Science

Upper primary

Syllabus 2003

Section 1

Curriculum Information

Papua New Guinea
Department of Education

Issued free to schools by the Department of Education

Published in 2003 by the Department of Education, Papua New Guinea

ISBN 9980–930–43–8

Acknowledgements

The Upper Primary Science Syllabus was prepared by the Curriculum Development Division of the Department of Education and was coordinated by John Kakas.

The Science Subject Advisory Committee as well as community members, teachers, inspectors, educators and representatives from government and non-government organisations have developed this syllabus through meetings, workshops and trialing.

This document was developed with the support of the Australian Government through the Curriculum Reform Implementation Project.

Secretary's Message

The current reforms in education have been in progress since 1992. The Education Reform has emphasised community-based schooling, the use of vernacular languages in schools, the introduction of Elementary schools and the expansion of Primary schooling to grade 8 and increased access to Grades 9 and 10.

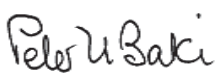
This syllabus is to be used by Upper Primary (Grades 6, 7 and 8) students in Primary schools throughout Papua New Guinea. This syllabus develops, extends, links and builds upon concepts, skills and attitudes flowing from Lower Primary (Grades 3, 4 and 5). This syllabus provides a sound foundation for further learning in the reformed school system.

Students' language abilities, already gained in their home environments and during the previous years of schooling, must be respected, built on and extended. Vernacular languages have a large part to play in our students' formative years and their first language should be used to promote a deeper understanding of difficult concepts when this is appropriate.

The study of Science encourages students to be curious and to actively search for new knowledge and understandings. Students do this by testing, playing with materials, exploring and questioning the world around them. Science education should nurture and promote an open-minded attitude to solving problems and to appreciating the opinions of others.

Papua New Guinea is unique in its biological diversity and richness of natural resources. This course of study encourages students and teachers to value and interact with their communities. Science encourages teachers to develop a student-centred approach with class activities promoting critical thinking, problem solving, and communication skills for all students.

I commend and approve this syllabus as the official curriculum for Science to be used in all Upper Primary schools throughout Papua New Guinea.



Peter M. Baki
Secretary for Education

Introduction

This syllabus makes explicit the knowledge, skills, attitudes and values that students should achieve for Grades 6, 7 and 8 in Science. These are expressed as learning outcomes and indicators.

The learning outcomes are student centred and written in terms that enable them to be demonstrated, assessed or measured. The outcomes are written to show a progression from one grade to the next.

Each learning outcome is illustrated with a list of examples of the kinds of things students should be able to do, know and understand if they are achieving an outcome. These are called indicators.

The learning outcomes and indicators will:

- give teachers individually or collaboratively, the flexibility to write programs and units of work—these can be developed to suit local conditions and individual student needs,
- help teachers assess and report students' achievements in relation to the learning outcomes,
- allow student achievement of the outcomes to be described in consistent ways,
- help teachers monitor student learning,
- help teachers plan their future teaching programs.

Science is to be timetabled for 180 minutes per week in all Upper Primary schools.

Rationale

Science helps students to explore, know and understand their world. Science education helps students to be able to make informed and responsible decisions about their lifestyle, their environment and the kind of society in which they wish to live. The nature of Science provides students with rich opportunities to solve problems using recognised scientific methods.

Science has a reputation for being exclusive to the academic world and as a consequence of little value to Primary school students. This type of thinking needs to change. The knowledge and intellectual resources of Papua New Guinea, practised here over thousands of years, are in danger of being lost as young people lose contact with their traditions and heritage. Science education has a role in encouraging students to learn about this rich source of knowledge, and its instrumental role in helping learners to better understand their own culture and those of others.

Science is best understood when it is linked to real life situations. It is important to present Science to students using authentic Papua New Guinean settings. Teaching with a local context heightens student awareness on how Science impacts on their everyday lives, both at the individual level, where it can inform personal choices, and at a social level where it can inform community and government decisions.

The knowledge, skills and attitudes developed by Science education will contribute to preparing students for subsequent studies, entry into the work force or value adding to the informal economy of their community. A practical, student-centred Science education encourages curiosity and a spirit of inquiry that is valuable in a country undergoing social, political, economical and technological change.

Curriculum Principles

Cultural relevance

Teachers need to be aware that some cultural and religious beliefs may exclude students from participating in planned Science activities. So as not to disadvantage students, discussion with parents should play an integral part in modifying or formulating alternative learning experiences.

Multiculturalism

Students come from different cultural backgrounds: they differ in where they live and the language, society and economic experiences that have influenced them in developing understandings about their world. This diversity is of benefit to the Science classroom because it encourages students to be aware of ideas and different ways of looking at the world.

Celebrating diversity helps to ensure social harmony and provides recognition for all students. It enriches learning experiences and improves the life chances and options for all students. It encourages students to respect and enjoy one another's cultural heritage.

Sustainability

When teaching Upper Primary Science, as many opportunities as possible should be taken to link what is being taught in Science to environmental issues impacting on life of the community and beyond.

It is now generally recognised that a coordinated approach to environmental sustainability is in itself problematic and that action through collaborative learning can help sustain the environment in a condition acceptable to present and future generations. This does not imply different or additional topic areas of study.

Environmental issues provide interesting and relevant contexts that can be used by teachers to develop learning experiences that incorporate Science skills and attitudes. This action on the part of teachers is essential if we are to have a scientifically knowledgeable population in the future who value their environment and are committed to protecting it.

Catering for diversity—Gender

The equal valuing of girls and boys should be reflected in the school's Science program as it plays an important part in each student's learning. Providing equal access to resources and teaching time for girls and boys is important in ensuring gender equity

The interests and preferred styles of girls and boys need to be considered. For example, greater female participation in Science at all levels can be promoted through:

- cooperative and collaborative teaching and learning styles which consider the need for both single sex and mixed sex groupings in the classroom,
- the use of inclusive language,
- acknowledgment of both the diversity and similarity of the male and female experiences.

Catering for diversity—Students with special needs

Students learn in different ways. Individuals bring to their learning in Science unique experiences, interests, motivations, and capabilities. This syllabus places importance on Science education being student centred, thus teachers are faced with the challenge of ensuring that all students have equal access to learning and to the available resources. All students should be encouraged to participate in a range of activities, which allow them to experience both enjoyment and success.

For all students to reach their full potential, learning experiences: planned units of work, will incorporate an assortment of student learning styles. Those who learn slowly should be given sufficient time to achieve, and those with particular talents should be given opportunities that challenge their abilities.

Teaching and Learning

In Primary schools, generalist teachers often prefer to use an integrated approach to teaching and learning. The teacher creates a program that is meaningful, appropriate, engaging and motivating to the students. The use of learning outcomes provides opportunities to integrate the curriculum.

Teachers should map out the learning outcomes for those parts of the syllabus that they are intending to teach in the coming term or year. Where there is more than one teacher across a grade, this should be done as a small team.

Teachers in the school with leadership responsibilities should be invited to attend and support this planning process. While carrying out this process, links between learning outcomes for different subjects should be noted, as there is scope for combining and using these outcomes in an integrated approach to teaching.

For example, a Language learning outcome might refer to the use of questionnaires and holding discussions with community members and a Making a Living learning outcome may also do this. In this way evidence of the achievement of these outcomes can be provided in more than one subject.

Student-centred learning

The Science curriculum focuses on students acquiring a deeper understanding of working scientifically through skills-based, student-centred learning activities. Students and teachers are encouraged to use the resources that are readily available to them in their own surroundings. Local knowledge and situations become very important in this approach. This practical approach is important because students must be able to use the scientific ideas that they learn to progress with the increasingly scientific and technological world in which they live.

Language development across the curriculum

Science uses particular vocabulary and language forms. A conscious effort should therefore be made to use and teach the language of Science. This includes teaching recognised reporting formats when communicating results of investigations as well as scientific vocabulary. This is of great importance to students developing English language skills.

Science without a laboratory

We can teach practical Science without a laboratory. The learning of Science processes and procedures will happen in a regular classroom. It is important that teachers establish an area in their classroom for Science where relevant materials and equipment are made accessible to students for planned scientific activities. This will often be materials collected from home or readily available from local stores, such as jars, tins, newspapers, scrap material, cardboard, natural vegetation, wires and batteries.

Science as Inquiry

Learning Science is something that students do, not something that is done to them. Hands-on activities, while essential, are not enough, students must have minds-on experiences in which they become fully engaged in creative scientific thinking.

Science as inquiry refers to the many ways in which scientists study the natural world. When engaging in inquiry, students:

- make observations by describing objects and events,
- ask questions,
- plan their activities,
- test ideas and carry out investigations,
- gather information,
- come up with their own conclusions,
- communicate their understandings to others,
- consider alternative explanations.

Science for all students

This principle is one of equity and justice. Science must be relevant to the purposes and interests of all students regardless of their age, sex, cultural background, disability, aspirations, or interests.

To meet the needs of all learners, teachers should make use of a wide variety of approaches to cater for different types of learning and seek assistance from the community to enrich experiences of students where useful.

Safety in Science

The nature of working scientifically can involve risks. All teachers are obliged to take reasonable precautions and duty of care to ensure the safety of all students and co-workers in their care at all times.

Aims

Students:

- apply scientific knowledge to their everyday lives,
- gain the foundation skills and knowledge upon which further Science learning can be based,
- learn to understand Science as expressed in the four learning strands,
- demonstrate interest in and curiosity about the natural processes in their environment and seek a scientific explanation for these processes,
- develop an understanding and appreciation of their relationship to the environment,
- demonstrate an ability to interact with the environment in a responsible and caring attitude,
- develop critical thinking skills and base their opinions on supportable and reliable evidence.

Content Overview

The content for this syllabus is organised into four Strands and six Sub-strands. A Strand such as Living Things is a useful and convenient way of organising the learning outcomes for a subject.

Each Strand identifies a particular aspect of a subject or a particular theme such as a set of processes. Each Strand displays a typical progression of learning from one grade to the next.

Working Scientifically is a process strand, which outlines the inquiry skills students will need to develop through their study of Science. It will not be taught on its own. It is skills based and is identified in the outcomes and indicators. The other three strands are content based.

Some Strands are further organised into Sub-strands to allow the content to be specified and described as learning outcomes.

Science has the following Strands: Working Scientifically, Living Things, Science in the Home and Earth and Beyond.

Living Things has two Sub-strands: Nature of Living Things and Ecology, Relationships and Interactions.

Science in the Home has two Sub-strands: Learning about Substances and Using Energy at Home.

Earth and Beyond has two Sub-strands: Our Earth and its Origin and Space Exploration.

Working Scientifically

This strand provides students with the opportunity to engage in the processes of Science and should complement learning in the three strands. Students learn to recognise and make adjustments to the factors that influence the processes.

There is a focus on analytical and creative approaches and students are encouraged to explore, question, test ideas and formulate conclusions. Also Science is put into practice in a socially responsible way. Working scientifically empowers students to implement problem-solving strategies when constructing understanding of the world around them.

Living Things

Nature of Living Things

It is important that learners appreciate and value their body and other living things. Our body is made up of a variety of tissues, organs and organ systems, which function in an integrated way. There needs to be an understanding of the structures and functions of each organ and organ system as it relates to the living form.

Ecology, Relationships and Interactions

Students are given opportunities to compare and contrast their learning in relation to other living organisms found living in their communities and formulate conclusions.

Understanding the basic processes and interrelationships associated with these systems will enable students to better understand how their own body functions and how they can care for themselves in terms of health and general wellbeing.

Science in the Home

Learning about Substances

The Science syllabus will enrich learning in Science that relates to the nutrition, health, socioeconomics, shelter and safety of students in their communities and homes. A scientific investigation using the home as a context will enable students and teachers to discover the principles behind familiar things that people use and their activities in carrying them out.

Energy at Home

The world we live in is shaped by forces, which influence the motion, shape, behaviour and energy of objects. The study of energy transfer and transformation is an integral part of the organisation and development of life. Students explore the effects of energy in their lives. They learn about methods of obtaining energy, how it is used and the social and environmental consequences of energy use.

Earth and Beyond

Our Earth and its Origin

Students explore ideas about the dynamic nature of the earth, solar system and universe, of which the earth is part. They investigate the earth's structure, the properties of materials, which determine the structure of the earth. They will be able to demonstrate the importance of care, respect and love for our land and its use. They will explore other environments and make comparisons in relation to what they already know.

Space Exploration

The universe of which the earth is part has many components. Students explore the relationship between the earth, solar system and the universe. They will also study things beyond our planet and gain insights into how they are similar or different to our own world. They investigate the many ways in which living things use the earth, solar system and the universe as resources and recognise the effects of this use.

Table of Strands and Sub Strands for Science

Strand	Grade 6	Grade 7	Grade 8
Working Scientifically	–	–	–
Living Things	• nature of living things • ecology, relationships and interactions	• nature of living things • ecology, relationships and interaction	• nature of living things • ecology, relationships and interactions
Science in the Home	• learning about substances • using energy at home	• learning about substances • using energy at home	• learning about substances • using energy at home
Earth and Beyond	• our earth and its origin • space exploration	• our earth and its origin • space exploration	• our earth and its origin • space exploration

Assessment and Reporting

Introduction

Assessment and reporting practices described here are detailed further in *The Assessment and Reporting Policy for Papua New Guinea* and in other support materials produced by the Department of Education.

Assessment

Assessment is the ongoing process of identifying, gathering and interpreting information about students' progress towards achievement of the learning outcomes described in the subject syllabuses.

Teachers record evidence of students' learning and use it to make judgements about students' achievements of the learning outcomes. To ensure that assessment is fair and balanced, teachers should use a range of assessment methods including:

- observing and recording details of students' demonstration of process skills and/or their performance on particular tasks,
- setting written assignments, projects and practical work,
- setting and marking written tests and/or examinations,
- keeping portfolios of students' work.

Teachers should provide opportunities for students to assess their own learning (self-assessment) and the learning of others (peer assessment) according to set negotiated criteria. The purpose of assessment is to improve student learning.

Science Assessment

In Science, assessment is an ongoing collection of information about the students' demonstration of learning in relation to the outcomes. It is expected that teachers will collect and use assessment information to monitor students' progress and to make judgements in order to:

- inform students, parents, carers and schools about demonstrations of learning outcomes,
- make decisions about students' needs, the learning and teaching processes and resource requirements,
- set learning goals with students and parents,
- guide the planning of school and class curriculum programs.

Principles of Assessment

Assessment focuses on learning outcomes. Students will be aware of what is being assessed, the assessment instruments being used and the criteria by which their demonstrations of the outcomes will be judged. The information collected by teachers will then be used to plan and direct students' further learning.

Using a comprehensive range of assessment techniques and tools will provide students with multiple opportunities to demonstrate the Science outcomes and will recognise that students have different learning styles.

Assessment tasks should be planned to address students' learning style, culture, ethnicity, gender, abilities, geographical location and socioeconomic status.

Assessment is an integral part of the learning process and should be factored into the learning experience from the unit planning stage and not left to the end. When selecting assessment strategies and instruments, teachers should consider prior student learning experiences and teaching methods used to address outcomes. Assessment tasks should be realistic and reflect real life situations, wherever possible.

Students must be taught to develop skills in self-monitoring and be critically reflective on the progress that they make towards demonstrating outcomes.

Students' demonstrations of learning outcomes should be monitored through the use of a range of assessment techniques:

- observation
- consultation
- focused analysis
- self-assessment
- peer-assessment

Making Judgements in Science

Teachers can make judgements about students' demonstrations of Science outcomes when they are satisfied with the evidence collected through assessment. Teacher's professional judgement is fundamental to school-based assessment. Consistency of teacher judgement is developed through processes that may involve:

- shared understandings
- criteria sheets
- joint planning and assessment tasks
- examination of students' folios
- progress maps
- formal and informal moderation processes

Reporting

Teachers must keep accurate records of students' achievement of the learning outcomes and report these achievements in fair and accurate ways to parents and guardians, teachers, students and others. Recording methods will include the following:

- journal, diary or anecdotal notes,
- portfolios,
- progressive records,
- checklists,
- work samples with comments written by the teacher.

Student reports should be based on assessment information collected from ongoing assessments and where appropriate, from external examinations (Grade 8). Schools will decide on how reports will be presented to best suit the needs of their communities.

Evaluation

Teachers will use assessment information to evaluate the effectiveness of their teaching, learning and assessment programs and to make improvements to their teaching practice in order to improve student learning.

Schools may use whole school assessment data to evaluate the effectiveness of teaching and learning in a particular subject or at particular grade levels and make decisions on how to improve student learning.

Science

Upper primary

Syllabus 2003

Section 2

Learning outcomes and indicators

Issued free to schools by the Department of Education

Published in 2003 by the Department of Education, Papua New Guinea

ISBN 9980–930–43–8

Acknowledgements

The Upper Primary Science Syllabus was prepared by the Curriculum Development Division of the Department of Education and was coordinated by John Kakas.

The Science Subject Advisory Committee as well as community members, teachers, inspectors, educators and representatives from government and non-government organisations have developed this syllabus through meetings, workshops and trialing.

This document was developed with the support of the Australian Government through the Curriculum Reform Implementation Project.

Secretary's Message

The current reforms in education have been in progress since 1992. The Education Reform has emphasised community-based schooling, the use of vernacular languages in schools, the introduction of Elementary schools and the expansion of Primary schooling to grade 8 and increased access to Grades 9 and 10.

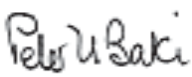
This syllabus is to be used by Upper Primary (Grades 6, 7 and 8) students in Primary schools throughout Papua New Guinea. This syllabus develops, extends, links and builds upon concepts, skills and attitudes flowing from Lower Primary (Grades 3, 4 and 5). This syllabus provides a sound foundation for further learning in the reformed school system.

Students' language abilities, already gained in their home environments and during the previous years of schooling, must be respected, built on and extended. Vernacular languages have a large part to play in our students' formative years and their first language should be used to promote a deeper understanding of difficult concepts when this is appropriate.

The study of Science encourages students to be curious and to actively search for new knowledge and understandings. Students do this by testing, playing with materials, exploring and questioning the world around them. Science education should nurture and promote an open-minded attitude to solving problems and to appreciating the opinions of others.

Papua New Guinea is unique in its biological diversity and richness of natural resources. This course of study encourages students and teachers to value and interact with their communities. Science encourages teachers to develop a student-centred approach with class activities promoting critical thinking, problem solving, and communication skills for all students.

I commend and approve this syllabus as the official curriculum for Science to be used in all Upper Primary schools throughout Papua New Guinea.



Peter M. Baki
Secretary for Education

Learning Outcomes and Indicators

Sub-strand	Grade 6	Grade 7	Grade 8
Working Scientifically	**6.1.1** Investigate the immediate environment and using scientific methods, organise their experiences and communicate their ideas	**7.1.1** Critically question their understandings of the broader environment and learn to make informed decisions based on scientific methods	**8.1.1** Identify the role of Science in the global environment and apply scientific methods to create solutions to problems
Indicators All Indicators are listed as bullet points after each Outcome. The list of Indicators always begins with the following statement: 'Students will be achieving this outcome when they, for example'.	Students will be achieving this outcome when they, for example • formulate questions to guide observations and investigations of familiar situations • conduct simple tests and describe observations • identify patterns and groupings in information to draw conclusions • cooperatively suggest possible improvements to investigations in the light of findings • describe and demonstrate how Science is used to improve our daily life	Students will be achieving this outcome when they, for example • suggest ways of doing investigations, giving consideration to fairness • organise, improvise and use simple equipment to gather and present information • argue conclusions on the basis of collected information and personal experiences • evaluate the fairness of a test designed and carried out • explain how responsible choices are made to use Science to improve community life	Students will be achieving this outcome when they, for example • identify factors to be considered in investigations, controls which may be needed and ways of achieving control • collect and record information as accurately as equipment permits and investigation purposes require • draw conclusions linked to the information gathered and the purpose of the investigation • review the extent to which answers are reasonable in relation to the questions asked • identify techniques and equipment used to collect information to make responsible decisions about an application of Science

Strand: LIVING THINGS

Sub-strand	Grade 6	Grade 7	Grade 8
Nature of Living Things	**6.2.1** Identify the basic structure of living things that allow them to function in their environment	**7.2.1** Identify and compare the basic structure of living things and how they allow them to function in their environment	**8.2.1** Describe and explain the processes of reproduction in living things and how the environment influences these processes
Indicators	Students will be achieving this outcome when they for example • identify many sources of information on the similarities and differences of plant and animal cells and communicate these to others • identify several sources of information to construct a model of a plant and animal cell, cell wall, nucleus, cell membrane, cytoplasm • identify and communicate the similarities and differences in cell structure • identify and describe the functions of sense organs and make comparisons with other living things • discuss in small groups the value of having senses • make comparisons between human senses and those of other animals and discuss • identify features of living things that can be used to classify them into groups	Students will be achieving this outcome when they for example • make comparisons between the body coverings of animals and explain how these structures are suited to the environment in which they live • use a field study data to draw conclusions about the structure and function of body coverings • investigate the structures and general function of the digestive system and make comparisons with other animals • using labelled illustrations or models to show the movement of food through the digestive system and the changes that take place • research using a variety of sources, the differences and similarities between digestive systems of different animals and present their findings using a model or poster	Students will be achieving this outcome when they for example • identify patterns of reproduction in living things • draw the stages of reproduction • write about the sequence of events in internal and external fertilisation processes • research and produce charts contrasting and comparing sexual reproductive structures of a variety of living things from various habitats • collect and analyse information on reproductive processes and formulate conclusions as to why living things reproduce differently in different environments • describe the interrelationship between the environment and the processes in living things

Sub-strand	Grade 6	Grade 7	Grade 8
Ecology, Relationships and Interactions	**6.2.2** Using a diagram, describe how energy moves through the living and the non-living community	**7.2.2** Interpret and discuss relationships that exist in a community, using a food web to show the human activity in that community	**8.2.2** Draw conclusions regarding the effects of excessive use of non-biodegradable materials on food webs
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• observe and collect data and make some generalisation regarding relationships between plants and animals in the local area • construct a food chain correctly using arrows to show the relationship between plants and animals	• construct a food web and identify the relationship between the plants and animals • research issues for a debate to show that human activity has an impact on the environment: over-hunting, over-fishing, use of fertilisers, introduced species	• design and conduct a fair test to distinguish the differences between biodegradable and non-biodegradable substances: plastics, glass, metals, wood, strings, cloth research information from a variety of sources and complete a table classifying materials as being biodegradable or non-biodegradable • conduct a survey and communicate their findings in such a way as it raise community awareness regarding the wise use of non-biodegradable materials

Strand: SCIENCE IN THE HOME

Sub-strand	Grade 6	Grade 7	Grade 8
Learning about Substances	**6.3.1** Identify and organise common substances into groups according to physical properties	**7.3.1** Explain the structure and behaviour of matter in terms of the particles from which it is made	**8.3.1** Conduct investigations and use collected data to identify patterns in the physical interactions of substances
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• collect materials and show that substances can be classified into groups, solids, liquids and gases • identify and describe the structure and functions of household substances and explain their importance: detergents, food items, other solutions	• construct simple particle models to explain the behaviour of matter • present information in a scientific way concerning the structure and behaviour of matter	• compare properties of different materials in terms of hardness, weight, size, and communicate their findings to others • design models of materials and test their interactions against each other: model canoe, log, stone, paper boat on water • discuss and link structures of materials to their ability to float or sink in water

Sub-strand	Grade 6	Grade 7	Grade 8
Learning about Substances	**6.3.2** Conduct practical investigations into the nature of mixtures and communicate their findings in a scientific way, using available materials	**7.3.2** Compare the properties of materials before and after physical and chemical changes and identify patterns in the types of changes that take place in the materials used	**8.3.2** Identify and collect basic and acidic substances found in nature and use this data to elaborate on how these can be used to benefit the community
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• collect substances and classify them into two groups: those that will mix and those that will not mix • describe the characteristics of a solution, make inferences and conduct investigations on how solutions can be separated: sugar in water, salt in water • describe the characteristics of a suspension, make inferences and conduct investigations on how substances can be separated: such as by decanting	• design and conduct simple experiments that demonstrate physical and chemical changes • using information collected from experiments to explain the nature of changes in matter • write simple word equations to describe chemical changes	• communicate to others the properties of acids and bases • identify familiar basic and acidic substances within the community and their uses • design simple tests that classify unknown substances as acids or bases using plant dyes

Sub-strand	Grade 6	Grade 7	Grade 8
Using Energy in the Home	**6.3.3** Identify and describe the sources and the types of energy	**7.3.3** Investigate how energy changes from one form to another	**8.3.3** Apply their knowledge about energy to investigate electrical and heat energy in the home
Indicators	Students will be achieving this outcome when they, for example • investigate and identify the types of energy sources in the home • collect information that demonstrate that energy can change from one form to another • identify and describe specific examples of energy transformation in their area such as burning wood, hydro electricity, lanterns, flash lights • construct a simple model that illustrates energy transformation such as the water wheel • identify and explain how simple machines can be used in homes and community to do work • identify the five different types of simple machines: levers, pulleys, axle incline planes and gears	Students will be achieving this outcome when they, for example • identify forms of energy including sound and heat and describe the effects and characteristics of these different forms • prepare a written report on the advantages and the disadvantages of friction • discuss and draw posters of how people apply different methods of using heat in different places such as in homes, factories, stores, gardens and workplace. • identify and make recommendations on how simple machines can make life easier through community field study • construct a field survey questionnaire which addresses the need for simple machines to do work	Students will be achieving this outcome when they, for example • analyse findings from surveys and make recommendations on how machines can be used to do work • identify and explain real life situations in the community where methods of applying and controlling heat are used to improve the living standard • select and produce a plan to demonstrate practical application of using and controlling heat • design, construct and test simple models of electrical circuits • sketc multiple designs of simple electrical circuits and construct and test these designs and communicate their results • evaluate results and make alterations based on their findings • conduct investigations on simple machines to establish the efficiency of the machine as a tool to do work

Sub-strand	Grade 6	Grade 7	Grade 8
Using Energy in the Home	**6.3.4** Identify and describe the nature of force as being a push or a pull	**7.3.4** Investigate how we use force in everyday life	**8.3.4** Apply their knowledge about force to investigate simple machines
Indicators	Students will be achieving this outcome when they, for example • design an experiment to demonstrate that a force can be either a push or a pull and that forces will make objects move • list and describe different types of forces, pull, push, gravity • explain how forces change our motion when we move • apply forces to an object to make it move and change direction • demonstrate and talk about how they transfer energy to a ball or balloon or a model car to make it move and change direction • draw a picture of forces in action such as a during a tug-of-war, hoisting a flag, pulling up an anchor, a person walking, flying a kite, levering a stone, catching a fish on a line, firing an arrow or spear and label the forces involved as a pull or a push	Students will be achieving this outcome when they, for example • make a list of forces that act around you during the day and night • design an investigation to find out how forces can be used to slow an objects motion • investigate and identify forces that slow things down • investigate and identify forces that speed things up • use a rope with two groups of students to investigate balanced and unbalanced forces	Students will be achieving this outcome when they, for example • demonstrate their understandings of simple machines by problem solving relating to the mechanical advantage of simple machines • investigate and describe how forces are applied in a simple machine such as a bicycle or hoop in order to make it move and change direction • show how a lever can be applied to move a heavy object and explain the forces involved • find out how some forces are measured • calculate the force by using an appropriate instrument and by applying a simple formula such as Work = Force x Distance

Sub-strand	Grade 6	Grade 7	Grade 8
Using Energy in the Home	**6.3.5** Identify and explain how simple machines can be used in homes and the community to do work	**7.3.5** Identify and make recommendations on how simple machines can make life easier through community field study	**8.3.5** Conduct investigations on simple machines and use problem solving skills to establish the efficiency of the machine as a tool to do work
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• identify the five different types of simple machines: levers, pulleys, axle and gear • elaborate on how each simple machine is used to do work	• construct a field survey questionnaire which addresses the need for simple machines to do work • analyse findings from surveys and make recommendations on how machines can be used to do work	• demonstrate their understanding of simple machines by solving problem relating to the mechanical advantage of simple machines

Strand: EARTH AND BEYOND

Sub-strand	Grade 6	Grade 7	Grade 8
Our Earth and its Origin	**6.4.1** Investigate the earth's structure and describe the formation, composition and the cycling of rocks	**7.4.1** Collect data of sedimentation process and observe the presence of fossils to explain the living past, using a variety of sources including first hand experiences	**8.4.1** Demonstrate the formation of igneous and metamorphic rocks and relate findings about the properties of rocks to the ways they are used
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• tell, listen to and collate stories in small groups about the earth's formation and illustrate their understandings as stories, poems, posters, role plays • make a model of the earth's structure, labelling the three main layers and describe the physical structure of each layer, crust, mantle and core • investigate the formation of rock and soil using a simple model of soil erosion and explain the rock cycle	• use a variety of activities to demonstrate the formation of layers in the process of sedimentation • use a variety of activities to demonstrate the formation of fossils in sedimentary rocks • describe in general terms how evidence is obtained for determining the formation of rocks • collect natural samples, one sample per group • discuss similarities and differences using their model samples with the natural samples to draw generalisation about the living past	• collect and describe the texture of stone tools and other rocks and draw conclusions as to why tools are made using these rocks and not other rocks • distinguish in general terms between sedimentary, igneous and metamorphic rocks on the basis of their formation and composition • demonstrate the formation of igneous and metamorphic rocks using simple experiments and observations in previous activities

Sub-strand	Grade 6	Grade 7	Grade 8
Space Exploration	**6.4.2** Identify and describe familiar events such as star patterns and moon phases	**7.4.2** Investigate the interactions between the earth, moon and sun	**8.4.2** Collect information about human exploration into space
Indicators	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example	Students will be achieving this outcome when they, for example
	• tell stories from personal experiences or use guest speakers to demonstrate an understanding of the star patterns and the moon phases and relate these experiences to daily activities • observe and keep a record of the different phases of the moon in the lunar circle over a period of time • explain how these events influence their daily lives	• design a scaled diagram of the solar system and identify distances and relationships between the components of the solar system • make a model of the solar system using given measurements and compare distances and sizes • using prior knowledge and data collected, demonstrate the position of the earth, moon and sun in explaining the tides • describe the observable effects of relative movements of planets, moon, sun and stars	• research information and write reports on space exploration and communicate understandings to others • design and make models of spaceships to explain their roles in space travels and communication • make a simple telescope and describe its purpose • design ways to demonstrate information about human exploration, such as models

References

Anderton, John (1988) *Fundamental Science for Melanesia*, Book 1. Longman, Cheshire

Anderton, John (1988) *Fundamental Science for Melanesia*, Book 2. Longman, Cheshire

Byers A, Students A. & Laine C. (1994) *The Science Teacher's Handbook, Ideas and Activities for every Classroom.* Heinemann

Jakab, Cheryl (1999) *Earth and Beyond, Activities for thinking scientists*, Book 1. Macmillan, Melbourne

Jakab, Cheryl (1999) *Earth and Beyond, Activities for thinking scientists*, Book 2. Macmillan, Melbourne

Jakab, Cheryl (1999) *Earth and Beyond, Activities for thinking scientists*, Book 3. Macmillan, Melbourne

NDOE (1999) *Reproductive and Sexual Health*, Supplementary Text, UNFPA and Department of Education, PNG.

QSCC (1999) *Science Years 1 to 10 Syllabus*, Queensland School Curriculum Council, Brisbane

QSCC (1999) *Science Years 1 to 10*. Queensland School Curriculum Council (1999) *Science Years 1 to 10*, Statement of Content for Education Queensland Schools, (1999)

QSCC (2000) *Science Years 1 to 10 Source Book*. Queensland School Curriculum Council, Brisbane