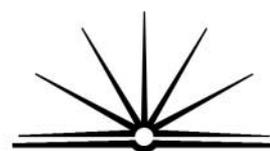
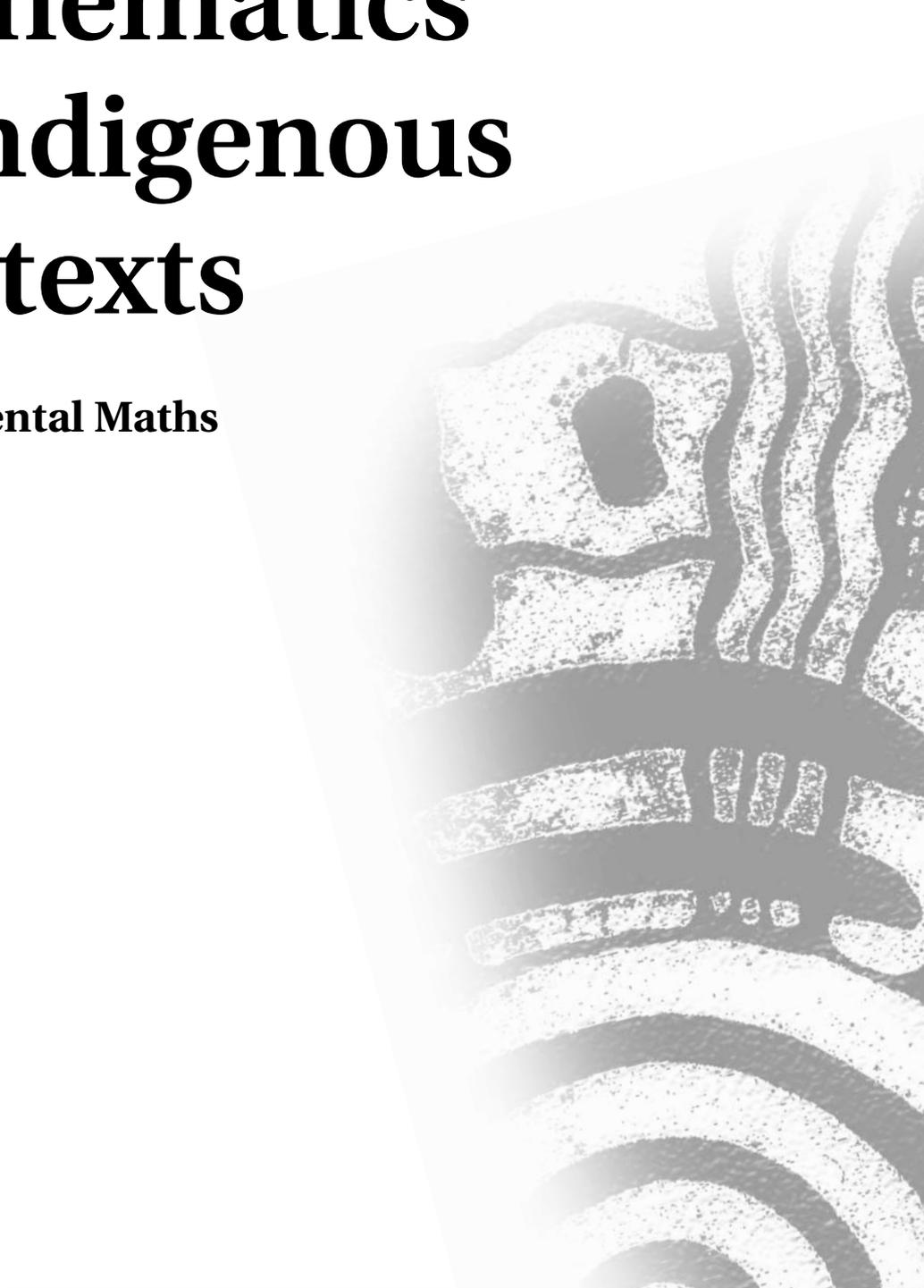


Mathematics in Indigenous Contexts

Environmental Maths



BOARD OF STUDIES
NEW SOUTH WALES

Walhallow Public School

Mathematics Unit

This Stage 2 unit is linked to an integrated multi-stage unit on Rainforest environments. This unit is attached.

The planting of an avenue of trees and the establishment of a bush tucker garden were a vital part of this unit. The measurement sequences involved activities based around these plantings.

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Mathematics – Unit

Term 3

Weeks 1 – 9

<p>Mass MS2.4 Outcome</p> <ul style="list-style-type: none"> Estimates, measures, compares and records mass using kilograms and grams 	
<p>Indicators</p> <p>The student:</p> <ul style="list-style-type: none"> identifies objects that have a mass of about one kilogram uses the abbreviation (kg) selects from a range of objects those which have a mass of more or less than one kilogram reads a scale (eg kitchen scales) in kilograms and grams converts from kilograms to grams converts from grams to kilograms estimates and checks the number of similar objects which have a total mass of one kilogram 	
<p>Activities</p> <p>The student will:</p> <ul style="list-style-type: none"> measure the mass of an object using a mixed collection of pebbles from the environment. Record the result. Repeat using stones of a different size. Discuss the difference. Repeat using large then small pebbles measure the mass of an object using bottle tops and record the result. The same mass is then measured using bolts, corks etc. Results are recorded in a graph or table, and differences in results are discussed measure amounts of water to find what amount equals one kilogram. discover the relationship between a litre and a kilogram. weigh amounts of soil etc to make a tree-propagating mix. compare the mass of seed pods to the amount of seed extracted. weigh the amount of food scraps to feed worms in the school worm farms. 	<p>Language</p> <ul style="list-style-type: none"> More than, the difference between, few, is balanced by, standard unit, same as, compare, heavier than, lighter than. <p>‘When I use big pebbles, I only need a few. When I use small ones, I need a lot.’</p>
<p>Resources</p> <ul style="list-style-type: none"> An equal arm balance, pebbles, bottle tops, bolts, soil, seed pods 	
<p>Assessment</p> <p>Ask students to:</p> <ul style="list-style-type: none"> measure the mass of an object using any informal unit and to compare their results with those of other groups explain the need for a standard unit 	<p>Evaluation</p> <ul style="list-style-type: none"> Were activities practical enough? Did the activities stimulate student interest? Did student-to-student discussion take place?

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Mathematics – Unit

Term 3

Weeks 1 – 9

Time MS2.5 Outcome <ul style="list-style-type: none">Reads and records time in one-minute intervals and makes comparisons between time units	
Indicators <p>The student:</p> <ul style="list-style-type: none">compares and orders two or more activities in terms of the time it takes to complete themreads in one-minute intervals on digital and analog clocksreads time using the terms quarter past and quarter toreads and writes analog time in hours and minutesrelates time facts to other students eg 'there are sixty seconds in one minute'relates analog notation to digital notation eg 'ten to nine is the same as 8:50'selects the appropriate unit to measure the duration of an event eg using minutes to measure the duration of a morning breakuses 'am' or 'pm' notation when recording timeuses a stopwatch to measure the duration of an event eg a one-hundred metre race	
Activities	Language
<p>The students will:</p> <ul style="list-style-type: none">compare how long it takes to fill a container eg one litre from the tree drip lines and from the hoserecord the time in analog and digital form for various activities during the day, eg bell time, tree watering time, shadow timedecide whether seconds, minutes or hours are the appropriate measure for the length of time taken to water treesrecord how often trees need watering in relation to temperature and rainfallrecord time taken for the seeds to germinate and grow to particular heights <p>Extra Activities</p> <ul style="list-style-type: none">Introduction to half pastTime snapDaily timesTime match (words to digital and clockface times)Digital clocksMinute handDigital / analog dominoesWriting times	<p>Hour, minute, half an hour, half hour, minute hand, hour hand, past, half past one, one thirty.</p> <ul style="list-style-type: none">'It's one thirty.''The short hand is the hour hand.''Alex's got a digital watch.''I wrote for half an hour this morning.''At six thirty we have dinner' <p>Digital clock, numerals, o'clock, three past six, six-oh-three, half past, thirty minutes past</p> <ul style="list-style-type: none">'It's three fifty six. That means it is nearly four o'clock.''At ten thirty we have assembly'
Resources <ul style="list-style-type: none">Various clocks (digital, alarm, analog), stopwatch, clock stamp, blank playing cards	

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Assessment	Evaluation
<p>Ask students to:</p> <ul style="list-style-type: none">▪ read digital and analog clocks for half past times▪ describe events or activities in the last half hour▪ write the time they get up, have lunch, go to bed etc, in digital form	<ul style="list-style-type: none">▪ Did I have a variety of clocks in the room for students to handle?▪ Did the students have enough opportunities to talk about time?▪ Were the activities appropriate to the students' interests?▪ Did I allow for individual differences?

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Mathematics – Unit

Term 3

Weeks 1–9

<p>Length MS2.1 Outcome</p> <ul style="list-style-type: none"> Estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres 	
<p>Indicators</p> <p>The student:</p> <ul style="list-style-type: none"> uses abbreviations for metre (m) and centimetre (cm) estimates, measures and compares the lengths of two or more objects using metres and centimetres records lengths or distances using metres and centimetres, eg 1m 25cm uses the abbreviation for millimetre (mm) measures and compares the distance between two objects in metres, centimetres or millimetres estimates and measures the lengths of objects to the nearest centimetre measures and compares the height of two students uses the term perimeter to describe the total distance around the edge identifies and measures the perimeter of two-dimensional shapes selects and uses the appropriate measuring device to determine lengths or distances selects and uses the appropriate unit to record lengths and distances reads and interprets calibrations on measuring devices eg ruler, measuring tape 	
<p>Activities</p> <p>The student:</p> <ul style="list-style-type: none"> estimates the length of two or more rows of trees, then measures using a tape measure records these distances using correct notation measures the height of trees: records in 'm', 'cm', 'mm', depending on age of tree, ie seedling, young tree, mature tree. compares various tree heights in and around the school measures and compares distances between trees measures the perimeter of bush tucker plantings, environmental – propagating hut, school grounds uses appropriate devices for measuring eg 30 cm ruler for seedlings, metre ruler for taller trees, shadow and tape measure for larger trees uses the 'mm', 'cm', 'm' units for measuring measures tree growth in the appropriate season <p>Extra Activities</p> <ul style="list-style-type: none"> More than one metre Body parts Small objects Perimeters Hopping Perimeters and circumferences Tapes and trundle wheels (relate to Fractions 8) 	<p>Language</p> <p>Metre, half metre, less than a metre, more than a metre, step, edge, around, perimeter, outside:</p> <ul style="list-style-type: none"> 'It looks like half a metre' 'The door is two and a half metres tall' 'If the carpet were a bit wider, it'd be two metres' <p>Short, long, less than half a metre, a little bit, centimetre:</p> <ul style="list-style-type: none"> 'The book is twenty-one shorts wide' 'I'm a metre and a bit tall' <p>Metre, centimetre, decimal point, less than a centimetre, more than a centimetre, perimeter, circumference:</p> <ul style="list-style-type: none"> 'It's longer than a metre; it's one metre and two centimetres' '0.7 is read as "nought point seven" or "zero point seven"'

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Resources	
30 cm and 1m rulers, measuring tapes, trundle wheels, string, shorts and longs, shadow measure	
Assessment	Evaluation
<p>Ask students to:</p> <ul style="list-style-type: none">▪ estimate lengths in metres, eg a desk, distance to the gate, height of furniture▪ estimate and then measure objects to the nearest half metre and record results, eg a newspaper, body dimensions, furniture▪ use a metre stick and longs to compare the heights of three friends, recording the results in metres and longs. Students then order the results from tallest to shortest. Discuss the implications of this activity▪ estimate and then measure the length of objects using a ruler marked in centimetres, eg desk, person's height, arm length▪ draw a line of given length, using a ruler▪ find objects of a given length, checking by measuring with a ruler marked in centimetres▪ use measuring tapes and trundle wheels to measure distances around the school	<ul style="list-style-type: none">▪ Did the activities have relevance for the student?▪ Were there sufficient resources for all students to participate?▪ Were girls as well as boys actively involved?▪ Were students estimating before measuring?▪ Did the students work cooperatively in small groups?▪ Are students expressing measurements of length correctly, both orally and in writing?▪ To what extent has work in this strand been linked to decimal work in the Number strand?▪ Did students investigate measurements in the local area with enthusiasm?

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Mathematics – Unit

Term 3

Weeks 1–9

<p>Volume and Capacity MS2.3</p> <p>Outcome</p> <ul style="list-style-type: none"> Estimates, measures, compares and records volume and capacity using millilitres and cubic centimetres. 	
<p>Indicators</p> <p>The student:</p> <ul style="list-style-type: none"> selects from a range of containers those which have the capacity of more or less than about one litre uses the abbreviation for litre (L) estimates and measures the number of litres required to fill a larger container eg bucket, sink estimates the capacity of containers to the nearest litre measures the capacity of containers to the nearest litre gives examples of situations where a unit smaller than the litre is required for measurement uses the abbreviation for the millilitre (mL) measures the capacity of small containers using millilitres describes the litre as being the same as 1000 millilitres 	
<p>Activities</p> <p>The student</p> <ul style="list-style-type: none"> studies containers used to protect the trees, to water the trees and to make propagating mix; in terms of their capacity records this information using correct notation studies how much water each tree requires looks at the flow rate from the drip lines onto the trees in the Bush Tucker area measures the volume of 'worm juice' produced in a day/week <p>Extra Activities</p> <ul style="list-style-type: none"> Displacement Different cups Estimate and check 	<p>Language</p> <p>Displace, displacement, immerse, compare, full, brim, overflow, sink, float, container, level, raise, lower, takes up space, takes up the same space, takes up less space, volume</p> <ul style="list-style-type: none"> 'I had to be careful to fill the container right to the brim' 'When Nicko put the stone in the container, the water overflowed. When he took it out, the water level went down because....' <p>Size, shape, capacity, more than, less than, larger than, smaller than, fill, full, litre, half a litre, estimate</p> <ul style="list-style-type: none"> 'Its not really fair because Carly's cup is bigger than mine.' 'Irene's lunch box holds a bit over a litre.' 'these small containers need to be measured in parts of litres.'

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Resources	
Various measuring cups, jugs, a range of containers, trays, jars, plastic bottles, match boxes	
Assessment	Evaluation
Ask students to: <ul style="list-style-type: none">▪ find two models with the same volume from a collection of models. They should discuss the reasons for choices and how to check for accuracy▪ build a variety of constructions, and describe them, the materials used, and how they went about it▪ order three objects by the displacement method▪ demonstrate an understanding of the idea that changing the shape of a particular object makes no difference to the volume of water it displaces▪ use class standard units for measuring capacity, eg using a matchbox to find the capacity of a juice carton, a chalk box or a party cup	<ul style="list-style-type: none">▪ Have students had sufficient background experiences and discussion to be able to carry out the planned activities successfully?▪ Did I organise sufficient equipment for all students be actively involved in group work?▪ Did I encourage students to make use of the playground for these water activities?▪ Did all students participate enthusiastically in the investigations?▪ Were the selected activities appropriate to achieving the unit objectives?▪ Did I relate the activities in this unit to student's everyday experiences?▪ Was there a variety of containers of various shapes and sizes?

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Mathematics – Unit

Term 3

Weeks 1-9

<p>Area MS2.2 Area Position SGS2.3 Outcomes</p> <ul style="list-style-type: none"> ▪ Estimates, measures, compares and records the area of surfaces in square centimetres and square metres ▪ Uses simple maps and grids to represent position and follow routes 	
<p>Indicators</p> <p>The student:</p> <ul style="list-style-type: none"> ▪ estimates the number of square metres in a given area ▪ records area in square metres ▪ identifies areas that are about a square metre ▪ identifies areas that are less than a square metre ▪ identifies areas that are more than a square metre ▪ uses simple maps and grids to represent position and follow routes ▪ uses a key or legend to locate a specific object ▪ constructs a simple map or plan; eg map of bedroom 	
<p>Activities</p> <p>The student:</p> <ul style="list-style-type: none"> ▪ estimates and measures the planted areas within /outside school grounds, recording the area in square metres ▪ draws a plan of the school and local area, showing areas planted ▪ measures and records the floor area of the environmental hut ▪ looks at the area (square metres) of shade cloth required to cover the rest of the walls and roof of the environmental hut ▪ compares the old plan of the area to the new plan - determines changes and additions e.g. revegetation ▪ discusses which units are suitable for measuring different sized areas ▪ places a key on their maps drawn in their 'Area' work ▪ uses a key to identify different tree species ▪ places directional points onto their map <p>Extra Activities</p> <ul style="list-style-type: none"> ▪ Measure for measure ▪ Measure your handprint ▪ The square metre ▪ Introducing the need for a large standard unit ▪ Direct comparison ▪ Surface areas ▪ Blobs 	<p>Language</p> <p>Tessellate, tessellation, gaps, square, circle, triangle, rectangle, oval, hexagon, pentagon, overlay, measuring units</p> <ul style="list-style-type: none"> ▪ 'The shapes don't leave any gaps.' ▪ 'Bricks in a wall are a tessellation.' ▪ 'I used twelve rectangles to measure this book.' <p>Larger than, smaller than, the same as, square metres, square centimetres, estimate, surface, area, surface area</p> <ul style="list-style-type: none"> ▪ 'I think this floor is about ten square meters' ▪ 'I changed the shape of my square metre.' ▪ 'The sports oval is about one hectare but the playground is smaller.'
<p>Resources</p> <p>Transparent grid overlays, cardboard shapes, grid paper, OHP pattern blocks, painting/drawing software, tape, scissors, art paper calculators</p>	

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Assessment	Evaluation
<p>Ask students to:</p> <ul style="list-style-type: none">▪ select objects which do and do not tessellate▪ select a grid which is most suitable for measuring the area of a hand print, giving reasons for the selection▪ measure the same area with different units and compare results, giving reasons for discrepancies▪ show an area which is smaller than /larger than /equal to a square metre▪ estimate and then measure floor area in square metres▪ measure the area of the surface of a small can and observe their strategies▪ explain and demonstrate ways of measuring a larger area so that the result is reasonably accurate eg a hoop▪ measure the difference in the surface area of two plates	<ul style="list-style-type: none">▪ Did the students have enough opportunities to examine tessellations in their environment?▪ Did both boys and girls have opportunities to be group leaders?▪ Did the students participate enthusiastically in activities that required them to work in pairs?▪ Should group structures be re-assessed at this stage?▪ Did I present the activities as problems for the students to investigate?▪ Did I encourage students to use a range of strategies to solve problems?▪ Did I encourage student language through careful questioning?

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Mathematics – Unit

Term 3

Weeks 1–9

<p>Data DS2.1 Outcome</p> <ul style="list-style-type: none"> gathers and organises data, displays data using tables and graphs and interprets the results. 	
<p>Indicators</p> <p>The student:</p> <ul style="list-style-type: none"> conducts a survey to collect data orders collected data by classifying presents data in a simple table interprets information presented in a simple table to answer given questions constructs a column graph on grid paper to represent collected data labels axes on a column or picture graph names the data display that has been made interprets information presented in a column graph on grid paper to represent collected data represents data in more than one way, eg a table and a column graph 	
<p>Activities</p> <p>The student:</p> <ul style="list-style-type: none"> Graphs the growth of the trees in the environmental hut, the Bushtucker plot and the area above the environmental hut Graphs the rainfall over a period of time (or lack of it) Conducts class surveys in which each student places a cross on a chart in a particular category, eg style of footwear worn to school <p>Extra activities</p> <ul style="list-style-type: none"> Favourite vegetable Playground games Probability 	<p>Language</p> <p>More than, the same as, the same number as, less than, equal to, least popular, most popular, sort, category, predict, bar graph, column graph, key, arrangement.</p> <ul style="list-style-type: none"> 'In our class, seven people like playing elastics best at playtime, five like marbles, six like team sports like cricket or netball, and nine like chasings' 'More people like running games than the other activities.'
<p>Resources</p> <p>Dice, grid paper, overhead transparencies, toothpicks</p>	
<p>Assessment</p> <p>Ask students to:</p> <ul style="list-style-type: none"> record the results of a survey or experiment using tally marks construct column graphs based on surveys of their choice, eg types of clothing worn by classmates ask each other questions about their graphs 	<p>Evaluation</p> <ul style="list-style-type: none"> Were open-ended questions used during activities? Did I encourage students to use different graphs? Was the data collected relevant to the student's interests?

Rainforests

The unit provides opportunities for students to investigate a rainforest environment in Australia. The unit focuses on comparing environmental patterns in Australia with those in other places in the world.

Unit Duration 7-8 weeks approximately

Subject Matter Focus In this unit, students learn about:

- geographic terminology
- communities, regions and environments in Australia and the world
- patterns of human involvement and use of environments
- effects of human and natural changes on environments
- different perspectives about the maintenance and improvement of environments.

Implications for Learning In this unit, students have opportunities to:

- locate features on world maps, including political boundaries, latitude and longitude, major cities
- explore changes that occur in environmental areas, incorporating a case study
- clarify and reflect on various perspectives about environmental use, including negative aspects
- participate in activities that contribute to environmental sustainability.

Outcomes and Indicators

ENS3.5

Demonstrates an understanding of the interconnectedness between Australia and global environments, and how individuals and groups can act in an ecologically responsible manner.

A student

- *uses maps and globes to locate global and Australian reference points*
- *locates and describes patterns of human involvement in environmental areas of Australia*
- *compares human use of an environmental area with uses in another area of the world*
- *explains the effects of human changes on an environment, evaluating the positive and negative aspects of these changes*
- *draws accurate sketch maps of a known area and includes title, key, scale and direction*
- *uses geographic terminology and tools to locate and investigate environments.*

ENS3.6

Explains how various beliefs and practices influence the ways in which people interact with, change and value their environment.

A student

- *examines factors that may give rise to different views about the care of places*
- *identifies the different viewpoints of groups and individuals, including Aboriginal people, farmers and miners, about uses of land*
- *expresses a personal point of view on an environmental issue and provides supporting evidence.*

Learning Experiences

Learning Sequence 1: What Is a Rainforest?

- Have students independently construct a concept/mind map showing what they already know about the rainforest.
- Where possible, jointly visit a rainforest or view a video and/or visual texts that depict a rainforest. Provide opportunities for students to gain access to a range of texts on rainforests, including electronic texts.
- Have students write a description of a particular rainforest. They could include diagrams or flow charts about the interactions between elements of rainforests.
- Return students to their concept/mind maps and have them add their newly acquired knowledge in a different colour. Provide students with atlases. Ask them to locate a rainforest on a map of Australia, eg the Daintree. Have students draw sketch maps of Australia, using a key and directional points to locate the rainforest region.
- Discuss and identify the main dangers affecting rainforests, including species extinction.

Learning Sequence 2: People and Rainforests

- Jointly research the life of Aboriginal peoples of the tropical rainforests of Australia. Use texts such as those written by Sue and John Erbacher, *Aborigines of the Rainforest* and *Survival in the Rainforest*, and the *Encyclopedia of Aboriginal Australia* (Horton (ed), 1994).
- Ask students to locate examples of where human impact on Australian rainforests is minimised, eg ecotourism, sustainable logging. Students could present an example as a flow chart.

Learning Sequence 3: Rainforests in Other Parts of the World

- Use a variety of resources, including the Internet and CD-ROMs, to compare the Daintree rainforest with a rainforest in another part of the world:

	(Daintree or another Australian rainforest)	(A rainforest in another part of the world)
animals		
plants		
people		
issues		
solutions		

Learning Sequence 4: What Can We Do?

- What can we do? A good reference here is the Rainforest Action Network (<http://www.ran.org/ran/kids>), which provides some options for student action.
- Encourage students to choose an appropriate form of environmental action, eg design a poster, write a letter, debate an issue.