraction of such materials are explored. Opportunities exist to discuss the importance of carbon compounds derived from crude oil to our lives. ***(Also refer to Topical Science)*** | | | | |
| **First Level** | | | | |
| Throughout all my learning, I take appropriate action to ensure conservation of materials and resources, considering the impact of my actions on the environment.  **TCH 1-02a** |  | |  | |
| **Second Level** | | | | |
| Having explored the substances that make up Earth’s surface, I can compare some of their characteristics and uses.  **SCN 2-17a**  **Key Words and Phrases**  crust, core, mantle, molten, volcano, sedimentary, igneous, metamorphic, metaphoric, lava, magma, rock cycle, slate, granite, sandstone, marble, limestone, erosion, weathering, compacting, permeability natural materials, rock, sand, soil, minerals, periodic table, elements, crude oil, gas, petrol. | Step 1   * I can make a simple model of the Earth’s structure and explain its structure. * I can name some of the different materials found on the Earth’s surface e.g. soil, rocks, minerals. | Step 2   * I can name some minerals and rocks and describe how they are used e.g. gold for jewellery, slate for roofing. * I can identify and compare some of the characteristics and uses of some substances that make up the Earth’s surface e.g. metals can be melted to make things, slate splits easily to make tiles etc. | | Step 3   * I can describe the processes that led to the formation of the three main types of rock (igneous, sedimentary, metamorphic). * I can give examples of useful materials that we obtain from the Earth’s crust and *why* we use these in everyday life. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

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| **Materials – Chemical Changes** | | | |
| **Chemical changes**  Learners gradually develop an understanding of chemical changes. They consider processes which take place in the environment and in the laboratory, and develop their understanding of the environmental impact of some changes. They develop their understanding of energy changes in chemical reactions and some of the factors affecting the rates of reactions. Learners develop the use of chemical names, formulae and equations as a way of conveying information about chemical changes. ***(Also refer to Topical Science)*** | | | |
| **Second Level** | | | |
| 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  **Key Words and Phrases**  conservation, sample, distilled, minerals, mineral water, solution, evaporates, crystals, dissolved, filtered, residue, undissolved, separated, purify, filter paper, pH value, acid, alkali, corrosive, universal indicator paper (litmus paper). | Step 1   * I can investigate how my family use water. * I can identify different methods of conserving water in the home and at school. * I can describe how water is collected, cleaned and transferred to our homes. * I can give examples of water pollution and describe how waste water is treated to ensure it can be returned to rivers. | Step 2   * I can investigate different samples of water and perform tests to find the properties of each. * I can demonstrate how to ‘clean’ a sample of water and explain why the sample may still be unsafe to drink. * I can demonstrate how to test the pH value of liquids and explain what the pH value represents. * I can use a pH scale and identify simple acid and alkali. | Step 3   * I can plan a fair test to find out the pH value of different water samples from our environment. |
| 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**  **Key Words and Phrases**  chemical reaction, gas, water vapour, carbon dioxide, reversible, irreversible, evaporation, filtering, burning, condensing, dissolving, freezing, hazard, mass, material, melting, solidifying. | Step 1   * I can talk about what happens in investigations and experiments when different materials are mixed. * I can talk about how to separate mixed materials, i.e. sand and sugar. | Step 2   * I can demonstrate by evaporation how some chemical changes can be reversed. | Step 3   * Through careful observations I can show that when an irreversible change takes place a new material is made; the new material can be a gas. * I can distinguish between reversible and irreversible change and identify examples of each. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | |

**Materials**

**Core Learning and Benchmarks**

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| **Core learning for Significant Aspects of Learning: Materials: Properties and uses of substances** | | | | |
| **Early** | **Early** | **Early** | **Early** | **Early** |
| Materials; characteristics and selection for a purpose. | Properties and sources of materials for a purpose and practical use. | Substances can change and such changes alter their characteristics. | The periodic table of elements; properties and uses of elements relative to their positions in the table. | The structure of the atom; bonding of atoms; relationship of structure to properties of a substance. |
|  |  |  | Making and breaking down compounds; properties of elements and compounds. |  |
|  | Dissolving: solids dissolving in water. | Substances can be pure or mixtures Separating mixtures of substances; common everyday examples. | Pure substances and mixtures; physical ways of separating mixtures into their component substances. | Novel materials; scientific basis of properties and potential impact on society. |
|  |  | Conditions which affect how much of a substance dissolves or the speed with which it dissolves. | Solubility of substances in different solvents  Concentration of solutions. Practical applications of solubility. | Conservation of mass in chemical reactions. |
|  |  | Earth’s surface; comparisons of the characteristics and uses of some component substances. | The formation, extraction, characteristics and uses of soils, minerals and basic types of rocks. Extraction of useful substances from natural resources. | Crude oil; materials derived from crude oil and their uses.  The importance of carbon compounds. |
|  |  | Water: properties, uses and importance of conservation. Methods of cleaning water. | Acids and bases; comparison of properties. PH; measuring and adjusting, indicators, neutralisation and formations of salts. Word and formula equations. | Measuring pollution in the environment. Using scientific knowledge and processes to monitor and protect the environment. |
|  |  | Chemical reactions; reactions in which a change takes place and different materials are formed. | Chemical reactions; indicators of chemical reaction and control of the rate of reaction. | Chemical reactions; energy changes and their importance. |
|  |  |  | Chemical reactions of materials from the Earth’s crust and applications of these reactions.  Collaborate to find and present information on innovative research and development carried out by scientists. | Order of reactivity of metals. Uses of reactivity series. |

**Topical Science**

**Progression**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Topical Science*** | | | | |
| **Topical science**  By considering current issues of science, learners increasingly develop their understanding of scientific concepts and their capacity to form informed social, moral and ethical views. They reflect upon and critically evaluate media portrayal of scientific findings. | | | | |
| **Early Level** | | | | |
| I can talk about science stories to develop my understanding of science and the world around me.  **SCN 0-20a** | Step 2   * I can talk about topical science stories and ideas from a wide variety of sources. | | Step 2   * I can talk about topical science stories and ideas from a wide variety of sources. | |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **First Level** | | | | |
| I have contributed to discussions of current scientific news items to help develop my awareness of science.  **SCN 1-20a** | Step 1   * I can identify some scientific news that is topical/current science and contribute this to discussions. | Step 2   * I can find and identify scientific news and contribute to topical/current science discussions. | | Step 3   * I can explain about topical/current science and contribute these findings to discussions. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |
| **Second Level** | | | | |
| 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** | Step 1   * I can discuss individuals who are making scientific discoveries/inventions that impact on society. | Step 2   * I can research and discuss individuals who are making scientific discoveries/inventions that are impacting on society. | | Step 3   * I can prepare a presentation on the impact of individuals who are making scientific discoveries/inventions and their impact on society. |
| I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.  **SCN 2-20b** | Step 1/ 2/ 3   * I can report and comment on current scientific news items. * I can reflect upon and critically evaluate media portrayal of scientific findings. * I can demonstrate knowledge and understanding of topical science issues. | Step 1/ 2/ 3   * I can report and comment on current scientific news items. * I can reflect upon and critically evaluate media portrayal of scientific findings. * I can demonstrate knowledge and understanding of topical science issues. | | Step 1/ 2/ 3   * I can report and comment on current scientific news items. * I can reflect upon and critically evaluate media portrayal of scientific findings. * I can demonstrate knowledge and understanding of topical science issues. |
| **See also the SALs of Inquiry and Investigative Skills/ Scientific and Analytical Skills/ Skills and Attitudes of Scientifically Literate Citizens as a vehicle for learning and teaching** | | | | |

**Topical Science**

**Core Learning and Benchmarks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Core learning for Significant Aspects of Learning: Topical Science** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Talk about science stories and science ideas. | Contribute to discussion of current scientific news items. | Research and discuss individuals who are making scientific discoveries or inventions. Comment on the impact of these discoveries on society. | Collaborate to find and present information on how scientists have contributed to innovative research and development. | Research new developments in science and explain how current or future applications might impact on modern life. |
|  |  | Report and comment on current scientific news items. Demonstrate knowledge and understanding of topical science issues. | Contribute to the evaluation of news items in terms of the scientific content and ethical implications. | For a selected topical scientific theme, critically analyse issues and develop an informed argument. |

**Inquiry and Investigative Skills**

**Progression**

|  |  |  |
| --- | --- | --- |
| **Inquiry and Investigative Skills** | | |
| **Inquiry and investigative skills**  ***As they experiment and carry out practical scientific investigations and other research to solve problems and challenges, learners:***   * *plan and design scientific investigations and inquiries* * *carry out practical activities* * *analyse, interpret and evaluate scientific findings* * *present scientific findings* | | |
| **Early Level** | | |
| Plan and design scientific investigations and inquiries. | Step 1   * I can explore and observe through play. * I can ask questions arising from play activities. * I can, with support, identify initial knowledge/understanding. * I can make suggestions about what to do to in order to answer the selected question. | Step 2   * I can make simple predictions of what might happen. * I can think of a questions to find out more about a subject/topic/object. |
| Carry out practical activities. | Step 1   * I can, with support, discuss obvious risks and take appropriate steps to protect myself and others. * I can offer ideas and make choices and decisions. * I can use my senses to acquire information. | Step 2   * I can measure using simple equipment and non-standard units. * I can record my findings by drawing a picture. |
| Analyse, interpret and evaluate scientific findings. | Step 1   * I can present data/ information using displays, photographs, simple charts and drawings etc. * I can, with support, discuss how an experiment might be improved. * I can give oral descriptions of what was done and what happened. | Step 2   * I can recognise similarities, patterns and differences in the findings and link these to their original question. * I can relate my findings to everyday experiences. * I can identify and discuss new knowledge or understanding. |
| Present scientific findings. | Step 1   * I can respond to questions about the investigation. | Step 2   * I can talk about and use drawings, photographs and displays to report to others. |

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| **Inquiry and investigative skills (continued)** | | | |
| **First Level** | | | |
| Plan and design scientific investigations and inquiries. | Step 1   * I can collaborate with others to raise questions to find out more about a specific scientific concept, idea or issue. | Step 2   * I can recognise when a test is unfair. | Step 3   * I can suggest how to make a test fair. * I can contribute to the design of procedures. * I can make predictions. |
| Carry out practical activities. | Step 1   * I can use simple equipment with adult support. * I can begin to measure using standard units. | Step 2   * I can use simple equipment provided showing awareness of risks. * I can measure with increasing accuracy using standard units. | Step 3   * I can identify risks and hazards and ensure safe use of all tools, equipment and procedures. * I can observe, collect information and measurements, using appropriate equipment and units. e.g. temperature, weight, speed, time, distance etc. |
| Analyse, interpret and evaluate scientific findings. | Step 1   * I can use labelling and scales. * I can organise data or information using a range of methods including tables, charts and diagrams. * I can identify significant patterns and relationships. | Step 2   * I can interpret findings and discuss links to an original question. * I can make decisions about and report back upon limitations of their investigation. * I can make decisions and explain how to improve an investigation. | Step 3   * I can present data and information using a range of methods including: tables, charts and diagrams. * I can relate my findings to everyday experiences. * I can identify and discuss additional knowledge or understanding through my learning. |
| Present scientific findings. | Step 1   * With adult support, I can report on my findings orally. | Step 2   * I can report on my findings in writing, orally or visually using a variety of media. * I can, with support, structure a simple presentation or report to present findings in coherent and logical way. | Step 3   * I can report on my predictions in writing, orally or visually using a variety of media. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Inquiry and investigative skills (continued)** | | | |
| **Second Level** | | | |
| Plan and design scientific investigations and inquiries. | Step 1   * I can discuss questions to investigate (with support). * I can discuss the appropriate apparatus I may need to support scientific investigations. * I can begin to independently formulate questions and predictions based on my observations and information. | Step 2   * I can identify the factors to be investigated and observed or measured when designing an investigation. * I can plan, predict and undertake a fair test and record my results (with support). * I can discuss which variable to change to make an accurate test with support from my teacher. | Step 3   * I can identify factors that can be changed when designing an investigation. * I can identify the factors which must remain constant when designing an investigation. * I can plan, predict and undertake a fair test and record my results appropriately. |
| Carry out practical activities. | Step 1   * I can make observations and collect information and measurements using a variety of devices, units and ICT. | Step 2   * I can anticipate what needs to be done in order to be safe and to control risks and hazards. | Step 3   * I can begin to take initiative about the appropriate measurement equipment and procedures to take. |
| Analyse, interpret and evaluate scientific findings | Step 1   * I can complete a simple results table. * I can use a simple spreadsheet. * I can complete a bar or line graph with labelled axes. | Step 2   * I can interpret information in a simple graph and draw conclusions through discussion. * I can begin to independently formulate questions and predictions based on my observations and information. * I can make links to my original questions or predictions. * I can collate, organise and summarise my findings. | Step 3   * I can identify relationships between the variables which can affect an investigation. * I can draw consistent conclusions from my findings. * I can recognise that some results are incorrect and these anomalous results may affect my findings. * I can identify errors in my findings and suggest possible sources of the error. * I can relate my findings to everyday experiences. * I can identify and discuss additional knowledge or understanding from my learning. |
| Present scientific findings | Step 1   * I can use a variety of methods to present findings, including reference to hypotheses and accurate testing (with support). * I can use senses and appropriate instruments and, with support describe objects, events and results using appropriate scientific terminology and unit symbols. | Step 2   * I can present data/ information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. * I can collaborate in and independently report my findings, in writing, orally or visually using a variety of media and to a range of audiences. | Step 3   * I can use appropriate scientific vocabulary and acknowledge sources of scientific knowledge and investigations. * I can structure presentation of findings using scientific reporting models.  e.g. hypothesis, conclusion, apparatus, method, evaluation etc. |

**Inquiry and Investigative Skills**

**Core Learning and Benchmarks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Core learning for Significant Aspects of Learning: Inquiry and Investigative Skills** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Explore and observe through play. Ask questions arising from play activities. With support, identify initial knowledge/understanding and which question is to be explored. Make simple predictions of what might happen. | In collaboration with others raise questions to find out more about a specific scientific concept, idea or issue. Make predictions. | More independently formulate questions and predictions based on observations and information. | Show initiative and independence in identifying a number of key questions and in formulating hypotheses and predictions based on information, observations and knowledge. | Independently and in more complex and less familiar contexts formulate hypotheses and predictions based on observations and knowledge. |
| Make suggestions about what to do to answer the selected question. | Contribute to the design of procedures. | Identify factors that can be changed. Identify the factors to be investigated and observed or measured, and those that are to be kept constant. | Design procedures to test an hypothesis, controlling and varying an increased number of more complex variables. | Identify appropriate dependent and independent variables together with those to be kept unchanged. Design a control if appropriate. |
| With support discuss obvious risks and take appropriate steps to protect themselves and others. | Identify risks and hazards and ensure safe use of all tools, equipment and procedures. | Anticipate and apply safety measures to control all risks and hazards. | Anticipate and apply safety measures to control all risks and hazards. | Anticipate and apply safety measures to control all risks and hazards  Independently plan and carry out all procedures. Collect complex data and information using data loggers and software analysis tools. |
| Offer ideas and make choices and decisions Use their senses to acquire information or measure using simple equipment and non-standard units. | Collaborate in investigations  Observe, collect information and measurements, using appropriate equipment and units. | Contribute to carrying out all the procedures Make observations and collect information and measurements using devices, units and ICT. | Increasingly take initiative in decision making about samples, measurements, equipment and procedures to use. Collect increasingly complex data and information using data loggers and software analysis tools. | Demonstrate precision in use of terminology, units and scales. |
|  |  |  | Demonstrate increased precision in use of terminology, units and scales. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Core learning for Significant Aspects of Learning: Inquiry and investigative skills (cont…)** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Present data/ information using displays, photographs, simple charts and drawings etc. Provide oral descriptions of what was done and what happened. | Present data/ information using a range of methods including tables, charts and diagrams, using labelling and scales. | Present data/ information by choosing from an extended range of tables, charts, diagrams, graphs, including bar graphs and line graphs. | Present data/ information using an increasing range of ways, choosing appropriately from an extended range of tables, charts, diagrams and graphs and using suitable scales. | Select appropriate ways of presenting qualitative and quantitative findings. |
| Recognise similarities, patterns and differences in the findings and link these to their original question. | Organise data or information and identify significant patterns and relationships. | Identify relationships between the variables. | Interpret and analyse the data and information and establish relationships between variables and link to the original hypothesis. | Identify trends and patterns within the data. |
| Link findings to original questions. | Interpret findings and discuss links to the original question. | Make links to original questions or predictions.  Draw conclusions consistent with findings. | Establish links between the findings and original questions and hypothesis or prediction. Use understanding of science concepts to explain the findings. | Relate findings to the original hypothesis, prediction or question. Use understanding of science concepts to explain the findings. |
| With support discuss how the experiment might be improved. | Report on limitations of their investigation and possible improvements. | Recognise anomalous results and suggest possible sources of error. | Evaluate range of aspects of the investigation/enquiry including relevance and reliability of evidence. | Evaluate aspects of the investigation/enquiry, including validity and reliability. Identify appropriate improvements to the methodology. |
| Relate findings to everyday experiences. Identify and discuss new knowledge or understanding. | Relate findings to everyday experiences. Identify and discuss additional knowledge or understanding. | Relate findings to everyday experiences. Identify and discuss additional knowledge or understanding. | Begin to consider alternative explanations and apply or extend conclusions to new situations or identify further studies. | Consider alternative explanations and apply or extend conclusions to new situations and indicate additional studies. |
| Use talk, drawings, photographs and displays to report to other children and known adults. | Report in writing, orally or visually using a variety of media. | Collaboratively and individually report in writing, orally or visually using a variety of media and to a range of audiences. | Communicate effectively in a range of ways including orally and through scientific report writing. | Communicate effectively in range of ways including orally and through scientific report writing. |
| Respond to questions about the exploration. | With support structure a presentation or report to present findings in coherent and logical way. | Collate, organise and summarise findings.  Use appropriate scientific vocabulary and acknowledge sources.  Use headings/questions to structure presentation of findings | Present findings in appropriate modes and formats for audiences which may consist of adults from out with the school and/or may be addressed through communications technology.  Provide supporting evidence and quote and acknowledge sources. | Present findings in appropriate modes and formats for audiences which may consist of adults from out with the school and/or may be addressed through communications technology.  Provide supporting evidence and quote and acknowledge sources. |

**Scientific Analytical Thinking Skills Progression**

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| **Scientific Analytical Thinking Skills** | | | | |
| **Scientific Analytical Thinking Skills**  ***In order to make sense of scientific evidence and concepts learners:***   * *Develop a range of analytical thinking skills.* | | | | |
| **Early Level** | | | | |
| Develop a range of analytical thinking skills. | Step 1   * I can demonstrate my natural curiosity and show development of basic skills of analysis in simple familiar contexts. * I can demonstrate my creative thinking by offering suggestions and solutions to everyday problems. | | Step 2   * I can demonstrate my reasoning by explaining my choices and decisions. | |
| **First Level** | | | | |
| Develop a range of analytical thinking skills. | Step 1   * I can contribute to the design process and the use of components to make models. | Step 2   * I can think creatively and offer solutions to scientific issues and problems. | | Step 3   * I can apply my knowledge, understanding and learning in the sciences. * I can demonstrate my reasoning skills and draw upon my understanding of science concepts to make and test predictions. * I can provide explanations, supported by the evidence around me. |
| **Second Level** | | | | |
| Develop a range of analytical thinking skills. | Step 1   * I can use a simple classification key to identify different animals and plants. * I can, with increasing independence, apply my analytical thinking skills in science when I am working on unfamiliar, more complex contexts. | Step 2   * I can create a classification key. * I can demonstrate my development of creative thinking to the processes of design, construction, testing and modification. | | Step 3   * I can analyse, synthesise and integrate learning in the sciences through my application to unfamiliar concepts. * I can apply my understanding of an increasing range of science concepts to solve new problems and provide solutions to questions. |

**Scientific Analytical Thinking Skills**

**Core Learning and Benchmarks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Core learning for Significant Aspects of Learning: Scientific Analytical Thinking Skills** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Demonstrate natural curiosity and show development of basic skills of analysis in simple familiar contexts. | Apply learning in the sciences. | With increasing independence, apply scientific analytical thinking skills working with less familiar and more complex contexts. Analyse, synthesise and integrate their learning in the sciences. | | |
| Demonstrate creative thinking by offering suggestions and solutions to everyday problems. | Provide creative solutions to scientific issues and problems. Contribute to design processes and use of components to make models. | Apply understanding of an increasing range of science concepts to solve problems and provide solutions. Demonstrate further development of creative thinking including through the engineering processes of design, construction, testing and modification. | | |
| Demonstrate reasoning skills by explaining choices and decisions. | Demonstrate reasoning skills and draw on understanding of science concepts to make and test predictions. Provide explanations, supported by evidence. | Express informed views, both orally and in writing. Present a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts. | | |

**Skills and Attributes of Scientifically Literate Citizens**

**Progression**

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| --- | --- | --- | --- | --- |
| **Skills and Attributes of Scientifically Literate Citizens** | | | | |
| ***Children and young people develop as scientifically literate citizens with a lifelong interest in science by:***   * *recognising the impact the sciences make on their lives, the lives of others, the environment and on society* * *expressing opinions and making decisions on social, moral, ethical, economic and environmental issues based upon sound understanding* * *developing scientific literacy skills.* | | | | |
| **Early Level** | | | | |
| Recognising the impact the sciences make on their lives, the lives of others, the environment and on society. | Step 1   * I can talk about the impact the sciences have on my life. | | Step 2   * I can talk about science showing developing understanding of risks and benefits. | |
| Expressing opinions and making decisions on social, moral, ethical, economic and environmental issues based upon sound understanding. | Step 1/2   * I can demonstrate respect for living things and their care, and for the environment. | | | |
| Developing scientific literacy skills. | Step 1/2   * I can demonstrate developing understanding of science in the world around me including meeting or finding out about people who use science as part of their job. | | | |
| **First Level** | | | | |
| Recognising the impact the sciences make on their lives, the lives of others, the environment and on society. | Step 1   * I can discuss science and its impact on our lives, environment and society. | Step 2   * I can make connections between science and my own health and wellbeing. | | Step 3   * I can discuss the impact of scientific developments on my life. |
| Expressing opinions and making decisions on social, moral, ethical, economic and environmental issues based upon sound understanding. | Step 1/2/3   * I can demonstrate increasing awareness of people using science in their everyday lives in a variety of jobs roles and careers. | | | |
| Developing scientific literacy skills. | Step 1   * I can discuss science topics in real- life contexts including in the media. | Step 2   * I can discuss science topics in real-life contexts and offer my opinion as to how it impacts on my life. | | Step 3   * I can demonstrate increasing awareness of my own impact on the world. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Skills and Attributes of Scientifically literate citizens (continued)** | | | |
| **Second Level** | | | |
| Recognising the impact the sciences make on their lives, the lives of others, the environment and on society. | Step 1   * I can identify examples of science having an impact on my life. | Step 2   * I can express an informed views, both orally and in writing on the impact of science on my life, the life of others, the environment and society. | Step 3   * I can demonstrate understanding of the relevance of science to my future e.g. career, health, environment. |
| Expressing opinions and making decisions on social, moral, ethical, economic and environmental issues based upon sound understanding. | Step 1   * I can express and evidence my opinion and make decisions based upon this. | Step 2   * I can present a reasoned argument based on evidence, demonstrating understanding of underlying scientific concepts. | Step 3   * I can demonstrate understanding of the relevance of science to my future life and the role of science in an increasing range of careers and occupations. |
| Developing scientific literacy skills. | Step 1   * I can demonstrate some awareness of creativity and inventiveness in science and the use of technologies in the development of sciences and the impact of science on society. | Step 2   * I can demonstrate increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. | Step 3   * I can express informed views about the wider world, in relation to scientific and environmental issues based on evidence. |

**Skills and Attributes of Scientifically Literate Citizens**

**Core Learning and Benchmarks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Core learning for Significant Aspect of Learning: Skills and attributes of scientifically literate citizens** | | | | |
| **Early** | **First** | **Second** | **Third** | **Fourth** |
| Talk about science showing developing understanding of risks and benefits. | Discuss the impact of scientific developments on their life. | Demonstrate understanding of the relevance of science to their future lives and the role of science in an increasing range of careers and occupations. | | |
| Demonstrate respect for living things and their care, and for the environment. | Make connections between science and own health and wellbeing. | Demonstrate increased awareness of creativity and inventiveness in science, the use of technologies in the development of sciences and the impact of science on society. | | |
| 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. | Demonstrate awareness of people using science in their everyday lives in a variety of jobs roles and careers. | Express informed views about the wider world, in relation to scientific and environmental issues based on evidence. | Discuss the moral and ethical implications of scientific developments. | |
|  | Discuss science topics in real –life contexts including in the media. Demonstrate awareness of their own impact on the world. |  |  | |

**Aberdeenshire**

**Progression Framework**

**Sciences**

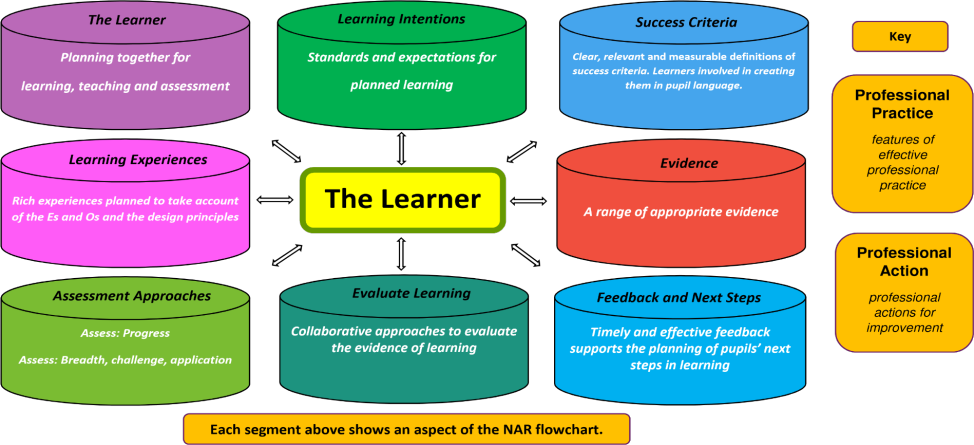
**Section 3**

**Learning, Teaching and Assessment:**

**Professional Curriculum Tool**

INTERIM December 2015

Learning, Teaching and Assessment: Professional Curriculum Tool



This tool can be used

* to provide an opportunity to reflect on effective practice in learning, teaching and assessment in the context of Aberdeenshire’s progression frameworks
* to allow practitioners to ‘dip into’ aspects of the learning, teaching and assessment process in order to reflect on their practice
* to inform planning for learning, teaching, moderation and assessment
* to support professional learning and/or moderation activities within a school or cluster

Key references used in this resource

* ***Taking a Closer Look at the National Assessment Resource*** (Education Scotland 2013)
* ***The Learning Set*** (Learning Unlimited 2004)

**The Learner**

**Planning together for**

**learning, teaching and assessment**

Use the experiences and outcomes (Es and Os) to plan your learning, teaching, assessment and moderation approaches and allow you to consider your focus for learners’ experiences.

Professional **Action**

Professional **Practice**

**Learners setting goals**

* help your learners ‘engage’ with their goals
* help them understand the big picture of where they are going
* give learners a structure in which to work   
  i.e. *ask questions/try things out/make connections/ask why*
* use variety of planning techniques  
  i.e. *floor book planning/carousel/ cooperative learning group discussion/ mind maps/interactive wall displays/ KWL grids*
* set group/class goals

**Learner engagement**

* learner should be at centre of planning for learning, teaching and assessment
* quality dialogue with learners should be embedded in practice
* principles and practice papers outline the broad features of assessment

**Learning Intentions**

**Standards and expectations for**

**planned learning**

The learning intention is what learners should know, understand or be able to do by the end of a learning experience.

The focus should be on what is to be learned as opposed to the task, activity or context.

By teasing out the learning from your chosen experience(s) and outcome(s), you will be able to develop learning intentions that focus specifically on what has to be learned.

When clear about the learning intention, learners will be more focused and actively engaged in their own learning. Sharing the learning intention makes it easier to give quality feedback specifically on what has been learned.

Professional **Action**

Professional **Practice**

***“Research tells us that goals which are specific, clear, challenging but not outwith the student’s reach have the most effect on performance.”*** *Caroline Gipps*

**Good learning intentions?**

* use SMART criteria
* focus on the specific
* not too broad - not too difficult – not too general
* child friendly, clear language
* skill or knowledge based - not concept
* use ‘learning’ words   
  *know/understand/learn/think/  
  use*
* consider phrasing and   
  tone

**Techniques to use**

* display the LI
* make LI accessible while children are working
* don’t confuse LI with activity
* build the LI into the lesson introduction
* signal the LI especially to younger children
* use examples
* involve pupils in setting SC

**Success Criteria**

**Clear, relevant and measurable definitions of**

**success criteria.**

***Learners involved in creating them in pupil language.***

Success criteria are suggested ways to achieve the learning intention.

Sharing success criteria enables learners to feel confident about how to achieve success in a lesson.

As you plan and consider your success criteria you should ensure that they are directly linked to your learning intentions and the evidence of learning which you will be aiming to collect.

Professional **Action**

Professional **Practice**

**Techniques to use**

* link to Learning Intention – “How will you know that … (*link to LI*) ?
* signal the SC throughout the lesson
* use examples by matching SC with a good quality piece of work
* involve pupils in the process
* focus on observable behaviours when tasks are open-ended *i.e. ‘what will ‘good’ look like?’*
* create a SC checklist for pupil use
* create a scoring scale for pupil use

**Good success criteria?**

* closely linked to learning intentions
* clear, easy to understand
* focused on how learning can be identified
* good use of ‘learning’ words  
  *know/understand/learn/think/use*
* looking at the learning not the task

**Learning Experiences**

**Rich experiences planned to take account of the Es and Os and the design principles**

**challenge and enjoyment**

**breadth progression depth**

***personalisation and choice***

***coherence relevance***

Learning experiences planned with the experiences and outcomes and design principles in mind will be **rich** and **fulfilling**.

As you plan a variety of experiences you will consider what activities will engage the learners and allow them to develop and demonstrate their knowledge and understanding, skills, attributes and capabilities.

Professional **Practice**

Professional **Action**

**Collegiate discussions (moderation)**

* with a colleague, discuss examples of your practice where you have met any or all of the seven design principles
* with a colleague, and using an experience and outcome of your choice, have a go at planning a set of learning experiences which would develop the seven design principles

**Setting Es and Os in context**

* know your children and your community – this will help engage them in their learning
* look at your plans and try to highlight the seven design principles
* refer to the **Aberdeenshire frameworks**
* read the **Assessing Progress and Achievement** curricular papers

***A range of appropriate evidence***

**Evidence**

**Product – artwork, report, project**

**Learners’ Records of Assessment**

It is essential that staff use evidence of learning from a broad range of contexts to check how a learner is progressing and that learning is secure. The evidence will be different depending upon the kind of learning being assessed, the learning activity and learners’ preferences about how to show what they have learned.

Evidence will come from day-to-day learning as well as from specific assessment tasks. The National Assessment Resource can help practitioners when deciding on what learners would need to say, write, do or make to demonstrate success.

Consideration should be given on how to reflect, share, discuss and agree these expectations with learners and with colleagues.

**Written Responses**

**Observation**

**Dialogue**

Professional **Action**

Professional **Practice**

**Collegiate discussions (moderation)**

* with a colleague, look at evidence you have gathered for a learning experience and agree if it fits with the original planning outline
* discuss whether or not the evidence is valid, reliable and proportionate (balanced)
* with a colleague, plan a variety of possible evidence

**Evidence of learning**

* match planned evidence with kind of learning being assessed
* engage pupils with Es and Os
* pupils help identify learning focus
* pupils select appropriate methods of assessment to inform range of evidence: *make-say-write-do*
* evidence should match Es and Os

**Assessment Approaches**

***Assess: Progress***

***Assess: Breadth, challenge and application***

Teachers need a range of assessment approaches to assess the different types of achievement across the curriculum. This range allows learners to demonstrate what they know, understand and can do.

The range and variety of assessment approaches should take account of the relevance of contexts to learners’ prior experiences, interests and aspirations and should link across learning where possible.

Teachers need to consider learning in terms of breadth, challenge and application.

Professional **Practice**

Professional **Action**

**Assessment across learning**

Ensure your planning takes account of

* **Progression** across levels
* **Breadth**  
  the number and range of experiences and outcomes encountered by learners
* **Challenge**the attributes, capabilities and skills (including higher order thinking skills) which are embedded in learning and may be planned through personalisation and choice
* **Application**   
  application refers to how knowledge and understanding, attributes, capabilities and skills (including higher-order thinking skills) are used in new and unfamiliar contexts so that they become transferable and secure - it is about learners becoming flexible and adaptable in the way they apply their learning

**Using Assessment Approaches**

* with a colleague, look at assessment approaches you have used and identify how breadth, challenge and application have been taken into account
* with a colleague, plan for breadth, challenge and application for a group of experiences and outcomes you plan to teach
* when planning, devise LIs and SC that will span across a level(s) in order to allow for progression
* to support differentiation, provide learners with opportunities to express how challenged they feel in their learning and how they think they are progressing

***Collaborative approaches to evaluate   
the evidence of learning***

**Evaluate Learning**

Evaluating the learning involves you in both considering the progress of each learner and considering the impact of the learning on the whole class/group.

Consistent judgements are made when staff have been collaboratively planning at all of the steps in the process.

When learners reflect on their own learning, they come to understand what they have achieved, what they can do to improve and how to go about it.

Professional **Practice**

Professional **Action**

**Reflecting on learning**

* learners can be helped to reflect on what they have understood and where they still need help or further explanation
* learners should be helped and carefully monitored as they learn how to self-assess
* learner self-assessment should not be a ‘bolt-on’ activity
* learner feedback from self-assessment informs planning
* other people in the learning community should be involved in evaluating progress in learning

**Approaches to evaluating learning**

* use examples of completed (anonymous) work as a focus for group or class discussion
* train, support and encourage learners to develop the skills of **self-assessment**
* train, support and encourage learners to develop the skills of **peer-assessment**
* plan self/peer-assessment opportunities alongside the curriculum learning and teaching
* adapt teaching to take account of learner feedback
* ensure learning is evaluated effectively and collaboratively against SC

**Feedback and Next Steps**

**Timely and effective feedback is essential for effective learning and teaching because it helps the planning of pupils’ next steps in learning.**

The quality of dialogue in feedback is very important and oral feedback can be more effective than written feedback.

Written feedback is more helpful to learning if it is in the form of comments and not marks or grades.

**Effective feedback**

* is part of a supportive ethos in which pupils ask for help when they feel they need it
* indicates positive aspects of work
* provides time to discuss with learners the links between their work and the LIs and SC
* helps learners to move on in their learning
* gives suggestions for improvement
* encourages learners to think things through for themselves

**Feeding back and next steps**

* with a colleague, discuss examples of your practice where learners were given time to reflect, use their feedback and identify next steps
* plan time for learners and peers to reflect on the advice and guidance received and identify next steps
* teach pupils how to be reflective   
  ~ use questions to focus feedback  
  ~ encourage rather than praise   
   e.g. *tell m*e *more/for instance? /so?  
  ~* prompt and probe to extend thinking  
  ~ keep comments positive and specific

Professional **Action**

Professional **Practice**