Akapapaanga Manako — Contents

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Te mekameka
O taku Ipukarea
Akararangiia ki te
Marama e te kite pakari o taku ui Tupuna
Atuituiia atu
Ki te au kite
E te marama
O teia tuatau

The Beauty
Of my Island
Garlanded with
The knowledge and wisdom
Of my ancestors
That links on
To the knowledge
And understanding of today

Ngamarama Wilson

Foreword

The *Cook Islands Curriculum Framework* (July 2002) establishes the policy for learning and assessment in all Cook Islands schools. Science has long been regarded as a core subject in the Cook Islands and its continued high importance is reflected in it being designated as one of the eight essential learning areas in the Curriculum Framework.

The goal of education in the Cook Islands includes the building of relevant knowledge, skills, attitudes and values to enable people to put their capabilities to best use in all areas of their lives. The new Science Curriculum exemplifies this goal of relevant learning and relevant application of learning. Through the Science Curriculum, students will find out about their world, gain an understanding and appreciation of their living, material and physical environment, and develop the knowledge, skills and attitudes to make decisions on issues that shape their world at the local, regional and global level.

Pursuant to section 37 of the Education Act 1986/87 which delegates authority over school curriculum to the Secretary of Education, I approve the Science in the Cook Islands Curriculum (March 2006) as an official curriculum for learning and teaching of Cook Islands Schools.

I am appreciative of the work done to develop the Science Curriculum by a wide range of people including teachers, Curriculum Advisory Unit staff, curriculum panel members, community members, and science professionals. In particular I acknowledge the significant contribution made by the Science Adviser, Gail Townsend, who has led the curriculum development in this essential learning area.

K. S. Matheson

Ken Matheson

Secretary of Education

Tuatua Akamataanga — Introduction

The *akaaiteanga tuatua* at the start of this document recognises that scientific knowledge and practice has been part of the Cook Islands culture for many generations.

Science is both a body of knowledge and a set of skills or practice. The intent of this reflection is to demonstrate that scientific knowledge and practice is not a separate entity of the Cook Islands but part `of who Cook Islanders are and what Cook Islanders practice.

Learning in Science is therefore crucial to understanding the world in which we live as Cook Islanders. It helps us to ask questions and clarify ideas. Science leads us to investigate our surroundings, to make observations and identify patterns and trends that help us to understand and use our knowledge in a constructive way. It helps us to make decisions about matters that will shape our world at an individual, community, regional and global level.

While embedding our initial learning in our own culture, we must also recognise Science as a universal branch of learning and acknowledge the perceptions and ideas that other cultures place on this knowledge.

Taieni is an exciting learning area involving students both in and outside their classroom and in their wider community as they make the links between the body of learning and their daily lives.

This curriculum provides a framework for that learning through four contextual and two integrated strands. This allows for learning and teaching programmes that can integrate areas to meet the needs and interests of the students. It is the intention of the curriculum to encourage student participation in and enjoyment of science through to senior secondary schooling.

Te Peu Maori i Roto i te *Akapaanga Kura Apii* — Culture in the *Cook Islands Curriculum Framework*

The importance of culture in the Cook Islands society is reflected in the Principles or Akakoroanga Tumu of the *Cook Islands Curriculum Framework* where it has been stated:

> *The Cook Island Curriculum reflects the unique nature of the Cook Islands including cultural and spiritual beliefs and values… The school curriculum will acknowledge and value the special place that is the Cook Islands, and will give students the opportunity to learn about Cook Islands culture and language. It will ensure that Cook Islands cultural traditions, spiritual beliefs, histories and events are recognised and respected.*
>
> *Cook Islands Curriculum Framework,* p. 5.

Scientific knowledge and practice is part of Cook Islands culture. An understanding of the environment, its patterns and responses, an understanding of materials and their uses and the use of natural land formations and celestial patterns all make up a body of knowledge developed and used by Cook Islanders in both the past and present.

This indigenous science must be recognised and legitimised by this curriculum. We should look at how science has been used to meet people's needs and create opportunities. Students should become familiar with the continuity and development of this knowledge over space and time. Students should discuss how the science of the Cook Islands has changed over time and the impact these changes have had on the people.

The current body of knowledge and set of practices should make up an integral part of the science programme offered by a school. Students should start their learning in science from their own experiences and observations. Learning in Science can be "culture building" by engaging students in interesting and important tasks that start with who they are and where they are going. Not only does this approach contextualise the science learning for students but also enriches their sense of self. It is important that the student's learning in science enables them to make connections with their every day lives, the practices of their communities, historical perspectives and practices of their ancestors. These should be reflected in the approach we take to science education so that young Cook Islanders can become and understand what it is to be a scientifically literate and productive member of Cook Islands society while also appreciating the role of the Cook Islands as Pacific neighbour, regional contributor and world member.

Koronga Tumu — General Aims

Science education contributes to the growth and development of all students in Cook Islands schools. It helps them to develop as individuals and to become responsible and informed members of the community. Scientific literacy helps people to become productive contributors to the future.

The aim of science education in the Cook Islands curriculum is to develop students learning of science by:

- Helping students to recognise the knowledge and use of science that takes place in their own community as part of Cook Islands practice.
- Helping students to develop a knowledge and understanding of the living, physical and material aspects of their world, the earth they live on and the universe in which it lies.
- Helping students develop problem solving and investigative skills and provide opportunities for students to develop the attitudes on which scientific investigations depend.
- Showing that science is both a process and a set of ideas and how the usefulness and value of those ideas can be assessed.
- Developing in students a value and awareness of relationships between science and the Cook Islands culture and traditions and its value amongst different cultures around the world.
- Helping students to explore issues, appreciate influences and make responsible decision about the use of science in their community and environment.
- Developing students understanding of the different ways people influence and are influenced by science and how science can be used to meet a particular need.
- Nurturing scientific talents to develop students' interest in science which could form the basis of a future career and ensure a scientific community within the Cook Islands.

Te Au Enu — The Strands

The science curriculum has four contextual and two integrated strands.

The four contextual strands are:

- Apinga Natura Ora (Living World)
- Tu e te Tienianga (Material World)
- Kaveinga Ririnui (Physical World)
- Enua e te Rangi (Earth and Sky)

The two integrated strands are:

- Kite Karape Taieni (Scientific Skills)
- Taieni e te Matakeinanga (Science and Society)

It is not intended that these strands be taught separately from one another. A unit of work in science is most likely to be based around one or two of the contextual strands with an aspect of the integrated strands incorporated. Scientific skills should be highlighted in every unit where as Science and Society may not necessarily be appropriate to every unit but its coverage should be monitored over the time span of a long term plan within a school.

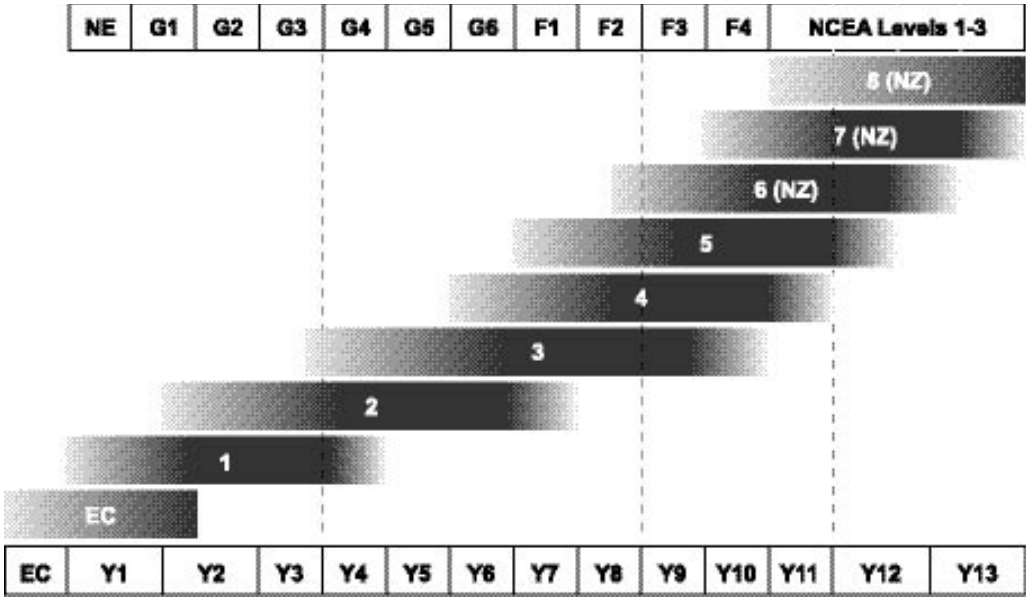
The next page indicates the approximate grade/year levels for each curriculum level. On the following pages are outlines of the general aims of each strand and a breakdown into a summary of the objectives for the strand at each curriculum level.

Revera o te Au Koronga Aruaruia — Levels of Achievement Objectives

The Cook Islands Curriculum Framework outlines eight levels of achievement for students. These levels are intended to help teachers identify a student's progress through out their schooling. By knowing the levels at which students in their class are working, a teacher is better informed on planning the next steps for each child's progress.

In any one class, students will work at different levels in different essential learning areas. In science, it is also important to note that a student may work at different levels in different contextual strands e.g. a student may work at Level 2 for Apinga Natura Ora but at Level 3 for Enua e te Rangi. Such information helps the teacher to identify students' interests and strengths and be aware of areas that need more time and development for that student.

The following diagram shows the approximate comparison between the eight levels of achievement and the class or year bands. These are an indication only and students will progress at different rates. Each student should be encouraged to feel comfortable and confident with the skills and knowledge needed at any one level while also looking forward to developing these further.



Apinga Natura Ora — Living World

Achievement Aims:

1. *Describe the ways in which living organisms grow, reproduce and change.*
2. *With particular reference to Cook Islands plants and animals investigate the relationship between structure and function in living things.*
3. *Describe grouping, order and patterns in living things and discuss its importance to science.*
4. *Research and investigate local ecosystems and understand the relationship between living and non-living features of the ecosystem.*

In their study of Apinga Natura Ora, students should start by using familiar contexts such as the school garden or local beach and move into more complex and larger ecosystems as their studies progress. The strand is open to teachers and their students to chose any suitable animals/plants or communities to study.

Achievement Aim four could be met through a separate class study, a year long commitment to a particular ecosystem or a school wide project. It would respond well to integration with Social Science.

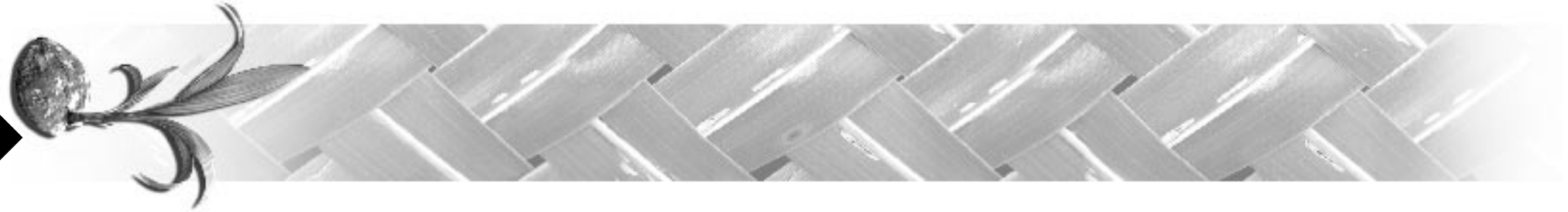
Possible Learning and Assessment activities include:

- *Exploring the beach and the different plants and animals that live there.*
- *Making leaf rubbings and looking for patterns.*
- *Creative writing, drawing or designing an animal based on questions prepared by teacher. (BSC 35 pg. 11)*
- *Labelling a diagram of a plant to show main parts.*
- *Grouping organisms found on the beach according to physical characteristics.*
- *Keeping a diary of a seed germinating and growing.*
- *Labelling a human body including main organ groups.*
- *Writing a story about the life of a plant or animal.*
- *Surveying the different colours of hibiscus in their village.*
- *Identifying features of wind and insect pollinated flowers.*
- *Drawing different types of skeletons e.g. fish, human.*
- *Bus stop game on structures of a plant or animal and its functions.*
- *Carry out an investigation/study on a unique plant or animal in the Cook Islands e.g. puaneinei, kakerori.*
- *Making up a key to classify chosen object on physical features.*
- *Surveying the class for observable characteristics e.g. ear lobes, hitch-hikers thumb, widows peak.*
- *Identifying the major organ systems of the human body and link structures and functions of a human organ system.*
- *Choosing one organ and making a flowchart of how it works.*
- *Identifying and discuss the adaptations of a shark e.g. structural, physiological, behavioural (Marine pack).*
- *Investigating adaptation in coconuts.*
- *Identifying ways fish have adapted to surviving on the reef.*
- *Drawing food chains, webs and pyramid for a local ecosystem.*

Apinga Natura Ora Living World

AIM	Achievement Objectives					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
1. Describe the way in which living organisms grow, reproduce and change.	Observe and decribe changes in plants and animals over time.	Investigate and understand changes that take place in animal and plant life cycles.	Investigate and describe patterns of variations in physical features.	Discuss patterns of inheritance of genetically controlled characteristics.	Describe how genetic information is transferred from one generation to the next.	Explain cell division and how it allows for variation between different generations.
2. With particular reference to Cook Islands plants and animals investigate the relationship between structure and function in living things.	Observe and identify parts of living things.	Understand the function of the main parts of plants and animals.	Describe and discuss how different structures and functions of plants/animals link together.	Investigate how particular structures and functions allow plants and animals to survive.	With reference to Cook Islands Plants and Animals investigate adaptations for survival.	Consider how plants and animals have changed over time to survive in different environment.
3. Describe grouping, order and pattern in living things and discuss its importance to science.	Group the living world according to physical characteristics.	Use similarities and differences to group living organisms.	Distinguish between organisms within groups of living things.	Investigate systems of classification for living things.	Investigate the microscopic word.	Describe and discuss helpful and harmful micro-organisms.
4. Research and investigate local ecosystems and understand the relationship between living and non-lving features of the ecosystem.	Identify the needs of and accept responsibility for a plant or animal.	Observe and describe the response of plants/animals to changes in the environment. (either natural or man-made)	Describe how a range of Cook Islands plants and animals live.	Discuss the effects of human intervention on a local ecosystem.	Investigate the different food chains, food webs and tropic levels of a local ecosystem.	Investigate how biological principles can be applied to plant and animal management.

Note: Students should be involved in investigating a range of ecosystems, plants and animals over a syndicate cycle.



Kaveinga Ririnui — Physical World

Achievement Aims:

1. *Use practical investigations and theoretical models to find and explore trends, patterns and relationships involving different experiences in the physical world.*
2. *Investigate the concept of energy and express ideas about how it is used and changed.*

Students will cover a wide range of contexts in Kaveinga Ririnui including but not limited to: electricity, sound, magnets, light, motion and forces. These contexts are not prescribed to any year level and can be selected according to student/teacher interest and needs. School wide planning will help to ensure that a variety of contexts are covered over a course of time depending on school rotation programmes.

Teachers are encouraged to let students find trends and patterns through investigation and experimentation and then develop the theoretical concepts in line with their observations.

The study of energy could start within the context of the sun where students can discuss ideas about light and heat. As students continue their studies, ideas relating to energy will expand to include kinetic, potential, chemical, sound, light etc. Students should become aware of the concepts of renewable forms of energy and energy conservation.

Possible Learning and Assessment activities include:

- *Investigate why the length of shadow changes during the day (BSC 9 pg. 19)*
- *Testing different places in the school for temperature or the best place to dry wet material.*
- *Investigate on which surface marbles travel the furthest along (BSC 36).*
- *Investigating sound travelling through different objects e.g. wooden desk, metal pole.*
- *Surveying different rooms in the school/home for how electricity is used.*
- *Rearranging batteries, wires and bulbs to make the bulbs go.*
- *Identifying the changes of state that caused by heat (the candle experiment.)*
- *Identifying how different surfaces absorb or reflect heat.*
- *Investigating the effect of unbalanced forces on an object..*
- *Calculating speed, distance and times for an object rolling down a ramp of varying heights.*
- *Distinguishing between renewable and non renewable forms of energy*
- *Investigate a range of instruments e.g. ukelele, pate, pau, for pitch and volume.*
- *Test the heat capacity of different stones used in an umu.*
- *Play different traditional games and*
  - *measure distance (non-standard and standard measures).*
  - *identify forces being used.*
  - *predict changes in direction/speed/time.*
  - *use simple formula e.g. s= d + t.*

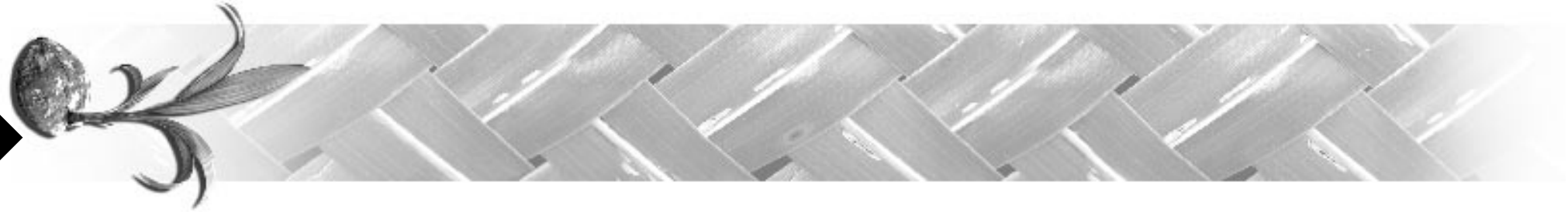
Kaveinga Ririnui — Physical World

Aim	Achievement Objectives					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
1. Use practical investigations and theoretical models to find and explore trends, patterns and relationship involving different experiences in the physical world.	Observe, describe and share ideas about different physical contexts, for example heat, sound, light, magnets,	Explore easily observable trends in a range of different physical contexts.	Explore relationships in a range of different physical contexts.	Process and interpret data to describe or confirm trends or relationships.	Explain patterns or trends using processed data and accepted scientific theory.	Use patterns to make useful predictions. Carry out practical investigations controlling variables.
2. Investigate the concept of energy and express ideas about how it is used and changed.			Describe different forms of energy and investigate aspects of each.	Describe how energy can be transferred and transformed.	Discuss the model of waves in transfer of energy.	Discuss the applications of energy transfer.

1. Trend a general direction in which something is developing or changing.
   Relationship: the way in which things are connected (often through mathematical formula.)
   Pattern: A regular form of order in which a series of things occur.

2. By the end of Grade 6 / Year 6 students should hve had learning experiences in light, sound, motion, forces, heat and magnets.
   By the end of Form 2/Year 8 learning experiences in simple electrical circuits should also have been experienced.
   These experiences should be at whatever achievement level is appropriate for the students concerned.

3. The study of the different contexts could include;
   Motion: distance, speed, time, acceleration.
   Sound: sources, vibrations, pitch, volume, movement, waves.
   Forces, push, pull, friction, gravity, momentum.
   Light: reflection, reflaction absorption, heat.
   Heat - temperature, effects of, transfer of.



Tu e te Tienianga — Material World

Achievement Aims:

1. *Explore and describe the properties of different materials and identify patterns within and between groups of materials.*
2. *Observe and discuss the nature of reactions and their applications.*

Material World in its simplest form will involve students exploring the properties of materials through observation – holding, bending, squeezing etc. Continued study will involve students using more complex properties such as floatation or lustre through to reactivity and periodicity.

Students will group materials according to their observations and find patterns within and between groups.

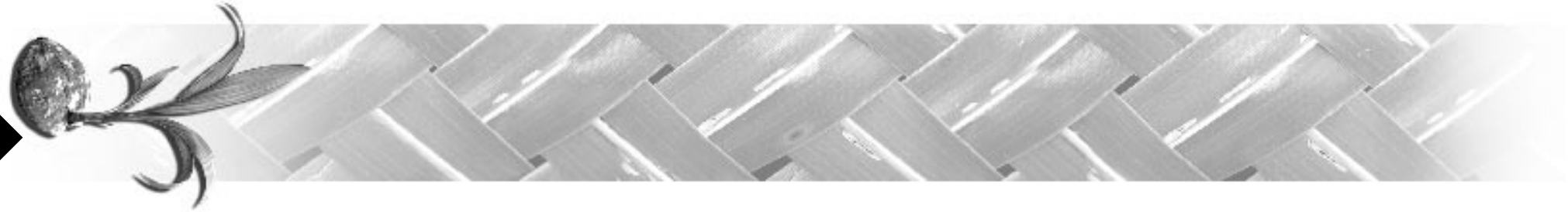
Students will observe change in materials and come to understand the concepts of temporary and permanent change. How and why materials change and how we use these changes in home and industrial applications can be set within a variety of contexts e.g. home brew, cooking, making medicines, soap production etc.

Possible Learning and Assessment activities include:

- *Using feely bags and identifying objects.*
- *Making pancakes, bread or ice blocks to see how materials change.*
- *Drawing pictures to show how a material changes e.g. melting ice cubes.*
- *Identifying the different materials used in an umu and relate use to properties.*
- *Investigating the best material (paper, plastic, cloth) to absorb water.*
- *Explaining the difference between a compound and a mixture.*
- *Investigating ways of separating mixtures.*
- *Testing the solubility of different compounds in water.*
- *Identifying properties of metals e.g. ductile, sonorous, malleability (BSC 32 pg 12)*
- *Discuss how kitchen utensils are made of combinations of materials to make it safer (BSC 33 pg 9).*
- *Comparing the properties of fresh and salt water.*
- *Reacting vinegar with a variety of other kitchen chemicals such as baking soda, powder etc. and recording observations.*
- *Investigating the simple chemical properties of metals (BSC 33 pg 13).*
- *Making paper and keeping a diary of all the processes and changes that take place.*
- *Investigating the actions of soap and detergents at different temperature.*
- *Testing the solubility of a range of household products in different solvents.*
- *Make a flowchart of the changes to kikau/kiriau in costume making.*
- *Using different plants and material in the drying and comparing strength and colour.*
- *Identifying the materials used to make traditional vaka and the properties that make them useful.*

Tu e te Tienianga — Material World

Aim	Achievement Objectives					
	Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
1. Explore and describe the properties of different materials and identify patterns within and between groups of materials.	Explore simple physical properties and use them to describe a group, for example colour, size, shape.	Relate the physical properties of materials to their use.	Use properties to separate materials, for example state of matter, physical properties. Distinguish between elements, compounds and mixtures.	Report on materials at an atomic level with reference to states of matter.	Investigate and group materials according to observations of their chemical properties, for example acidity, solubility, conductivity.	Investigate how chemicals can be grouped into families using chemical properties.
2. Observe and discuss the nature of reactions and their applications.	Observe and describe how materials can be changed, for example heating, cooking, cutting.	Describe common changes in substances, for example condensation, evaporation, dissolving, melting.	Examine and describe temporary and permanent change in materials. Examine the difference between chemical and physical change.	Investigate how substances can be changed chemically.	Find patterns in the chemical change of materials.	Investigate and describe factors that affect chemical and physical change.



Enua e te Rangi — Earth and Sky

Achievement Aims:

1. *Explore the relationships between our planet, the moon, sun, solar system, galaxy and universe and describe the patterns that these relationships generate.*
2. *Investigate the structure and history of the earth and the processes which have shaped it.*

Students may begin their study of this strand by looking at simple patterns such as day and night, phases of the moon or tides. An appreciation for the size and complexity of our own solar system will develop over primary education levels.

At a more senior level students may be involved in extending their ideas about objects in space through such activities as specific research projects, investigating space travel and the development of knowledge about space and how people have used this knowledge.

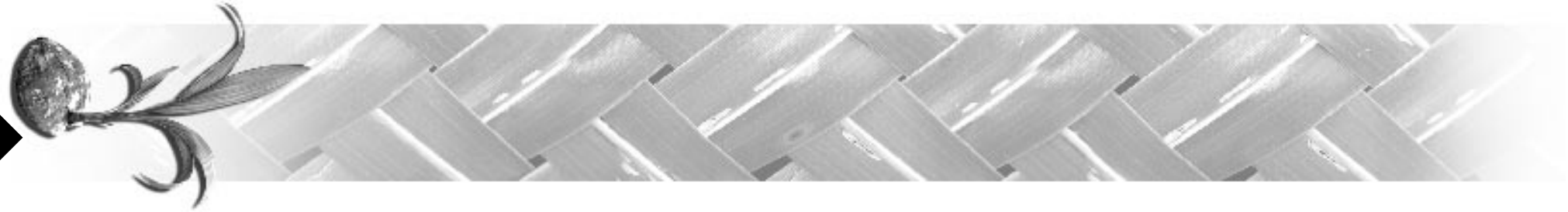
In the investigation of our earth, its structure and history, students should once again start with their own local landscape – observing and describing its features. As study continues, students will become involved in investigating how certain features are formed including the formation of the islands of the Cook Islands.

Possible Learning and Assessment activities include:

- *Recording daily information about the weather.*
- *Keeping a moon diary.*
- *Visiting water reservoirs such as waterfalls and caves.*
- *Explain the differences between day and night.*
- *Talking to people who use the Arapo for planting and fishing about patterns they have noticed.*
- *Making sand mountains and recording changes in shape over the space of a week.*
- *Investigate the process of weathering/erosion (BSC 2 pg. 15).*
- *Finding out about spring and neap tides (Marine pack "How do tides work?)*
- *Reading about legends relating to phases of the moon and the tides. Talk about the science ideas found.*
- *Find out about traditional navigation techniques.*
- *Making a model of the earth to show it's structure.*
- *Reading local legends about constellations.*
- *Doing a beach study to investigate the effects of storms, wave actions etc.*
- *Investigating the debate on climate change.*
- *On a map, mark in the ocean currents and prevailing winds and discuss with reference to migration across the Pacific.*
- *Talk about the stories relating to the formation of your island and draw the landscape features on a map.*

Enua e te Rangi — Earth & Sky

Aim	Achievements Objectives					
	Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
1. Explore the relationships between our planet, the moon, sun, solar system, galaxy and universe and describe the patterns and effects these relationships generate.	Share ideas about objects in space and the patterns and effects associated with them e.g. day and night.	Find out about major objects in our solar system e.g. planets.	Investigate models of changing spatial relationships between the earth, sun and moon and how different cultures have used those relationships, e.g. tides, phases of the moon.	Extend their ideas about objects in space, for e.g. stars and constellations.	Describe the technological devices used to investigate space and how these have changed our understanding over time.	Explain spatial relationships in the night sky.
2. Investigate the structure and history of the earth and the processes which have shaped it.	Share ideas about observable features of their environment e.g. physical features, weather, water resources.	With reference to features of their local landscape investigate and describe how the earth has changed over long periods of time.	Investigate cycles in the environment e.g. water, carbon, tides, and how these can affect the landscape.	Investigate the structure of the earth and how the structure influences the landscape e.g. tectonic plates.	Describe the processes which change the earth's surface, for e.g. volcanoes, earthquakes, weathering and erosion. Investigate how they have affected the local area.	Classify the rocks and minerals that make up the earths surface. Investigate the three major types of rocks and how rock sequences provide evidence about the past.



Kite Karape Taieni — Scientific Skills

Achievement Aim:

- To develop investigative skills, attitudes and opinions.

Science should be discovered through investigation. This way, students take ownership of their learning.

The development of scientific skills through planning and focusing, gathering information, processing and interpreting information and reporting, are skills that Science can offer to other Essential Learning Areas.

As they have more and more experiences, students will also start to develop attitudes and values specific to scientific investigation. These will include open mindedness, honesty in recording data, willingness to accept uncertainty and the conditional nature of science. During investigations, more experienced students should start to consider issues of rigour and validity.

The objective of this strand has been transferred into a grid of skills involved in practical investigations (see grid on the following page). Although students will most likely work through all of the skills while carrying out an investigation, each unit of work should focus on one or two of these skills. Students may not necessarily be at the same level for each section or develop skills in a set order. Teachers will need to look at a holistic or overall achievement for students in this strand.

Kite Karape Taieni - Scientific Skills

Skills	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Focusing and Planning	Talk about what they have seen. Ask questions about what they have seen. Decide what they want to find out.	Use their prior knowledge to make a prediction about what might happen.	Ask questions and identify questions suitable for investigating. Suggest simple trials for investigation.	Use their prior knowledge and observations to suggest solutions to questions. Start to design a test to trial their solutions. Consider the idea of controls.	Make testable predictions.	Design fair tests with specification of variables and controls.
Information Gathering	Talk about what they saw.	Seek information from books and people. Make formal observations	Make detailed observations and simple measurements.	Write and complete a survey to find out other peoples ideas. Take measurements and record observations using appropriate equipment for enhancement.	Select and use instruments to make quantitative and quantitative observations.	Use information sources with purpose Prepare directed questions.
Processing and Interpreting	Discuss their ideas about what they saw. Start to introduce how, why and what.	Discuss their findings with peers and teacher to reach an understanding about their results.	Find trends or patterns between observations and measurement.	Group findings according to common features or outcomes. Find trends or patterns - make links from organised data.	Analyse data using statistical and graphing procedures.	Compare their findings against established theory to draw conclusions.
Reporting	Tell other people what they found out. Draw pictures of what they saw.	Make posters,. Write down what they found out.	Complete a report of what they found out. Use scientific report structure for e.g. title, aim, method, results, conclusion.	Write a report of what they found out. Use scientific report structure, e.g. title, aim, method, results, conclusions.	Write reports that include processed relevant data.	Include ideas on sources of error and evaluation of the investigation in their report

Taieni e te Matakeinanga — Science and Society

Knowledge of science enables people.... to adopt a responsible role in using science in their lives

Cook Islands Curriculum Framework, p. 15

Achievement Aims:

- Develop an awareness and understanding of how science affects society and how society promotes or constrains science.

Scientific literacy is becoming more and more important in a rapidly advancing and global world. Cook Islanders are starting to face decisions about scientific and technological advances that previously did not impact upon their lives. Young Cook Islanders need to gain an appreciation for the effect science will have on their lives and be able to make informed decisions on scientific processes in the Cook Islands. These decisions will need to take into account ethics and values as well as the different genders, cultures and backgrounds of the people involved.

Learning in this strand will be integrated within one of the contextual strands. This strand could involve students in surveying community opinion on a topic, taking a historical perspective and making a timeline of events or in classroom debates to discuss the implications of a scientific concept.

A study on the reef could extend to issues relating to raui or fishing licences. A look at motion could discuss the number of cars on the road and other traffic issues. At a senior level this will broaden into such issues as genetic modification, nuclear power, biodegradability of materials etc.

Taieni e te Matakeinanga — Science and Society

Aim	Achievement Objectives					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Develop an awareness and understanding of how science affects society and how society promotes or constrains science.	Talk about the science used in their community and how they feel about it.	Describe how an aspect of science is used in their community and peoples attitudes towards it; e.g. preserving food, raui, recycling, preparing an umu.	Find out how a range of their peers view a particular science topic. Present information on a development in science identifying positive and negative effects for e.g. hydroponics, waste disposal.	Identify and report on the views of a particular group of the community towards a scientific issue; e.g. fishermen, shop owners, WWF, Mangaia Rangers.	Identify and compare the views of different groups of people about a given scientific issue and how it has promoted or constrained science.	Explain the beliefs, values or ethics that have promoted or constrained a recent scientific development in their community / region and the impacts of any decisions made.

Kimi Kite Marama e te Apiianga — Learning and Teaching

There are many possible approaches to planning for learning and teaching in science. Teachers are encouraged to find out about the interests and abilities of their students and plan units of work which develop these while taking into account the consideration of resources, time and integration with other essential learning areas.

Science in the Primary School

Most schools will find taking a thematic or topic study approach to science the most appropriate. A few may find a specific time for science on a weekly timetable works best for them.

When developing long term plans it is important to check that all achievement objectives are covered at least once over a syndicate cycle. Achievement objectives from different contextual strands may be combined into one unit as well as the inclusion of objectives from the two integrated strands.

The achievement objectives are prescriptive however schools, teachers and students will need to make decisions and take action over aspects such as learning outcomes, contexts of study and assessment. Some examples have been given but teachers are encouraged to use these as an indication of possibilities only and to plan around the needs of and opportunities available to their students.

Science in the Secondary School

The majority of secondary school students will experience science as a timetabled core subject along with other essential learning areas.

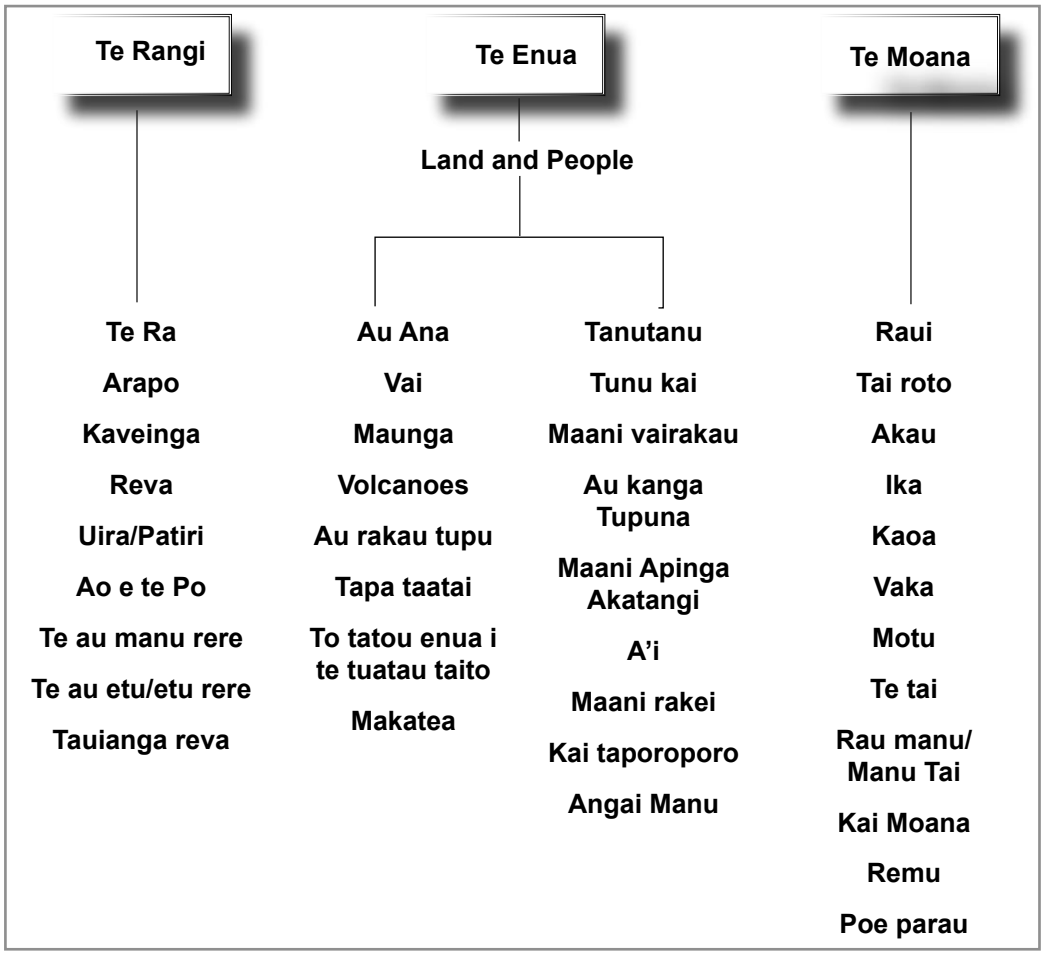
In planning for science at this level, teachers should look to cover work from all achievement objectives at least once. Combining objectives within suitable contexts is encouraged.

At a senior school level, students will most likely undertake courses towards NCEA Levels 1, 2 and 3 and based on the documents *Science in the New Zealand Curriculum, Biology in the New Zealand Curriculum, Chemistry in the New Zealand Curriculum* and *Physics in the New Zealand Curriculum.*

Selecting Contexts for Science Units

The majority of contexts for science units should be selected from those which inform and celebrate Cook Islands practice. Many scientific ideas can be found in traditional and current Cook Islands practice. The *Languages Curriculum - English* document has identified a body of cultural knowledge called “Te Tango ia o Te Peu Maori” which would be appropriate to review when planning science units.

The following structure outlines possible contexts for science units. This structure is similar to that identified in the *Languages Curriculum - English* document.



Each island would bring its own flavour and traditions to these contexts and different schools may identify different achievement objectives for the same context e.g. Vaka could come from Material World and look at the properties of materials used to make a Vaka or come from Physical World and look at the areas of motion and forces.

It is important that student's first learning experiences in science are from contexts with which they are familiar. As students move through senior primary and into secondary schooling the contexts in which units are set would become more global and abstract.

The following diagram highlights for all, some issues to be considered as we approach learning and teaching in science. The metaphor of a germinating coconut is used for us to reflect on the place of the child and science education.

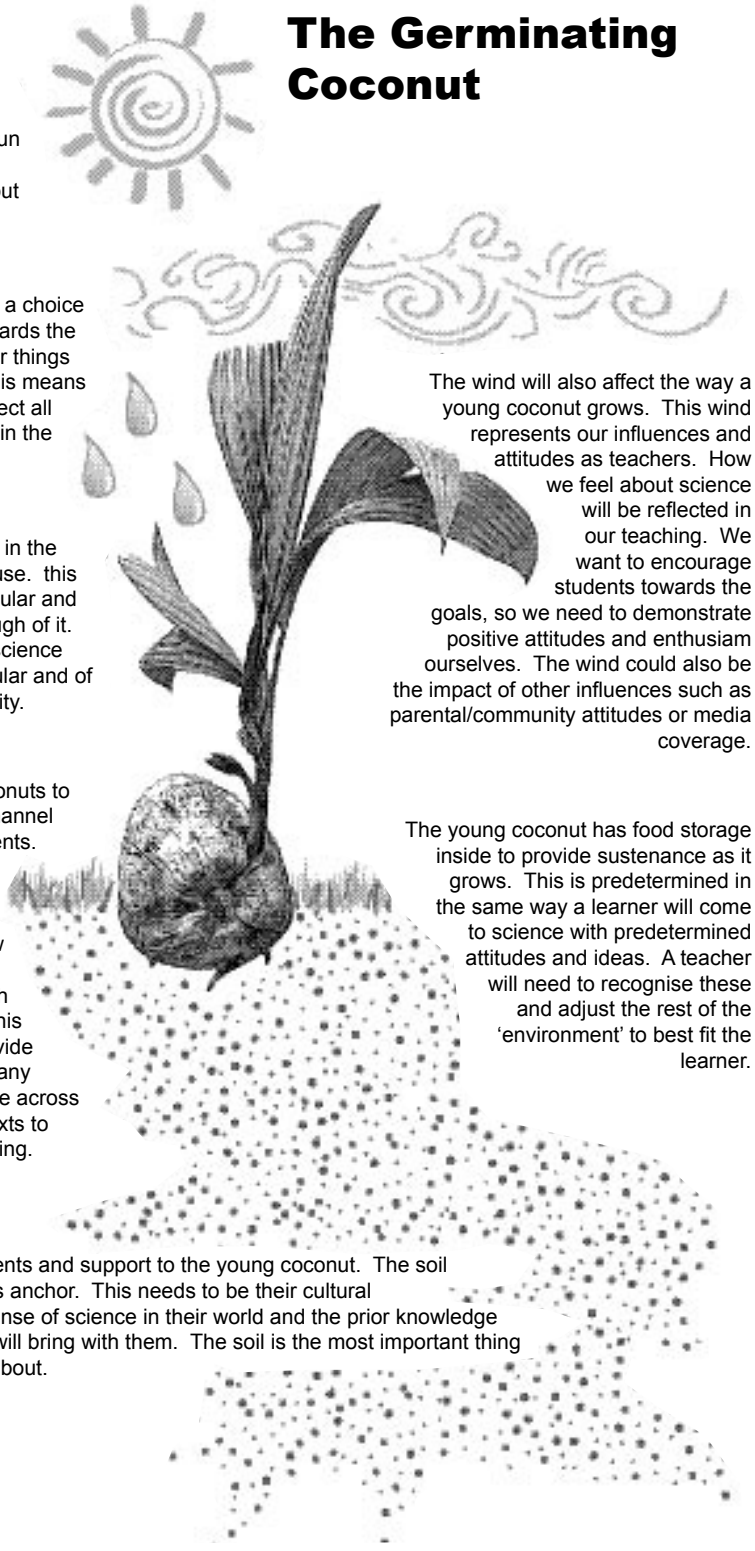
The Germinating Coconut

The young coconut will bend towards the sun. For our students, the sun represents goals which should be achievable but challenging.

The coconut may have a choice in the way it heads towards the sun depending on other things in the environment. This means that we should not expect all learners to meet goals in the same way.

Rainfall provides water in the soil for the coconut to use. this rainfall needs to be regular and there needs to be enough of it. This is our delivery of science which needs to be regular and of good quality and quantity.

The roots hold the coconuts to the soil and act as a channel for the water and nutrients. These 'roots' channel the experiences of the students into their learning. To grow well a coconut needs strong roots that branch out to find nutrients. This means we need to provide our students with as many experiences as possible across a broad range of contexts to channel into their learning.



The wind will also affect the way a young coconut grows. This wind represents our influences and attitudes as teachers. How we feel about science will be reflected in our teaching. We want to encourage students towards the goals, so we need to demonstrate positive attitudes and enthusiam ourselves. The wind could also be the impact of other influences such as parental/community attitudes or media coverage.

The young coconut has food storage inside to provide sustenance as it grows. This is predetermined in the same way a learner will come to science with predetermined attitudes and ideas. A teacher will need to recognise these and adjust the rest of the 'environment' to best fit the learner.

The soil provides nutrients and support to the young coconut. The soil represents our learners anchor. This needs to be their cultural understanding, their sense of science in their world and the prior knowledge and experiences they will bring with them. The soil is the most important thing for a teacher to know about.

Kite Karape Puapinga — The Essential Skills

The eight essential skills of the Cook Islands Curriculum Framework represent those skills that will enable students to reach their potential, participate fully in society and mature into people capable of meeting the demands of the modern world with a strong knowledge of who they are, where they have come from and who they want to be.

There are many types of activities that teachers may use to develop these skills within a science context. The following are suggestions only and certainly not an exhaustive list.

Communication Skills

- think-pair-share activities
- reporting
- fat and thin question activities
- peer teaching
- predicting and reasoning.

Numeracy Skills

- measuring
- finding patterns
- interpreting and calculating results.

Artistic and Creative Skills

- drawing and labelling diagrams
- making two and three dimensional models
- designing solutions
- making collages and posters
- representing patterns.

Self Management, Work and Study Skills

- cooperative learning
- research
- activity cards.

Physical Skills

- handling equipment safely
- following instructions.

Social and Co-operative Skills

- grouping
- reporting
- discussion activities
- brainstorming.

Information Skills

- making charts
- writing and using surveys
- fieldwork for observations
- collecting data
- mapping activities
- analysing and evaluation information.

Problem Solving Skills

- designing investigations
- modelling problems
- group discussions
- preparing design briefs to solve a problem.

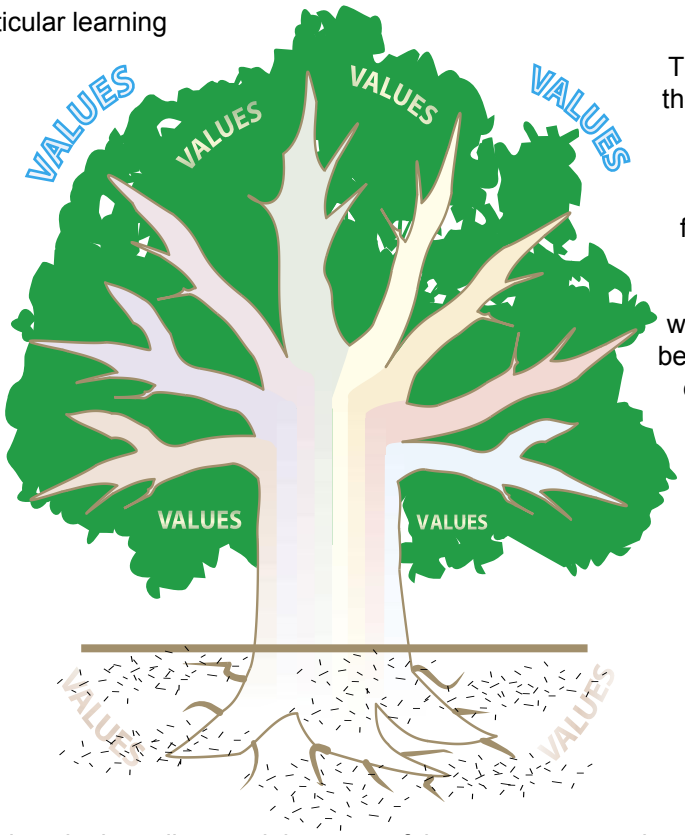
Te Au Irinakianga e te Au Tu Tangata — Attitudes and Values

Values and belief systems determine behaviour in society including how members communicate and interact with one another, what knowledge is learnt and how such knowledge is imparted.

Cook Islands Curriculum Framework, p. 24

The tree of learning that forms the basis for the Curriculum Framework identifies three sources of values that will influence students learning

The values amongst the leaves are those that relate to particular learning areas.



The values in the air around the tree are those which will come from outside the Cook Islands but will impact on behaviour and experiences

The values in the soil around the roots of the tree represent the shared values of all Cook Islanders, that children need to experience.

None of these values are stand alone and all will impact on our practice as teachers and the behaviour and experiences of our learners.

The awareness and development of attitudes will be particularly supported in science through objectives from the two integrated strands.

Kite Karape Taieni — Scientific Skills

Achievement Objective:

To develop investigative skills, attitudes and opinions.

With science it is particularly important to note the values that relate to scientific investigations. Students developing attitudes towards science are very much influenced by their role and ownership of investigations and outcomes. The following values and attitudes should be inherent to any investigation:

- Kimi matatio oonu/Curiousity – to ask questions, identify options.
- Umuumu/Perseverance – to continue with an investigation.
- Aru i te au manako o te katoatoa/Flexibility – to modify ideas and investigations.
- Ariki e te oraora manako/Open mindedness - to accept unexpected results and validate data.
- Honesty in recording data – as it occurs and to give honest observations and interpretations.
- Willingness to accept uncertainty – and understand that it is part of the nature of science and learn to appreciate it's influence on results.
- Conditional nature of scientific explanation – to understand that the body of knowledge that is science is constantly changing and that we can only interpret results with the knowledge known and accepted at that time even though this may change in the future.

Taieni e te Matakeinanga — Science and Society

Achievement Objectives:

- Develop an awareness and understanding of science affects society and how society promotes or constrains science.

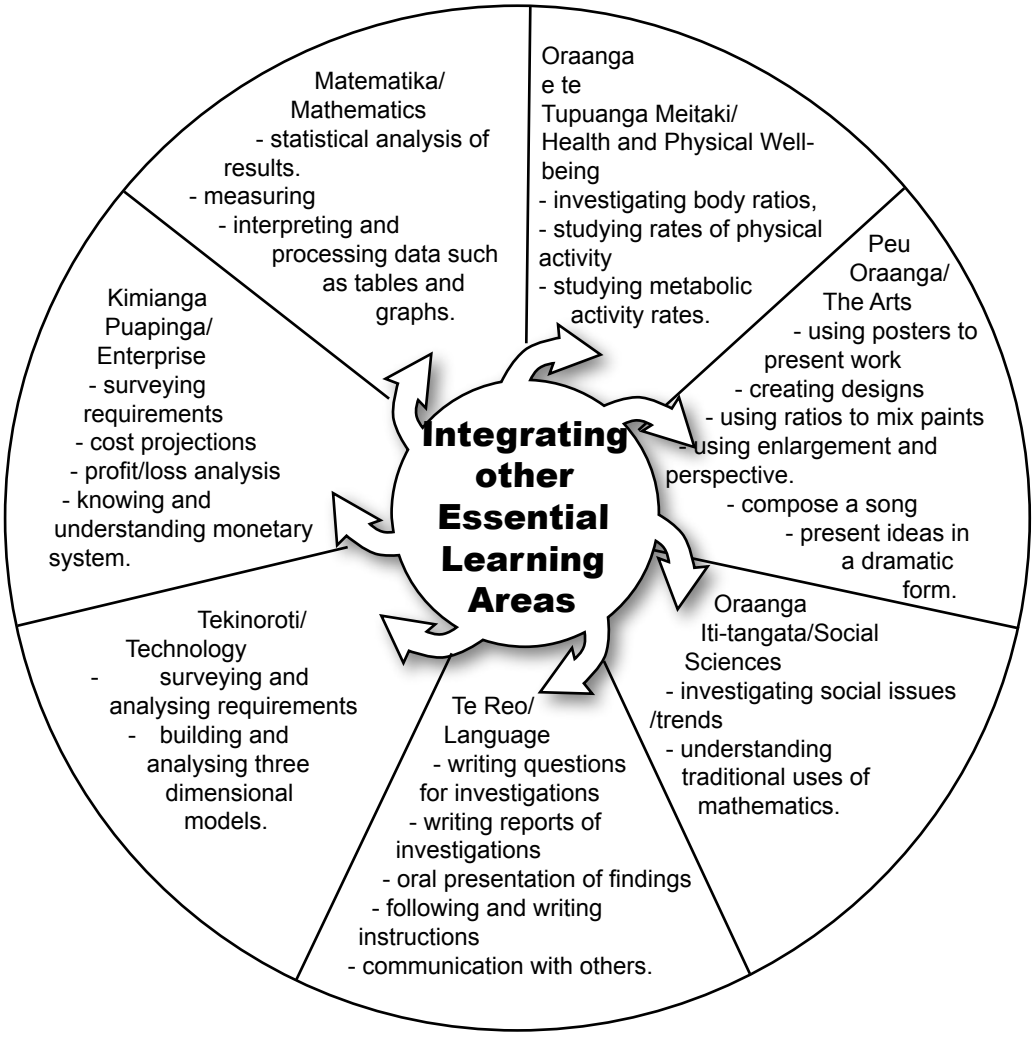
The development of science is influenced heavily by society. Science is used to meet needs within society but also influences how society views possible outcomes to those needs and create new opportunities from scientific knowledge.

Ethics and values underlying decision making about resources and environments are also major issues influenced by people's level of scientific literacy and ability to make informed decisions.

Students need to have opportunity to develop opinions and discuss ideas about the different uses of science in their community.

Te Au Ravenga no te Taokotaianga atu ki te au Tuanga Apii Puapinga —Integration with other Essential Learning Areas

Science by its investigative nature leads itself to integration with other essential learning areas. Content and processes from these other areas are called upon by students as part of their construction of scientific understanding and investigation. The diagram below shows some of the types of activities undertaken in the different essential learning areas that could be part of a science programme.



Apii Taokotai — Inclusiveness

> *The Cook Islands Curriculum supports the implementation of an inclusive curriculum in all schools, and one that recognizes and responds to the diverse background of students and their educational needs, experiences, and interests.*
>
> *Cook Islands Curriculum Framework*, p. 32

A school's science programme should cater to the needs of all learners. To provide quality science education for all students we must work towards minimising barriers to achievement and encourage students to continue participating in scientific learning.

By recognising the different perspectives of different groups of learners, the experience of science education of all learners will be developed.

Students with Special Needs

This is a wide ranging group of students including those with physical, intellectual or emotional challenges, young people with specific learning issues and those yet to become fully literate in the language of instruction. It should also be noted that students who have special needs in some areas of science knowledge or practice may not have the same needs in another area.

An inclusive curriculum in science for these students is one in which:

- all stake holders identify the particular needs of the students and plan to meet them
- peers are involved in supporting the student
- they are given encouragement and support to enable them to participate as fully as possible
- where necessary, alternative resources and equipment are used to support learning.

Teachers should be aware of any particular disabilities a student may have which could impact on their safety during investigations e.g. If using burners or acids. Support structures should be put in place so that these students may still be involved in the activity while ensuring the safety of all learners. Such structures could involve the use of peer buddies to help arrange equipment or where necessary and available, a teacher aide or where appropriate parental support.

Students with Special Abilities

The curriculum can offer acceleration opportunities to nurture students with special abilities in science. It is important that these students:

- have their special ability acknowledged and valued
- have opportunity to develop skills and knowledge at their own pace
- have opportunity to use higher-order thinking skills during science activities
- encourage lateral thinking
- can work with others of similar ability to communicate their ideas.

Girls and Science

Girls can and do, do well in science, however many girls will choose not to take science at a senior level as they do not make the connection between their daily lives, their future lives and the scientific knowledge they are learning.

In a science programme opportunities need to be given to girls to:

- learn science that they value
- use their strengths from other areas e.g. language to support their learning in science
- have equitable share of teachers time
- have access to an environment and resources that are non-sexist.

Religion

Students in the classroom may come from a variety of different religious or belief system backgrounds.

It is important that all classroom members respect the views of others even when they are in conflict with their own.

In senior science the study of evolution can raise concerns with some students and their families. Evolution is a theory for which there is a given amount of evidence and it should be presented as such. Students who wish to challenge the evidence are encouraged to do so as long as the challenge is related to scientifically supported evidence.



Vaitoanga Kite — Assessment

The purpose of assessment is to *"improve students' learning and the quality of learning programmes" (Cook Islands Curriculum Framework*, p. 29).

Assessment should be seen as part of the whole learning and teaching programme and not just something that happens at the end. The relationship between learning, teaching and assessment should constantly be reviewed and strengthened as we use assessment indicators to help us meet the needs of students in our classroom to improve learning.

Teachers have a wide variety of tasks open to them to use as assessment tools in a science programme. These tasks could include but are not restricted to activities such as:

- ☐ cloze activities
- ☐ investigations (design and reports)
- ☐ think-pair-share activities
- ☐ posters
- ☐ scale diagrams
- ☐ written tests
- ☐ oral discussions
- ☐ graphs and tables
- ☐ songs/poems
- ☐ sequencing diagram
- ☐ workbooks
- ☐ learning logs
- ☐ Video reports
- ☐ field trip participation and reports
- ☐ reports on guest speakers
- ☐ collages and posters
- ☐ flowcharts and scale diagrams or models
- ☐ observations
- ☐ checklists
- ☐ portfolios
- ☐ structured overviews
- ☐ dramas/role plays
- ☐ oral presentations
- ☐ self assessment reports
- ☐ research projects

Activities may include a mixture of self, peer and teacher assessment. Teachers should use as many occasions as possible during the learning programme for both formative and summative assessment to give students multiple opportunities to demonstrate their learning.

Assessment tasks must be fair to all students, valid in that they assess the learning outcome identified and reliable so that similar results would be obtained with a similar task.

Students should be encouraged to see assessment as a positive part of their learning and use it to improve their own understanding of their learning and progress.

Apinga Turuturu Apii — Resources

Resources for science include texts, posters, videos, practical equipment and people in our community.

Useful Text Resources include:

Teachers Texts:

- Building Science Concepts Series
- Making Better Sense Series
- Seread: What is Weather?
- Seread: What is Climate?
- Pathfinder Series
- ESA Study Guides
- Marine Studies Programme

Student Texts:

- PM Readers/Science Concepts
- Kiwi Integrated Science (Books 1-4)
- Making Science Work
- ESA Study Guides
- Pathfinder Series (particularly for able Year 9 and 10 students)

Language Support in Science:

- Sunshine Series
- IOE Publications – Vaka Series
- Fastzone

Posters:

Schools should try to obtain posters on:

- Clouds
- Solar System
- Skeleton
- Water Cycle

Basic Practical Equipment Includes:

- Test tubes
- Beakers
- Bunsen or spirit burners
- Measuring cylinders
- Small circuit boards with components
- Magnets
- Plane Mirrors

Useful consumables include

- Balloons
- Straws
- Marbles
- String and tape
- Plastic spoons
- Vinegar
- Baking soda and baking powder

Contacts within our community include:

Government Bodies:

Ministry of Agriculture

PO Box 96, Rarotonga ph 28711 fax 21881

Research Station, Titikaveka ph 28720 or 26720

cimoa@oyster.net.ck

The Ministry of Agriculture have a number of publications on food production. The Research Centre have staff who can provide help with biological control and genetic modification. Happy to answer faxes/emails from any school.

Note: There are Agriculture Officers on every island with the exception of Nassau. They may be able to assist as well or have some publications with them already.

Ministry of Marine Resources

PO Box 85, Rarotonga ph 28 721 fax 29721

The Ministry of Marine Resources have posters and videos that may be borrowed/ purchased. Teachers/senior students may also have access to their library.

Environment Services

PO Box 371, Rarotonga ph 21256 fax 22256

Education Officer

resources@environment.org.ck

The Environment Service has videos and books that schools may access. They are happy to do classroom talks or answer emails/faxes. Environment Service can cover areas such as Climate Change, Clean Water, Biodiversity, Conservation, and

Pollution.

Ministry of Health

PO Box 109, Rarotonga ph 29664 fax 29100

Many resources available on food groups, food composition etc. Let them know your unit ideas and they can let you know what is available.

General health issues – useful if integrating with a health unit.

Meteorological Service

PO Box 127, Rarotonga ph 20603 fax 21603

The Met Office can supply weather data, maps etc. Professional support for teachers developing weather based units. Some resources on Climate Change.

Non-Government Organisations:

World Wildlife Fund (WWF)

WWF Cooks Islands ph: 25 091

WWF have a range of books, posters and CDs that schools can borrow. WWF run school and community based programmes and competitions.

Taporoporoanga Ipukarea Society (TIS)

Ph 21 144 Fax: 22 128 PO Box 649, Rarotonga

TIS can provide information on Climate Change, Waster Management and Pollution. They are also in the process of making a video on each island to look at landforms, tradition and legends. These will be made available to schools. Staff can visit classrooms or students. Fax/email your questions and they will reply. TIS also

Science Progress Indicators

	Level One *Students can:*
Apinga Natura Ora — Living World	
1. Describe the ways in which living organisms grow, reproduce and changes	Observe and describe changes in plants and animals over time.
2. With particular reference to Cook Islands plants and animals investigate the relationship between structure and function in living thing	Observe and identify parts of living things
3. Describe grouping, order and pattern in living things and discuss its importance to science	Group the living world according to physical characteristics.
4. Research and investigate a local ecosystem and understand the relationship between living and non-living features of the ecosystem	Identify the needs of and accept responsibility for a plant or animal.
Kaveinga Ririnui — Physical World	
1. Use practical investigations and theoretical models to find and explore trends, patterns and relationships involving different experiences in the physical world.	Observe, describe and share ideas about different physical occurrences and contexts for example heat, sound, light, magnets, movement, buoyancy
2. Investigate the concept of energy and express ideas about how it is used and changed	
Tu e te Tienianga — Material World	
1. Explore and describe the properties of different materials and identify patterns within and between groups of materials.	Explore simple physical properties and use them to describe a group, for example colour, size, shape Investigate materials along a range of values for a property for example hardness, flexibility.
2. Observe and discuss the nature of reactions and their applications	Observe and describe how materials can be changed, for example heating, cooking, cutting
Enua e te Rangi — Earth and Sky	
1. Explore the relationships between our planet, the moon, sun, solar system, galaxy and universe and describe the patterns and effects these relationships generate.	Share ideas about objects in space and the patterns and effects associated with them e.g. day and night.
2. Investigate the structure and history of the earth and the processes which have shaped	Share ideas about observable features of their environment, for example physical features, weather, water resources.