PLANTING THE SEEDS OF SCIENCE

A flexible, integrated and engaging resource for teachers of 3 to 8 year olds
SECOND EDITION

EDITED BY CHRISTINE HOWITT AND ELAINE BLAKE
ACKNOWLEDGEMENTS

The pre-service early childhood teachers who participated in Science Education 225, School of Education, Curtin University in 2008 and 2009 are acknowledged for their outstanding contributions during the development of this book.

The early childhood consultants, Natalie Birrell, Mary Morris, Heidi Mullender and Karen Wood, are sincerely thanked for their professional feedback throughout the development of the book.

Teachers and children in the following schools are especially thanked for their time, expertise, commitment and feedback in trialling the modules that make up this book: Ellenbrook Christian College, John Calvin Kelmsoct School, Lake Joondalup Baptist College, Perth College and Woodlupine Primary School. Thanks are extended to all children who allowed their work to be photographed for this book.

Professor Lesley Parker, Chair of the Reference Group, for her wisdom, and support organisations that provided sage advice throughout the project, are sincerely thanked for their contributions. Representatives from the following organisations are especially thanked for their time and support:

- Wendy Gorman: Association of Independent Schools, Western Australia
- Don Watts: Australian Academy of Technological Sciences and Engineering, Western Australian Division
- Crescentia Anthony: Catholic Education Office in Western Australia
- Louise Neilson, Gail Clark, Margaret Waterton: Department of Education, Western Australia
- Janice Lake: Engineers Australia
- John Clarke: Science Teachers Association of Western Australia
- Denise Kirkpatrick, Paul Nicholls: Scitech

Photographs have been contributed by many educators including: Jacqui Arnold, Natalie Birrell, Elaine Blake, Martina Calais, Jessica Deed, Shelley Forbes, Sandra Frid, Christine Howitt, Emily Upson, and Louise Vanderlecq. Their dedication to recording and generosity of sharing is acknowledged with thanks.

The Project Team express thanks to Curtin University for the opportunity to undertake this project.

Permission has been obtained from parents for all photographs that identify children.
Wherever there is a child there is curiosity and where there is curiosity there is science.
Introduction
How to use this book as a flexible and adaptive curriculum
Philosophy

Module 1: Look what we found in the park! Christine Howitt, Elaine Blake, Sandra Frid and Yvonne Carnellor

Module 2: Is the grass still green at night? Christine Howitt, Elaine Blake and Marjan Zadnik

Module 3: We’re going an a (forensic) bear hunt! Christine Howitt, Elaine Blake and Simon Lewis

Module 4: Muds and suds: The science of cleanliness Christine Howitt, Elaine Blake and Mauro Mocerino

Module 5: The Sun changes everything! Christine Howitt, Elaine Blake and Martina Calais

References
Resources
Contributors
Whether children are observing water as it trickles down a slope, building towers, exploring the different electronic sounds of a mobile phone, feeling the sensation of mud between their toes, or noticing the difference between sweet and sour foods, they are engaged in science. Such simple play-based activities can evoke a sense of curiosity, and open up a world of science for children to explore.

*Planting the Seeds of Science* offers a flexible and integrated approach to the teaching and learning of science for 3 to 8 year old children. This book was designed as a catalyst for pre-service early childhood teachers’ engagement in science learning and teaching. Pre-service (and in-service) teachers bring many strengths into the classroom that are essential in science: respect for children’s intellect, curiosity and questioning; celebration of a child’s wonder; excitement associated with exploration and discovery; and a willingness to develop instruction based upon children’s thinking that embraces open-ended inquiry (Howes, 2002). At the same time teachers sometimes bring a lack of self confidence to teaching science due to their limited science content knowledge and lack of experience. This book has been developed to allow teachers to work with their strengths while connecting with science in a manner that is comfortable for them.

Five modules of work are presented in this book based around the themes of the environment, astronomy, forensic science, cleanliness and solar energy. These themes were chosen and developed so they would easily tap into children’s curiosity while connecting directly with their everyday experiences. Each module has been developed through a close collaboration between teacher educators, scientists, engineers, pre-service teachers and experienced early childhood teachers.

Used as a flexible and adaptive resource for teaching science in the early childhood years, this book will provide the seeds for ideas that support children’s curiosity and engagement in science. *Planting the Seeds of Science* aims to support early childhood teachers as they embark on a fun-filled scientific journey with the children they teach.

Scientific ideas and activities that respect a child’s intellect, curiosity and questioning.
How to Use this Book as a Flexible and Adaptive Curriculum

The information presented within Planting the Seeds of Science provides a range of possible science ideas and activities. It is important to note that this book is NOT intended to be a teaching program nor a syllabus. Rather, Planting the Seeds of Science has been developed as a resource with an emphasis on a flexible and adaptive curriculum.

Planting the Seeds of Science is divided into five themed modules based upon the environment, astronomy, forensic science, cleanliness and solar energy. Each module contains the following information:

- an overview
- an introduction with a range of ideas and activities
- focus questions relating to the introduction
- a range of follow-up sub-themes, each with their own ideas and activities
- a conclusion with a range of ideas and activities
- background information in the form of questions and scientific answers that can easily be explained to children
- suggestions for diagnostic, formative and summative assessment
- a list of resources that include people, websites, books, and raps and rhymes
- suggestions for curriculum integration
- suggestions for addressing Learning Outcomes of the Early Years Learning Framework
- suggestions for addressing strands of The Australian Curriculum: Science
- a case study illustrating how the module has been implemented in the classroom.

Flexibility is a key component of how this book has been developed, and how it should be used. The wide range of ideas and activities presented make it almost impossible to use them all.

While a general theme is followed within each module, teachers are encouraged to read an entire module first, and then choose and adapt those ideas and activities that accommodate the children’s interest, the teaching context and the intended outcomes. Between the suggested introduction and conclusion for each module, it is recommended that children are provided with a wide range of experiences that allow them time, depth and opportunity to achieve the desired outcomes. Ideas and activities from other modules may also be selected to meet these outcomes.

Each module contains warnings related to health and safety, school policies, law and/or websites that should be acknowledged before commencing investigations.

Thoughtful questioning forms a considerable part of this book. It is recommended that questions be adapted to suit the children’s developmental stage and context. Using various levels of questioning, children should be encouraged to think beyond their present knowledge and analyse their thought processes more fully. Such questions can include: What do you think this is? Where would you usually find …? What is causing it to behave that way? How can we change the …?

While some questions that children ask can even confound scientists, it is important that answers are given honestly and accurately. If a teacher does not know an answer, they must be prepared to acknowledge this. A suitable response can be sought with the assistance of the children or through available resources to satisfy their curiosity. If alternative or ‘magical’ solutions are offered, children could develop ideas that confuse scientific fact. Scientific explanations should only be offered that are appropriate to the child’s developmental level.

Questions that elicit a descriptive answer require thoughtful and attentive listening and thinking. The skills of questioning, listening and thinking out loud should
be modelled and encouraged by the teacher. This will assist children to develop a process of how to think things through and how to follow a logical process of events. Additionally, conversations between children, their families, and the broader community are actively encouraged to promote opportunities for shared thinking and collaborative learning. Careful thought about the implementation of any activity within a given context should guide the teacher.

To achieve maximum engagement, a flexible learning environment is recommended. Suggestions for whole class discussions and investigations, small group activities, partner work, or individual activities are included within all modules. Indoor and outdoor environments are also included to support all aspects of learning.

To ensure that richness of diversity is valued, activities in this book are intended to be accessible, meaningful and relevant for all children. They contain an emphasis on everyday interests and curiosity, and readily accommodate the cultural, language and diverse abilities found in most classrooms. Mainly of an investigative play-based nature, these activities provide opportunities for children to develop social and language skills while acknowledging cultural differences. Teachers, using professional judgement, will be persuaded which ideas and activities best suit the context of their school environment.

Suggestions for diagnostic, formative and summative assessment are presented in each module. These suggestions also reflect the flexibility of the book, as they are not meant to be prescriptive. Rather, using professional judgement, teachers are in the best position to decide what is appropriate for their children, their class context, and the specific outcomes sought.

This book should be seen as complementary to The Australian Curriculum: Science (Australian Curriculum, Assessment and Reporting Authority, 2010), the ‘Belonging, Being and Becoming’ philosophy of the Early Years Learning Framework (Commonwealth of Australia, 2009), and the Primary Connections books and professional learning program (Australian Academy of Science, 2005).

The philosophy of Planting the Seeds of Science presented on the following pages provides a starting point for explanations as to why science is included in the early childhood classroom. This information can also be used to inform parents of the importance of and link between a curious mind, science and other learning areas. It is recommended that the reader becomes familiar with this philosophy and the foundation it provides to support science teaching and learning for the youngest children in our schools.

Flexibility is a key component of how this book has been developed and how it should be used.
The science ideas and activities presented within *Planting the Seeds of Science* have been developed based upon a philosophy that consists of five components:

- acknowledgement of the place of young children as natural scientists
- active involvement of children in their own learning through play and guided inquiry
- recognition of the place of a socio-cultural context for children’s learning
- emphasis on an integrated approach to children’s learning experiences
- the use of a variety of meaning making practices for children to demonstrate their understanding and learning.

Young children continually try to make sense of their world. They demonstrate an immense curiosity and thirst for knowledge by questioning everything around them and by engaging their five senses. The role of the early childhood teacher is to acknowledge this natural curiosity and provide opportunities, within a safe and caring environment, where young children can explore, question, observe, discover and share their wonder of the world (Howitt, Morris & Colvill, 2007). The activities presented in *Planting the Seeds of Science* support and encourage children’s curiosity, allowing them to develop a better understanding of their world through play and implicit teaching.

Play provides numerous opportunities for children to actively learn through discovery, creation, and imagination. As children play with other children they create social groups, test out ideas, challenge each other’s thinking, ask questions, solve problems, engage in critical thinking and build new understandings (Commonwealth of Australia, 2009).

A guided inquiry approach also acknowledges the active involvement of children in their own learning through structured experiences provided by the teacher (Hackling, 2007). Inquiry-based learning supports hands-on and explorative learning experiences, encourages curiosity and excitement of discovery, develops knowledge and understanding of scientific ideas, supports children in using data and evidence, and allows children to experience...
working like a real scientist (Crawford, 2007). Such an investigative approach to science through play must also be supported by scientific explanations at an appropriate level. This play should be planned and purposeful, providing children with challenging and worthwhile ideas and activities. Planting the Seeds of Science presents five different contexts where children can actively explore and investigate scientific concepts while being supported by the teacher.

A socio-cultural approach to learning acknowledges the place of personal, social and cultural aspects in children’s learning (Robbins, 2005). Children do not learn in isolation. Rather, they learn through the many interactions they have with others. Their friends, parents, teachers, and the wider social and cultural context contribute to the overall teaching and learning experienced by young children. Many of the activities presented in this book encourage the interaction of children with their peers, family, and the community and its particular culture, values and resources.

An integrated curriculum provides children with the opportunity to play, explore, gather, organise and share information with an emphasis on relationships and links between learning (Wilson & Jan, 2003). Such an approach to learning embraces teachable moments afforded through children’s everyday questions, investigations and social encounters. This approach also acknowledges the responsibility of an educator to develop all areas of the curriculum. While the emphasis in Planting the Seeds of Science is science, there has been a deliberate attempt to integrate with the other learning areas of the school curriculum, in particular literacy and numeracy. An important component of the literacy link is the development of appropriate hierarchical questioning skills by and for both the teacher and the children.

As active co-constructors of knowledge, young children generate understanding about their world through creating webs of meaning (Surman, Ridgway & Edwards, 2006). Children use many ‘languages’, or representations, to make meaning of their world, including talking, reading, writing, singing, drawing, constructing, painting, story telling, imagining and acting. These, supported with various electronic means, assist children to express themselves and to better understand their world. The use of multiple meaning making practices, or ‘the hundred languages of children’ (Fraser, 2006), allows children to revisit their own learning at a pace and in a context that suits them. It also allows children to present their understanding according to their skills and ability. The activities presented in Planting the Seeds of Science purposefully use a variety of meaning making practices to assist all children with their learning.

The activities presented in Planting the Seeds of Science support and encourage children’s curiosity, allowing them to develop a better understanding of their world.
LOOK WHAT WE FOUND IN THE PARK!

CHRISTINE HOWITT, ELAINE BLAKE, SANDRA FRID AND YVONNE CARNELLOR
# CONTENTS

- Overview ............................................................. 11
- Module outline ................................................... 12
- Introduction: Our trip to the park ..................... 13
- Focus questions ................................................. 14
- Look what we found! .......................................... 14
- The wonder of a tree ........................................ 16
- Shades of green .................................................. 17
- My walk in the park ............................................ 18
- Making a map of the park ................................. 18
- Class mascot ...................................................... 19
- The classroom park .......................................... 20
- Conclusion: Let’s go back to the park ............... 21
- Q&A ..................................................................... 22
- Assessment ........................................................ 23
- Resources ........................................................... 24
- Curriculum integration ...................................... 26
- Connections to Early Years Learning Framework: Learning Outcomes ....................... 28
- Connections to The Australian Curriculum: Science ......................................................... 30
- Case study 1. The charcoal and the pine trees: Integration and flexibility to be creative .... 31
Children love exploring their outside environment. *Look what we found in the park!* allows children to develop a greater sense of their local environment and their place within it.

This module starts with children exploring a local park, bush area or beach, the school yard or the school’s suburb and collecting a range of objects that provoke interest. These objects then become the basis for activities to increase knowledge of their natural environment, connections with it, and an awareness of their responsibility towards that environment.

There are nine sub-themes presented in this module, each with a different number of ideas and activities. *Look what we found in the park!* provides children with the opportunity to discover and explore in detail trees and their many components (leaves, bark, nuts, seeds, sticks and flowers), produce park art, celebrate the many shades of green or brown found in nature, map the park, adopt an animal as a mascot, turn their classroom into a park, and revisit their park in a different season.

Teachers are reminded that excursions must be thoroughly planned and comply with the school’s excursion policy documents and health and safety requirements. These could include safety policies relating to children with special needs, child welfare, and health and safety issues in case objectionable items such as syringes or condoms are found. Disposable gloves and tongs must be available for the children to use to collect objects. A reconnaissance trip to the park by the teacher beforehand will provide valuable insight and information for a successful outing.

It is important to remember that picking wildflowers is strictly prohibited unless on private property and with the permission of the owner. Please ensure that natural materials are only collected from the school garden or public open spaces.

An outline of *Look what we found in the park!* is provided in the following table, demonstrating opportunities to integrate the module within the curriculum. Many of the activities presented in this module also have links with Biological sciences and Chemical sciences within the Science learning area of The Australian Curriculum.

Ideas and activities presented in *Look what we found in the park!* are suggestions to engage children in science learning. Allow them to guide the direction their learning takes. Flexibility is the key to working with young children, and for using this resource.
### module outline

#### Look What We Found in the Park!

<table>
<thead>
<tr>
<th>Sub-Theme</th>
<th>Idea</th>
<th>A</th>
<th>E</th>
<th>M</th>
<th>H&amp;P</th>
<th>LOTE</th>
<th>S</th>
<th>S&amp;E</th>
<th>T&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Our trip to the park</strong></td>
<td>What do children know about parks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collecting in the park</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>What can we find out about trees?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recording our discoveries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wonder box</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Look what we found!</strong></td>
<td>Look what we found in the park!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Park art</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tree weaving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>What can we do with a gum nut?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>What can we do with bark?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The wonder of a tree</strong></td>
<td>Helpful trees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tree model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shades of green</strong></td>
<td>Nature green</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green colours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>My walk in the park</strong></td>
<td>Recalling the detail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Making a map of the park</strong></td>
<td>Park maps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Park games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Class mascot</strong></td>
<td>Our class mascot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>What lives in the park?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bird talk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The classroom park</strong></td>
<td>Decorating our classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class park areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grand opening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Let’s go back to the park</strong></td>
<td>Revisiting our park</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Looking at other parks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Possible curriculum links: A (Arts), E (English), M (Mathematics), H&P (Health & Physical Education), LOTE (Languages other than English), S (Science), S&E (Society and Environment), T&E (Technology and Enterprise)
What do children know about parks?
Inform the children they are going to investigate a natural environment. For the purpose of this module, it is assumed a local park is visited. To ascertain the children’s prior knowledge of parks, ask questions such as: What is a natural environment? Why are there parks? What might be found at the park? What do the children expect to see, hear, smell or touch at the park? Encourage children to ask questions about their own interests. Create a question wall to display their questions.

Discuss natural and processed objects and record responses on a T-chart. Ask children to predict what natural and processed objects they might find in the park. Discuss safety in the park.

Collecting in the park
Take special baskets to carry ‘finds’, rubber gloves, tweezers and tongs. Useful, but not obligatory items could include magnifying glasses, binoculars and digital cameras. Collect a range of natural objects off the ground, such as sticks, twigs, stones, pebbles, leaves, bark, flowers, seed pods, dead insects or feathers. Emphasise objects must be taken off the ground, rather than pulled from trees or other plants. One possible approach is that children are to collect four favourite objects and place them into individually named zip-lock bags. This prevents too many objects being collected. Another approach is to split the children into named groups according to the specific object they are to collect (for example, gum nuts, leaves, bark). Take photographs of things that cannot be collected, such as a spider’s web, a bird’s nest, and ants.

What can we find out about trees?
Get to know the different trees in the park. Name the parts of a tree? What do the branches, bark, leaves and flowers look, feel and smell like? Listen to the tree. Give each tree a special name. Give a tree a hug. How many people does it take, standing side-by-side, to go around the biggest tree? Make a list of what lives in or on a tree? How many children can hide behind one tree? How many different types of trees are there? Classify trees from tallest to shortest based upon height. Using string, measure the circumference of two tree trunks and compare results. How many trees of the same type can be seen? Identify a trunk, a branch, a limb and a twig.

Explore the purpose of tree parts verbally in the park then expand this back in class. Why do trees have leaves? Why do trees need bark? Why do trees have flowers? What do roots do? What is a seed? What is the purpose of a seed pod? (See Q & A)
Recording our discoveries
Photograph the major objects found in the park, such as trees, swings, slides, signs, and paths. Photograph different trees, with different children standing next to them for a height comparison. How are other people using the park? Discuss the signs in the park, and their meaning.

Conclude the visit by having the children make a personal record of something memorable about their visit to the park. Depending upon their ability, children could use clipboards, paper and pencils to write or draw their response. Ideas include drawing their favourite tree, a special find, or their favourite place in the park. Ask children (or an adult) to write a sentence as to why this was their favourite tree, find or place.

Look what we found in the park!
Display objects (leaves, nuts, seeds, bark, twigs, flowers, feathers, stones or other items) collected from the park so they invite examination and play. Set up a ‘Let’s Explore’ table with disposable gloves, tongs, tweezers and magnifying glasses. Nearby, have paper, crayons or fine line pens to assist recording information.

Encourage the children to use the leaves or feathers as a non-standard measurement. How many leaves or how many feathers are required to measure the length of the teacher’s table? What other objects in the classroom do the children wish to measure using found park objects?

Ask children to draw or describe the objects to each other, focussing on the senses, minute details and the use of descriptive words relating to shape, colour, size and texture. Create a word wall near the ‘Let’s Explore’ table which continues to grow as new words, descriptive language, questions and answers associated with the park develop. Make an alphabet list using park associated words. Make associated word charts of the collected objects in English and any other language(s) used at school or home.

Classify the objects in different ways, such as long/short, rough/smooth, dark/light. Use hoops, trays or charts to sort and classify objects. Classify and sort the leaves according to size, shape and colour. Discuss other ways the objects can be classified.

Park art
Look closely at the leaves and bark with a magnifying glass. What patterns can be seen? Draw pictures of the leaves or bark. Use rubbings, clay or paint to make prints and other detailed representations of the leaves or bark. Place leaves on a light table and describe the detail of a leaf, including the veins. Trace the detail of the leaves onto paper.

FOCUS QUESTIONS RELATING TO THE INTRODUCTION
Possible focus questions to direct student thinking in the park
1. What does this object (for example, leaf) look/feel/smell/sound like?
2. Where do you think this object comes from?
3. Why do you think it comes from there?
4. What does natural mean?
5. What is the purpose of this ... (park bench - tree - bird - moth)?
6. What are the main parts of this ... (park bench - tree - bird - moth)?
7. Why do people go to the park?
8. Who do you think looks after the park?
9. Why do we have parks in our community?
10. What changes would you make to have a better park?
Trace around a leaf, add eyes, a mouth, arms and legs to create ‘leaf people’. Children could use their imagination and develop a story about their leaf person or leaf family.

Use art books that have an emphasis on natural products to provide inspiration for creative art. Books by Andy Goldsworthy (see Resources) are ideal for this. Arrange leaves or feathers into patterns. What happens when the wind or the children blow the leaves or feathers? How does the pattern change?

Laminate real gum leaves to use as gift bookmarks. Make leaf prints or rubbings for gift wrapping paper and matching gift cards.

Develop a tree collage. Have each child draw a tree, and then glue bark, leaves, or flowers into place. Give the tree a name, and label its parts.

Arrange any rocks, stones, or pebbles collected from the park (or the school yard or a garden centre) according to size, shape or colour. Build a tower of rocks on a tray. Place ice cubes in various places and observe how the water runs down the rocks as the ice starts to melt. Tell a story about where the rocks were found and suggest possibilities about how that particular rock got to the park.

**Tree weaving**

Tree weaving involves two trees, wool or string, and a selection of natural objects (such as twigs, bark, leaves, feathers or flowers). Some processed objects (such as lace, ribbon or strips of material) can be added for texture. Find two trees approximately 2 meters apart. Tie the wool or string tightly between these trees, at children's height, about a dozen times. Model weaving an object, such as a twig, through the wool and then invite the children to weave. If trees are not available, then two solid uprights, a Y-shaped branch or a hoop could be used as a substitute.

As children are weaving their objects through the wool, encourage talk. What is the object? What does it feel like? Is it rough and hard (such as some wood)? Is it smooth and shiny (like some leaves)? What does it look like? Is it long and thin or short and fat? Is the object heavy? Is it light? How can you stop a smooth or heavy object from falling through the weaving? What happens if you twist the strings a couple of times before adding an object? Does a rough surface help to hold an object in the weaving? If so, why? Can you weave through holes in leaves or bark as well as the wool?

Encourage positional and descriptive language such as over, under, around, round and round, in between, through, behind, above, twist, weave, spiral, thread, up and down, sideways, and other words. Develop procedural language with the children as they describe how they made their tree weaving. For example, first I twisted the stick into the wool, and then I placed a leaf between the wool and the stick. Next I …

Laminate real gum leaves to use as gift bookmarks. Make leaf prints or rubbings for gift wrapping paper and matching gift cards.

What can we do with a gum nut?

Look closely at the gum nuts (or other seed pods) with the magnifying glass. Describe them in detail, looking at the general shape of the nut, the shape and length of the stalk, and the presence of any ridges or grooves. How many ways can you classify gum nuts?
Using fine line pens draw a gum nut from different perspectives. Paint faces on the gum nuts and give them names. Use them as puppets.

Count the gum nuts, placing them into a variety of groupings such as lots of 2, 3, 4 or 5. Can the class collect 50 or 100 nuts? What about 1000 nuts? Use gum nuts to write letters of the alphabet, the first letter of the children’s names, or their whole name.

What can we do with bark?
Describe the size, shape and texture of any bark that has been collected from the park. What could a piece of bark cover? Look at a large piece of bark. What things could you carry with this type of bark? Find a curly piece of bark. What things could you carry or not carry with this type of bark? In what special ways can Aboriginal people use bark?

Design and construct bark mobiles. Using a selection of curled bark, small twigs, nuts, leaves or pine cones, along with large beads and soft wire, design a simple mobile that starts with the twig or the curled bark and finishes with something large like the gum nut or the pine cone. Construct the mobile by twisting soft wire around each item, add beads where required. Display the finished mobiles in a prominent place.

Helpful trees
Make a T-chart and list all the useful purposes of a tree for animals and for people. What animals live in trees? What do these animals eat? Or what eats them? Where do these animals sleep? How do people use trees? How many items can be listed that are made of wood?

Print out photographs of the different trees in the park. Describe these trees in detail. What shape are the trees? Rank the trees from tallest to shortest or from widest to narrowest. How are the trees similar? How are the trees different? Research the common and botanical names of the trees and label the photographs. Make up your own botanical names and assign these to different trees.

Tree model
Make a large cardboard classroom tree. Make giant leaves and create acrostic poems to write on these leaves. Trace a leaf shape and write one descriptive word for a leaf on the shape. Generate sentences with the children that retell their visit to the park, such as “I played under the tree and collected some gum nuts”. Hang these stories from the tree.
SHADES OF GREEN

Nature green
How many different shades of green or brown can be seen in the collected leaves? Use commercial paint colour charts to explore the different shades of green or brown.

Outside, set up buckets of plain water and green water (using food colouring). Have a large plastic spoon available at each bucket. Invite the children to add different amounts of plain water and green water to clear plastic cups to produce different shades of green. Challenge each child to make three different shades of green. Ask the children to order the cups of green water from lightest to darkest.

Look at different leaves that have been collected, are in the home garden or in the playground. Count the different shades of green. Describe the different shades of green with the children. Create a name for each shade of green. Collect a range of green objects and make a ‘Green Display’. Encourage the children to contribute something from home to add to the Green Display. Place these objects in order from lightest green to darkest green.

From a collection of pictures and photographs, discuss the many shades of green in nature. Using a variety of shades of green edicol dye, have children draw trees and smaller plants with white or black wax crayon then wash over the page with the variety of green dyes.

Green colours
Mix green paint with shaving cream. Let the children fully explore this with their hands. How many different shades of green do they produce? Photograph the process and different shades.

After investigating commercial paint colour charts, challenge each child to make their own shades of green. Provide them with paint, edicol dye, water, or any other liquid that they consider will help them achieve their goal. Allow the children to name the new colours with words that they think are appropriate. Using the new shades of green paint, invite the children to produce a ‘shades of green’ picture.
MY WALK IN THE PARK

Recalling the detail
Retell the walk in the park according to the child’s ability. This could be a verbal retell, an oral recording, written, drawn, modelled from clay, acted out or transcribed as a child recalls the sequence of events. Create a story map with photos or student illustrations. Each child could contribute a section to the retell including a drawing and one sentence for the longer story. This is then displayed in sequence along the corridor or around the room. Alternatively, this could be made into a concertina sequential picture story.

Produce a whole class PowerPoint of the walk in the park as a visual reminder of what the children did. Let the children play this PowerPoint whenever they wish. Share the PowerPoint with others.

Develop a class book about the trip to the park using photographs, drawings and writing. Each child recounts their favourite part and contributes to the book. The book could be housed in the reading corner or presented to the school library.

MAKING A MAP OF THE PARK

Park maps
Children could explore Google Earth maps to experience a ‘bird’s-eye’ view. Depending on skill, develop a simple map of the park with the children using their imagination of being a bird. Place photos from the park in appropriate places on the map. Name the paths in the park.

Make a whole class 3D map of the park, or an individual story map. Glue on leaves, bark, seeds or feathers where the children believe they were collected.
CLASS MASCOT

Our class mascot

Adopt an animal local to your environment as a class mascot. This could be a bird, rodent, frog, lizard, or an insect. A soft toy or hand puppet could represent the species chosen. A web search, or contact with the local vet, zoo or museum will help provide details about the habitat, food and characteristics of your mascot. Results of this research could include a ‘spotting chart’ so that children can record how often this animal is observed in its natural environment.

Park games

Create a barrier game using the park map. Have a simple base map with a path, a few trees, and a swing. The child places a picture of themselves next to an object in the park and then describes where a specific feature is located. For example, “I am walking along the path near the swings” or “I am under a tree by the gate”.

Does the park have a name? Research how the park got that name, or make up a story about how the park got its name. Make up botanical names for trees. (See Q&A)

An alternative game can be developed based upon coordinates on a map. Model using coordinates on a mat with the children first. Use masking tape to make large squares on a mat and label the rows as numbers and the columns as letters. Illustrate to the children how to name each square, based on the row and column names. Invite the children to stand on squares 2B or 3C, to become accustomed to using coordinates.

Develop a base map that shows landmarks in the park. Add grids: rows as numbers and columns as letters. Laminate and model how to use coordinates on the base map. Locate specific items or places in the park. Ask the children questions, such as: What can you find at B2? or Where will I find the swings?

Make maps in sand trays. Add natural objects where the children think they were collected.
What lives in the park?
In pairs, children investigate an animal of their choice from the local environment. Books and the internet can be used to gather information for their research and to answer questions provided by the teacher. These questions could include: What does it look like? Where does it live? What does it eat? How does it move?

Design and produce a 3D model of the animal using recycled materials. Children then share the findings of their research and their model with the class. Create a big book to share all the different animals with the class and the school.

Bird talk
Dramatise being a bird. Children could demonstrate how to preen feathers and describe what they see from their nest or as they are flying around. Play background music of bird songs (see Resources). Provide bird puppets for the children to manipulate. Models of many species of birds can be borrowed from a museum loan centre, such as the Perth Museum (see Resources).

Decorating our classroom
Encourage children to suggest a variety of ideas to bring nature into the classroom and create their own indoor park. For example, they could make a giant tree, using one of the photos from the park as a guide. Make each part of the tree as accurate as possible. Decorate the classroom with lengths of green and brown material, large leaves, large potted plants, and toys and puppets to represent life in the park. Have an area where large pieces of bark can be spread out on the floor. If possible, add a park bench. Prominently display the children’s collections, the PowerPoint of their visit to the park, and any books they have produced.

What name will the children call their class park? On the class door, place a sign that names their park, lists the park rules, and invites the community to visit.

Class park areas
Two alternatives are suggested for children to make representations of their park. The first involves the children developing a model of the park. Invite the children to identify, design and label components of a park, such as play equipment, a duck pond or a group of trees. The children then produce their design from a selection of recycled materials.
CONCLUSION: LET’S GO BACK TO THE PARK

The second representation involves turning the classroom into a park. Split the class into certain areas that relate to parks, for example a Picnic area, a Park Sculpture/Art area and a Nursery area for seedlings.

Revisiting our park
Revisit the park and see if the children can remember where they collected their objects. Have a picnic in the park. Revisit the same park in a different season to note the changes in both natural and processed objects. The school could adopt the park and children return year after year from different year levels.

Looking at other parks
Visit another park to look at the similarities and differences between the two parks, or invite children to tell the class a story about a different park they have visited. Discuss differences between the two parks. Have a map indicating locations of different parks children have visited (include international parks). Ask the following questions: What special features were in this park?, What were the main uses of this park?, and What trees, animals or birds were found in this park? Encourage parents to share their stories, photos and their experiences in parks.

Grand opening
Have a grand opening of the classroom park. Children make ‘leaf people’ invitation cards to invite their parents, the principal, and another class to come to the grand opening of the classroom park. This will present an opportunity to showcase the module’s work and the children’s accomplishments. It also presents opportunities for assessment.

The reading corner could become the Picnic area. Dramatise having a picnic in the park. Place a picnic rug and cushions in a special place in the classroom for quiet reading or listening to bird songs. Have a variety of natural art books, including rock photo books, on display.

The art corner could be the Park Sculpture/Art area. Make a wall mural of the park. A large unusual shaped branch could be hung from the ceiling and made into a mobile of children’s art, or objects collected from the park. Develop a fabric collage of the park. Use an assortment of different materials with different textures, such as open weave, felt, cotton wool, stones, buttons, plain cotton, twigs, leaves and/or grass to represent park features.

In the Nursery area children could care for potted gum seedlings, which would eventually be transplanted into the school grounds. Invite a guest speaker from the nursery, or the school gardener, to talk about looking after trees or other plants. Explore the life cycle of a tree. Dramatise and role-play this life cycle.
WHY DO TREES HAVE LEAVES?
Leaves help to produce food that plants need to survive. Through the process called photosynthesis, leaves turn sunlight, carbon dioxide (from the air) and water into food (in the form of carbohydrates) and oxygen. Leaves contain many small green particles called chloroplasts which act as machines to produce the food. Sunlight is the power that runs these small machines. It is the green chloroplasts that give leaves their predominately green colour.

WHY ARE LEAVES GREEN?
Not all leaves are green. Take a closer look at leaves. They can be many different colours. How many different shades of green can you see? If this activity is done in autumn then you will see leaves with many different colours and many different shades of a colour. Also see the answer to the above question.

WHY DO TREES NEED BARK?
Bark protects the inner, more delicate parts of the tree. Bark not only keeps the inside parts from drying out, but also guards against outside injuries. Bark also provides a home for many insects and spiders.

WHY DO PLANTS HAVE ROOTS?
Plants need roots for two main reasons: anchoring them to the ground, and absorbing water and nutrients from the soil. The roots of most, but not all, plants grow in soil. Thousands of tiny hairs project from the surface of young roots allowing them to absorb nutrients from the soil.

WHY ARE THERE SO MANY DIFFERENT SHAPED LEAVES?
The shape of the leaves tends to reflect the environment in which the plant lives. Eucalyptus leaves tend to be long and skinny, to prevent them from losing too much water in hot weather. In contrast, rainforest leaves tend to be large and wide, as they need to produce as much food as they can to outgrow other plants.

WHY DO LEAVES FALL OFF SOME TREES IN AUTUMN?
In autumn many leaves change colour and drop from the tree. This is because the tree becomes dormant in winter (similar to an animal hibernating), so saves its energy by losing its leaves.

DO ALL TREES LOOSE THEIR LEAVES IN AUTUMN?
Some trees lose their leaves, while other trees do not. Many Australian native trees do not lose their leaves in autumn. Rather, they shed leaves in summer when they are trying to conserve water. Native Australian trees can easily cope with our winter conditions, and therefore do not lose their leaves. Native European trees have to cope with extremely cold conditions, often with snow and ice. Hence, these trees need to lose their leaves in order to survive the cold winters. Trees that lose their leaves in autumn are called ‘deciduous’ trees. Trees that keep most of their leaves all year round are called ‘evergreen’ trees.

WHY DO TREES HAVE FLOWERS?
Flowers are the reproductive part of a plant. Flowers produce the fruits of the plant, which in turn contain the seeds.

WHY DO FLOWERS HAVE DIFFERENT COLOURS?
Flowers require insects to pollinate them. Different insects are attracted to different colours. Hence, a flower will be a certain colour in order to attract a certain type of insect.

WHAT IS THE DIFFERENCE BETWEEN NATURAL AND PROCESSED OBJECTS?
Natural objects are those produced by natural processes. They include such things as wood, rocks, soil and bone. Processed objects are those that have been produced by human processes and include metals, plastics, detergents and medicines. There are many processed objects that are made of natural materials (ceramics are made from clay, and tables are made from wood).

HOW ARE SPECIES NAMED?
The formal system for naming species in biology is called ‘binomial nomenclature’, ‘binary nomenclature’, or the ‘binomial classification system’. The name given for a species according to this system is commonly called its ‘scientific name’ or its ‘Latin name’. The first word of a scientific name is the genus, usually capitalized (i.e., Homo in Homo sapiens), and provides a general description. The second word is called the ‘specific name’, and is always in lower case. This word is usually Latin or a Latinised name of a specific person or place.

From 2003 to 2009 a large number of new species of wattle (acacia) were found in the Pilbara in north-western Western Australia, as a consequence of the growth in the mining industry. Many of the new species’ names reflect stories of botanical dedication and mining. For example, Acacia robeorum is named after Robe River Iron Associates (part of the Rio Tinto mining group). Acacia walkeri was named after the work of Ken Walker, who collected more than 600 plants from the Pilbara.
Acknowledging children’s many ways of knowing and reporting their information, the following suggestions for diagnostic, formative and summative assessment are presented. Please note these are not prescriptive for the module. Using professional judgement, teachers should decide what is appropriate for their children, their class context, and the specific outcomes hoped to be achieved.

**Diagnostic assessment**

Use the following questions to determine how much children know about parks.

Who uses a park? Why do people use a park? What things are in a park? Why are those things in a park? What do you do in the park? Who looks after the park?

Children draw a picture of their perception of a park, and explain the detail to another.

**Formative assessment**

Children provide detailed representations of what they did or found in the park. These could include drawings, story mapping, writing, sculpting, art work, drama, or telling.

Ask the children to recount the trip to the park. How much detail do they remember?

How do the children contribute to a whole class or small group presentations on the park? This could include a Power Point presentation.

How do the children contribute to creating a map of the park? How well can they describe where objects were found in the park?

Children find pieces of information about a tree or a bird found in the park? What does this information indicate about their learning?

**Summative assessment**

Children share information they have learnt over the term. This could be done in groups of three: taking turns, one telling, one asking questions (from a list of possible questions), and one writing or drawing interesting findings that will be reported back to the class.

Depending on skill, each child paints or draws four facts they have learned about the parks.

Children complete a TWLH chart over the term. The ‘T’ and ‘W’ are completed at the start of the term, and stand for What the children think they know about parks and What they want to know about parks. The ‘L’ and ‘H’ are completed at the end of the term, and stand for What the children learned over the term about parks and How they know this new information.

Choose and prepare a talk about social issues: why we should (or should not) have public parks, our responsibility in a public park, things that make our park special, or the value of natural and processed objects in a park.

Children set up a Natural Museum of their local environment where other sections of the community can share their discoveries. To complete this task collect, identify and classify objects; design the space in which the objects will be placed; consider safety aspects of the exhibit; label the displays appropriately; maintain the exhibit; write invitations for an ‘Exhibition Opening’; write a media release for the school’s newsletter; and prepare posters, pamphlets or information sheets about the objects on display. This form of assessment clearly covers many different learning areas, and is suitable for all levels of learning and ranges of abilities.

For extension: children design and make a model of a park bench.
RESOURCES

This list of resources is not exhaustive and should be considered a starting point for finding more information. It is a good idea to also check the parent list as there can be some very useful resources readily available among the families in the school. While many of these resources are Western Australian, teachers are encouraged to find the equivalent resources within their own state.

People

Local council member or town planner to discuss the importance of parks, how parks are positioned within a community, and who is responsible for looking after parks.

Park ranger to discuss his/her job and children’s responsibility in relation to the park.

Parents with a strong interest and knowledge about the local environment.

School or local gardener, botanist or someone from the local nursery or arboretum to discuss different trees and how they are grown.

Local environmental groups to discuss the importance of looking after local flora (plants) and fauna (animals).

Vet to discuss the characteristics and habitats of different animals.

Websites

Perth Museum
www.museum.wa.gov.au

Loan centre for the Perth Museum

EcoEducation (Perth) – Department of Conservation and Environment
http://www.calm.wa.gov.au

Department of Environment and Conservation, Nature Base (Perth)
http://www.naturebase.net/content/view/2244/1088

Kings Park (Perth)

Men of the Trees (Perth). Work with seed collection, seed propagation, revegetation, and providing native seedlings to the community.

www.menofthetreesc.com.au

Whiteman Park (Perth)

Children’s Parks and Activities – Perth and WA

Ribbons of Blue (Perth). Develops community awareness and understanding about local water quality.

Australian Geographic. Provides some excellent information and images relating to Australian bush and adventures.

Bird information from Australian National Parks

Aboriginal bark canoe and bark paintings from the Kimberley, WA
http://australianmuseum.net.au/image/Aboriginal_bark_canoe

Interactive story books, for use with computers and/or whiteboard.

Little Animal Activity Centre
The Missing Pencil, by Jeff Capel
http://www.bbc.co.uk/schools/laac/story/sbi.shtml

Website music

Home amongst the gum trees

Words and bird songs
http://www.canteach.ca/elementary/songspoems52.html

Bird song recordings and visuals

© Uncle Bignose
Books

Factual texts


Narrative texts


Raps and rhymes

I went to visit the bush one day, I saw a ______ upon my way (text innovation: traditional song I went to visit a farm one day)

Each child adds another sighting to the rap and each repeat must have the new item added. Slap the knees to help keep the beat.

For example:

I went to visit the bush one day and saw a leaf along the way
I went to visit the bush one day and saw a leaf and a dog along the way
I went to visit the bush one day and saw a leaf, a dog and a tree along the way

Think I’ll go eat worms

http://kids.niehs.nih.gov/lyrics/worms.htm
http://bussongs.com/songs/nobody_likes_me_worms.php

Nobody likes me, everybody hates me, I’m going to the park to eat worms.

Big fat juicy ones, long slim slimy ones, ooy gooy ooy gooy worms.

Well, you bite off their heads and squeeze out the juice and throw the rest away.

Nobody knows that I exist on a hundred worms a day!

Magpie sits in the old gum tree (text innovation: traditional song Kookaburra sits in the old gum tree)

Try changing the name of the bird, or create your own song.

For example:

Magpie sits in the old gum tree
Guarding babies close as can be
Sing magpie, fly magpie
Please don’t swoop on me!

Running to the tree (text innovation: traditional rhyme Running to the corner)

Running to the tree, running very fast
Running to the tree, getting there at last
I’m puff, puff, puff, puffing, I’m puffing a lot.
I’m hot, hot, hot!
CURRICULUM INTEGRATION

Look what we found in the park!

**Science**
- Explore a range of objects using the senses of feel, see, hear, and smell
- Collect, describe and classify a range of natural objects
- Adopt an animal, insect, spider or bird from your park to study
- Look at the decomposition of a leaf, leaf matter, or a decaying tree
- Describe natural and processed objects in the park
- Plant native seeds and describe the growth
- Investigate the planning, protection and maintenance of a park

**Society & Environment**
- Explore a local environment (park, the bush, backyard, around the block, seashore) and list features
- Discuss the importance of parks
- Interview parents about the usefulness of a public space
- Who goes to the park? Why?
- What is the history of the park? When is its birthday?
- What equipment is in the park? Where did the equipment come from? What equipment would you like to see in your park?
- Take a trip to a different public open space. How is this similar or different to the first area visited?
- Invite parents to the park, take them on a guided tour and share the knowledge gained
- Is there a litter problem in the park? Write to the council asking how the school could help solve this problem
- Describe responsibilities as a ‘user’ of the park

**Languages Other Than English**
- Label objects using local indigenous language
- Compare parks in other countries with local parks
- Show pictures of parks from other countries. How are they used?
- Make associated word charts in English and the school’s LOTE language

**Mathematics**
- Develop a bird’s eye perspective or 3D map of the park
- Describe relational position of park objects
- Count the number of paces between trees
- Measure a tree. Do your arms fit around a tree? How many need to hold hands to reach around the tree? How many hand spans fit around the tree?
- Sequence leaves longest to shortest, or widest to narrowest
- Use found items (nuts or rocks) as arbitrary weights for balance, measurement or base numbers
- Count the number of leaves, seeds or twigs
- Look for patterns in leaves and bark
- Create different patterns with leaves and bark
- Name the shapes of the objects found in the park
- Map and grid concepts/skills
English
- Descriptive language associated with each object found in the park
- Retell trip to the park: verbal, sequential pictures and/or sentences, caption photos, PowerPoint, illustrated story map
- Make up a related story. For example, A leaf fell ... Where does it end up? Detail its journey using natural elements such as wind and water
- Use positional language to find things: front, back, on, under, over there, beside, behind, or near
- Develop a park word wall
- Write descriptive leaf words on the shape of a leaf
- Give bird’s eye view descriptions
- Develop a story book for each child or a whole class book, using their words, drawings and photos
- Use a range of adult and child made visual aids to retell the trip to the park (birds, trees, seeds, signs)

The Arts
- Use collected dried leaves, seeds, bark and twigs to make patterns, collages and rubbings
- Dramatise a picnic in the park (include the pesky ants!)
- Make a giant mosaic or collage using found natural objects
- Find an interesting shaped large branch to hang made mobiles
- Drill bark chips or gumnuts and make necklaces
- Make ‘bush sculptures’ using found objects
- Make clay models of favourite things in the park
- Recreate the park in the classroom
- Listen to bird songs, learn to whistle
- Lie under a tree and look up; draw a picture of what you see
- Create a tree weaving
- Dance of the falling leaves, crawling ants, or flight of the birds

Technology & Enterprise
- Make a model of your park, based upon the map and photographs taken
- Take a digital camera on the walk to record evidence and events. Turn this into a PowerPoint
- Photograph children with objects they found in the park and location found. (For example, bark comes from the trunk of a tree.)
- Create a digital story of the children and the class mascot
- Plan and build a park in the classroom
- Design, plan and make a nest for a bird
- Design a giant tree for inside the classroom
- Design a park bench or a picnic table. Where would you place it in the park?

Health & Physical Education
- Jump on leaves, roll in leaves, make a leaf path and tip-toe along these
- Play hide and seek behind the trees
- How many children can hide behind one tree?
- Use trees to define boundaries or a running track
- Have a healthy food picnic in the park
- Pretend to be a bird. Practise landing and balancing on one leg
- Discuss the dangers in parks
- Safety with sticks
- Personal health for a long walk: sun screen, hat and water
- Shade and ‘sun safe’
**CONNECTIONS TO EARLY YEARS LEARNING FRAMEWORK: LEARNING OUTCOMES**

The five Learning Outcomes of the Early Years Learning Framework provide broad and observable outcomes of young children’s learning and development. Examples of these outcomes in relation to *Look what we found in the park!* are presented below. As there are many ways that children express their learning, these should be considered a guide only.

### Outcome 1. Children have a strong sense of identity

<table>
<thead>
<tr>
<th>Children feel safe, secure and supported</th>
<th>Children develop knowledgeable and confident self identities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• openly express ideas about the natural environment</td>
<td>• share how natural environment is used in own culture</td>
</tr>
<tr>
<td>• listen to and respond to ideas from others about animals and plants</td>
<td>• use home language (or standard Australian English) to describe the different parts of a tree</td>
</tr>
<tr>
<td>• confidently explore the local park with others</td>
<td>• invite others to join activities such as tree weaving</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Children develop their emerging autonomy, interdependence, resilience and sense of agency</th>
<th>Children learn to interact in relation to others with care, empathy and respect</th>
</tr>
</thead>
<tbody>
<tr>
<td>• celebrate own success in collecting objects from the park</td>
<td>• contribute to shared play with toy animals</td>
</tr>
<tr>
<td>• open and accepting to new discoveries</td>
<td>• engage with gardener or park ranger</td>
</tr>
<tr>
<td>• share objects that have been found in the park</td>
<td>• use a toy bird to express empathy and respect.</td>
</tr>
</tbody>
</table>

### Outcome 2. Children are connected and contribute to their world

<table>
<thead>
<tr>
<th>Children develop a sense of belonging to groups and communities and an understanding of the reciprocal rights and responsibilities necessary for active community participation</th>
<th>Children become aware of fairness</th>
</tr>
</thead>
<tbody>
<tr>
<td>• cooperate with others when sorting a range of natural objects</td>
<td>• discuss and demonstrate choices: what to collect and what to leave</td>
</tr>
<tr>
<td>• express an opinion on the importance of plants and animals</td>
<td>• share collected objects (gum leaves and nuts) with others</td>
</tr>
<tr>
<td>• allows others to join in construction of a bird’s nest</td>
<td>• use toy animals to demonstrate kindness and compassion for all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Children respond to diversity with respect</th>
<th>Children become socially responsible and show respect for the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• explore how different cultures use natural environments</td>
<td>• use dramatic play and pretend to be a park ranger</td>
</tr>
<tr>
<td>• listen to others’ ideas about the importance of and use of parks</td>
<td>• observe over time and respond to changes to natural environment</td>
</tr>
<tr>
<td>• respect coexistence of people plants and animals in park areas</td>
<td>• consider the importance of picking up own rubbish</td>
</tr>
</tbody>
</table>

### Outcome 3. Children have a strong sense of well being

<table>
<thead>
<tr>
<th>Children become strong in their social and emotional wellbeing</th>
<th>Children take increasing responsibility for their own health and physical wellbeing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• make choices about safety and personal care while exploring</td>
<td>• conduct a checklist of personal requirements for an excursion</td>
</tr>
<tr>
<td>• enjoy quiet times and playful times among the trees</td>
<td>• run confidently between trees and other objects in the park</td>
</tr>
<tr>
<td>• celebrate the success of the class in decorating the classroom as a park</td>
<td>• place their findings from the park into a snap-lock bag</td>
</tr>
</tbody>
</table>
**Outcome 4. Children are confident and involved learners**

**Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity**
- express wonder about the natural world
- ask questions of the park ranger related to their curiosity about the park
- create shades of green using shaving cream, water and food colouring

**Children develop a range of skills and processes such as problem solving, enquiry, experimentation, hypothesising, researching and investigating**
- use gum nuts to measure the length of an object
- draw the pattern of veins on leaves
- compare differences of bark from different trees

**Children transfer and adapt what they have learned from one context to another**
- after tree weaving, children reproduce smaller scale weaving
- use their made shades of green paint to represent a picture of the park
- discover new places for a possum to live

**Children research their own learning through connecting with people, place, technologies and natural and processed materials**
- use their senses to describe elements of the park
- investigate and discuss items collected from the park
- take photographs in the park that indicate natural and processed materials

**Children transfer and adapt what they have learned from one context to another**
- after tree weaving, children reproduce smaller scale weaving
- use their made shades of green paint to represent a picture of the park
- discover new places for a possum to live

**Children research their own learning through connecting with people, place, technologies and natural and processed materials**
- use their senses to describe elements of the park
- investigate and discuss items collected from the park
- take photographs in the park that indicate natural and processed materials

**Outcome 5. Children are effective communicators**

**Children interact verbally and non-verbally with others for a range of purposes**
- describe objects collected in the park with others
- share a story of the made leaf family
- using movement and dance explore leaf (or bird) movements

**Children engage with a range of texts and gain meaning from these texts**
- co-construct a book that retells the visit to the park
- write and read park words such as gum nut, leaf, bark, flower, gate and swing on a Park Word Wall
- share story books about animals and being in the environment

**Children express ideas and make meaning using a range of media**
- draw their favourite object in the park
- listen to music and recorded bird calls
- pretend they are a tree growing from a seed

**Children begin to understand how symbols and pattern systems work**
- develop a basic map of the park
- photograph signs in the park then use them to recognise and connect for future visits
- recognise relationships by clapping, counting and making patterns using a range of natural objects

**Children use information and communication technologies to access information, investigate ideas and represent their thinking**
- use interactive story books about parks
- photograph parks from around the world using information and communication technologies
- draw their favourite object in the park using information and communication technologies
The Australian Curriculum: Science (Version 1.0, 8/12/2010) consists of three interrelated strands: Science Understanding, Science as a Human Endeavour, and Science Inquiry Skills. Examples of these strands in relation to \textit{Look what we found in the park!} are presented below.

### Science Understanding

**Biological sciences**
- Exploration of natural things that live in the park such as trees, birds, seeds, and insects
- Learning about particular animals in the local environment
- Planting and care for local seeds or seedlings
- The importance of trees for people and animals

**Earth and space sciences**
- Developing basic maps of the local environment
- Use senses to find differences of a tree on wet and sunny days
- Observe, describe and photograph the seasonal changes in the park
- Describing how the park changed over time

**Chemical sciences**
- Exploration of natural and processed objects in the park
- What are processed objects made of?
- Classifying natural objects based on size, shape, colour and texture
- Identify and describe objects made of wood

**Physical sciences**
- Explore the shadows of the trees in the park
- How does a swing or see-saw work?
- Does the park have lighting? How are the lights powered?
- Sound and movement associated with natural objects (leaves) on a windy day

### Science as a Human Endeavour

**Nature and development of science**
- How are parks used for scientific research?
- Why do scientists use botanical names for plants?
- What information can scientists gather from animals scats?
- Develop simple questions about plants and animals to explore as a class

**Use and influence of science**
- People use parks everyday for many different uses
- Why should people pick up their own rubbish?
- Who looks after our parks? How do they look after our parks?
- How does the school gardener look after the school environment?

### Science Inquiry Skills

**Questioning and predicting**
- Predict what objects may be found in the park
- What are the different parts of a tree?
- Encourage questions about the park to place in the Wonder Box
- What will the park look like in a different season?

**Planning and conducting**
- Collect a range of natural objects and place them in snap-lock bags
- Research the common names and botanical names of plants
- Use string to measure the circumference of a tree trunk
- Observe and draw a gum nut or leaf in detail

**Processing and analysing data and information**
- Draw a map of the park based on memory
- Present one object that slipped through the tree weaving. Was this expected?
- Sort objects from the park into groups to determine which one is most common
- Compare results of adding green paint to shaving cream with children’s predictions

**Evaluating**
- Compare detailed drawings of gumnuts to notice similarities and differences
- Discuss different classifications of natural objects
- What similarities can be found in the objects that slipped through the tree weaving?
- Compare and discuss string lengths to determine the tree with the largest circumference

**Communicating**
- Use positional language while performing tree weaving
- Describe the different shades of green at the park
- Dramatise being a bird
- Write stories or poems about trees
CASE STUDY 1. THE CHARCOAL AND THE PINE TREES: INTEGRATION AND FLEXIBILITY TO BE CREATIVE

Background
Sandra (a pseudonym) is a Year 1 teacher of 27 children in a large independent K-12 school in Perth. Sandra has been teaching for 7 years and is the Primary Curriculum Coordinator. Sandra recognises the value and benefit of teaching science, but is concerned at times she does not have the technical knowledge to teach science effectively.

How was the book used?
After becoming familiar with the Philosophy and How to Use the Book sections, Sandra looked through the entire book before choosing Look what we found in the park! She then read this whole module in detail. Sandra treated the ideas and activities within the module as a road map: providing a starting point, showing her where she could go and how to get there, and having a finishing point. Sandra selected various activities from the module to develop a 6-week teaching program for Term 4 that would cover all learning areas. Her aim was to develop rich integrated learning experiences for the children that would help them to connect more with their local environment.

Sandra took some learning experiences straight from the book. For example, the class had an initial visit to their local park. This set the scene for all their learning, as they kept referring back to their visit to the park.

How was the module modified?
As pine trees were a feature of their local environment, Sandra found these to be the catalyst to integrate Science, Society and Environment, Art, and Literacy. In class, the children had discussed the differences between eucalyptus trees and pine trees, why the pine plantation was located next to the school (relating this to underground water), the many uses of pine wood, and where pine trees originally came from. They were also introduced to charcoal, how it is formed, and how it can be used in art.

To develop a more powerful learning experience, Sandra wanted the children to expand their knowledge of pine trees. To achieve this, the children sat at the school boundary with their hats, water bottles, clipboards and paper and observed the pine trees across the road. They again described and compared the parts of the eucalyptus trees and pine trees in detail before drawing their chosen trees with charcoal.

An overview of the book
Sandra found the book presented rich integrated learning experiences across all the learning areas. In particular, she was impressed with how the themes were explored through the different learning areas, starting with what the children already knew. She believed the structure of the module gave the teacher the flexibility to explore topics creatively and lead the children on their own learning journey.

Sandra found this book demystified science and the preciseness of the topic, and removed the anxiety attached to teaching science. She found the book both easy to use and easy to plan around, because it provided starting points and a wide range of activities. Sandra loved the choice of activities and ideas; however she also recognised that others may not like such flexibility.

Sandra recognised that the structure of the book allowed (and even encouraged) the teacher to go off on a tangent based upon children’s ideas and questions. She commented that the book modelled how to develop an integrated program from any theme. Sandra also highlighted the structure of the modules allowed reflection and growth within teaching and learning science in early childhood education.
IS THE GRASS STILL GREEN AT NIGHT?
Astrophysics of the dark
The rhythm of day and night is a part of everyone’s life and children can easily relate their experiences of daylight and night time dark. *Is the grass still green at night? Astrophysics of the dark* introduces children to scientific concepts related to day and night.

This module is designed to expand a child’s knowledge of why there is a light and a dark part of every day through developing a greater understanding of the characteristics of day and night, exploring shadows, and observing the relationship between Earth and the Sun.

There are seven sub-themes presented in this module, each with a different number of ideas and activities. *Is the grass still green at night? Astrophysics of the dark* begins with children discussing living and working during daytime, and living and working at night time. The night time discussion acknowledges that some children are afraid of the dark and sensitively addresses this issue. It also discusses monsters, and allows children to confidently experience being in the dark. A comparison between day and night is then made. Children investigate how shadows are made, by examining shadows of themselves, the changing shapes of shadows, and shadows on balls. Using the relationship between the Sun and the Earth, children explore day and night with various hand-held models. Finally, they answer the question ‘Is the grass still green at night?’

As a consequence of children developing their own explanations to everyday phenomena, they may hold many alternative conceptions in astronomy. For instance when a question as simple as, ‘Where does the Sun go at night?’ is not factually or satisfactorily answered, children will construct their own explanation. Further, the use of everyday terms such as ‘sunrise’ and ‘sunset’ reinforces a belief that the Sun actually moves and Earth is at the centre of the Solar System. Expressions such as ‘the Sun is going down’ and ‘the stars are coming out’ illustrate how familiar language contrasts with scientific views.

This module relates only to day and night, providing many learning opportunities and different representations to reinforce scientific concepts associated with day and night. While the Moon will become a part of the children’s discussion of night, no attempt is made to explain the phases of the Moon here. Presenting young children with models of day and night, phases of the moon, seasons of the year, and the apparent motion of the stars all at the same time can leave them confused. Such abstract concepts should only be presented when children are mature enough in thought to construct the true understanding of these phenomena.

Health and safety issues, such as never look directly into a bright light or into the Sun should be introduced before the commencement of activities in this module. If teaching Indigenous students, there is a need to liaise with parents or the community, as the children may have strong beliefs about night spirits.
An outline of *Is the grass still green at night? Astrophysics of the dark* is provided in the following table, demonstrating opportunities to integrate the module within the curriculum. Many of the activities presented in this module also have links with Earth and space sciences and Biological sciences within the Science learning area of The Australian Curriculum. Ideas and activities presented in *Is the grass still green at night? Astrophysics of the dark* are suggestions to engage children in science learning. Allow them to guide the direction their learning takes. Flexibility is the key to working with young children, and for using this resource.

### IS THE GRASS STILL GREEN AT NIGHT? ASTROPHYSICS OF THE DARK

<table>
<thead>
<tr>
<th>SUB-THEME</th>
<th>IDEA</th>
<th>POSSIBLE CURRICULUM LINKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living and working in day time</td>
<td>The feel of day time</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Day time routine</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Living and working in night time</td>
<td>The feel of night time</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Monsters and make believe</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Night works!</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Let’s make it dark!</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Things to do in the dark</td>
<td>The dark room</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Animals: nocturnal and diurnal</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Night walks</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Comparing day and night</td>
<td>Day and night journal</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Day and night role play</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Exploring shadows</td>
<td>Shadow games</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Changing shadows</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Shadow art</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Why do we have a day time and night time?</td>
<td>Children’s ideas about day and night</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Modelling day and night</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Shoe box model</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>The night is just the Earth’s shadow</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Celebrating day and night</td>
<td>Is the grass still green at night?</td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
<tr>
<td>Star gazing</td>
<td></td>
<td>A  E  M  H&amp;PE  LOTE  S  S&amp;E  T&amp;E</td>
</tr>
</tbody>
</table>

Possible curriculum links: A (Arts), E (English), M (Mathematics), H&PE (Health & Physical Education), LOTE (Languages other than English), S (Science), S&E (Society and Environment), T&E (Technology and Enterprise)
INTRODUCTION: LIVING AND WORKING IN DAY TIME

The feel of day time
Brainstorm as a class what day time looks like, sounds like, feels like and smells like. Record these responses to ascertain what the children know about day time. Take the children into the playground and ask them again what day time looks like, sounds like, feels like and smells like. Allow them to observe and discuss the things that are happening around them in the school yard, outside the school yard, and in the sky. Perhaps the Moon will be visible during the day. Incorporate children’s responses into a Y-chart.

Day time routine
What is a routine? Engage children in conversations about things that happen in their homes during day time. What is the routine of the children during the day? Is it the same routine on hot days and on cold days, school days and holidays? Develop a timeline of a child’s school day: get up and get dressed, have breakfast, come to school, have recess and lunch, go home, play, have dinner, have a bath and, go to bed. Children learn this is called a routine and a clock helps establish a routine. Talk about how a clock is related to the passing of time, and how different things happen at different times. Reinforce the cyclical rhythm of day time and night time through the use of a simple circular diagram such as that given below.

Encourage children to write a short story that matches their timeline, starting with ‘A day in the life of (child’s name)’. Alternatively, have the children give a recount using hoops to step out the sequence of events.

Make lists of the following: What animals can be seen at day time? What can be seen in the sky on fine days and on cloudy or wet days? Who works in the day time? Have children draw a picture of their house during day time. Write a caption sentence about what is happening in their house during the day. List the things we do in the day time that we don’t usually do during the night time (wear school clothes, play, stay awake).

FOCUS QUESTIONS RELATING TO THE INTRODUCTION

Possible focus questions to direct student thinking

1. How can you tell if it is day time or night time?
2. What things do you see during the day time?
3. What does day time look, sound, feel and smell like?
4. What things happen in your home during the day time?
5. Why do these things happen during the day?
6. What things do you see at night time?
7. What does night time look, sound, feel and smell like?
8. What things happen in your house at night time?
9. Who do you think works at night?
10. Why do some people work at night?
11. What causes day time and night time?
LIVING AND WORKING IN NIGHT TIME

The feel of night time
Repeat the process with night time, asking the children what night time looks like, sounds like, feels like and smells like. How do they know when it is night time? Ask children to recall what can be seen in the night sky. What things happen at night in their house? Record all responses. What is the routine of the children at night? What clothes do they wear at night time?

Develop a class timeline of night activities. Draw a picture to match their day time house, this time showing it at night time. How will they make the picture look dark like night time? Write a sentence about what is happening in their house at night. To create their own night picture, cut a window from white paper and draw what they see using a white or yellow pencil/crayon onto black paper.

Monsters and make believe
Sensitively acknowledge that sometimes people are afraid of the dark. As this is a real fear for some children, teachers should judge the appropriateness of the following activities.

Read the book *Where the wild things are* by Maurice Sendak or a similar story that show activities taking place at night (see Resources). How do the children know the story is taking place at night? What pictures in the book indicate the story is taking place at night?

If children start talking about monsters in the dark, then the following ideas may be helpful. Talk about monsters and other things that children might see or imagine in the dark. Read books like *The owl that was afraid of the dark* or *There’s a monster in the house* (see Resources). Explain that monsters are make-believe. It is our imagination that makes up the monster. Suggest that each child think up their own monster and draw it for others to see. Make this monster in 3D form, using recycled materials. What materials do the children require to make their monster? Why have they chosen those materials? Give their monster a name. Display the finished monsters among books about monsters and make believe. Make up a whole class monster poem. Get the children to describe all the good things that they will do with their monster. Have a monster parade where children dress as monsters or carry their new 3D monster friend.

Night works!
Who works at night time? Make a list with the children. Such night workers could include miners, nurses, police, firemen, ambulance drivers, pilots, radio and television announcers, rubbish collectors, taxi drivers, truck drivers, people who fix roads, newspaper deliverers and street sweepers. Arrange for a ‘night time worker’ to come to school and tell the children about working at night and sleeping during the day. Ask children to develop a range of questions to ask the speaker. How do some people dress at night to be safe and seen? What is the best colour to wear at night to be safe and seen? When do night workers eat their breakfast?

From the list of ‘Who works at night time?’ each child chooses a person and, with assistance, researches what that person does at work. What clothes do they wear at their job? Findings are contributed to a class book about ‘Living and working at night time’. The children could come to school dressed as that person and/or wear a label such as, ‘If I was a night time taxi driver I would have to sleep in the day time’.
Let's make it dark!

How can you make a room dark so you can sleep during the day? List ideas presented by the children so they can be tested later. What can you place over your eyes to make it seem dark? Investigate children’s different ideas (hands, sun glasses, hat, beanie, scarf) to see which is the darkest and the most comfortable to place over their eyes to help them sleep during the day. Could you fall asleep with your hands over your eyes? Play ‘Blind man’s bluff’.

Investigate how different materials such as black plastic, thick material or alfoil block out light by taping the material to a classroom window and observing how much light shines through. Investigate which coloured fabrics can be seen best at night using different materials (coloured, white, reflective) in a classroom cave.

Create Sgraffito artworks of the night sky. Sgraffito (Italian meaning ‘to scratch’) is created by covering the entire surface of paper using oil crayons in a range of sun-rise and sun-set colours from light to dark. Details are not drawn, just bold stripes of various colours, with the exception of black. The picture is then covered entirely using black wax crayons or thick black paint. Then using a pointed stick children create their own nightscape by scratching a scene through the black surface.

Introduce famous works of art depicting the night. For example, *Starry Night* by Vincent Van Gogh (1888).

The dark room

Have a discussion circle to find out how children feel in the dark? Is it scary, frightening or fun? Ask them to substantiate their responses – why is it scary, frightening or fun? Simulate the dark in the classroom by having the children sit in small groups under dark blankets placed over a table or in big boxes (such as those from fridges or washing machines). Alternatively, use a tent or beach shelter with a blanket over the front. This place could be called the ‘dark room’ or any other name the children prefer. Place cushions and puppets of nocturnal animals inside the box or tent to make it more comfortable for the children. What other items would the children like to add to the dark room?

To become accustomed to the dark space, have torches and allow children to move in and out of the ‘dark room’ until they are comfortable in the dark without a torch. Talk about how the torch gets its energy from a battery to create light, whereas during the day time we get light energy from the Sun. Play a game of ‘Guess who’s hiding under the blanket (or in a box)?’ by asking questions to the hidden child that can only be answered using ‘Yes’ or ‘No’.

Once children are comfortable to sit in the dark get them to sit very still. What do they feel? What do they see? What do they hear? Do they start to listen more carefully? Do their eyes become accustomed to the dark? They could write individual thoughts about ‘What I can do in the dark’ or ‘I like the dark because...’
Animals: nocturnal and diurnal
Revisit the list of which animals the children are familiar with seeing in the day time and ask – where do these animals sleep at night time?

Nocturnal animals can be introduced by reading *Animals awake: While you are asleep or Eyes in the dark* (see Resources). Match the animals in the stories with toys or puppets. Discuss nocturnal animals that mostly come out at night: owls, possums, mice, cockroaches, moths and bats. Discuss animals that can be seen at twilight or dusk: mosquitoes, kangaroos, rabbits, and birds. How do nocturnal animals see at night? What do nocturnal animals do at night? What do nocturnal animals do during the day? Where do nocturnal animals sleep during the day?

Day and night journal
Develop a class day and night journal and ask each child to complete their pages at home. Over the weekend, with the help of an adult, children keep a two day journal. Two A3 pages stapled together is perfect for this journal. Using front and back of pages provides four sections for entries: Saturday day time, Saturday night time, Sunday day time, and Sunday night time. On each section, depending on the child’s ability, they record (write, draw, paint or photograph) four things that signify day time or night time at their home. Once children have all presented their findings to class, the journals are collated and made into a class book.

Night walks
Invite children and their families to participate in ‘The Great Australian Marsupial Night Stalk’ (see Resources). Select a local bushland, park, or simply the school grounds to walk through at night. Make sure everyone brings a torch. What can be seen at night that could not be seen during the day? Will they find sleeping animals? The children will probably be making that much noise that they are unlikely to see many animals. However, they will be having a wonderful time playing with the torches in the dark.

*Note: The images mentioned in the text are not included in the natural text.*
Day and night role play
Refer back to the children’s diagrams of a day in their life. Discuss the rhythm of day and night with the children. What sorts of things do people do at different times of the day and night? Illustrate with a clock to demonstrate the link between time and the passing of day and night.

Shadow games
Introduce with a shadow puppet story. Brainstorm and record children’s ideas about what makes a shadow. Ask questions such as: What makes a shadow? When do we see shadows? What happens to a shadow if you tread on it? Can we see shadows at night time? Are shadows visible on cloudy days? These will help gain some insight into the children’s understandings of shadows.

On a sunny day, take the children outside to investigate their own shadow. How can they make their shadow change its shape? Play shadow games: treading on another’s shadow, making shadows long and short. Can they make their shadow completely disappear? Can they jump on their own shadow? Can they catch another child’s shadow? How can three people make just one shadow? Can they make a shadow on the ground and then on a wall? Is a shadow connected to your body? What happens to the shadow when they jump off the ground? What happens to the shadow when they are on a swing? Can they find shadows of buildings, trees, clouds or aeroplanes on the ground?

Children dress up to try and change their shadow, for example wear a hat or fairy wings. Get them to predict the shape of their shadow before they test it. Take photos of the children’s shadows, and produce a class booklet of shadow photos. Can the children identify each other’s shadow in the book?

Ask a group of 3 or 4 children to make up a simple story. They then use their own shadows to dramatise this story. Take photographs of the shadows the children make, or let them take their own photographs. Back in the classroom and using PowerPoint, show the photographs to the class. What story does the class comes up with from the photographs? Compare this to the original story.

Changing shadows
Using chalk and working in pairs, have children draw around each other’s feet and then the shadow on the footpath. Ask them to go and stand in the same place at different times of the day and see if their shadow shape and position are still the same. Record one of these as a class example by taking photos to produce a PowerPoint of how their shadows change with time. At the end of the day have a ‘sharing circle’ so changes may be discussed and explanations offered as to why these changes occurred. This exercise can be repeated with a range of stationary objects such as tree, poles, or buildings. What would happen to their shadow if a cloud moved in front of the Sun?

Can shadows have holes in them? Investigate shadows of a variety of non-solid objects such as strainers, or loosely woven objects. Can there be shadows in the dark? Do the children have a shadow in the dark room?

Investigate what happens as you move an object closer to or further away from a light source? Use different light sources (such as torches, lamps or an overhead projector), a wide range of objects, and a light coloured wall. Investigate if an object can have more than one shadow, by using several torches.
Can you place shadows on top of each other? What shadows can you make with your hands? Place different objects on the overhead projector, or hang a range of objects from the overhead projector, to explore the different shadows produced.

Using the overhead projector and solid 3D shapes observe different shadow shapes as the 3D shape is turned. Different sides may reveal alternative shadow perspectives. Draw and discuss changes in shape of the shadow.

**Shadow art**

Encourage families to visit the annual Sculptures by the sea exhibition or sculptures in other locations to experience the changing shadows and shapes created when art work is viewed from different perspectives. Alternatively look at the way light falls through the leaves of a tree and creates moving shadows on the ground or path.

Produce a shadow puppet show of a favourite story. Children design and produce their own puppets by cutting out shapes, gluing them to pop-sticks and then creating a tale that uses their puppets to illustrate the story line. Allow them to retell the story in as many different ways as they wish.

Introduce children to silhouettes. Place each child side on in front of an overhead projector to create a silhouette of their profile. Capture the silhouette onto paper on the wall by tracing around the shadow. Cut out the result and glue onto black paper. Alternatively, draw the shadow onto black paper using a white pen. Can the children guess which silhouette is theirs? Do they recognise anyone else? What is distinctive about each child’s silhouette?

Develop a class concept map of shadows. Discuss what things are needed to produce shadows – a light source and an object to block the light. Have children draw a picture of how shadows are formed and write or describe their own definition of a shadow.

**WHY DO WE HAVE A DAY TIME AND A NIGHT TIME?**

**Children’s ideas about day and night**

Without dispelling the joy of childhood, ask the children to explain what happens to the Sun at night? Get them to draw pictures and explain their ideas to an adult. The explanation could be scribbled for the children if necessary. Introduce other cultures’ myths and legends of how day and night came about. In particular, consider Aboriginal stories of day and night time. Allow the children to dramatise these legends.

Use Google Earth to show pictures of the Earth from space, and the NASA website for pictures of the Sun (see Resources).

**Modelling day and night**

Provide torches for the children and a variety of different sized balls. In pairs, ask them to explore the shadows on the ball by using the torch. For greater results they could do this inside the dark room. One child shines the torch at the ball, while the other child looks at the ball from different positions. What shadows do they see on the ball? What caused the shadow? Develop a class discussion explaining how you can have shadows on balls. (The ball blocks the light and causes the shadow. See Q&A)

If children are ready, explore their views of how day and night occur, using models. The torch would represent the Sun, a ball represents Earth, and a sticker on the ball represents a person on Earth. In small groups, allow the children time to discuss how they think day and night occur. Then have each group present their explanation of night and day by using their model. Encourage discussion of each model and questions. Are children able to use a model and explain day and night adequately to other children?

Introduce a globe (of Earth) to the children and show how the globe spins around. Place a plasticine model of a person on Australia. Using a torch or the overhead projector as the light source to represent the Sun, demonstrate that when Australia faces this ‘Sun’, it is day time. As the Earth turns, it causes Australia to move away from the Sun and Australia falls into shadow. This is night time in Australia. The length of the day and night depends largely on the seasons. The Earth takes 24 hours to spin around once. A part of each day is called twilight. See if children can identify when it would be twilight. Encourage the children to look at the globe from different positions to observe the shadows. Night is a big shadow. What caused the shadow? The Earth itself!
Is the grass still green at night?
Arrange an evening class to investigate if the grass is still green at night. Ask children to predict the colour of the grass at night. In the dark, observe the colour of the grass. Then give the children a torch and ask the question again. Can they explain why the grass is still green at night?

If an evening class is not possible, then use an opened box to answer the question ‘Is the grass still green at night?’ Cut a hole in the bottom of the box about 10 cm square. Place the box upside down over real or fake grass. Have the children look through the hole, trying to block out as much light as possible. What colour is the grass? Now let a second child shine a torch into the hole as the first child observes. What differences do they notice? What colour is the grass this time? The light from the torch should show the true colour of the grass. Is the grass still green at night? The use of this box in a classroom is presented in Case Study 2.

Star gazing
If possible, have a whole class evening, or sleepover (with parents), to celebrate and share the children’s understanding of day and night. Children lie on mats on the ground and look up at the night sky. Adult supervisors ask what they see. Can they find patterns in the sky as they draw imaginary lines to connect the stars? Can they make stories from their imaginary patterns, like people did in ancient times? Do they see any ‘shooting stars’ (meteors), satellites or the International Space Station? Use binoculars to enhance the experience. Invite an astronomer with a telescope, or take the children to a planetarium to discover more about the night sky. These experiences provide rich conversation to embed the knowledge.

Shoe box model
Depending on capability of children and adult help, a model of day and night could be produced using a shoe box painted black on the inside to represent the night sky, a table tennis ball and a pipe cleaner. Poke two holes in the table tennis ball to allow the pipe cleaner to pass straight through the ball. Hook the ends of the pipe cleaner to the top and bottom of the box. Draw some countries on the ball, making sure that Australia is present. Using a torch as the Sun, demonstrate the phenomena of how Australia has day and night because the Earth is spinning. Cut slits in the sides and on top of the box, to allow children to peep through the slits to see both the light and shadow on the ‘Earth’ at the same time. Alternatively, older children in the school could make this model and demonstrate it to your class.

Allow the children back into the dark room to demonstrate day and night with a torch and ball. Can they explain what is happening to another child or adult?

The night is just the Earth’s shadow
To assess learning, ask the children ‘What causes night?’ Get them to draw pictures again and to explain their ideas in detail. Refer back to the myths and legends around the origins of day and night time. How do these myths and legends differ to the science of day and night time?
WHY DO WE HAVE A DAY TIME AND NIGHT TIME?
As the Earth spins (rotates), on its axis, the Sun shines on one side at any one time. The side facing the Sun is day time. On the shaded side it is night time, as light from the Sun does not reach that side of the Earth. As the Earth continues to turn, the shaded side moves into the Sun’s light (morning). At the same time the sunlit side turns away from the light into shadow (evening). Night time is a shadow caused by the Earth itself. Dawn and dusk are on the outer edges of that shadow.

HOW LONG IS DAY TIME AND NIGHT TIME?
The Earth takes 24 hours to fully rotate or turn once. Depending where you live on Earth, and the season of the year, you will experience different lengths of day time and night time. There are more hours of day time in summer than in winter. The closer you live to the equator, the more similar the amount of day time and night time. In contrast, people living close to the poles (at latitudes greater than 66.5°) will experience 24 hours of day time for part of the summer and 24 hours of night time for part of the winter. The varying length of day and night is a result of the Earth’s axis of rotation being 23.5° at an angle to its plane of orbit around the Sun.

WHAT IS THE SUN?
The Sun is a star. This means that the Sun generates (makes) its own energy by nuclear fusion (converting hydrogen into helium). The Sun is the nearest star to Earth and appears to be the biggest. Light from the Sun heats our world and makes life possible on Earth. The next nearest star is Proxima Centauri, part of the Alpha Centauri System.

WHERE IS THE SUN IN DAY TIME WHEN I CAN’T SEE IT?
The Sun is still there. However, clouds in the sky can prevent you from seeing the Sun directly.

WHAT IS A SHADOW?
Light travels in straight lines. This means that it cannot bend around objects. When light rays cannot travel through an object, you see a dark image or a shadow of that object. Hence, shadows require a light source and an object.

WHY DOES A SHADOW CHANGE SHAPE?
The shape of a shadow depends upon the shape of the object that has blocked the light, the angle of the surface upon which the shadow falls, and the distance between the object and the light source. Hence shadows can and do change shape, especially if the object or light source moves.

CAN YOU HAVE MORE THAN ONE SHADOW?
A light source is needed in order to produce a shadow. One light source will produce one shadow. Two light sources will produce two shadows. Look at footballers playing under lights at night time. How many shadows do you see?

WHY CAN’T I FIND MY SHADOW SOMETIMES?
If there is no light source, there is no shadow or it is so cloudy that sunlight is too diffuse. So if you move from a light area into a dark area, you will not see your shadow. If you move your shadow into a bigger shadow, then you will not be able to see your shadow.

CAN YOU HAVE A SHADOW AT NIGHT TIME?
Shadows require a light source and an object. At night time that light source could be street lights, car lights, or even light from the Moon. So, yes, you can have shadows at night time.

WHY DOES THE MOON APPEAR TO SHINE?
The only reason that we can see the Moon from Earth, or that it appears to ‘shine’, is because light from the Sun strikes the Moon’s surface and is reflected to us on Earth.

WHY CAN THE MOON SOMETIMES BE SEEN DURING THE DAY?
The Moon is easy to see at night as it is so bright compared with the dark night sky. For half the month the Moon can be seen during the day time.

WHY CAN’T I SEE THE SUN AT NIGHT?
Your place on Earth is facing away from the Sun at night. This is why we have day time and night time.

WHY CAN’T I LOOK DIRECTLY AT THE SUN?
You can look directly at the Sun, but you would permanently damage your eyes and go blind. This happens because the Sun is an intense light source, plus our eyes’ lenses focus on this intense light into the back of the eye retina, damaging it. So never, ever look directly at the Sun.

WHY DO STARS TWINKLE?
All light entering our atmosphere appears to twinkle. Turbulence in Earth’s atmosphere causes the light to appear to twinkle. As stars are so far away from Earth, they look like a twinkling dot. The planets are much closer to Earth, and do not appear to twinkle because they have a ‘disc’ shape.

WHY ARE SOME STARS BRIGHTER THAN OTHERS?
The brightness of stars differs enormously depending on their original masses and stage of evolution. Generally, stars closer to Earth ‘appear’ to be brighter.

WHY ARE STARS DIFFERENT COLOURS?
The colour of a star relates to the size, mass and the temperature of the star. Blue coloured stars are hot (20,000ºC surface temperature) and are burning their fuel rapidly. In contrast, red coloured stars are cool (about 2000ºC surface temperature). The more massive the star, the faster it uses its fuel, the brighter it is, and the shorter will be its life.

DOES THE NIGHT SKY ALWAYS STAY THE SAME?
The night sky is constantly changing. Because the Earth is moving around the Sun, we see different stars and patterns (constellations) at different times of the year. We also see different phases of the Moon over a month. Planets too move around the Sun and so they appear to ‘wander’ against the background stars. Occasionally we see comets. ‘Shooting stars’ are really meteors burning up in Earth’s atmosphere. If a meteor lands on Earth it is called a meteorite.

WHAT IS THE SOUTHERN CROSS?
The Southern Cross is a constellation that can only been seen in the Southern Hemisphere. A representation of the Southern Cross appears on the Australian and New Zealand flags.
Acknowledging children’s many ways of knowing and reporting their information, the following suggestions for diagnostic, formative and summative assessment are presented. Please note that these are suggestions and not prescriptive for the module. Using professional judgement, teachers should decide what is appropriate for their children, their class context, and the specific outcomes hoped to be achieved.

**Diagnostic assessment**
What are the children’s initial ideas about day and night? How aware are they of their daily routine? What examples were provided of people who work during the night? What nocturnal animals were listed by the children? What information could children supply in their descriptions of day and night?
What were the children’s initial understandings of shadows?
What initial ideas/models could the children present to explain day time and night time?

**Formative assessment**
Do the children have an understanding that some people work at night and why they work at night? Can the children tell their own day/night sequence of events?
What are the children’s understandings of shadows? Can they accurately predict the shape of shadows from a range of objects? Test their predictions. Can they explain why they were correct or incorrect?
How well can the children explain day and night using themselves as a model of the Earth?
What differences and similarities do the children notice when comparing the Earth and the Sun?

**Summative assessment**
Children develop a story or design a poster based on people who work during the day and night. Identify and name work that is usually done during day or night.
Children create a shadow story. Make shadow puppets to go with the story, incorporating certain characteristics of shadows. For example, shadows can have holes in them and shadows can change shape.
Ask the children to draw a diagram of how day time and night time occur, with a detailed explanation of what they drew. Compare this with the original ideas the children presented.
For extension: children write an acrostic using the letters from N.I.G.H.T. T.I.M.E.
This list of resources is not exhaustive and should be considered a starting point for finding more information. It is a good idea to also check the parent list as there can be some very useful resources readily available among the families in the school. While many of these resources are Western Australian, teachers are encouraged to find the equivalent resources within other states.

**People**

Parents or friends who work at night time
Astronomer, or expert on the night sky from a high school, university, planetarium or observatory
Someone from the zoo who looks after nocturnal animals
A member of an astronomy club

**Websites**

Fear of the Dark
www.betterhealth.vic.gov.au

Perth Observatory

Gravity Discovery Centre (Perth)
www.gdc.asn.au

Perth Zoo – nocturnal house
www.perthzoo.wa.gov.au/animals/nocturnal.house

Perth Zoo – The Great Australian Marsupial Night Stalk

Google Earth
http://www.google.com/educators/p_earth.html

NASA – education
www.nasa.gov

Planetarium for your computer
www.stellarium.org

Scitech – planetarium (Perth)
www.scitech.org.au

Bob Miller’s Light Walk
http://www.exploratorium.edu/light_walk/lw_main.html

**Interactive story books, for use with computers and/or whiteboard**

The Moon and the Rabbit

Interactive stories for kids. Goodnight Bird
www.woodlands-junior.kent.sch.uk/interactive/onlinestory.htm

KS Bite Size. Light and Shadows
www.bbc.co.uk/schools/ks2bitesize/science/physical_processes.shtml
Books

Factual texts
Perth Observatory (every year) produces the *Western Australian Astronomy Almanac: The really useful guide to the wonders of the night sky*.

Narrative texts
(Beware of the alternative conceptions that can be presented in these books)
Nottingham, F. (2000). *Animals awake: While you are asleep*. Victoria: Over the Fence

Raps and rhymes

**Twinkle, twinkle, little star** (traditional rhyme)
Twinkle, twinkle, little star
How I wonder what you are.
Up above the world so high,
Like a diamond in the sky.
Twinkle, twinkle little star.
How I wonder what you are.

**Sally go round the stars** (Clark, 1995, p. 74)
Sally go round the stars
Sally go round the Moon
Sally go round the chimney pots
On a Saturday afternoon.

**Starlight, star bright** (traditional rhyme)
Starlight, star bright, first star I see tonight
Wish I may, wish I might
Have the wish I wish tonight.

Games

**Echo game**
Have you heard the ...(cat)... at night? Miao, miao, miao
Have you heard the ....(owl)... at night? Woohoo, woohoo, woohoo
Continue and add night time animals such as fox, beetle, dingo, Tasmanian Devil, mice, bats until all sections of the class are making night time animal noises!

**Someone is hiding**
Here is a box,
Put on the lid
I wonder whoever inside is hid?
Why it’s……without any doubt
Open the box and let him (her) out.

**Blind man’s bluff**
Child A has eyes covered with a blindfold. Five other children remain in a predetermined and uncluttered space. Child A tries to catch one of the others while they try to avoid being caught. Child A has to guess which child has been caught. The person caught is the next blindfolded child.
CURRICULUM INTEGRATION

Is the grass still green at night?
Astrophysics of the dark.

Science
- Difference between day time and night time
- Rhythms of day time and night time
- How do my senses change in a dark place?
- Researching nocturnal animals
- Exploring shadows; what causes a shadow?
- Relationship between the Earth and the Sun
- Earth takes 24 hours to rotate
- How eyes adjust to seeing in the dark (dilation of the pupils)

English
- Make a night and day book or poster
- Determine fact and fiction in stories written to help understand phenomena (ie sunset/sunrise)
- Reading monster stories
- Write monster poems
- Expressions associated with feelings about the dark
- Lists, captions, pictures, words, or questions for a Day and Night Word Wall
- Developing questions for invited speaker
- Descriptions of shadows
- Stories created for puppet shows
- The days of the week are related to astronomical objects (Saturday – Saturn; Sunday – Sun; Monday – Moon)

Mathematics
- Time: Hours/minutes/seconds
- Time: Calendars/days/weeks/months/years
- Size and shape of Earth and the Moon
- Distance from the Earth to the Moon
- Measurement: perspective of near and far
- Measurement: lengths of shadows
- Measurement: shorter and longer (days/nights)
- Record sunrise and sunset times
- Problem solve: How many times has the Earth moved around the Sun since you were born?
- Personal timeline of day time and night time in your 24 hours
- What is the shape of the Earth and the Sun

Languages Other Than English
- Make associated word charts in English and the school’s LOTE curriculum
- The names of the Earth and Sun in different languages
- Cultural stories of the origins of day and night including Dreamtime stories
- Aboriginal story of ‘The emu in the sky’
- Monster stories associated with other cultures
- Greetings for ‘good morning’ and ‘good evening’ in other languages
**The Arts**
- Sgraffito art
- Act out jobs people do during the day and night
- Role play the Sun and the movement of the Earth
- Create a recording of day and night noises
- Make shadow puppets and create stories to help explain day and night
- Dramatise myths and legends of origins of day and night from other cultures
- Paintings by famous artists, such as Turner’s *Sun Sets* and Van Gogh’s *Starry Night*  

**Health & Physical Education**
- Changing body shapes, positions and postures to alter shadows
- Chasing, hopping and jumping shadows
- Shadows from swings
- Vitamin D for the skin
- Eye care – sunglasses and reading with a good light
- Skin care – protection against sun burn, cancer
- Free movement in and out of a dark place
- Explore emotions/feelings related to day time and night time
- Reinforce the ‘No hat, no play’ school policy
- What does ‘Slip, slop, slap, seek, slide’ mean?
- Eye pupils dilating in the dark

**Society & Environment**
- Different people have different jobs
- What people work at night, and why do they work at night?
- How do people dress if they work in the dark?
- How do people live and work in countries where they have long periods of day time or night time?
- Discuss the ‘Land of the midnight sun’, and why is it called that?
- Adopt an Antarctica scientist, and find out what they do and how they cope working through long periods of day time or night time
- Compare day in Australia and night in New York

**Technology & Enterprise**
- Watches, clocks, calendars, sextants, geographic positioning satellite (GPS)
- Photographs of shadows over time
- Develop a shadow story PowerPoint using photographs
- Google Earth
- Explore the NASA website to find pictures of the Earth from space
- Making a monster from recycled materials
- Developing shadow puppets from a range of materials, including translucent and opaque
- How do telescopes work? Why is a telescope like a time machine?
- Satellite communication
The five Learning Outcomes of the Early Years Learning Framework provide broad and observable outcomes of young children’s learning and development. Examples of these outcomes in relation to *Is the grass still green at night?* Astrophysics of the dark are presented below. As there are many ways that children express their learning, these should be considered a guide only.

### Outcome 1. Children have a strong sense of identity

<table>
<thead>
<tr>
<th>Children feel safe, secure and supported</th>
<th>Children develop knowledgeable and confident self identities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• use of daily routines of family members</td>
<td>• accept and know that it is OK to be afraid</td>
</tr>
<tr>
<td>• explore dark places through use of play and made constructions</td>
<td>• use home language to contribute to class record of their weekend routine</td>
</tr>
<tr>
<td>• play with others in a darkened space</td>
<td>• invite community members to class to share stories and culture</td>
</tr>
</tbody>
</table>

**Children develop their emerging autonomy, interdependence, resilience and sense of agency**

| • make own shadow change shape | **Children learn to interact in relation to others with care, empathy and respect** |
| • play with others to make shadow stories | • role play night work of adults |
| • explore nocturnal house at a zoo | • read stories, discuss and empathise emotions associated with the dark |

| • use of daily routines of family members | **Children learn to interact in relation to others with care, empathy and respect** |
| • explore dark places through use of play and made constructions | • role play night work of adults |
| • play with others in a darkened space | • read stories, discuss and empathise emotions associated with the dark |

### Outcome 2. Children are connected and contribute to their world

**Children develop a sense of belonging to groups and communities and an understanding of the reciprocal rights and responsibilities necessary for active community participation**

| • tell stories of experiences on wet days and sunny days | **Children become aware of fairness** |
| • respectively listen to and acknowledge others’ stories | • make choices about imitating people who work at night |
| • cooperate with others when creating shadow games | • take turns playing in the darkened area |

**Children respond to diversity with respect**

| • explore how different cultures respond to day time and night time activities | **Children learn to interact in relation to others with care, empathy and respect** |
| • listen to and respect others’ ideas about what causes shadows | • role play night work of adults |
| • hear Australian Aboriginal stories about constellations | • read stories, discuss and empathise emotions associated with the dark |

### Outcome 3. Children have a strong sense of well being

**Children become strong in their social and emotional wellbeing**

| • make choices about safety and personal care while engaging in a night walk with family | **Children take increasing responsibility for their own health and physical wellbeing** |
| • enjoy quiet times and playful times during light and dark times of the day | • discuss personal requirements for an excursion to school at night time |
| • confidently celebrate the beauty of the night | • actively engage in safety requirements for playing in the sunshine |

**Children take increasing responsibility for their own health and physical wellbeing**

| • discuss personal requirements for an excursion to school at night time | • acknowledge and accept affirmations about drawings created |
Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity

- encourage others to contribute ideas for Venn diagrams
- ask questions to satisfy curiosity about night time
- explore shadows with torches and small objects

Children develop a range of skills and processes such as problem solving, enquiry, experimentation, hypothesising, researching and investigating

- express opinions and conduct experiments about finding the colour of grass at night
- construct a journal of day time and night time activities
- compare differences of day time and night time

Children transfer and adapt what they have learned from one context to another

- draw a representation of the view from a window at night
- make connections between their shadows and a drawn representation (silhouette)
- problem solve what causes night time dark by using a ball and a torch

Children research their own learning through connecting with people, place, technologies and natural and processed materials

- use their senses to describe how they feel in dark places
- investigate and discuss colour of the grass in a darkened situation
- apply generalisations to famous paintings of the night to own knowledge

Outcome 4. Children are confident and involved learners

Children interact verbally and non-verbally with others for a range of purposes

- demonstrate an increasing understanding that the night is just a shadow
- share paintings and drawings exposing perceived differences between night time and day time
- using movement and dance explore the habits of a nocturnal animal

Children engage with a range of texts and gain meaning from these texts

- co-construct a book that retells experiences with shadow play
- write and read day and night words such as Sun, stars, dark, spooky on a specific Word Wall
- share story books about animals that live in the dark

Children express ideas and make meaning using a range of media

- use toys to represent characters in stories
- create and photograph made monsters from recycled materials

Children research their own learning through connecting with people, place, technologies and natural and processed materials

- use their senses to describe how they feel in dark places
- investigate and discuss colour of the grass in a darkened situation
- apply generalisations to famous paintings of the night to own knowledge

Outcome 5. Children are effective communicators

Children use information and communication technologies to access information, investigate ideas and represent their thinking

- use watches and clocks to note passing of time
- listen to distinguish which music they feel represents day time and which represents night time
- draw the night sky using information and communication technologies

Children begin to understand how symbols and pattern systems work

- create a personal timetable of daily routines
- construct a classroom timetable
- notice how shadows change size and pattern throughout the day

Children express ideas and make meaning using a range of media

- use toys to represent characters in stories
- create and photograph made monsters from recycled materials

Children transfer and adapt what they have learned from one context to another

- draw a representation of the view from a window at night
- make connections between their shadows and a drawn representation (silhouette)
- problem solve what causes night time dark by using a ball and a torch

Children research their own learning through connecting with people, place, technologies and natural and processed materials

- use their senses to describe how they feel in dark places
- investigate and discuss colour of the grass in a darkened situation
- apply generalisations to famous paintings of the night to own knowledge
The Australian Curriculum: Science (Version 1.0, 8/12/2010) consists of three interrelated strands: Science Understanding, Science as a Human Endeavour, and Science Inquiry Skills. Examples of these strands in relation to *Is the grass still green at night?* Astrophysics of the dark are presented below.

### Science Understanding

**Biological sciences**
- What are nocturnal animals?
- How do nocturnal animals see in the dark?
- How do our senses change in the dark?
- How do people adjust their lives if they work during night time and sleep during day time?

**Chemical sciences**
- What materials are used to make a torch (or a clock)?
- What types of materials reflect light?
- What materials can block out heat and light?
- What is needed to make a shadow?

**Earth and space studies**
- Day and night are caused by Earth rotating about its axis
- The Earth rotates once every 24 hours
- The relationship between the Earth and the Sun
- Night time is a shadow

**Physical sciences**
- What are shadows and how do they change?
- What causes torch light?
- What powers lights used at night time (street lights, car lights)
- How does the Sun produce light and heat?

### Science as a Human Endeavour

**Nature and development of science**
- What does an astronomer do? (Do they only work at night?)
- How can an astronomer help people?
- How does a telescope work?
- Develop simple questions about day time and night time to explore as a class

**Use and influence of science**
- Awareness of the everyday dangers of the Sun: how to protect eyes and skin from the Sun
- Investigate routines of children in countries where there is long periods of day time and night time
- The importance of shade cloth over playground equipment
- Exploring different light sources so that people can work safely during night time

### Science Inquiry Skills

**Questioning and predicting**
- Is the grass still green at night?
- What causes night time dark?
- What animals come out at night?
- Predict the shape of a shadow before testing

**Planning and conducting**
- Investigate daily routines
- Research nocturnal animals
- Investigate if an object can have more than one shadow
- Draw around a shadow and observe how it changes over time

**Processing and analysing data and information**
- Compare shape of shadows to predictions
- Record the number of hours of day light and dark
- Do most parents work in day time or night time? Develop a bar graph of results
- Compare nightly observations with predictions

**Evaluating**
- Compare day and night drawings to notice similarities and differences
- Compare features of day time and night time and discuss those common to both
- Compare the class interpretation of the shadow story to the original story
- Discuss with the class if the grass is still green at night

**Communicating**
- Use the term ‘rotation’ or ‘spinning’ of the Earth to explain day and night
- Record observations in a day/night book
- Describe feelings when sitting in the ‘dark room’
- Write myths about day time or night time
Background
Jill (a pseudonym) is teacher of a Pre-primary class of 26 girls in a Perth inner city independent school. Her history as an educator includes teaching in Junior Primary classrooms for 13 years and in her current position is the Early Learning Coordinator. Jill enjoys teaching science and finds it easy to integrate scientific concepts into her teaching and learning program.

How was the book used?
While looking through Planting the Seeds of Science, Jill was taken by the flexibility offered in the choice of activities, and the integrated curriculum learning areas associated with the book. She found this made planning science lessons easy. As she read each module she thought they would all be fun to implement.

After reading through the entire book, Jill chose to develop the science concepts associated with Is the grass still green at night? Astrophysics of the dark. She selected various ideas and activities from the book which were considered appropriate for her class. She started the module with a group discussion to find the girls’ notions about whether or not the grass was green at night. Children’s ideas ranged from the grass being blue, dark green, brown, silver and green at night. The children then made their own comparisons between day time activities and night time activities.

How was the module modified?
Without a consensus about whether or not the grass was in fact still green at night, and without the opportunity to have a sleep over or a late night at the school for the girls to test their ideas, the class discussed ways to remedy this conundrum.

The day time activity that met their needs was to place a box with a hole in it over some grass in the darkest place they could find at school. They looked through the hole in the box to check the colour of the grass. The girls soon realised they also needed a light source to test their ideas, and decided to use a torch to represent the Moon. (This simple yet effective modification made by Jill has now been added to the book.) Some of the conversation recorded at the testing is presented below.

Teacher: What do you see when you look into the box? (with no light)
Child A: It’s sort of greenish black.
Child B: A bit dark green.
Child C: I see black.
Child D: Dark and light green on there and dark blue.

Teacher: What do you see now? (with torch)
Child A: I can see some green where the ‘Moon’ is shining on the grass!
Child B: Some bits around it are dark greenish and bits away are real dark.
Child C: The Moon shines light at night.

Teacher: Where does the Moon get its light from?
Child C: The Sun.

Teacher: Yes, you are right, it is the Sun. The Sun’s light shines on the Moon at night…we call this reflection.
Child A: Then the Moon shines so we can see it…but it can only make the grass shiny not green.

Teacher: But let’s think…is the grass still green at night?
Child A: Yes, but the Moon can’t shine much more light.

An overview of the book
“I found the book very easy to use. It presents ideas that you can plan around and [it] actually acknowledges that even the youngest students have knowledge to build on. And I like the variety. The flexibility is best for my class because I know my students and what their interests are so I can adapt these ideas to suit their science needs.”

Jill went on to explain how this particular resource did not expect a teacher to be rigid about what had to be taught for science in early childhood education. This enabled the teacher to move to where the children’s interests were, and because of its early childhood appropriateness avoided the tendency to ‘push down the curriculum’.

The Q & A section helped Jill with correct scientific facts so that alternative conceptions would be avoided. She thought the assessment ideas made tasks easier, and she enjoyed having a resource with a ‘local’ flavour. Overall, Jill found she could implement a good science program easily using the children’s interests and Planting the Seeds of Science.
WE’RE GOING ON A (FORENSIC) BEAR HUNT!

CHRISTINE HOWITT, ELAINE BLAKE AND SIMON LEWIS
Children love being part of a mystery. *We’re going on a (forensic) bear hunt!* introduces children to the fundamental principles of forensic science, and allows them to solve a class mystery.

The children are initially presented with a set of bear footprints. However, you could use any footprints appropriate for your context. For example, unique Australian animals such as the emu, kangaroo or lizard, or farm animals such as the horse, pig or duck. Through the completion of various basic forensic activities where children collect clues and evidence using their observational, descriptive and classification skills, they can solve this mystery. The song and actions to Michael Rosen’s *We’re going on a bear hunt* are used to elaborate the experiences. Questioning is considered an integral part of this module to encourage children to think about the collected evidence and to assist them in developing higher order thinking skills.

Within the module six sub-themes are presented, each with a different number of ideas and activities. *We’re going on a (forensic) bear hunt!* provides children with the opportunity to solve a class problem while at the same time becoming more familiar with their own body. Children compare their footprint, handprint and hair with those that the bear has left behind, as they learn about their own uniqueness.

Children observe the detail of cuts to patterned paper as they determine what instrument cut the paper. They also investigate which type of food can be used to make obvious fingerprints. Finally, they bring all the evidence together to determine who left the footprints in the classroom.

If using forensic science websites, please be aware they may contain inappropriate graphic images for young children.

An outline of *We’re going on a (forensic) bear hunt!* is provided in the following table, demonstrating opportunities to integrate the module within the curriculum. Many of the activities presented in this module also have links with Biological sciences and Chemical sciences within the Science learning area of The Australian Curriculum.

Ideas and activities presented in *We’re going on a (forensic) bear hunt!* are suggestions to engage children in science learning. Allow them to guide the direction their learning takes. Flexibility is the key to working with young children and for using this resource.
### Module Outline

#### We’re Going on a (Forensic) Bear Hunt!

<table>
<thead>
<tr>
<th><strong>SUB-THEME</strong></th>
<th><strong>IDEA</strong></th>
<th><strong>POSSIBLE CURRICULUM LINKS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>A</strong></td>
</tr>
<tr>
<td>The footprints</td>
<td>Whose footprints?</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>How does my footprint compare?</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Differences in footprints</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Folio of evidence</td>
<td></td>
</tr>
<tr>
<td>Ripping into it</td>
<td>The fabric evidence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Like a jigsaw</td>
<td>●</td>
</tr>
<tr>
<td>Let the fur fly!</td>
<td>The fur evidence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hair it is!</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is special about my face?</td>
<td>●</td>
</tr>
<tr>
<td>Hand in the honey</td>
<td>Sticky fingers</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Hand over hand</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Painted handshake</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Exploring fingerprints</td>
<td>●</td>
</tr>
<tr>
<td>Collating the clues</td>
<td>Discussing the evidence</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>The bear hunt</td>
<td>●</td>
</tr>
<tr>
<td>The bears’ picnic</td>
<td>Reporting the mystery</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Teddy Bears’ Picnic</td>
<td>●</td>
</tr>
</tbody>
</table>

Possible curriculum links: A (Arts), E (English), M (Mathematics), H&PE (Health & Physical Education), LOTE (Languages other than English), S (Science), S&E (Society and Environment), T&IE (Technology and Enterprise)
**INTRODUCTION: THE FOOTPRINTS**

**Whose footprints?**

A series of life-sized bear footprints are to be laid out before the children enter the classroom. Using laminated footprints allows for reuse in other activities. Allow the children to discover the footprints then determine their prior knowledge by asking what they think they are. Do they recognise a footprint? Who do they think owns the footprints? How do the children think footprints got into the classroom? How can we find out whose footprints they are? Record the children’s ideas so they can be revisited as the forensic activities continue. Alternatively, you could use three different sized footprints in all the following activities and then relate your context to the tale of The Three Bears.

**How does my footprint compare?**

Look at the size of the found footprints. Draw an outline of each child’s foot, cut it out and make comparisons between these and a found footprint. Which is shorter, longer, wider, or thinner? What other differences can be found between the children’s own print and the found footprints – shape, number of toes, size? Is the found footprint a left or a right foot? Perhaps the owner has four feet? Would the found footprints belong to an adult or a child? How can this exercise help us to find out whose footprint was found in the classroom? Continue to ask this question as more evidence is found. Maintain a record of the children’s answers.

Establish the idea of a mystery which the class has to solve. Ask the children about possible ways to keep a record of any evidence they find. Such suggestions may include photography, drawings, and note taking of the evidence, which will indicate children’s prior knowledge of this topic. Question the children as to why they think these actions may be an appropriate method to use. Photograph the evidence (footprints). If possible, cordon off the area with tape as done for real crime scenes.

Investigate various animal tracks on the internet to determine which type of animal may have left the footprints. How many different types of bear tracks can be found? How many different types of bears are there? If interest is high this could become an extension investigation for a group of children.

Use small plastic counting bears, or some other form of non-standard measurement, to measure the length or area of their footprint. Sequence children’s foot outlines from longest to shortest.

Each child makes their footprint using paint. Compare these footprints for similarities and differences to the found footprint. Compare with a teacher’s footprint in paint. Can children collect the gardener’s or the principal’s footprint in paint for further comparisons? Ask children to bring to school a foot outline from each member of their family. Classify these footprints by right or left foot, size or shape.
Take photographs of each child’s feet. Print them out and get children to write a sentence or two about something special their feet can do. Using fine tipped pens children make observational drawings of their own feet based on the photographs and their direct observation. Alternatively, they make a detailed drawing of another child’s foot. Display photographs and drawings that allow comparisons between class members.

Develop a body collage as the activities progress. Trace an outline of each child’s body onto paper, cut around the outline and hang for easy viewing. Glue each foot in the correct place.

**Differences in footprints**

Look at footprints in dry and wet sand. How are these similar and different to the footprints in paint?

Look at a range of more common animal footprints from a book (see Resources) or from a website. Create a wall chart of the tracks of familiar Australian animals, such as emu, goanna, kangaroo, dingo and crocodile. Write the local Aboriginal word for these animals next to the appropriate tracks. Use this wall to create various stories. For example, kangaroo and dingo footprints going across the page could indicate a dingo was chasing a kangaroo.

Develop a series of picture cards with separate photographs of animals and their tracks. Treat this as a game, to see who can match the tracks to the animal.

What footprints can be found in the school ground? Repeat the process with shoe prints in sand. Make plaster casts of feet or shoe prints. Make salt dough footprints. Can you see fine lines in the casts that have come from your feet?

In pairs, children select one native animal and investigate the type of footprint that animal makes. What other types of evidence do animals leave behind, such as scats/poo? (See Resources) What is the oldest animal footprint ever found? This could lead on to discussions about fossilised dinosaur footprints found in Broome, Western Australia (see Resources).

**Folio of evidence**

Construct an ongoing class book of evidence and activities, based upon the photographs that have been taken and the children conducting their activities. This could be a ‘Whose footprint is this?’ type of book, and placed in the home reading section or used as a take home reader. Alternatively, develop a wall of evidence (or clues), or an evidence table, for you and the children to use as a reference.

To assist in collecting and observing clues, have tweezers or tongs, disposable gloves, snap-lock bags and magnifying glasses on the table available for the children to use freely.

**FOCUS QUESTIONS RELATING TO THE INTRODUCTION**

**Possible focus questions to direct student thinking**

1. What do you think this is? (referring to the footprint)
2. Where do you think this has come from?
3. What could have made this footprint?
4. How do you think this got into the classroom?
5. How can we find out what made the footprint?
6. How is this similar to our footprint?
7. How is this different to our footprint?
8. Why would an animal (a bear) come into our classroom?
The fabric evidence
Collect three or four second-hand colourful shirts. Cut a piece of fabric out of one shirt using scissors with a distinctive cutting pattern (for example, a zigzag pattern). Place the piece of especially cut fabric from the shirt in a prominent place inside or outside, for example on playground equipment, for the children to find. Place the shirts outside for the children to discover at a later time.

Allow the children to discover the piece of fabric and discuss its relevance. Photograph the evidence. Ask the children what they think it is, where they think it came from, how it got there, and how we can answer these questions. Record the children’s ideas. Add the piece of fabric and the photographs to the evidence display.

Like a jigsaw
As whole class activity, look closely at the edges of the piece of fabric with magnifying glasses. Is it a clean cut, a tear, a zigzag cut or some other pattern? Using the children’s suggestions, and a range of scissors with different cutting patterns, let them investigate the type of scissors used to cut the fabric. Children then write and explain their choice of what type of scissors caused the cuts.

To develop observational skills, encourage children to create their own small jigsaw puzzles using pieces of coloured or patterned paper and scissors with different cutting patterns. This could involve simply cutting the paper in half or into three pieces with a particular pair of scissors. Challenge other children to complete the made jigsaws. Remind children to look closely at the cut edge of the paper, and the colour and pattern on the pieces of paper, to help solve the jigsaws. Can the children work out what scissor pattern was used to make the cut edge of the paper?

Let children find the shirts placed outside. Compare the cut piece of fabric with each shirt. Look for similar patterns to match the piece of fabric with the shirt – just like doing a jigsaw. Have other pieces of cut fabric for children to investigate cutting edges and to fit together.

The fur evidence
Use a sample of faux fur material. As the teacher, make sure that you wear light coloured clothing on the day. Place some pieces of fur on your clothes, and also in a couple of other places around the classroom for the children to find. Walk around the class until a child notices the fur on your clothes. Wonder aloud where the fur could have come from and ask children to see if they can find any more in the classroom.

To act like forensic scientists, children can wear plastic gloves, use tongs or large tweezers to collect the fur, and place it in evidence bags (plastic snap-lock bags). Don’t forget to label and photograph the evidence as it is gathered. Develop questions and record these ideas, as with the footprints. Whose fur is this? How did it get into the classroom?

Hair it is!
Hair and fur are the same things. All animals have hair on their body, including humans. Different animals have different types of hair on their body. Use digital microscopic photographs (see Resources) to observe different types of hair (cat, dog, or human).

Look at children’s hair colour and length. Develop class graphs of hair length (short or long) and then hair colour. Using a magnifying glass, observe how the children’s hair is similar and different to the found hair. How can this exercise help us to find out whose fur was found in the classroom?

Why do we have hair on our head? How do we look after this hair? Where else do we have hair on our body (for example, in noses and ears of elderly people, beards, moustache, pubic, under arm)?
What is special about my face?
Each child looks in a mirror and draws their own face, including their hair, eye brows and eye lashes. Photograph all faces. What is special about their face? Add the face drawing or photograph to the body collage. Alternatively, display both the photograph and drawing to allow a comparison between the two, and between class members.

Sticky fingers
Walk into the classroom and discover some honey ‘pawprints’ (perhaps on a piece of paper or plastic for ease of cleaning). Where did the honey come from? Whose pawprints are these? How did they get into the classroom? Record these ideas with the footprints. Take a photograph of the evidence. Then allow the children to take samples using cotton buds for evidence. What does the substance look like, smell like and feel like?

Using recycled objects, such as buttons, lace, soft wire or wool, children make a collage representation of their face.

Using the children’s photographs, play a game of match the head and the feet of children. Do the same with animal pictures and footprints.

Hand over hand
Create hand art. Children draw around their hand and turn it into an animal. Colour and add movable eyes and pom poms, or other suitable materials. Look at the different shapes that the hand can form – open hand with fingers spread, open hand with fingers together, open hand with thumb and little finger spread, or a closed fist. Name the different fingers.
Create Aboriginal hand art. Discuss Aboriginal art, the symbols used and the stories these pictures tell. Trace around a child’s hand and cut it out. Use dot art and other Aboriginal shapes to create a handprint and story. Alternatively, using an atomiser spray paint over the hand to mark the outline and then use this to create an Aboriginal handprint.

Take photographs of everyone’s hands. Print them out. Using the photographs and looking at their own hand, have the children draw their own hand in detail. Have children write a sentence or two that states something special about their hands. Add left and right hand images to the body collage. Match photographs of faces and hands.

Painted handshake

Perform a painted handshake to demonstrate Locard’s Exchange Principle that every contact leaves a trace. (See Q6A) One child paints a hand using a water soluble coloured paint. This child then shakes hands with a classmate. This classmate then shakes hands with another classmate, who shakes hands with another and so on.

Observe how the paint is transferred from one hand to the other in this process. How many classmates are required to shake hands until there is no more paint to pass on? Photograph the hands after they have been shaken to observe how the coloured paint decreases with each successive handshake. Alternatively, video the handshaking process to illustrate how the paint is transferred from one child’s hand to the other, or record the child’s painted handprints on paper to show the decreasing amount of paint.

Use the paint from the painted handshake to demonstrate how bacteria/germs can be transferred. This emphasises the importance of washing hands. Show pictures of what germs look like under a microscope (see Resources).

Exploring fingerprints

Explore fingerprints using 2B pencils. Make a smudge on paper using a 2B pencil. Roll (not push) the index finger onto the smudge. Place a small amount of adhesive tape over the finger tip with the pencil smudge. This will transfer the fingerprint onto the adhesive tape. Remove the sticky tape from the finger and place onto white paper. This produces a record of a fingerprint, and is much cleaner than using ink pads.
Look closely at the detail in fingerprints, perhaps through enlarging them with a photocopier. What patterns can you see in the fingerprints? If the children can identify these, make simple pictographs of whorls, loops and arches. (See Q&A) Add the fingerprints to the body collage. Emphasise that we all have our own unique fingerprints.

Fingerprints can easily be left on a glass surface, such as windows or a drinking glass, by first applying a hand cream. Fingerprints can also be left in softened plasticine, play dough or potter’s clay. Provide a selection of these substances for children to freely experiment with to see which one provides the clearest example of their fingerprint.

What else could be used to make fingerprints? Use the children’s ideas to extend this investigation. For example, can you leave fingerprints on jelly? Perhaps butter, Vegemite or peanut paste can be used? Try touching jelly, butter or Vegemite and then picking up a glass. Are there fingerprints on the glass? Alternatively, perform an investigation into foods that can be used to make fingerprints. Use the children’s suggestions of the types of food to investigate. Spread the different food onto a section of clear plastic sheet. Using a different finger for each food, place the finger in the food and then onto the clear sheet, away from the food. Was a fingerprint made? Which foods helped produce the clearest fingerprints?

Create fingerprint art. Turn fingerprints into animals or plants, simply by adding a few lines or squiggles.

Investigate if our toes have unique prints. Use the children’s ideas to establish a procedure to perform this investigation. Similarly, let the children decide what equipment will be required.

Discussing the evidence

Go through all the evidence that has been collected. Refer to and classify each item that has been collected, including any photographs that have been taken. Can the children come up with answers to the following questions? How did these clues come to be in our classroom? Who left these clues? Why are they in the classroom? What conclusion can be made based on the evidence collected?

Get the children to draw a picture of what animal they think left the clues. They must provide an explanation of why they think their animal fits all the evidence. The teacher could model writing up a report based on evidence, just like a scientist would.

Using all the available evidence, have the children write a description of their animal and create a wanted poster for the animal.

How well can the children verbally describe a bear (or any animal) to a partner? As one child describes the bear, the other draws it literally. This encourages listening skills, and both logical thinking and scientific language, as they attempt to describe their bear in detail.
The bear hunt

By now you may want to start singing We’re going on a bear hunt (see Resources). Consider changing the words around, using the evidence collected and the local surroundings. Dramatise the actions to the song.

Have children make a class bear cave using large boxes or dark lengths of material. Perhaps the cave could be a quiet reading area. Encourage the children to decorate the cave with pictures they have drawn, or letters to the bear. Alternatively, investigate, design, produce and evaluate a cave for a teddy bear that would protect it from the wind and the rain. Use the class bear cave, along with other appropriate materials, to act out the bear hunt song.

Take the class outside to look for a bear, while singing their song. Take photographs on the bear trail. Stamp feet to make footprints in the sand pit. Look for evidence of other footprints along the way, such as birds, lizards, or a bear!

Perhaps the bear cave can be placed outside, with someone dressed up as the bear inside the cave. Make sure the bear is wearing the cut shirt, or a tie of the fabric that was earlier investigated. Alternatively, leave a note to the children from the bear saying he couldn’t stay at school but has left a toy bear for the class as a thank you present for letting him use the classroom (see Case Study 3).

Use photographs and children’s drawings to create a story map. Sequence the photos or pictures. Encourage the children to retell the story of the bear hunt.

CONCLUSION: THE BEARS’ PICNIC

Reporting the mystery

Have children retell, in writing or by drawing a sequence of pictures, how the class collected various pieces of evidence to solve the mystery of the footprints. How well can they retell the story in the correct sequence? How well can they put the photographic evidence (or real evidence) in the correct order that it was found?

To embed their learning, encourage the children to make up their own mystery. What clues would they leave behind as evidence?

Teddy Bears’ Picnic

Discuss preparations for a Teddy Bears’ Picnic with the children. Decisions to be made include a place, the time, who could attend, what games would be played, and any other details required to make the picnic a success. To develop sequential thinking, ask children for directions to make honey sandwiches. Construct a recipe by making a list of ingredients and utensils. Model procedural writing as children remind each other of the steps to follow to make a honey sandwich. Make and serve at the picnic. Alternatively, the honey sandwich procedure could be presented in any other language(s) used at the school.

Assist the children to make two invitations to come to the picnic. One invitation is to invite their toy bear, while the second is to invite a grandparent or special friend.

Once the children have brought their toy bears to school, trace the toy bear’s footprint and compare this with the original footprint found in the classroom and the children’s footprint. Count the number of toy bears and arrange them in order from shortest to tallest, or some other way. Draw an outline of the bear. How many plastic bears (or some other form of non-standard measurement) fit into the outline?

Using the bear’s cave (see ‘The bear hunt’ activity) as a feature, set up the class Teddy Bears’ Picnic. Children could paint their noses black, add bear ears, or get dressed up as a bear, before eating the honey sandwiches.

Make up a new song now that the mystery has been solved. One idea is to change a known song to words that suit this situation. For example, ‘Head, Shoulders, Knees and Toes…..We all clap hands together’ could become ‘Hair, Fingers, Feet and Clothes …..We all track bears together’. (See Resources)
WHAT IS FORENSIC SCIENCE?
Forensic science describes the application of scientific methods and knowledge to legal problems. Forensic scientists have three major duties: performing scientific analysis of physical evidence, writing reports of analysis, and offering expert testimony in criminal and civil proceedings.

WHAT ARE SOME AREAS OF CRIMINAL FORENSIC SCIENCE?
- Criminalistics (these people are involved in the collection and analysis of all kinds of trace evidence such as drugs, blood, DNA, fire and explosive residues, hair and fibres, glass, soil particles, paints and plastics, fingerprints, and bullets)
- Pathology (forensic pathologists determine the cause, such as heart attack or bleeding to death, and manner of death, such as homicide, natural, accidental, or suicide)
- Anthropology (forensic anthropologists work with skeletal remains to determine if bones are human or animal; they can determine gender, age, racial characteristics, cause of injury, and even build a face from a skull if the remains are human)
- Entomology (forensic entomologists use insects to determine how long a body has been deceased, and to determine the presence of poisons or drugs in the deceased body)
- Engineering (forensic engineers work with mechanical or structural failures, such as cars in automobile crashes, and accident reconstruction)
- Odontology (forensic dentists work with the shape and structure of the teeth and jaw, bite marks, and identifying remains of victims through dental records)

WHAT ARE THE BASIC PRINCIPLES IN FORENSIC SCIENCE?
Every contact leaves a trace. This is called Locard’s Exchange Principle. Every time objects come into contact with each other there is an exchange of information. For example, this information could be fingerprints, hair, soil or blood. This evidence is also called the ‘silent witness’, hence the name of the popular television show.
All things are unique in space and time. No two (or more) objects are absolutely identical. Not even twins.

WHAT IS PHYSICAL EVIDENCE?
Evidence is information, whether personal testimony, documents or material objects, given in a legal investigation to make an issue more or less likely. In everyday terms, evidence is anything that tends to prove or disprove something. One of the aims of forensic science is to establish the uniqueness of a particular piece of physical evidence through a process of identification and comparison. The goal of processing a crime scene is to collect and preserve physical evidence for later analysis and reporting.

IS ALL HAIR/FUR THE SAME?
Each animal species has differences in their hair/fur that can be detected under a microscope.

HOW CAN YOU BE SURE THAT ALL FINGERPRINTS ARE DIFFERENT?
It is generally agreed, on the basis of studies over the last 100 years, that the ridge patterns on fingers are unique. Not even identical twins have the same patterns. On this basis, impressions of these patterns (fingerprints) are in principal unique. However, this may be difficult to detect with a smudged print.

CAN YOU REMOVE FINGERPRINTS?
It is possible to sand off your fingerprint, but it would leave scars on your fingers that would be permanent and could be more individual than your fingerprints.

WHAT ARE THE MAJOR PATTERNS ON FINGERPRINTS?
There are three major patterns on fingerprints: loops, whorls and arches. Loops make up 65% of all fingerprints, whorls make up 30%, and arches make up 5%. Some fingerprints may have a combination of two of these patterns. These three major patterns are the primary method used to classify fingerprints. However, they are not the sole method of identification. Identification also depends upon the examination of many tiny features within the fingerprint called minutiae.

DO FINGERPRINTS CHANGE AS YOU GET OLDER AND FINGERS GET BIGGER?
While fingerprints do change in size and shape as you get older, the pattern on your fingerprint will still be the same. Even if you cut your finger and it leaves a scar, the original pattern on the skin will reappear over a period of time.

WHY DO POLICE PUT BLACK POWDER ON FINGERPRINTS?
Police use a variety of different powders to test for fingerprints, depending on the surface where the fingerprint was found. Smooth surfaces can be dusted with fingerprint powder, which comes in a variety of colours. The powders are applied with brushes that have very soft bristles. A powder will be used such that its colour contrasts with the colour of the surface being dusted. For surfaces that have a fine texture, such as some plastics and animal hides, magnetic powders are used with magnetic brushes. The brush is moved across the surface of the object without touching it. This allows the powder to cling to the surface of the fingerprint residue without getting into the cracks of the surface. The basic scientific principle involved in this process lies in the fact that fingerprint contains oil and moisture, and powder sticks to this residue.

WHAT IS DNA? HOW IS DNA USED TO SOLVE CRIMES?
DNA (or deoxyribonucleic acid) is a complex chemical found in the nucleus of the cells that makes up your body. It is essentially a blueprint for your individuality. DNA from cells can be analysed by molecular biologists to determine that blueprint. Every person has a unique DNA.

HOW CAN ANIMAL TRACKS AND POO BE USED TO IDENTIFY DIFFERENT ANIMALS?
Most of Australia’s mammals are very difficult to find in the bush, as they are nocturnal and tend to stay away from people. However, it is possible to find out a considerable amount of information about them simply by observing and understanding the signs they leave behind. As different animals have different shaped bodies, they will also have different shaped footprints. Two legged and four legged animals leave different tracks. Also, an animal that uses its tail to move will leave a very distinctive track. Similarly, different animals eat very different types of food. This means they will have different types of poo (or scats, which is the scientific word for poo). Scats are one of the most characteristic signs left by an animal, and the one most likely to be found in the bush.
Acknowledging children’s many ways of knowing and reporting their information, the following suggestions for diagnostic, formative and summative assessment are presented. Please note these are suggestions and not prescriptive for the module. Using professional judgement, teachers should decide what is appropriate for their children, their class context, and the specific outcomes hoped to be achieved.

**Diagnostic assessment**

Could children recognise a footprint?

What were the children’s initial ideas about the footprint, and how realistic or imaginative were these ideas?

What ideas were suggested to work out who the footprint belongs to?

What are the children’s prior experiences with the words ‘print’ and ‘evidence’?

What clues are used in everyday life to find things? (For example, using a mobile phone to ring the one that you have misplaced, or how do children remember where they left a toy?)

**Formative assessment**

How well can the children draw their foot, hand or hair?

How well can children describe how to care for those parts of the body being investigated?

How well can the children place their photographed foot, hand, fingerprint, face/hair in the correct place on the body collage?

How well can the children retell the sequence and describe the clues collected?

**Summative assessment**

Explanations can be provided about why their conclusions fitted all the evidence, or why they changed their mind, based upon evidence collected.

Could each child bring together information about the evidence found by writing, discussing or drawing the outcomes of their investigations?

How well can the children demonstrate an understanding of forensic science? This can be achieved by having the children complete the following sentence: ‘If I was a forensic scientist I would ….’

The completed body collage with photographs, along with a written/verbal/drawn explanation of what each part is used for and how it is looked after.

For extension: children collect and classify the index fingerprint of 10 adults.
RESOURCES

This list of resources is not exhaustive and should be considered a starting point for finding more information. It is a good idea to also check the parent list as there can be some very useful resources readily available among the families in the school. While many of these resources are Western Australian, teachers are encouraged to find the equivalent resources within their own state.

People

Parents in professional positions related to your investigations, such as police, journalist, lawyer, principal, or scientist

Member of the police force that can talk about forensic science or criminal investigations

A scientist to talk about scientific investigations, forensic science or Australian mammals

Local chemist or doctor to discuss the spread of germs

Someone from the zoo who looks after bears

Websites

Animal tracks, scats and bones (Australian)
http://www.wildlifewa.com/tracks/tracks.html

Animal tracks - general

Bear track images
Grizzly bear and black bear:
http://safety.eas.ualberta.ca/images/bears/image011.jpg

Grizzly bear:
http://fwp.mt.gov/content/getItem.spx?id=14846&maxwidth=475

Grizzly bear:
http://www.nps.gov/dena/images/bear_tracks_in_mud_web.jpg

Caution: Forensic science websites may contain graphic images

Forensic Science (The Chemical Detective)
http://agrippina.bcs.deakin.edu.au/bcs_courses/forensic/chemical%20Detective/forensic_science.htm

Forensic websites: student resources

Forensic Investigations in upper primary school

Federal Bureau of Investigation – Kid’s page
http://www.fbi.kids (for children K-4)
www.fbi.kids/6th12thinvestigates/investigates.htm (for older students >Yr 5)

Fingerprinting Merit Badge. Boy scouts of America
http://onin.com/fp/fpmeritbdg.html

Landsdale Farm School (Perth)

Perth Zoo
www.perthzoo.wa.gov.au

The bear hunt – video
Numerous videos available on Youtube, including Michael Rosen retelling the story.

Images of bacteria or hair
Numerous images available on the web via various search engines. Choose those images that are suitable for your children.

Interactive story books, for use with computers and/or interactive whiteboard

Little Animal Activity Centre

The Butterfly Trail, by Rachel Dawson
http://www.bbc.co.uk/schools/laac/story/sbi.shtml
**Books**

**Factual texts**


**Narrative texts**


**Raps and rhymes**

1, 2, 3, 4, 5 once I caught a fish alive...(ABC, 1985, p. 76)

1, 2, 3, 4, 5 once I caught a fish alive
6, 7, 8, 9, 10 then I put it back again
Why did I let it go?
Because it bit my finger so!
Which finger did it bite?
The little pinky on my right!

**Head, shoulders knees and toes**...(Clark, 1995, p.10)

Head and shoulders, knees and toes, knees and toes, knees and toes
Head and shoulders, knees and toes, we all clap hands together.
Alternatively, change the words to
Hair, fingers, feet and clothes, feet and clothes, feet and clothes
Hair, fingers, feet and clothes, we all track bears together.

**I know a hairy bear** (Clark, 1995, p.66)

I know a hairy bear,
A very, hairy bear,
A very, hairy, scary bear,
I know a hairy bear,
And s/he can growl like this.

**We’re going on a bear hunt**

(Based on the story by Michael Rosen)

(Teacher leads and children repeat each line)

We’re going on a bear hunt,
We’re going to catch a big one,
I’m not scared,
What a beautiful day.

Uh-oh!
Grass (or mud, cave)
Long, wavy grass (thick oozy mud, a dark gloomy cave)
We can’t go over it,
We can’t go under it,
We can’t go round it,
We’ll have to go through it
Swish, swish, swish (or squelch, squelch, squelch; tip toe, tip toe, tip toe)
CURRICULUM INTEGRATION

We’re going on a (forensic) bear hunt!

Science
- Develop a photo book of hands, feet, eyes, ears, hair and fingernails showing differences and uniqueness of people
- Do a web search for types and habitats of bears
- Observe tracks and traces made by animals and people
- Classify foot/hand/hair data
- Explore the playground for ‘evidence’
- Investigate differences and similarities in fingerprints
- Classify evidence collected

Mathematics
- Find length of foot or area of foot with non-standard measurements
- Use wool to find perimeter of feet
- Sum the total of toes/fingers in the room
- Calculate the number of girl/boy/adult toes or fingers in the classroom
- Base five mathematics
- Space (using bear cave)
- Graph feet according to size
- Count how many ‘bears’ reside in the children’s homes

English
- Descriptive language associated with body parts
- Make invitations for the Teddy Bears’ Picnic
- Develop sentence structure with ‘What is important about feet/hair/hands?’
- Make up your own story about a bear hunt
- List reasons why a bear would come into the classroom
- Construct associated word chart on the shape of a bear
- List honey sandwich ingredients and do procedural writing to construct a recipe
- Construct a wanted poster with a description of the missing bear
- Story map of the bear hunt
- Develop sequential writing to make a class book about the mystery

Society & Environment
- Discuss reasons for having forensic specialists in our community
- Invite a forensic specialist to speak to the class
- Discuss bears and where they can be found
- Investigate ‘natural bear environments’ on the web
- Discuss how to keep the community healthy and prevent the spread of disease
- Visit the zoo and learn about bears
- Plan and implement a Teddy Bears’ Picnic
- ‘Adopt’ a bear through www.savethebears.co.uk
- Invite grandparents to the Teddy Bears’ Picnic
The Arts

- Drawing the feet/hands/face in detail
- Painted feet/handprints
- Make a wanted poster
- Act out the story ‘We’re going on a bear hunt’
- Perform a rap using foot taps, hand claps and rubs to the song ‘We’re going on a bear hunt’
- Make a border using different footprints
- Make footprint collage
- Decorate a ‘bear cave’
- Collage of children’s body with photos or drawings of feet, hands, fingers and face

Health & Physical Education

- What traces do you leave behind whenever you touch or visit something?
- Why are our feet important? How should we look after our feet?
- Why are our hands important? How should we look after our hands?
- Why is our hair important? How do we take care of our hair?
- Catch bean bags as a bear would catch fish
- Hygiene of hands, hair, nails, feet
- Hygiene and appropriate food for a picnic
- Health and safety in passing on germs (painted hand shake)
- Safety using scissors
- Physical actions when acting out a bear hunt

Technology & Enterprise

- Design a class or individual cave
- Make a model of a bear cave before constructing a bigger one
- How can we use a cave in the classroom?
- Design a bear cage or zoo pen
- Design the uniform for a Park Ranger so s/he would be safe from bears
- Photograph the parts of the body being investigated and use to make a class book that demonstrates uniqueness
- Photograph children’s activities for home newsletter or personal accounts of helping to solve a mystery

Languages Other Than English

- Make associated word charts in English and the school’s LOTE curriculum
- For one whole day – don’t say ‘bear’ in English and see how many times you can be caught out
- Ask each other questions about bears and caves – each time substituting the words for those of another language
- Sing ‘We’re going on a bear hunt’ in another language
The five Learning Outcomes of the Early Years Learning Framework provide broad and observable outcomes of young children’s learning and development. Examples of these outcomes in relation to We’re going on a (forensic) bear hunt! are presented below. As there are many ways that children express their learning, these should be considered a guide only.

**Outcome 1. Children have a strong sense of identity**

**Children feel safe, secure and supported**
- openly express ideas about how footprints were left in the classroom
- listen to and respond to ideas from others
- confidently explore the school area with others looking for clues

**Children develop their emerging autonomy, interdependence, resilience and sense of agency**
- celebrate own success in finding and collecting clues
- open and accepting to new discoveries
- share found objects with others to construct ideas about the mystery

**Children develop knowledgeable and confident self identities**
- collect family footprints for display
- openly discuss differences in fingerprints
- invite others to join activities measuring and comparing own footprints

**Children learn to interact in relation to others with care, empathy and respect**
- respond to others’ suggestions and contributions of clues with respect
- acknowledge others’ uniqueness related to hair colour and handprints
- explore aspects of identity through life size paper cut outs of self

**Outcome 2. Children are connected and contribute to their world**

**Children develop a sense of belonging to groups and communities and an understanding of the reciprocal rights and responsibilities necessary for active community participation**
- cooperate with others when sorting clues to solve the mystery
- express an opinion about found foot and handprints
- build on own experiences to recognise that every contact leaves a trace

**Children respond to diversity with respect**
- show respect for others when commenting on personal attributes
- become aware of similarities and differences of people from their personal collage

**Children develop knowledge of fairness**
- react in positive ways to similarities and differences

**Children become aware of fairness**
- discuss choices about which food to include and exclude in fingerprint experiments
- be aware that everyone should have an opportunity to contribute ideas
- use bear story to discuss fairness about hunting bears

**Children become socially responsible and show respect for the environment**
- use dramatic play and pretend to be a bear saver
- recognise bears do not live in our local environment
- consider the life of a bear in the zoo

**Outcome 3. Children have a strong sense of well being**

**Children become strong in their social and emotional wellbeing**
- make choices about safety and personal care while collecting clues
- enjoy the cuddly softness of toy bears for peaceful moments
- using home language or standard Australian English compare the characteristics of a real bear and a person

**Children take increasing responsibility for their own health and physical wellbeing**
- conduct a checklist of personal requirements when collecting clues
- engage in complex gross motor routines while pretending to find a bear
- place their clues into a snap-lock bag
Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity
- express curiosity about the clues found
- ask questions of each other about what constitutes a mystery and what is evidence/clues
- demonstrate persistence and imagination to solve a mystery

Children develop a range of skills and processes such as problem solving, enquiry, experimentation, hypothesising, researching and investigating
- use small toys to measure and compare the size of a footprint
- explore and explain patterns in cut fabric
- use problem solving skills to manipulate clues and construct an answer to the mystery

Children transfer and adapt what they have learned from one context to another
- create a story map of the bear hunt
- use handprints to construct art work
- express effective methods used that could help police solve mysteries

Children research their own learning through connecting with people, place, technologies and natural and processed materials
- invite police officers into class to hear how they investigate mysteries and solve problems
- investigate where and how bears live in the natural environments around the world
- compare bears’ lives in natural and man-made environments

Children transfer and adapt what they have learned from one context to another
- create a story map of the bear hunt
- use handprints to construct art work
- express effective methods used that could help police solve mysteries

Children research their own learning through connecting with people, place, technologies and natural and processed materials
- invite police officers into class to hear how they investigate mysteries and solve problems
- investigate where and how bears live in the natural environments around the world
- compare bears’ lives in natural and man-made environments

Children interact verbally and non-verbally with others for a range of purposes
- describe clues collected and how they fit the mystery
- share bear stories from different cultures
- act out Rosen’s story: We’re going on a bear hunt

Children engage with a range of texts and gain meaning from these texts
- co-construct a class book that retells how the mystery was solved
- write and read words associated with the classroom mystery posted on a clue collection display
- share story books about bears

Children express ideas and make meaning using a range of media
- draw a picture of the bear they think created their mystery
- identify what is needed to conduct a Teddy Bears’ Picnic
- place photographs in a logical sequence that retells the bear hunt story

Children interact verbally and non-verbally with others for a range of purposes
- describe clues collected and how they fit the mystery
- share bear stories from different cultures
- act out Rosen’s story: We’re going on a bear hunt

Children engage with a range of texts and gain meaning from these texts
- co-construct a class book that retells how the mystery was solved
- write and read words associated with the classroom mystery posted on a clue collection display
- share story books about bears

Children express ideas and make meaning using a range of media
- draw a picture of the bear they think created their mystery
- identify what is needed to conduct a Teddy Bears’ Picnic
- place photographs in a logical sequence that retells the bear hunt story

Children begin to understand how symbols and pattern systems work
- create a line of footprints from smallest to biggest
- compare the lines on fingerprints for differences
- recognise animal footprints and how they help tell stories

Children use information and communication technologies to access information, investigate ideas and represent their thinking
- use internet to find information about bears
- using information and communication technologies collect photographs of bear environments
- draw a bear using information and communication technologies
CONNECTIONS TO THE AUSTRALIAN CURRICULUM: SCIENCE

The Australian Curriculum: Science (Version 1.0, 8/12/2010) consists of three interrelated strands: Science Understanding, Science as a Human Endeavour, and Science Inquiry Skills. Examples of these strands in relation to We’re going on a (forensic) bear hunt! are presented below.

### Science Understanding

**Biological sciences**
- Why are hands, feet, fingers and hair important?
- Looking after hands, feet, fingers and hair
- Look for differences in animal footprints
- Everyone has differences that make them unique

**Chemical sciences**
- How are fingerprints reproduced?
- Exploration of different substances in which handprints, footprints and fingerprints can be made
- Using different equipment to collect and save evidence
- What clues could be collected from fabric?

**Earth and space studies**
- Where does a bear live?
- How are caves formed?
- Describe the different landscapes in the song We’re going on a bear hunt
- How can weather conditions change a footprint?

**Physical sciences**
- How do bears move? Compare this with how people move
- What is hibernation? Why do bears hibernate?
- Compare running and tiptoeing footprints in sand to observe the different force applied
- Test possibilities of walking soundlessly

### Science as a Human Endeavour

**Nature and development of science**
- What does a forensic scientist do?
- How do forensic scientists help solve mysteries?
- Identify the three major patterns associated with fingerprints
- Develop simple questions about hands, feet, fingers and hair to explore as a class

**Use and influence of science**
- Appreciating individual differences
- Notice wet footprints after a bath or when leaving the pool
- Use clues to assist finding misplaced everyday objects
- Everyone leaves behind clues, such as hair and fingerprints

### Science Inquiry Skills

**Questioning and predicting**
- Predict which animal left behind the print, hair and honey
- Why was that animal in the class?
- Encourage questions that will discover differences in people’s hands, feet, fingers and hair
- What will happen to the paint in the ‘painted handshake’?

**Planning and conducting**
- Investigate which food can be used to make clear fingerprints
- Use non-standard measurements to measure the length of feet
- Observe what happens to the print in the ‘painted handshake’
- Research different types of animal footprints

**Processing and analysing data and information**
- Draw and describe a picture of the animal from the clues
- Develop a bar chart of eye or hair colour
- Was the result of the ‘painted handshake’ similar or different to that predicted?
- Sort food into two categories: those that made clear fingerprints and those that didn’t

**Evaluating**
- Class discussion on the clues left behind and how they assist in identifying the animal
- How well do children’s observations fit the collected evidence?
- Class discussion on what types of food leave clear fingerprints
- Compare individual footprints to note the range in length and width

**Communicating**
- Describe each piece of evidence in detail
- Develop a wall of evidence to display findings and discuss content
- Write a story about the day in the life of a bear
- Report findings verbally, written or in pictorial form
Background
Elizabeth (a pseudonym) is a third year pre-service teacher who completed her 3-week practicum with a class of 20 Kindergarten children in a Perth primary school. Elizabeth fully supported young children being actively involved in their own learning, and expressed a desire to use a hands-on approach in science teaching and learning. She was, however, unsure just how to accomplish this in science.

How was the book used?
Elizabeth was immediately attracted to the forensic science module as she had a personal interest in the topic. She had never considered that forensic science could be taught to young children, so was intrigued to see what the module presented. Elizabeth’s hesitancy was put at ease when, during an informal session before practicum, the children talked about the place of clues in solving crimes. The class had already been introduced to Michael Rosen’s story, We’re going on a bear hunt, and some children had asked if they could build a cave and dress up as bears. This provided the ideal context to perform the forensic bear hunt.

Elizabeth was restricted to delivering six half-day science lessons with the children. She decided to follow the same sequential order as presented in the module, but only chose one or two of the activities from each sub-theme that were appropriate for Kindergarten. She found it very easy to modify the activities for the age group, time frame and availability of resources. Her choice of activities included discovering bear footprints, discovering fur, discovering honey pawprints, planning and conducting a class investigation on ‘What foods can we make fingerprints with?’; going on a bear hunt outside, and having a whole class Teddy Bear’s Picnic.

How was the module modified?
Elizabeth set up a wall of evidence in the classroom. Each piece of evidence was labelled and displayed for all the children to see. She found this essential to remind the children about evidence that had been collected on previous days, as well as highlighting the order of collection. When bringing the evidence together to determine what animal had been in the classroom, the wall of evidence again became essential. (This idea has subsequently been added to the book.)

An overview of the book
Elizabeth found Planting the Seeds of Science to be an extremely useful guide as she planned and delivered her lessons. She felt that all information required was at her fingertips: activities, focus questions, websites, questions and answers, integration, and even songs. Elizabeth commented that the book was very easy to use, noting that she could always see the bigger picture of the overall lessons, even when delivering an individual lesson. The flexibility to take the ideas and activities and make them appropriate for her context was considered to be a huge advantage of the book. Elizabeth believed the module outline table assisted her immensely in planning lessons: while there was an emphasis on science, she could justify how she was integrating the other curriculum areas into her lessons.

Elizabeth told the story that the children were engaged, motivated and immensely excited about the forensic science activities, which made teaching science easy. The children in her class clearly displayed self-discovery when they started looking for their own clues during free play and found evidence that had not been ‘planted!’ They demonstrated transferability of information by sharing stories from home of wet footprints when they got out of the bath. They also expressed some logical ideas about who had been in the classroom, as illustrated by the following child’s response:

The bear left the honey footprints here. The bear took it (the hair) off his skin and threw it on your coats. I want to talk about clue one. The bear left the footprints.

Elizabeth believed the success of the program was evident by the responses from the children, which reflected their interest in the topic. She believed the children had fun learning science, and she certainly had fun teaching it.
MUdS AND SUDS: THE SCIENCE OF CLEANLINESS

CHRISTINE HOWITT, ELAINE BLAKE AND MAURO MOCERINO
Overview ............................................................. 79
Module outline ...................................................... 80
Introduction: Animal scrub .................................. 81
Focus questions .................................................... 81
Animals can clean themselves ............................. 82
How I get dirty and how I get clean ...................... 82
Surveying our home .............................................. 84
Mud, glorious mud! ............................................... 84
How does soap work? ........................................... 86
Bubbles forever! .................................................... 87
How do wet objects dry? ....................................... 88
Conclusion: Our Wishy Washy day ....................... 88
Q&A .................................................................... 89
Assessment ........................................................... 91
Resources ............................................................ 92
Curriculum integration ........................................... 94
Connections to Early Years Learning Framework: Learning Outcomes ...................................... 96
Connections to The Australian Curriculum: Science ................................................................. 98
Case study 4. Healthy science! ............................. 99
Cleanliness and hygiene are concepts that children can readily relate to by the time they start school. *Muds and Suds: The science of cleanliness* is designed to expand children’s basic knowledge of these concepts in relation to themselves and their everyday life.

This module aims to promote in children a greater sense of responsibility in maintaining their own health through an understanding of how and why both animals and humans wash themselves, the differences between being dirty and clean, and how soap works.

*Muds and Suds: The science of cleanliness* has nine sub-themes, each with several ideas and activities. The module begins with the children being introduced to the Joy Crowley book, *Mrs Wishy-washy*, to discuss why and how the animals in the story were cleaned. Children then investigate various ways that animals stay clean, make a comparison of how they get dirty and how they get clean, explore the properties of mud, and find out how soap works. Opportunities to investigate bubbles and to discover how wet objects dry out are also provided. There is constant referral to the book *Mrs Wishy-washy* throughout this module.

Within this module children are encouraged to actively explore clay, chocolate mousse, and bubbles with their hands. Emphasise to children the importance of not ingesting any of these substances. Use clean clay that can be bought through art supplies. Have plastic gloves available for those children who do not want to touch the substances with their naked hands, or are allergic to them. Safety must be exercised when using detergents as chemicals in some products may cause allergic reactions, or illness.

An outline of *Muds and Suds: The science of cleanliness* is provided in the following table, demonstrating opportunities to integrate the module within the curriculum. Many of the activities presented in this module also have links with Biological sciences and Chemical sciences within the Science learning area of The Australian Curriculum.

Ideas and activities presented in *Muds and Suds: The science of cleanliness* are suggestions to engage children in science learning. Allow them to guide the direction their learning takes. Flexibility is the key to working with young children and for using this resource.
### Module Outline

**Muds and Suds: The Science of Cleanliness**

<table>
<thead>
<tr>
<th>Sub Theme</th>
<th>Ideas</th>
<th>A</th>
<th>E</th>
<th>M</th>
<th>H&amp;PE</th>
<th>LOTE</th>
<th>S</th>
<th>S&amp;E</th>
<th>T&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal scrub</td>
<td>Sam and Jane Wishy Washy</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Dog wash</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animals can clean themselves</td>
<td>Staying clean</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Build a bird bath</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>How I get dirty and how I get clean</td>
<td>This is the way I get dirty</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>This is the way I get clean</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>It's in the bag!</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Why must I be clean?</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Surveying our home</td>
<td>Brand it - graph it</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>What do the words mean?</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Mud, glorious mud!</td>
<td>Messing about with mud</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Useful mud</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Mousse mud</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>No yuk here!</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>How does soap work?</td>
<td>History of cleanliness</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>The cleaning process</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Investigate cleaning a stain</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Bubbles forever!</td>
<td>Making bubbles</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Can I make a square bubble?</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>How long does a bubble last?</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Creative bubble art and stories</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>How do wet things dry?</td>
<td>How animals dry themselves</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Drying the wet clothes</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Where do puddles go?</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Our Wishy Washy Day</td>
<td>Dramatise the story</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Investigating with our parents</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

Possible curriculum links: A (Arts), E (English), M (Mathematics), H&PE (Health & Physical Education), LOTE (Languages other than English), S (Science), S&E (Society and Environment), T&E (Technology and Enterprise)
INTRODUCTION: ANIMAL SCRUB

Sam and Jane Wishy Washy
Introduce and read the book Mrs Wishy-washy. Why did Mrs Wishy-washy wash the animals? How did Mrs Wishy-washy wash the animals? What equipment did she use? What clothing did she wear? Why did she wear those clothes?

Develop a procedure for washing animals based upon the story. Support this with a story board of what went into the tub (animals, dirt, water, soap, scrubbing brush). For example, ‘The ______ is in the tub.’ Select children to mime this procedure and perform the story for the class.

Act out the story with children dressed up as Mrs Wishy-washy and the animals. Use an old brown sheet as the mud, and encourage children to roll in the mud.

Alternatively, use plastic toy animals, small plastic tubs, scrubbing brushes, water and soap to retell the story. Photograph the experience so children can develop their own story book called ‘Jane Wishy Washy’ or ‘Sam Wishy Washy.’ Develop a sequence of events around the story that begins with the plastic animals rolling in mud, the children washing the animals in a plastic tub with lots of suds and a brush for scrubbing, and the animals drying off.

Dog wash
How do we wash a dog? Children brainstorm the procedure and what equipment would be needed. Using modelled procedural writing, develop the process of how to wash a dog. Arrange for either a mobile dog wash to visit, or ask a parent to bring a very placid dog to demonstrate the procedure at school. Take photos of the sequence of events, showing the dog before, during and after the wash.

Display photographs in the correct order so a story wall can be made and a sequence demonstrated. If neither option is possible then video or photograph a friend’s dog being washed. Have children draw a diagram to illustrate the sequence of how the dog was washed. Write one or two sentences to describe the pictures. Invite an RSPCA Education Officer to discuss pet care and responsibility (see Resources).

Write a washing song based upon the procedure. For example, use This is the way we wash the cow to the tune of Here we go round the mulberry bush.

FOCUS QUESTIONS RELATING TO THE INTRODUCTION

Possible focus questions to direct student thinking
1. How did the animals in the story get dirty?
2. How did these animals get clean?
3. How would the animals get clean if Mrs Wishy-washy was not there to help?
4. What equipment did Mrs Wishy-washy use to clean the animals?
5. What procedure was followed to clean (the duck)?
6. How do animals usually clean themselves?
7. Which animals need our help to keep clean?
8. What is the procedure for washing a dog?
9. What would happen if you didn’t wash your dog?
ANIMALS CAN CLEAN THEMSELVES

Staying clean
Investigate with the children how different animals stay clean. Use children’s prior knowledge, books, the internet and a variety of pictures to obtain information. Set up a picture and word wall showing how different animals clean themselves. For example, birds preen themselves and have baths - some even have dust baths! Many animals lick themselves, some rub up against a tree or have a mud bath, some big animals allow small birds to sit on their back and peck insects off their body, and big fish allow smaller fish to clean out their mouths. Emphasise the verbs used in cleaning language, such as rub, sit, peck, roll, preen and lick. Add these to the word wall. Invite children to individually select one animal and role play how it cleans itself. The rest of the class have to guess which animal they are and how they are cleaning. To assist this role play, have picture cards that illustrate a variety of animals and how they clean themselves.

Build a bird bath
If there is a bird bath at school, ask children to watch out for a bird bathing itself and describe the details to the class. If there is no bird bath at school, use the technology process to plan, design and construct a bird bath. What materials (plastic, wood, paper, cardboard) will the children use for their bird bath? How will they test the materials to see if they are water proof? Using plastic birds, have the children test, evaluate and modify their bird bath. Photograph the process of making and testing. Set the completed bird baths in the playground and see which bath the birds prefer.

HOW I GET DIRTY AND HOW I GET CLEAN

This is the way I get dirty
Find out how much the children know about their own personal hygiene. Children need to feel comfortable about getting dirty and knowing they can be easily cleaned. Brainstorm with them ways to get dirty. See how many different ideas the children come up with: spilling food, getting sweaty, or painting. Using one example, such as playing in the sand pit, list the possibilities of getting dirty such as sand in hair, on hands, under finger nails, in clothes or shoes. Develop a class list of all the parts of their body that get dirty, and how they get dirty. Children can draw a picture of themselves getting dirty. Turn the picture into a collage by adding real dirt to the picture. A short sentence can then be added to the picture by child or adult, about how they got dirty. Children then share their drawings and story with the class, describing which parts of their body are dirty and how they got dirty.

In the sandpit, encourage the children to make ‘mud pies’. Include a variety of objects for them to mix up in their mud pie.

This is the way I get clean
Create a 3D mind map (Howitt, 2009). Brainstorm with the children how they get clean. Different parts of their body require different cleaning. How do they clean these areas? Children draw a picture of a part of their body. Produce some real objects that are used to clean different parts of the body. For example, if a child states that they clean their hands, ask that child to draw or trace their hand. Then ask how they clean their hands. If they state that soap is used to clean hands, place soap on the picture of the hand. If the children mention objects that you don’t have then either write or draw them on a piece of paper, or add the real object at a later time. Continue with other parts of the body. Leave this as a ‘work in progress’ so that children can add or change the results when they have a new body cleaning idea.
Develop a matching chart of all the parts of their body, how they are cleaned and the product used to clean that part.

Alternatively, a body cleaning collage could be made where the children draw a picture of self and glue on cut-out pictures from magazines or catalogues, small pieces of flannel, soap, or photos of bubbles to demonstrate cleanliness.

Using repetitious language, encourage children to write short sentences about how they clean themselves. For example, 'I clean my … with ….' Allow the children to share their drawings and sentences with others, describing and dramatising how they clean themselves. Alternatively collect drawings with captions to make into a 'Clean my body' book for shared reading.

Recognise that children use a variety of home language for some objects. List and display words relating to a familiar cleaning object.

It’s in the bag!
Develop the getting dirty and getting clean concepts with a ‘Getting dirty – Getting clean’ home bag. The bag contains a copy of Mrs Wishy-washy along with associated toys and a diary for records. At home, the child chooses which toys to play with and ensures that at least one gets dirty so that it can be cleaned. With assistance from an adult the child adds their own experience to the diary as they describe the toy they chose, how it got dirty and how the toy was cleaned. If they wish, they can photograph the toy at home or add a drawing to the book. In addition the story could be told to the rest of the class when ‘the bag’ is returned to school.

Why must I be clean?
With children make a list of reasons why they need to stay clean. Introduce the notion of personal hygiene and why it is important for them to be responsible for their own cleanliness. In particular, discuss why, when and how the children should wash their hands. Develop a cleanliness chart using their contributions to complete these sentences: ‘We wash our hands before we…, We wash our hands after we…’ Demonstrate the correct way to wash and dry hands, and then have each child show how they wash and dry their hands. Emphasise the importance of washing hands before we eat and after going to the toilet.

Discuss germs and how they make us sick. Show magnified pictures of germs (see Resources), discuss their purpose and how they can be harmful. From the module, We’re going on a (forensic) bear hunt!, perform a painted hand shake where the paint represents germs. The paint in this activity illustrates how germs can be transferred from one person to another.
SURVEYING OUR HOME

Brand it – graph it
Conduct a bath/shower survey as an example of collecting data. Who has a bath or who takes a shower? Construct a simple tick or bar chart to illustrate results. Have the children conduct a simple survey to find out the brand names of toothpaste, soap (solid and/or liquid) or hair shampoo they use at home. Ask children to bring from home empty toothpaste and/or soap packets. Classify the collection in different ways, such as by colour, size or shape. How many different brands of toothpaste/soap/shampoo are used by the class? Develop simple pictographs to present these results.

What do the words mean?
Children identify and discuss a common brand of toothpaste and its purpose. How do we know this product is used for cleaning teeth? What does the package tell us about the product inside the box? What do the words on the box say about toothpaste and teeth? Place various words from this description, for example bright, onto a Mud Word Wall and discuss meanings. Introduce some basic scientific literacy by asking the children if they think their teeth really are bright after using the toothpaste. From the package discuss ingredients that make toothpaste. Invite a dentist or dental nurse to class to talk about oral hygiene and the correct way to clean teeth.

Introduce sayings such as ‘clear as mud’, ‘clean as a whistle’, ‘squeaky clean’ and discuss their meanings and use in Australian language.

MUD, GLORIOUS MUD!

Messing about with mud
Brainstorm children’s prior experiences with mud to find what they know about mud. What is mud? Where have you seen mud before? What is the composition of mud? What is the purpose of mud? Who or what uses mud? Why did the animals in Mrs Wishy-washy roll in the mud?

Allow children to explore mud or potter’s clay. Remind children to wash hands afterwards, use gloves if required, and use an apron to protect their clothes. What does the mud look like, feel like, smell like, and sound like? How is mud similar and different to dry soil? Record ‘mud words’ on the word wall.

Encourage children to make their own mud by mixing clean dry soil and water together and play with the results.

Using potter’s clay create a mud handprint and once it is dry, use a pencil to add lines and turn it into their favourite animal from the Mrs Wishy-washy story. Glue on wobbly eyes, cut it out, attach it to a pop-stick, and use it to create a puppet story about dirty animals.
Useful mud
What animals, other than those in the story, like to be covered in mud? Why do pigs like rolling in mud? Would pigs be happy without mud? Research pig farms where pigs play in straw or recycled shredded paper instead of dirt. Why would farmers use straw?

Conduct class research to find different ways that humans use mud. Show pictures of mud brick houses and fences from around the world. Mud bricks are not uncommon and there may be an example of a mud-brick building near your school for a class visit.

Use the technology process to make mud bricks in the playground. After children predict how they could make mud bricks, look for ‘recipes’ on the internet (see Resources). Decide as a class on a ‘best’ recipe and ask where all the necessary ingredients would come from. Make mud bricks with the children. Evaluate the bricks with the children. Are they solid? Are they strong? How could they test the strength of their mud bricks? What else could they include or change in their recipe to make a stronger brick? What could damage a brick? Using photographs, record the process of making the class bricks and ongoing evaluation over a prolonged period. These can be turned into a PowerPoint to demonstrate the creation of the bricks and changes that occur over time.

How many bricks did the pig in the story of The Three Little Pigs have to make to build his house? Use empty tissue boxes or egg cartons to represent bricks for a whole class construction in the classroom. This could be built over time, representing the process of a real building project.

Clay is like mud and is used to build, to sculpt and to make pottery. Visit a potter, or ask one to come to class and show the children the craft. Provide clay for each child, divide the class into three and have each group make ‘a herd of cows’ ‘a flock of ducks’ or ‘a drift of pigs’ from the story. Notice how the clay dries out, changes colour and cracks over time.

Mousse mud
Now use something very different to represent mud. Chocolate mousse makes a great substitute and this can be made using one of many recipes available on the web or use a commercial brand. What does the chocolate mousse look like, feel like, smell like, and sound like? Add these descriptive words to the word wall.

Compare descriptions of the two types of mud: real mud and mousse mud. Using hoops and word cards, create a Venn diagram to record how the mud and chocolate mousse are similar and different to each other.

No yuk here!
Mrs Wishy-washy had to wash the farm animals because they rolled in mud. Can children design a farm so that animals would not get dirty? Start with a class brainstorm of what things are needed on a farm – house, fences, tractors, dam, animals, food and water for animals, paddocks. If another language is used or taught in class, make a comparative list of words in English and the other language. Using objects to represent these parts of a farm, children in small groups discuss and create possible ways to make a farm where the animals would not get dirty. This activity would be best set up outside to give it a sense of reality. Name the farms according to children’s suggestions.
History of cleanliness
Find out how people used to keep clean in the past when cleaning products were not readily available (see Resources). What did people use before soap was invented? how did they wash their clothes? take the class to a history museum to view clothes and washing equipment that was used a long time ago. Look at how a cleaning object, such as the washing machine, has changed over time. Introduce children to washboards. Invite grandparents who may have stories to share about how their grandparents washed in the past. Research how other cultures do the washing. Compare pictures of ‘stone washing,’ using a copper and stick, or using a Laundromat with the methods they currently use at home. Perhaps someone has an old washing machine that children could take apart, or old wringers that could be set up and tested in class.

The cleaning process
Mrs Wishy-washy cleaned the dirty animals by placing them in a tub and using soap, water and a scrubbing brush. Using brainstorm, find out how much the children know about cleaning dirty clothes. What do they know about the actual process of washing clothes, as opposed to stating “we use a washing machine”? Discuss with children the importance of the soap, water and agitation to help get dirty clothes clean. Ask children what they think ‘agitation’ means (mixing soap, dirt and water). Agitation helps break dirt particles into smaller pieces so the soap can loosen and carry dirt away from the clothes. (See Q&A) Refer back to Mrs Wishy-washy and how soap, water, a scrubbing brush and agitation (rubbing and scrubbing) were used in order to remove the mud from the animals.

Investigating cleaning a stain
Conduct a simple but fair investigation with the class to find out if agitation or no agitation is the best way to remove a stain from a piece of material. Equipment to perform this investigation includes two tubs, water, small strips of material all the same size, a suitable stain (such as tomato sauce or mud), cold-water laundry detergent, teaspoon, ‘agitator’ and ‘no agitator’ labels, newspaper, and white paper.

Place the strips of material onto the newspaper. Put a small amount of tomato sauce onto the centre of each strip of material, and rub in with the back of the teaspoon. To obtain better results, leave the stain for 24 hours before continuing the investigation.

Add the same amount of cold water and laundry detergent to each of the two tubs. Stir in the detergent with the teaspoon, making sure that each tub is stirred the same amount of time. Set up the labels beside the tubs. Place the plain white paper nearby, labelling one as ‘agitator’ and the other as ‘no agitator’.

Keep one strip of stained material so that the original stain can be compared to the washed strips. For the ‘no agitator’ tub, have a child push one strip of material under the water and leave it there. At the same time have another child dip a strip of material in and out of the ‘agitator’ tub. Perhaps have the children count to 20 as the ‘agitator’ child keeps dipping the strip of material.

The children remove their strips of material at the same time and place on the appropriate labelled white paper. Have pairs of children repeat this procedure until the whole class has cleaned a strip of material. As a whole class compare the agitated and non-agitated strips to the original stain. Which methods of cleaning a stain (agitation or no agitation) produced the cleanest strips of material? When performing this investigation, note the amount of stain (tomato sauce) that has come off the material into the water as another form of comparison.

Further investigations could be based on the following questions: Does warm water or cold water work best for cleaning a stain? What type of stain is hardest to remove from material? Is detergent better than no detergent for removing a stain? Using empty detergent containers, look at the ingredients used in laundry detergents. Research the use of these ingredients. (See Q&A)
Making bubbles

Have gloves available in case of allergies. Allow the children to play freely with a soapy bubble solution to make and test bubbles. How can a bubble be made using bubble solution and just your hands? Have them develop step-by-step instructions. In pairs, model the process to a buddy or as a whole class activity. Encourage inquiry by asking how bubbles move in the wind. Look for detail in a bubble by discussing shape, size and colour of bubbles.

Develop a Y-chart of bubbles: What do bubbles look like, feel like, and how do bubbles move in the wind? Record each child’s bubble experience on bubble images to decorate the word wall. What questions do the children have about bubbles? What investigations could these lead to? Imagine you are a bubble – what does it feel like to float? Role play being a bubble, float and pop!

How long does a bubble last?

How long do bubbles last? Develop a simple counting method with the children to answer this question. Investigate if larger bubbles last longer than smaller bubbles? Make giant bubbles (see Resource). Create a bubble trampoline by threading string through two straws and tying off. Immerse this completely into bubble mixture then lift out and pull the straws apart. A film of bubble mixture should be created, thus forming a trampoline for bubbles to bounce off.

Can I make a square bubble?

Have the class suggest various objects that could be used to create bubbles. Ensure the children offer explanations about why they think their suggestion will work. Use a predict-observe-explain model to test a range of everyday objects for blowing bubbles. Using a good bubble solution and different objects with holes in them, encourage the children to test the shapes of bubbles. Which objects worked best? Which objects didn’t make bubbles? Can a square bubble be made?

Predict:
I think if we use a paperclip we will blow a long thin bubble.

Observe:
Use senses to test prediction

Explain:
Verbally or draw and label an explanation of the results.

Creative bubble art and stories

Produce bubble art by setting up containers with water, detergent and different food colouring so there is a choice of colours. Once you are sure children can blow through a drinking straw, have them blow through the straw into each container and create colourful bubbles. Place a sheet of paper over the top of the bubbles to create bubble patterns. The results are ideal to use as wrapping paper, background sheet for displays or to make into greeting cards.

Collect ideas from the children for a whole class fantasy story. For example, What the bubble saw when it floated away, or The day I floated away on a bubble.
How do wet things dry?

How animals dry themselves
Discuss how animals dry themselves. How did the animals in Mrs Wishy-washy dry themselves? Children role play being a wet animal, then drying off by shaking, rolling or standing in a warm place. Photograph the role play and place in a PowerPoint to watch, enjoy and comment on.

How do people dry themselves? List different ideas from the children. Encourage and positively respond to creative ideas. Compare how people dry themselves and how animals dry themselves. Look for similarities and differences.

Drying wet clothes
Brainstorm how wet clothes can be dried off once they have been washed. List children’s suggestions about how different weather conditions influence drying wet clothes. What weather conditions help clothes to dry? What weather conditions stop clothes from drying? Investigate whether wind helps clothes to dry through the use of a fan. Discuss evaporation and how the sun dries wet things. (See Q6A)

Draw the outline shape of various different clothes on A3 paper, such as a dress, top, pants and a shirt. Children colour them using Edicol dye and wax crayons to highlight features such as buttons. Cut out the shapes. Find a safe place to hang a clothes line in the class, and peg the clothes to this line.

Where do puddles go?
Illustrate evaporation by getting the children to create various small puddles outside on a sunny day. Draw around the edge of the puddle with chalk, and observe the puddle over time. Take photographs over time, as a reminder and for a talking point with the children. Ask the children where the water goes. (See Q6A) Using a spray bottle filled with water or a broad paint brush, have each child write their name or initial in water onto a flat surface (untreated concrete works well). Observe how this water evaporates over time.

CONCLUSION: OUR WISHY WASHY DAY

Dramatise the story
Invite the parents to class to celebrate the children’s learning. Children and parents could attend dressed as a character from the Mrs Wishy-washy story. Have the PowerPoint presentations rolling during the visit. Dramatise the story of Mrs Wishy-washy for the audience. Depending on ability, a child could narrate the story while others play the characters.

Alternatively, create stick puppets of the story’s characters and present a puppet show. Another possibility is to present a TV program where children, in turn, report an activity related to the module. For example how to wash a dog, how to clean finger nails, how to make mud bricks, how to make bubbles, why bubbles pop, the best way to remove a stain, or complications of washing a cow. Other children could perform advertisements of cleaning products during the TV program, and another could present a weather report in relation to drying the washing.

Investigating with our parents
While parents are visiting children take them on a tour of the Mud Word Wall, the best places at school to dry the washing, demonstrate how agitation works, and read to them the books made about clean and dirty. Have various investigations set up for the parents to perform, with the children explaining the procedure and the results. The day could include bubble blowing, clay painting, mud brick making, mud mousse prints, and removing a stain.
WHAT IS SOAP AND HOW IS IT MADE?
Soaps are cleaning agents made from the reaction of fats or oils with an alkali (or strong base). Soaps (and detergents) contain surfactants (surface active ingredients). These surfactants interact with water and the water insoluble dirt particles, allowing the dirt to be taken up into the water and removed from the object being cleaned.

Soap is obtained by a process called saponification. In this process fats or oils are hydrolysed to give salts of fatty acids and glycerol (or glycerine). Traditionally, soaps were prepared by reacting fats with either soda ash (sodium hydroxide) or potash (potassium hydroxide) at high temperatures (80-100°C). Today the most popular method is the ‘cold process’ method. In this process, melted fats or oils are mixed with lye (sodium hydroxide solution) at low temperatures (~40°C).

The variation among different soaps (other than the added perfumes, dyes and emollients) is due to the different fatty acids used in their preparation. If the soap is to be used in saltwater or other ‘hard’ water, it will produce a better lather if made with a high percentage of coconut oil. Palm oil soaps give small, long-lasting bubbles and are very mild to the skin. As soap makers must formulate each soap base with a different blend of fatty acid, soap making is as much an art as it is a science.

WHAT IS DIRT?
Dirt can be defined as any material that is unwanted and needs to be removed to make something clean. It can come from soil, foods, machines or almost anywhere. Water soluble dirt like salt and sugar, are easily removed with water alone and are often not thought of as dirt. Dirt from soil (like clay and mud) and dirt from foods and machines (oils and greases) are removed by soap and water.

HOW DOES SOAP REMOVE DIRT?
Soap works by making oil or other dirt mix with water, so that the water can wash it off. In order for oil to mix with water, some means must be found to make the oil (or dirt particles) more like the water particles. This is the task of the soap molecules.

Soaps are large molecules that look a bit like tadpoles, and consist of two basic parts: the head and the tail. The tail of the molecule is structurally very similar to oil and thus is soluble in oil. The tail of the soap molecule is nonpolar (does not have a charge) and does not like water. Hence, it is called hydrophobic or ‘water fearing’. The head of the tadpole has a slight charge (and is called polar), making it soluble in water. The head of the soap molecule is called hydrophilic or ‘water loving’. These water fearing and water loving properties of soaps are essential to how soap works.

When we wash with a solution of soap and water, we rub and scrub (or agitate) to break up the oil or dirt into small droplets. The soap molecules dissolve their tail (oil-like end) into these droplets, leaving their charged ends sticking out into the surrounding water. The soap molecules form a kind of shell around the oil droplet. This small sphere, with a captured oil drop in the centre, is called a micelle. The soap camouflages the oil droplet, making its exterior attractive to water. The micelle (disguised with its oil and dirt) is then easily washed away.

WHAT IS MUD?
Mud is a mixture of soil and water. There are many different types of soils: clay, loam and sand are just some of them. Soil found in the garden has many different things in it: minerals, rock particles, and organic matter (broken down leaves, twigs, and insects). If you wish the children to use soil in class you will need to make sure that it is ‘clean’ soil. This can be achieved by sifting the soil, or purchasing clean soil from a nursery. Soil from your back yard will not be clean. The best soil to use would be one with a high clay content, as this has a very muddy, smooth and sticky texture when wet, allowing a lot of descriptive language to develop. Alternatively use potter’s clay.

Figure (A) represents a soap molecule, showing the nonpolar tail (hydrophobic end) and the polar head (hydrophilic or water loving end).

Figure (B) represents a cross section of a soap micelle in water. Soap micelles repel each other because of their negative surface charges.

(Blackman et al, 2007)

A soap micelle with a ‘dissolved’ oil or grease droplet.

(Blackman et al, 2007)

Reproduced with permission of John Wiley & Sons, Australia, Ltd.

Soaps increase the compatibility between water and dirt (oil and grease) by being able to partly dissolve in oils and partly dissolve in water, thereby linking the two dissimilar materials together.

WHAT IS MUD?
Mud is a mixture of soil and water. There are many different types of soils: clay, loam and sand are just some of them. Soil found in the garden has many different things in it: minerals, rock particles, and organic matter (broken down leaves, twigs, and insects). If you wish the children to use soil in class you will need to make sure that it is ‘clean’ soil. This can be achieved by sifting the soil, or purchasing clean soil from a nursery. Soil from your back yard will not be clean. The best soil to use would be one with a high clay content, as this has a very muddy, smooth and sticky texture when wet, allowing a lot of descriptive language to develop. Alternatively use potter’s clay.
WHY DO PIGS LIKE MUD SO MUCH?
Rather than being dirty animals, pigs are very clean animals. The reason some people think they are dirty is due to the fact pigs like to roll in the mud. However, pigs tend to roll in mud in the hot summer months to help them cool off. Pigs cannot sweat to cool down, like humans can. Therefore, pigs are extremely sensitive to heat. They can suffer from sunburn and heat stroke, just like humans. Wading in water and rolling in mud assists pigs from becoming over heated, and also helps control parasites.

WHAT IS A BUBBLE AND WHY DOES IT POP?
Soap bubbles are pockets of air (or any other gas) trapped inside a liquid ball of a water and soap solution. Bubbles form when soap weakens the surface tension that makes the ‘skin’ form on the surface of water. It then stretches the skin and eventually a bubble breaks free when air is gently blown in.

Bubbles can be found in a range of everyday items, like soft drinks, beer and champagne, and in soap solutions. Bubbles can be seen in boiling water, and rising to the surface of lakes. Bubbles are also used to break up oil spills, put out fires, to treat wastewater, and to extract valuable minerals like gold from ore in a process called floatation.

Bubbles pop due to dryness, rather than sharpness. If bubble tools are wet with bubble solution it is possible to touch the bubbles without popping them. Similarly, it is possible to hold or catch a bubble if your hands are covered in bubble solution.

WHY ARE SOME STAINS HARD TO REMOVE FROM CLOTHES?
The ease of removal of dirt from clothes (or any other object) depends on how strongly the dirt is bound to the clothes. Some dirt is just physically entangled in the fibres of the clothes (like sand or clay) and can often be removed by beating the clothes with water (minimal soap is required). Other forms of dirt interact with the surface of the fibres and may even react with the fibre. These are harder to remove and require soaps or detergents to remove them. For a soap to remove dirt from fabric, the soap and dirt must interact better with each other than the dirt and fabric interact with each other. It is a bit like a tug of war between the soap and the fabric.

HOW DOES ANTIBACTERIAL CLEANSER WORK IF YOU DON’T USE WATER?
Typical antibacterial hand gels consist of water, alcohol, moisturising agents (glycerol, propylene glycol, triethanolamine) and an antibacterial agent. When used to clean your hands without water, they do not actually remove any dirt from the hands. When you rub it into your hands, antibacterial agent kills the germs, while the other ingredients either evaporate or are absorbed into the skin. Any dirt on the hands remains there (along with the dead germs).

There is some debate as to the effectiveness of antibacterial cleansers when compared to soap and water. Soap and water may not effectively kill bacteria, but they do wash them away (along with other forms of dirt). Although not yet proven, some scientists are concerned that the widespread use of antibacterial cleansers will increase the likelihood of developing resistant bacteria.

WHAT DOES THE STAR RATING ON WASHING MACHINES MEAN?
There are two star ratings for washing machines. The water rating indicates how ‘water-wise’ the machine is while the energy rating sticker indicates the machine’s energy efficiency. The water rating sticker also indicates how many litres are used per full load wash. Front loading machines are much more water-wise than top-loaders, using less than half the water that equivalent size top loaders use.

In the energy rating system each extra star indicates the machine is about 30% more energy efficient than a machine with one less star. Again, front loader washing machines are generally more energy efficient than the top loader, mainly because there is less water to move around when agitating the wash.

WHAT INGREDIENTS ARE PUT INTO WASHING POWDERS?
The ingredients fall into six main categories: surfactants, builders, fillers, bleaches, fluourescers and enzymes. The main ingredient is the surfactant (soap or detergent). This is the principal component in the dirt removal process. Builders are added to assist the surfactant to do its job. Builders are added to help maintain the appropriate pH (washing powders need to be a little alkaline, but if they are too alkaline, the clothes will be damaged) and to help remove metal ions that make the water hard (these ions reduce the effectiveness of the detergent). Fillers are added mainly to produce a free flowing powder. Bleachers are added to help remove stains by oxidation. This process chemically alters the compounds in the stain. This can be in the form of making them colourless or making them easier to wash out. Fluorescers are added to give clothes the ‘whiter than white’ look. As white fabrics age they tend to yellow. Fluorescers absorb UV light and re-emit it as blue light (yellowed fabrics do not reflect blue light fully from sunlight). You may have noticed that some clothes ‘glow’ in UV light (some night-club lighting is rich in UV). Enzymes are added to help break down complex dirt molecules like proteins and fats. Once broken down into smaller fragments, they are more soluble and can be easily washed out.

HOW DOES TOOTHPASTE WORK?
Toothpaste consists of an abrasive material embedded in a gel. It is the abrasive material that helps rub the plaque off the surface of the teeth and gums. The abrasive material is chosen such that it is almost, but not as hard as, tooth enamel. That way it will rub off the dirt without scratching the tooth. A small amount of detergent is also added to help the paste form foam when you brush. Flavours are added to make the process of tooth brushing more pleasant.

HOW DO WET CLOTHES DRY OFF?
Through the process of evaporation, the Sun dries off the water that is on the materials. This water has gone from the material into the air (as opposed to into the Sun). However, this concept is very difficult for children to understand as they cannot see the water in the air. Water molecules on the outside of the materials evaporate first. Once these have evaporated, water further in the material is pulled to the surface where it is also evaporated. And so the process continues until the item of clothing is completely dry.

Clothes dry off quicker on a windy day as both the Sun and the wind assist in this process, with the wind blowing the water particles away as soon as they evaporate. It is very difficult to dry clothes outside on a very humid day, as the atmosphere is just as ‘wet’ as the clothes.
Acknowledging children’s many ways of knowing and reporting their information, the following suggestions for diagnostic, formative and summative assessment are presented. Please note that these are suggestions and not prescriptive for the module. Using professional judgement, teachers should decide what is appropriate for their children, their class context, and the specific outcomes hoped to be achieved.

**Diagnostic assessment**

What are the children’s initial ideas about dirty and clean? Have them explain how they get dirty and how they get clean? What are their ideas about how soap works?

What was their initial understanding about the importance of hygiene?

What original ideas did the children have regarding bubbles? What language is used to describe bubbles?

**Formative assessment**

Children draw pictures of themselves that illustrate getting dirty and getting clean. What detail is used to explain the differences between the two illustrations?

Each child reports the procedure for cleaning the dog: oral, written or a drawn sequence of events. Does this procedure represent a logical and complete sequence?

How well can children follow or give directions to blow bubbles?

**Summative assessment**

Children develop their own Wishy Washy book with photos of the animals they have washed. Based upon the animals they have chosen to clean, what sequence was used to write (or tell) their own story? Do they include the necessary components to wash dirt from an animal – tub, soap, water, brush, agitation?

What level of detail does each child use to describe and demonstrate the best way to make bubbles with their hands? How well are instructions followed? What detail do the children provide when discussing the making and popping of bubbles?

How well does the child recount the investigation into cleaning a stain? Can they recognise the place of agitation in cleaning a stain?

For extension: children illustrate and explain the process of how soap works.
This list of resources is not exhaustive and should be considered a starting point for finding more information. It is a good idea to also check the parent list as there can be some very useful resources readily available among the families in the school. While many of these resources are Western Australian, teachers are encouraged to find the equivalent resources within their own state.

**People**
- Dentist, nurse or doctor to discuss hygiene and the spread of germs
- RSPCA representative – helping animals remain healthy
- Perth Zoo – animal cleanliness expert
- Vet – dog bathing
- Chemist – how detergents and anti-bacterial solution work

**Websites**
- Mrs Wishy-washy. Contains some excellent information for literacy ideas with the story, and many excellent links. [http://www.thevirtualvine.com/mrswishywashy.html](http://www.thevirtualvine.com/mrswishywashy.html)
- Bathing your dog. Provides step by step instruction, along with photographs, showing how to clean your dog. [http://dogs.about.com/od/grooming/ss/bathingy_6htm](http://dogs.about.com/od/grooming/ss/bathingy_6htm)
- How to make soap, and related soap making information [www.soapmakingfun.com](http://www.soapmakingfun.com)
- The Soap and Detergent Association - Hygiene and children’s news [www.sdahq.org/sdakids/index.cfm](http://www.sdahq.org/sdakids/index.cfm)
- Sustainability on washing and drying clothes. Ways to save water and your clothes in relation to the washing and drying processes. [www.appropedia.org/washing_and_drying_clothes](http://www.appropedia.org/washing_and_drying_clothes)
- American Chemical Society provides educational background information for all ages relating to bubbles, soap, detergent and other aspects of this module. [www.acs.org](http://www.acs.org)
- The Bubblesphere. Contains some great information about bubbles, including answers to many common questions [http://www.bubbles.org/](http://www.bubbles.org/)
- Bubbles. Another great bubbles website. [http://www.exploratorium.edu/ronh/bubbles/bubbles.html](http://www.exploratorium.edu/ronh/bubbles/bubbles.html)

**Interactive story books, for use with computers and/or whiteboard**
- BBC Learning Objects – Ages 5 to 6 Sorting and Using Materials [www.bbc.co.uk/schools/scienceclips/ages/5_6/science_5_6.shtml](http://www.bbc.co.uk/schools/scienceclips/ages/5_6/science_5_6.shtml)
Books

Factual texts


Narrative texts

The prime book used in this module is *Mrs Wishy-washy* written by Joy Crowley and illustrated by Elizabeth Fuller. It is a big book from the Story Box Collection that was published in 1980 by Shortland Publications in Auckland. The story has been reprinted many times and is readily available. Other *Mrs Wishy-washy* books written by Joy Crowley include: *Mrs Wishy-washy’s farm*, *Mrs Wishy-washy’s scrubbing machine*, *Mrs Wishy-washy makes a splash*, and *Mrs Wishy-washy’s splashy splishy day*. Putting ‘Mrs Wishy-washy’ into an online search will provide a plethora of associated material.


Driehus, L. (2008). *Brushing my teeth is fun!*. Western Australia: Toddler be Good. Also available I go to the toilet.


Raps and rhymes

*Bath time* (*ABC*, 1985, p.35)

Splish-et-y, splash it’s bath time,
Slip-er-y, slidy bath time
Splash, splish, now I’m a fish
Swimming around at bath time.

Rub-a-dub-dub, it’s towel time
Pit-apit-pat, it’s towel time
Rub a dub dry
And powder till I
Am warm and sweet at towel time.

*Wet Washing* (*ABC*, 1985, p.34)

Wet washing hanging on the line
Drying very quickly when the weather’s fine
Along comes the wind and flaps it all about
Flip flap, flip flap
Blowing in and out

*This is the way* (text innovation: traditional rhyme, *Here we go round the mulberry bush*)

This is the way we wash our face, wash our face, wash our face, this is the way we wash our face on a bright and shiny morning.

This is the way we brush our teeth, brush our teeth, this is the way we brush our teeth on a bright and shiny morning.

This is the way we brush our hair....

This is the way we clean our shoes.....

This is the way we wash our socks....

*I’m gonna wash this mud right offa my dog* (text innovation: song, *I’m gonna wash that man right outa my hair*)

I’m gonna wash this mud right offa my dog,
I’m gonna wash this mud right offa my dog,
I’m gonna wash this mud right offa my dog
And send it on its way.

I’m gonna rub the water right onto this towel
I’m gonna rub the water right onto this towel
I’m gonna rub the water right onto this towel
Then hang it out to dry.

I’m gonna brush these fleas right outta my dog
I’m gonna brush these fleas right outta my dog
I’m gonna brush these fleas right outta my dog
Then he don’t scratch no more.

So now my dog is nice and clean
So now my dog is nice and clean
So now my dog is nice and clean
And we can go out and play.
CURRICULUM INTEGRATION

Muds and suds: The science of cleanliness

Science
- Develop observational and reporting skills related to washing and drying a dog, self and fabrics
- Explore washing products, their uses, ingredients and packaging
- Consider weather conditions such as sun, wind, rain and shade for drying purposes
- Discuss evaporation
- Invite guest speakers: vet, dentist, RSPCA, ranger
- Make a cyclic diagram of washing a dog
- Classify colours of cleaning products
- Investigate the ‘dryness’ of antibacterial hand wash
- Investigate how well different stains are removed from materials
- Mix, experiment and test to find the best bubble making solution

Society & Environment
- Class survey of family pets
- Survey use of detergents in each child’s home
- Survey best drying and washing conditions
- Investigate the history of washing methods
- Discuss the history of soap
- Interview adults for alternative methods of washing and drying clothes
- Do all pets need humans to clean them?
- Make a pictograph of one or more surveys using advertising material
- Research mud brick houses in other countries
- Discuss ways to develop a healthy community

English
- Descriptive language associated with each object/activity
- Retell dog wash experience: make a series of drawings for a class book
- Speaking and listening through discussion, brainstorms, retells, interviews, show and tell presenting a TV program
- Develop a word wall for associated words
- Develop a story book for each child to develop understanding of personal hygiene using words, drawings and photos
- List and discuss ‘wash sayings’: ie clean as a whistle, all froth and bubble
- Record ideas, lists, procedures and use as environmental print
- Report actions, processes and outcomes orally, written or sequential drawings
- Discuss the labels on toothpaste and soap packets

Health & Physical Education
- Discuss personal hygiene – list ideas
- Why should we be personally responsible for our hygiene?
- How do we help others by keeping personally clean?
- Invite medical person (dentist/doctor/nurse) to discuss hygiene
- Discuss procedure to wash hair or clean teeth
- Discuss and model steps to wash and dry hands correctly
- Investigate chemicals: find warning labels on containers of cleaning products
- Safety storage, personal and young sibling danger
The Arts
- Make bubble prints
- Display photographs of various investigations
- Drawings of dog washing
- Sing washing songs
- Role play being Mrs Wishy-washy and cleaning the animals
- Role play being an animal: have a dust or bird bath, rolling in the mud
- Create a collage of toothpaste or soap labels and pictures
- Listen to wash board music
- Charcoal drawings of a windy day/drying washing
- Make clay sculptures of animals

Mathematics
- Make tallies from data gathered in survey
- Count the number of pets/dog breeds in class
- How to measure a bird in order to make the bath for T&E project
- Survey minutes taken for a shower for each child, sum the total and discuss whole class results
- Estimate how many bricks are needed for the third little pig’s house
- Measure the time for drying
- Make a pictograph of toothpaste and soap brands used in homes
- Classify toothpaste and soap brands into different categories
- Squeeze the contents of a toothpaste tube and measure using arbitrary units

Technology & Enterprise
- Design and make a waterproof bird bath
- Photograph activities from children’s museum
- Make a PowerPoint presentation of various investigations
- Use computer to design and plan a ‘clean farm’
- Make musical washing instruments for class orchestra (bottles, sticks, washboard)
- Design, make and test a bubble blower from ‘found objects’
- Research and develop a recipe for mud bricks
- Source materials for, and make, mud bricks
- Design and make the third little pig’s brick house

Languages Other Than English
- Discuss washing and hygiene methods in other countries
- What pets do children have (and wash) in other countries?
- According to which LOTE is taught, make an associated word chart in English and contextual language
- Find the words ‘mud’ and ‘wash’ in a variety of languages
The five Learning Outcomes of the *Early Years Learning Framework* provide broad and observable outcomes of young children’s learning and development. Examples of these outcomes in relation to *Muds and Suds: The science of cleanliness* are presented below. As there are many ways that children express their learning, these should be considered a guide only.

### Outcome 1. Children have a strong sense of identity

<table>
<thead>
<tr>
<th>Children feel safe, secure and supported</th>
<th>Children develop knowledgeable and confident self identities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• openly express ideas about being dirty and how they get clean</td>
<td>• use home language or standard Australian English to construct meaning of products used for personal hygiene</td>
</tr>
<tr>
<td>• listen to and respond to ideas from others about cleaning their bodies</td>
<td>• write own name in chocolate mousse or mud</td>
</tr>
<tr>
<td>• know it is OK to get dirty and that keeping clean is sometimes difficult</td>
<td>• share the development of a clean farm with classmates</td>
</tr>
</tbody>
</table>

**Children develop their emerging autonomy, interdependence, resilience and sense of agency**

| • celebrate own success in cleaning objects | **Children learn to interact in relation to others with care, empathy and respect** |
| • acknowledge that some animals need assistance to keep clean | • contribute to shared play about the animals on Mrs Wishy-washy’s farm |
| • confidently demonstrate how to wash and dry hands | • engage in cleaning of toy animals |

### Outcome 2. Children are connected and contribute to their world

<table>
<thead>
<tr>
<th>Children develop a sense of belonging to groups and communities and an understanding of the reciprocal rights and responsibilities necessary for active community participation</th>
<th>Children become aware of fairness</th>
</tr>
</thead>
<tbody>
<tr>
<td>• conduct a painted handshake to demonstrate community responsibility</td>
<td>• discuss and demonstrate choices about what is used to clean teeth</td>
</tr>
<tr>
<td>• express an opinion about the usefulness of farm animals</td>
<td>• recognise that others are entitled to a turn when contributing to a 3D mind map</td>
</tr>
<tr>
<td>• allows others to join in constructing a bird bath</td>
<td>• think critically about the fairness of Mrs Wishy-washy’s animals rolling in the mud after a bath</td>
</tr>
</tbody>
</table>

**Children respond to diversity with respect**

| • explore farming stories from different cultures | **Children become socially responsible and show respect for the environment** |
| • listen to others’ ideas about the importance of cleanliness | • use dramatic play to pretend to wash and dry the clothes |
| • respect coexistence of people with differing opinions about certain farm animals | • comment on differences between farming pigs in sheds, in straw, and in the natural environment |
|                                                                 | • consider reasons for not putting detergents onto the garden |

### Outcome 3. Children have a strong sense of well being

<table>
<thead>
<tr>
<th>Children become strong in their social and emotional wellbeing</th>
<th>Children take increasing responsibility for their own health and physical wellbeing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• make choices about personal care and hygiene</td>
<td>• conduct a checklist of personal requirements before eating</td>
</tr>
<tr>
<td>• demonstrate confidence during dirty play and experiments like making mud pies</td>
<td>• independently wash hands after using the toilet</td>
</tr>
<tr>
<td>• celebrate the success of building a bird bath</td>
<td>• becoming alert to slippery situations and being able to physically negotiate them</td>
</tr>
</tbody>
</table>
Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity
- express curiosity about the structure of potter’s clay
- engage in washing a dog in either a real or pretend situation, by asking questions or offering advice
- wonder about the structure and creation of bubbles

Children develop a range of skills and processes such as problem solving, enquiry, experimentation, hypothesising, researching and investigating
- test a variety of bubble making devices to find the most suitable
- survey the number of children in class who own a dog and represent data as a simple graph

Children transfer and adapt what they have learned from one context to another
- count the number of legs each of Mrs Wishy-washy’s farm animals have
- use knowledge of farm animals to make clay models
- role play Mrs Wishy-washy and the animals getting bathed

Children research their own learning through connecting with people, place, technologies and natural and processed materials
- use their senses to describe differences between mud and mousse
- investigate different ways of getting dirty or clean
- talk with a vet about animals that clean themselves and animals who need help to keep clean

Children interact verbally and non-verbally with others for a range of purposes
- describe the sequence of washing a dog
- listen to stories of others about their animal cleaning experiences
- using movement and dance pretend to be a bubble on the wind

Children engage with a range of texts and gain meaning from these texts
- co-construct a book that retells making clay animals
- write and read words about being dirty and clean or sayings such as ‘clean as a whistle’ on a Mud Word Wall
- share story books about personal hygiene

Children express ideas and make meaning using a range of media
- draw in detail a pig or a duck
- make bubble prints for wrapping paper
- create a finger painting using mud

Children begin to understand how symbols and pattern systems work
- construct a basic understanding about the workings of soap, water, and agitation to remove dirt
- create patterns using cut outs of cows, ducks and pigs
- recognise cleaning products and create a 3D mind map using them

Children use information and communication technologies to access information, investigate ideas and represent their thinking
- make a personal account of washing animals using information and communication technologies
- collect photographs of animals from around the world and classify into domestic and wild categories
- draw their favourite animal from the farm using information and communication technologies

### Science Understanding

#### Biological sciences
- The importance of personal hygiene to stay healthy
- The correct way to wash hands
- Why animals clean themselves the way they do
- Why do pigs roll in the mud?

#### Chemical sciences
- How do soaps and detergents work?
- What ingredients are placed into cleaning products?
- Bubbles: what are they and where do they occur?
- The importance of clay to build and sculpt

#### Earth and space studies
- Mud: what does it look, feel, smell and sound like?
- How are mud and sand different?
- What weather is best for drying clothes?
- What happens when you mix sand and water?

#### Physical sciences
- Why is agitation important in the cleaning process?
- How does wind assist in drying clothes?
- The place of evaporation in drying puddles
- How can mud be turned into bricks?

### Science as a Human Endeavour

#### Nature and development of science
- What does a chemist do?
- How do chemists help develop cleaning products?
- What is the role of vets in looking after animals?
- Develop simple questions about the history of washing to explore

#### Use and influence of science
- The importance of daily personal cleanliness
- How to wash hands properly
- The importance of keeping pets clean
- The dangers of germs

### Science Inquiry Skills

#### Questioning and predicting
- What do the children know about washing themselves?
- How did Mrs Wishy-washy wash the animals?
- How do animals clean themselves?
- What would happen if people didn’t clean themselves?

#### Planning and conducting
- Research the different ways that animals clean themselves
- Use senses to describe clay mud and mousse mud
- Spray or paint letters with water on the ground
- Investigate the differences between agitation and no agitation when cleaning a stain

#### Processing and analysing data and information
- Compare times used to dry fabric: one in sunshine and the other in shadow
- Compare actual results of agitation investigation with predictions
- Classify animals by the different ways they clean themselves
- Which feels better: clay mud or mousse mud? Was this expected?

#### Evaluating
- Discuss similarities and differences in clay mud and mousse mud
- Compare agitation and no agitation stains and discuss similarities and differences
- Using class results of drying fabrics, identify the best place in school to dry fabric
- Compare the different ways animals clean themselves to how people clean themselves

#### Communicating
- Role play the Mrs Wishy-washy story
- Develop a Mud Word Wall
- Use the senses to describe mousse mud
- Create a bubble story
CASE STUDY 4: HEALTHY SCIENCE!

Background
Lily (a pseudonym) is a fourth year pre-service teacher who completed her 8-week final teaching practicum with a mixed gender class of 26 Year 1 children in a Perth independent school. Lily was enthusiastic about teaching science, but hesitant as to how she should go about this.

How was the book used?
Lily was asked by her supervising teacher to teach the theme ‘Looking after your body’ for Health. To assist her programming, she consulted Muds and Suds: The science of cleanliness within Planting the Seeds of Science. Lily looked for activities that would relate to germs and cleaning your body. She highlighted these activities, placed them into her developing program, and allocated them to a specific week and lesson prior to starting her practicum. The day before the lesson, Lily looked over the allocated activity and adjusted it according to the specific needs of the class and its context.

How was the module modified?
As suggested in Muds and Suds: The science of cleanliness, Lily started her program by reading Joy Crowley’s Mrs Wishy-washy to the children. The children had not read this book before, and Lily was delighted that she could introduce such a fun book to them. When asked to role play the characters in the story, Lily found the children instantly captivated. What surprised her was the children’s eagerness to continue with the role play in their free time. One child would choose to read the book, others would get dressed up as the characters, and the whole class would entertain themselves with the story.

An overview of the book
Lily found Planting the Seeds of Science provided her with wonderful ideas to assist in the development of her health and science program. The flexibility to pick and choose activities from any modules that were most appropriate for her class was considered a real strength of the book. Lily continually referred to the activities, resources, assessment, Q&A and integration components of Muds and Suds: The science of cleanliness as she found they contained the “essential information needed when planning and documenting learning.” She also frequently referred to the book to capitalise on the ideas for her planning.

Lily particularly liked to use the integration of the different learning areas within the modules. Even though she was required to teach health, she had access to a science book which gave her not only excellent health activities and ideas, but provided answers to many of the questions the children asked. The integrated approach of the book allowed Lily to effectively link science across all the learning areas, and teach a new topic with confidence and success.
THE SUN CHANGES EVERYTHING!

CHRISTINE HOWITT, ELAINE BLAKE AND MARTINA CALAIS
## CONTENTS

Overview .......................................................... 103
Module outline .................................................... 104
Introduction: Freda the frilled neck lizard ...... 105
Focus questions .................................................... 106
Reptile roundup .................................................. 106
The power of the Sun ...................................... 108
What was hot and what was not? .................. 109
Melt down! ......................................................... 111
Melting ice ......................................................... 112
Conclusion: Solar chefs .................................... 113
Q&A ................................................................. 114
Assessment ........................................................ 115
Resources .......................................................... 116
Curriculum integration ..................................... 118

Connections to *Early Years Learning Framework*: Learning Outcomes ............. 120

Connections to *The Australian Curriculum: Science* ........................................ 122

Case study 5. Science as the basis for integrated programming ......................... 123

Case study 6. More than “just rubbish”: Kindergarten solar cooking .................... 124
Children can easily relate to their experiences of warmth from the Sun and other heat sources. *The Sun changes everything!* has been designed around everyday experiences to expand children’s knowledge about how the Sun’s heat and light energy influence their lives.

Energy is a very abstract concept for young children to comprehend. It is therefore best to focus on how energy is associated with situations undergoing change that they can easily relate to, rather than trying to define energy. Hence, the emphasis within this module is on the influence of the Sun’s energy on a child’s everyday life and how the Sun’s energy creates changes.

*The Sun changes everything!* has seven sub-themes, each with several ideas and activities. The module begins with a puppet, symbolising an Australian reptile in search of a suitable place to warm up. A frilled neck lizard called Freda is used to introduce reptiles and their need of the Sun’s light energy. The characteristics of a lizard are then compared with those of a human. This is followed by a sequence of activities to investigate the power of the Sun by identifying warm and cool places inside and outside the classroom, and how a range of familiar objects can change if left in sunlight. The module concludes with the production of a basic solar cooker to make ‘sun-bread’. Freda features throughout the module with reference to her need of the Sun’s heat to live. Ideas are included to investigate reptiles further, if desired.

It is recommended that Health and Safety issues, including the handling of reptiles and hot items, not looking directly into the Sun or bright lights, acknowledging allergies, and protecting the skin from sunburn, are discussed at appropriate times throughout this module. To ensure the warm sunny conditions necessary to illustrate various activities, this module should be conducted in either Term One or Term Four.

An outline of *The Sun changes everything!* is provided in the following table, demonstrating opportunities to integrate the module within the curriculum. Many of the activities presented in this module also have links with Biological sciences and Physical sciences within the Science learning area of The Australian Curriculum.

Ideas and activities presented in *The Sun changes everything!* are suggestions to engage children. Allow them to guide the direction their learning takes. Flexibility is the key to working with young children and for using this resource.
### Module Outline

#### The Sun Changes Everything

<table>
<thead>
<tr>
<th>Sub Theme</th>
<th>Ideas</th>
<th>A</th>
<th>E</th>
<th>M</th>
<th>H&amp;PE</th>
<th>LOTE</th>
<th>S</th>
<th>S&amp;E</th>
<th>T&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freda the frilled neck lizard</strong></td>
<td>Warming up to Freda</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Personal warming experiences</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Lizard like</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Freda’s trip home</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Reptile roundup</strong></td>
<td>Up close with reptiles</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Reptilian homes</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>The power of the Sun</strong></td>
<td>The Sun and us</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Whether the weather is hot or cold</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Measuring the power of the Sun</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>What was hot and what was not?</strong></td>
<td>Hot potato!</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>My spot in the Sun</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Environmental walk</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Warming up in the Sun</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Warming without the Sun</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Hot spots</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Melt down!</strong></td>
<td>Melting clocks</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Melting chocolate</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Melting objects</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Melting ice</strong></td>
<td>Melting ice</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Melting icebergs</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Cooling down</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td><strong>Solar chefs</strong></td>
<td>Solar ovens</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Sun-bread</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Reptile party</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

Possible curriculum links: A (Arts), E (English), M (Mathematics), H&PE (Health & Physical Education), LOTE (Languages other than English), S (Science), S&E (Society and Environment), T&E (Technology and Enterprise)
**INTRODUCTION: FREDA THE FRILLED NECK LIZARD**

**Warming up to Freda**

For the purposes of this module, a story involving a puppet called Freda the Frilled Neck Lizard is used. The story revolves around Freda waking and asking children to help her find an appropriate place to warm up. Freda explains to the children that reptiles cannot move quickly without the help of a heat source, usually provided by the Sun. Lizards need to move quickly in order to survive: to out run predators and to catch food. If a toy frilled neck lizard is not available, substitute with any other Australian reptile puppet or toy. Children may like to name the puppet, as it is used throughout the module.

Children brainstorm various warm places in the classroom and, along with Freda, move there to feel the warmth of each place. What is the source of heat for these warm places? Is it the Sun or is it something else, like a heater? Identify the warmest and coolest places in the classroom. Ask children, If you were Freda the frilled neck lizard which place would you choose to warm your body? and, Why would you choose this place? Children then draw a picture with Freda in the spot they chose. Their illustration should also demonstrate the source of heat or warmth. This source could even be themselves, using their body to keep Freda warm.

**Personal warming experiences**

Chart children’s responses about the different ways they can become warm or hot (increase body temperature). Responses could include cuddling a hot water bottle, standing near a heater, running around, wrapping up in a quilt, wearing a coat/gloves/scarf, or drinking hot soup. Repeat this process to obtain children’s experiences of different ways to become cold.

Using individual T charts, ask children to draw a picture of themself when they are warm and when they are hot, so that a comparison can be made between feeling warm and feeling hot. Alternatively, ask the children to draw a picture of when they are hot and when they are cold. Children tell the story to others.

Collect images from post cards, magazine cut outs, travel brochures and photographs that show both hot/cold places or warm/cool places. Children classify the images into suitable temperature categories, such as cool, warm, hot, cold.

To assist literacy development, make a Sun Word Wall and add all associated words that emerge while developing *The Sun changes everything!* Include the scientific concept that heat energy from the Sun helps reptiles survive. If another language is used or taught in class, use this to add word variations where appropriate.
Lizard like
Discuss the similarities and differences between humans and reptiles. Look closely at the body parts of a reptile and compare with the children’s body parts. Draw the outline of one child, and draw the outline of a reptile. How many legs does a reptile have? How many legs does a human have? A reptile has a tail. Does a human have a tail? How does a reptile’s face differ to that of a human? Record comparisons.

Using an appropriate DVD or video about reptiles (see Resources), show the children pictures of reptiles warming up in the Sun, moving over natural terrain, racing to avoid danger, and chasing and eating their food. How does a reptile run? How is this different to the way humans run? Move outside and ask children to try running like a lizard. Have ‘lizard’ races.

Role-play being a cold, slow reptile then warming up and moving faster. Select appropriate music with slow and fast sections for the role play. Discuss with the children why they think certain types of music are ‘fast’, ‘slow’, ‘warm’ or ‘cool’.

Investigate opposite words: cool/warm, cold/hot, slow/fast, drowsy/alert and list on the class word wall. Use these words to describe Freda under certain conditions. For example, Freda is fast in the middle of the day because she has warmed up. Or, Freda is slow in the morning because she has not yet warmed her body. Children could use the same words to describe themselves. For example, they are fast when chasing a friend, but slow when they are tired.

Freda’s trip home
Develop a take-home science bag that includes Freda, a digital camera, a log book and a digital thermometer. In turns, children take this bag home overnight and record Freda in the coolest spot and the warmest spot at their home. With an adult, the child measures the temperature of three different places inside the home then records these measurements in the class logbook. This could relate to sensory feeling of warm, hot, cool or cold, or the use of a thermometer. They also record the time and location. The warmest place is identified in the home, and a photo is taken of Freda and the child in that place. The next day the child shares their experience in class. Download the photo for the whole class to see.

As the whole class gathers their data, a class summary of warmest places can be developed. Is there one place that is consistently warmer in homes that Freda visits? Compare the different places in the home where children measured the temperature?

FOCUS QUESTIONS RELATING TO THE INTRODUCTION
Possible focus questions to direct student thinking
1. Is it better to feel warm or cold?
2. How do you know when you feel warm?
3. How can you warm up when you are cold?
4. What makes a place warm (or cold)?
5. What is a reptile?
6. How are reptiles and humans the same?
7. How are reptiles and humans different?
8. Why do reptiles need to find warm places?
9. Why do most reptiles prefer to live outside rather than inside?
10. Where would reptiles live in the wild?

Up close with reptiles
Ask the children what they know about reptiles and what they want to find out about them. Brainstorm Australian reptiles such as snakes, lizards and crocodiles. Where do these reptiles live? Do the children have any stories to tell of previous experiences with reptiles? List names for reptiles in Aboriginal language or other languages appropriate to the school. What other reptiles do the children know of that don’t live in Australia?

Organise an incursion or excursion to advance the reptile part of this module. An incursion could involve borrowing reptile specimens from the Perth Museum, or inviting a group such as Radical Reptiles to bring reptiles into the school for children to observe, and perhaps pat, a real reptile. (See Resources). Discuss safety and responsibility in handling or disturbing reptiles.

Ask the children to use the senses of sight and touch to observe and describe the reptiles. What are the usual colours of reptiles? Discuss camouflage. Look closely at human skin, and then look at the scales on a reptile. Using a magnifying glass look closely at the scales: what shapes and colours are they? Why do reptiles have scales? (See Q&A)

With a fine tipped pen draw a reptile in detail. A mosaic reptile could be made where pre-cut scale shapes are glued onto the outline of a reptile. Models of children’s drawings could also be made from clay or play-dough, using a wooden skewer to outline reptilian scales.
Search for pictures and other information about reptiles in books, from home and on the web. Make a class chart ‘I found out that a reptile...’ to highlight new information. Place the name of the child next to the item of information they provided.

I found out that a reptile...
...has eyes.
...has a tail.
...can have 4 legs or no legs.
...lays eggs. (some don’t)
...needs to warm up in the Sun.
...feels vibrations.
...has bones.
...can be a pet.
...is a cold blooded vertebrate.
...can be a lizard, a snake, a turtle, a tortoise or a crocodile.

In small groups, discuss and draw plans for Freda’s home being mindful of engineering qualities such as size, strength and practicality. Remember, the puppet Freda has to fit into her new house, keep warm and be well camouflaged. Encourage the children to label their plans.

Using the agreed plan, children construct Freda’s house. For records of progress, photograph construction phases as well as the final product. These photographs could be used in a PowerPoint to demonstrate sequence, accomplishment and illustrate the procedure to others. Children then evaluate the reptilian house with Freda, and make any required changes. Record these changes and why they have been made.

Have a sharing session, perhaps using the PowerPoint, where each group presents the construction process of their home for Freda to the rest of the class and explains which materials were used and why they were used.

Reptilian homes

Using the technology process, invite the children to build a reptilian ‘home’ for Freda. Investigate where frilled neck lizards live in the wild. Recall camouflage and other needs of lizards.

Invite the children to develop some criteria for Freda’s home such as colour for camouflage, strength for longevity, and warmth for survival. Ask the children to come up with a list of materials which they think satisfy these criteria. Encourage the use of natural suitable materials including bark, wood, stones, and sticks.

Provide a range of both natural and man-made materials. Children explore these materials before designing Freda’s home. For each material, develop a Y-chart that describes colour, strength and warmth or any other criteria considered important for Freda’s home. Discuss with the class how to find out if the chosen material would become warm enough if left in the sunlight. Consider results on cloudy and wet days.
THE POWER OF THE SUN

The Sun and us
To find children’s prior knowledge, ask what they know about the Sun. Construct a mind map with the Sun as a central figure to illustrate this knowledge. Add any key words to the map as they are offered, for example, heat and light. Discuss how we benefit from the Sun through its heat and light energy.

Children could draw images they wish to add to the map. These could include the benefits of the Sun like playing at the beach in summer and limitations, such as getting sun burnt or hurting eyes if they look directly at the Sun.

Reinforce the concept of ‘No hat – no play’ and discuss why schools have this rule. Discuss the ‘Slip, slop, slap, wrap’ message. Children could create their own message based upon the same health and safety principles in relation to the Sun. Video the children’s results and share with the rest of the school and wider community.

Whether the weather is hot or cold
Is today a hot day or a cold day? What makes a hot day or cold day? Can the weather be warm and cool on the same day?

List who feels best on a warm day and who prefers cooler weather. Discuss how the children feel in different weather. Could the weather or temperature be represented by colours? Develop a colour scale from ‘really cold’ to ‘very hot’. A commercial paint colour chart could be used to provide a range of colours.

Take the children on a ‘weather walk’ around the school yard to identify places they think are warm or cool. Create two maps of the playground, one showing warm and cool places in the morning and the other showing warm and cool places in the afternoon. Select appropriate colours to distinguish the warm and cool places on each map. Compare the two maps and look for places that are cool in the morning yet warm in the afternoon. Can the class explain how a cool place warms up? Make a time-lime of one place noting temperature changes during the day.

Measuring the power of the Sun
Develop a daily weather chart with the children. Gather information from the newspaper or do an on-line search. Ask children to make predictions as to whether the day will be warm/hot or cool/cold, and why they made that prediction.

Introduce a thermometer with an LCD display and show the children how to read it. Children then use this thermometer to read the temperature of the classroom or some other place, at regular times during the day. Develop a classroom weather chart using numbers or representative colours to record the information they gather.

If there are children in class with languages other than English, encourage them to use that language to provide descriptions of the day’s weather for classmates.
WHAT WAS HOT AND WHAT WAS NOT?

**Hot potato!**
What experiences do children have with hot objects? How do adults pick up hot objects at home? What precautions do they take? Discuss safety aspects with hot things. Set up a kitchen corner with plastic objects. Place the words ‘HOT’ (in red) and ‘COLD’ (in blue) on various cooking utensils including pots and pans. Encourage the children to play with these objects, ensuring they use oven gloves when picking up the ‘hot’ objects.

Play Hot Potato with the children. Select an object to be the ‘hot potato’. Children stand in a circle and pass the object around as quickly as possible without dropping it. Children without the ‘potato’ rub the palms of their hands and chant ‘Hot potato, hot potato, do not stop; Hot potato, hot potato, do not drop’. Repeat this chant as the ‘hot potato’ is passed from child to child. If a child drops the ‘hot potato’ they stand out of the circle.

**My spot in the Sun**
Investigate how the sun can warm objects outside. Children select one object from the classroom which they think will warm up if placed outside in the sunlight. Attach a name tag to the object and allow children to decide where they will place it. Once each child has placed their object in ‘their’ spot, ask them why they decided to put it there. Select a suitable amount of time to leave the objects outside – depending on the weather conditions. Did the object become noticeably warmer? Remind the children about safety concerns if doing this on a very hot day.

**Environmental walk**
Conduct an environmental walk around the school. Children are invited to carefully touch a range of objects made from different materials to discover what is warm and what is not. On the walk take photographs of objects that have been touched.

Create a chart titled ‘What is hot and what is not?’ with the headings: Name of the object. What is it made of? What does it feel like? Back in the classroom this chart could be developed by adding the photos to the first column, representative objects, or descriptions to the second column, and children’s words to the third column. For the second column drawings or small pieces of metal, plastic, glass, cardboard, or wood could be used to represent the different objects touched on the walk. These representative objects may be obtained from ReMida (see Resources) or scrap yards. Once again, remind the children about safety concerns if doing this on a very hot day.

With assistance, children record their investigation based on the following sentence template. A labelled drawing depicting the location could also be added. Alternatively, take photographs of the object outside in the Sun, with its label.

My __________ felt __________ before I placed it outside.
I put my __________ on the __________ near the __________.
My __________ felt __________ after it had been in the Sun.
Warming up in the Sun

Having identified the ‘hot spots’ in the playground, perform a class investigation with different coloured plastic cups to determine if one colour heats up more than others. Ensure that one cup is very dark or black in colour. Feel the cups before and after they have been in the Sun. Did the cups warm up? Which colour warmed the most and which colour warmed the least? Is it possible to place the cups in order from hottest to coldest? Invite the children to retell how they conducted the investigation and what they found, by gluing small coloured pieces of paper, representing the coloured cups onto a chart.

As an extension, repeat the same investigation using different coloured materials. These could include various pieces of coloured cloth, black plastic, alfoil and brown paper. Place materials on a flat surface and leave in the Sun. Children predict which will become hotter. Let them feel the materials at the beginning of the investigation and again after they have been exposed to sunlight. What do they notice?

Freda wants a scarf to help her warm up because she has shed some of her scaly skin. What colour material would you use to keep Freda warm? Draw Freda with her new scarf. Why is it not necessary for real lizards to wear a scarf? Why are lizards the colour they are? Why do lizards shed their skin? (See Q&A)

Warming without the Sun

Conduct a survey to find how children’s homes are heated in the winter. Graph the results using a simple bar graph demonstrating the use of gas, electricity or solid (wood/coal) fuel.

Create a ‘convection’ snake to illustrate how heat energy can move air. Draw a snake on paper in a spiral position. This snake could be coloured to represent The Rainbow Snake. Cut the snake according to its spiral design and attach to a rod over a heater. With the heater turned on, the snake will move in spirals. This is the effect of hot air rising from the heater. (See Q&A)

Hot spots

Why do reptiles lie on a road, the sand or a path on a warm day? Ask children to relate childhood stories of walking on a hot footpath, a hot road or on hot beach sand. Record their stories then connect their scenario with that of the lizard.

Some places in the world are not like Australia. Some are very, very cold and others are very, very hot. Find cold and hot places around the world using a globe, world map or the internet. How do children in cold countries keep themselves warm? How do children in hot countries keep cool? How did people keep themselves warm or cool before electric heaters and air conditioners were invented?
MELT DOWN!

Melting clocks
Present the Salvador Dali painting, *The Persistence of Memory*, as a stimulus. What objects are in this picture? Would these objects normally look like that? What do you think has happened to these objects?

![The Persistence of Memory](image)

What do children think the term ‘melt’ means? Using a T-chart, discuss objects they think melt easily, and objects that do not melt easily.

Elicit children’s experiences with melting, such as eating an ice cream. Imagine the melting ice cream dripping down the hand and clothes. What language would they use to describe this melting ice cream? Add these ideas and words to the word wall. Role-play eating a melting ice cream.

![Melting ice cream](image)

Melting objects
Refer back to the Salvador Dali painting and extend the children’s imagination by asking how hot it would have to get to really melt clocks. Use the internet to find out how hot the Sun is, and how hot it needs to be to melt roads. Can the children find pictures of melted objects on the internet? Do they think the Sun is hot enough to cook food? If they are unsure, leave them to think about the possibilities as they are addressed later in the module.

What happens to a candle in the Sun? Encourage children to use their imagination to describe and draw an object, for example a chair or table, and what it might look like if melted. Dramatise themselves as candles melting in the Sun. Construct a class melting poem.

Ask children to interview their parents using the question: What’s the oddest thing you have seen melted by the Sun? Make a chart of these stories as children share them with the class. Alternatively, invite the parents into class to tell their ‘melting’ story.

![Melting butter](image)

Melting chocolate
Perform a class investigation that melts chocolate in the Sun. Ask children if they think the Sun could melt a piece of chocolate and gather estimations of how long it will take. Place chocolate on a small white plastic plate and decide which of the identified ‘hot spots’ around the school would be best for their investigation. Take a photo of the original unmelted chocolate and then, at regular intervals, depending on the weather conditions, photograph the chocolate and ask children to describe what they see. Replay the photographs as a PowerPoint slide-show to demonstrate the process of melting. Different brands of chocolate melt at different rates due to the additives in the chocolate. Try melting different brands before selecting one for this investigation. Alternatively, substitute butter for the chocolate. Inform the children that the chocolate cannot be eaten during this investigation.

At the end of the investigation ask children what will happen to the melted chocolate if it is placed in the fridge. Will the chocolate turn back into its original shape? Take a photo after it has been in the fridge for an hour. Compare this picture to the original taken at the start of the melting investigation.

![Melting chocolate](image)
Melting ice
Place an ice cube into each child’s hand. Ask them what it feels like? Capture any stories that the children start to tell as the ice cube begins to melt. Add their descriptive words and sentences to the class word wall.

How quickly can an ice cube melt in the Sun? Each child places an ice cube into a named cup. They then select a place outside where they think their ice cube will melt fastest. Check the progress of the melting ice cubes over regular time intervals. Share results to find which place was best suited to melt the ice cubes.

Ice cubes or ice blocks can be made in plastic cups or ice cream containers to provide many great investigations into melting. Observe a coloured ice block melting in water. How does it melt? Which part melts first? Predict how long it takes to melt an ice cube or ice block, and then test this prediction.

What happens to a melting ice cube if you place different objects, such as a key, on the ice cube? Make sure the ice is placed into a container to collect the melting water.

Melting icebergs
As a whole school activity, ask every family to make a coloured or plain ice block in an ice cream container. Have a set day and reserve a place at school such as the basketball court to conduct the investigation. Research icebergs via the internet, books and stories. On the arranged day, families bring iceblocks to school. Make two ‘icebergs’ using the collected ice blocks: one in direct sunlight and one in the shade. Join the iceblocks together with salt.

Have students and parents make a prediction as to which ‘iceberg’ will melt first, and how long it will take for the ‘icebergs’ to melt. Encourage the children to dress up in winter clothes, such as beanies, gloves, and scarves for the occasion. Take a series of photographs of the melting ‘icebergs’ throughout the day for discussions about the activity, for the school newsletter, and for scientific records.

Cooling down
Conduct a survey to find children’s favourite way of cooling down after a hot day at school. Examples could include a swim in the pool, a change of clothes, a visit to the beach or river for a swim, use the air conditioner to cool a play room, suck ice, drink icy water, have a cold shower. Make the results into a class book called ‘The best way to cool down on a hot day.’
CONCLUSION: SOLAR CHEFS

Solar cookers
Inform the children that another name for the Sun is Sol. This is the derivation of the Latin word ‘Solaris’ and the English word ‘solar’.

Ask the children if they think the Sun is hot enough to cook food, and encourage reasons for their answer. Discuss how people in places without gas or electricity cook their food. How can we use the sunlight to help cook food? What are the benefits of solar cooking? Some people who build solar cookers are called engineers. Engineers understand the science of cooking with the Sun. Inform the children that they are going to pretend they are engineers and build a solar cooker to cook ‘sun-bread’. Why would we call it a ‘solar’ cooker? Could ‘sun-bread’ be called ‘solar bread’?

Sun-bread
Perform this activity on a warm, clear and sunny day. Equipment required includes dough (self raising flour, a little salt and water), paper cups, dark paint, elastic bands and plastic wrap. Damper dough is perfect and could be made prior to this activity or with the children.

To prepare mini-solar ovens, children paint a paper cup each in lizard colours such as black or dark brown. While waiting for the paint on the cups to dry, allow the children to investigate the pre-made dough, or take this opportunity to make it with the children. Ask them to describe what the dough looks like, smells like and feels like. Record the children’s responses. This is an important step that will be repeated after the dough is cooked to discuss changes. Explain that sun-bread is an experiment and should not be eaten.

When the paint is dry, each child rolls a dessert spoon of dough and places it inside their cup. Ensure there is a spare cup with dough to act as the ‘tester’. Place plastic wrap over the top of each cup, and hold in place with an elastic band. Put the cups with dough inside in direct sunlight for best results. An adult will need to check the ‘tester’ at 30 minute intervals. As the bread cooks a crust will form on the outside. These can be tested by ‘knocking’ the top of the bread. It should sound hollow when cooked.

While waiting for the sun-bread to cook, record the procedure using words, drawings, photographs or any other media that children can easily relate to. Once cooked, the children remove their sun-bread and describe it using the same questions as before: what does it look like, smell like and feel like. Note the differences between the description of the dough and the description of the sun-bread. Discuss with the children what caused these differences.

As an extension, investigate having half the cups lined with alfoil and half not lined (as photographed). What differences can be found in the sun-bread between the alfoil lined and unlined cups? Alternatively, box solar ovens could be used to cook mini-muffins. See Case Study 6 which provides an example of solar cooking with boxes in a Kindergarten class.

Reptile party
Let the children plan a reptile party for Freda. Make a list of reptilian friends that could be invited and reptilian games they could play. What type of weather would be the best for a reptile party? Write invitations for the party. Children could bring a reptile toy, picture or puppet to school as guests for Freda’s party. For human consumption, snake jelly could be on the menu. For snake jelly, make jelly in a clear disposable cup and place a lolly snake into the jelly before setting it in the fridge.
WHAT IS THE SUN?
The Sun is a star (not a planet) and is the closest star to Earth (but still 150 million kilometres away). It therefore looks very bright. Actually it is only an average star in our Galaxy (the Milky Way) and there are billions of stars brighter and duller, bigger and smaller. About 1 million Earths could fit into the Sun. The Sun is the most important source of energy for life on Earth. The Sun produces both heat energy and light energy, including the ultraviolet light which can cause cancer if we don’t cover ‘cover up’!

HOW HOT IS THE SUN?
The Sun is the hottest object in our Solar System. The centre of the Sun is estimated to be 15 million degrees Celsius. The surface of the Sun is much cooler (only 5500° C). This is so hot that any object that comes too close to the Sun will melt.

WHAT IS ENERGY?
Energy is a human construct that has been used to help us explain how certain things work. The formal definition of energy is “the ability to do work”. This definition is meaningless in early childhood. A more useful definition is “energy makes things happen”. In teaching about energy to young children it is best to focus on how energy is associated with situations undergoing change, rather than a formal definition of energy. It is possible to trace the energy from the Sun to making plants grow and helping animals to live.

WHAT ARE THE DIFFERENT FORMS OF ENERGY?
There are many different forms of energy.
- Potential energy refers to stored energy. For example, winding up a toy or an old watch or grandfather clock.
- Kinetic energy refers to energy associated with movement. For example, a wind-up toy moving, cars, planes, boats and waves.
- Heat is a form of energy. For example, the heat from the Sun can melt chocolate.
- Sound is a form of energy that is produced by vibrations. For example, feel the vibration on a speaker when you play music.
- Light is a form of energy that is made up of photons. For example, light from a torch, the Sun or a laser.
- Electricity is a form of energy resulting from the flow of electrons. For example, switching on the lights or the television.

WHAT DOES THE TRANSFERENCE OF ENERGY MEAN?
The Law of Conservation of Energy states that matter cannot be created nor destroyed, but it can change form. Hence, any energy form can be converted (or transformed) into a different energy form(s). For example, a wind-up toy that makes sound and also has a light is an example of potential energy (through winding the toy up) being transferred into kinetic energy (the toy now moves), along with sound, light and heat energy.

WHAT IS A REPTILE?
Most reptiles are egg-laying vertebrates (have a back-bone) that have a dry skin covered in scales. They are cold-blooded animals, which mean they cannot generate their own heat. There are four major types of reptiles: snakes and lizards, crocodiles and alligators, tortoises and turtles, and tuataras (only found in two small groups of islands off New Zealand). Most reptiles lay eggs on land and the young emerge fully formed. When a reptile comes straight out of an egg it is called a hatching. Until it is mature, a reptile is called a yearling. A person who studies reptiles and amphibians is called an herpetologist.

WHY DO REPTILES NEED TO WARM UP IN THE SUN?
Reptiles are cold-blooded animals, which mean they do not generate their own heat. Reptiles are unable to keep their body at a constant temperature, like humans can. Hence, reptiles must warm themselves up from an external source, such as the Sun or sitting on a warm road.

WHAT ARE SCALES?
Scales are made of keratin, which is similar in composition to human hair and fingernails. Scales protect reptiles from predators, parasites and dehydration. Scales differ between reptiles. On some species the scales can be different shapes and sizes in different parts of the body. All reptiles replace their scales by shedding their outer skin. This allows room for growth, and also replaces skin that is worn out. Snakes loose their skin in one piece. Lizards, crocodiles and turtles lose their skin in chunks or flakes. Reptile scales differ greatly in size, shape and texture. They may be smooth or rough, and may overlap like roof tiles, butt up against each other, or have layers of stretchy skin in-between. The scales on the back of a crocodile are strengthened by bony plates.

WHAT IS HEAT?
Heat is a form of energy which is felt as warmth by all living things. Animals and plants use heat energy to keep warm and stay alive. Heat is energy transferred from a warmer object to a colder object. Heat can move through certain solids, liquids and gases in three different ways – conduction, convection and radiation.

WHAT IS THE DIFFERENCE BETWEEN CONDUCTION, CONVECTION, AND RADIATION?
Conduction refers to the transfer of heat through a solid. Metals are examples of good conductors. Alfoil is also a good conductor. Wrapping an ice cube in alfoil at room temperature (about 20° C) will increase the rate of melting compared to using no alfoil. Convection refers to the transfer of heat through liquids and gases. Heat travels through water by convection. Placing an ice cube in water will increase the rate of melting compared to using no water. Heat travels through the air as hot air rises. On a large scale, convection currents cause the winds and the sea currents. Radiation means the flow of energy in the form of waves. Radiated energy from the Sun strikes the Earth’s surface and is converted into heat energy. This in turn heats the atmosphere through the convection currents in the air.

WHY DOES HOT AIR RISE?
Hot air vibrates faster than cold air. This vibration moves the particles in the air further apart. Thus, hot air is less dense than cold air and therefore rises.

WHY DOES THE COLOUR BLACK WARM UP THE MOST?
Black absorbs all the colours of the spectrum, thus all the light waves. Other colours, like white and silver or even a mirror, reflect most of the light that hits them.

WHAT IS MELTING?
Melting is the process that results in a substance changing from a solid to a liquid by the application of heat.
Acknowledging children’s many ways of knowing and reporting their information, the following suggestions for diagnostic, formative and summative assessment are presented. Please note that these are suggestions and not prescriptive for the module. Using professional judgement, teachers should decide what is appropriate for their children, their class context, and the specific outcomes hoped to be achieved.

**Diagnostic assessment**

What conceptual information do children have about the sun in relation to light and heat?

What logical explanations were offered to warm Freda the frilled neck lizard?

In relation to temperature have each child provide appropriate examples of hot and cold, warm and cool. What suggestions are made for making a cold object warmer?

What conceptual information do children have in relation to solar cookers?

**Summative assessment**

Children locate warm and cool places within the classroom, and provide an explanation of why those places are warm and cool.

Could children relate (using any form of media) sunlight and its heating ability?

Children draw a sequence of three pictures to illustrate the process of ice melting in their hands.

**Formative assessment**

In relation to the activity Warming up in the Sun, have children retell and demonstrate the investigation using small coloured pieces of paper to represent the cups. Are the coloured pieces placed in order to explain warmer to cooler?
RESOURCES

This list of resources is not exhaustive and should be considered a starting point for finding more information. It is a good idea to also check the parent list as there can be some very useful resources readily available among the families in the school. While many of these resources are Western Australian, teachers are encouraged to find the equivalent resources within their own state.

People
Herpetologist, vet or someone from a reptile centre or the zoo who looks after reptiles
A chef or parent who is familiar with solar cooking
A scientist, librarian or teacher who can talk about the Sun and solar energy
A doctor, nurse or appropriate person to talk about being ‘Sun smart’

Websites
Early childhood sun safe resources: Cancer Council ACT
http://www.actcancer.org/sun-smart/resources-childhood.aspx

ABC TV. For the juniors: Hot weather
http://www.abc.net.au/juniors/pages/weather/hot/intro.htm

WA Museum Loan Exhibits – available for schools all over WA
Email: Loancentre@museum.wa.gov.au Phone: 089 4272859

Perth Zoo

Armadale Reptile & Wildlife Centre - Perth

REmida - recycling centre - Perth
http://www.remidawa.com/links.shtml

National Earth Science Teachers’ Association. Windows to the Universe. The Sun
http://www.windows.ucar.edu/tour/link=/sun/sun.html

Kidcyber – primary student research website

Planet Patrol - How do we capture solar energy?
http://www.planetpatrol.info/se2.html

CSIRO. Scope. Renewable energy.
http://www.csiro.au/scope/episodes/e45.htm

http://solarcooking.org/plans/plans.pdf

CSIRO. Science by email. Pizza box solar oven

Kidcyber. Primary student research website. Reptiles and amphibians

Live Science. All about reptile. Reptile images
http://www.livescience.com/reptiles/

Unique Australian animals. Frilled lizard
http://www.australian-animals.net/liz.htm

The Zoo and Aquarium Association (Education/Animal Fact Sheet/ Frilled lizard)

CSIRO. Frilled neck lizard (Video)

Australian Government - Bureau of Meteorology

Interactive story books, for use with computers and/or whiteboard
Interactive stories for kids. Sun, wind and rain.
http://www.woodlands-junior.kent.sch.uk/Games/educational/onlinestory.htm

www.dreamtime.aus.net/default.asp?PageID=71
Books

Factual texts

Narrative texts

Raps and rhymes
*I’m a little teapot* (Clark, 1995, p. 17)
I’m a little tea-pot, short and stout
Here is my handle, here is my spout
When I get all steamed up, hear me shout
Tip me over, pour me out.

*Ten lazy lizards* (text innovation: traditional rhyme, *Ten fat sausages*...
Ten lazy lizards sizzling in the pan
One went pop and another went BANG!
Nine lazy lizards sizzling in the pan,
One went pop and another went BANG!
Eight lazy lizards sizzling in the pan,
Seven lazy lizards sizzling in the pan,
One went pop and another went BANG!
Six...five...four...etc

*Running to the Corner* (Clark, 1995, p. 76)
Running to the corner
Running very fast
Running to the corner
Getting there at last
I’m puff, puff, puff, puff, puffing,
I’m puffing quite a lot
And I’m hot, hot, hot, hot, hot!

Youtube video
They Might be Giants: *The Sun is a Mass of Incandescent Gas* (song)
http://www.youtube.com/watch?v=me06i9GDM_k&feature=related
Health & Physical Education
- Danger of sun on unprotected skin and eyes
- Physical safety, safe hours to play, shade benefit, reptile danger
- No hat – no play
- Slip, slop, slap, wrap
- Hydration of skin and body
- Cooking and eating rules for safety
- Slither like a snake, run like a lizard
- Melting movements
- Construct movements to warm the body
- Jump on each other’s shadow

Science
- Differences between warm/cool and hot/cold
- How to stay cool on warm days, and how to stay warm on cool days
- Daily temperature variation/weather chart
- Investigating solar energy: what is the Sun?
- Introduction to light and heat energy
- Transference of light and heat energy
- Heating, melting, cooling
- Exploring characteristics of reptiles
- Similarities and differences between reptiles and humans
- Animal skin – scales

Languages Other Than English
- Make associated word charts in English and the school’s LOTE
- Reptiles names in countries other than Australia
- Explore the significance of the Rainbow Snake in Aboriginal culture
- Label parts of lizard using a language other than English

English
- Describe: How does the Sun make you feel?
- Word wall: charts, mind-maps, lists, questions, new vocabulary
- Acrostics: S.U.N.
- Close sentences (see activity: What was hot and what was not)
- Reptile sentences (join descriptive words in snake shape)
- Fiction and non-fiction books for free reading
- Story telling (and/or) retelling
- Verbal presentations of findings to class groups
- Create a ‘Sun Safety’ book related to experiences
- Poetry, raps and rhymes related to sun and lizards
- Opposite language: warm/cool, hot/cold
- Make bookmarks using the Slip, Slop, Slap, Wrap theme

CURRICULUM INTEGRATION
The Sun changes everything!
Mathematics
- Time to measure hours to play, melting or warming objects
- Introduction to temperature and how to measure temperature
- Measuring length of ‘convection’ snake
- Graph time it takes to heat black and white cloth in the sun
- Positional language
- Tally number of homes using solar power
- Map classroom and/or school yard for warm and cool places
- Tessellate ‘reptile scales’
- Collect disused copper 2 cent coins (with frilled neck lizard) and use as non-standard measurement units

Technology & Enterprise
- Design and produce posters for Sun safety
- Design and test a solar cooker that will melt chocolate
- Internet research on reptiles, Sun’s temperature
- Photograph chocolate or ice cubes melting over a period of time, and present results on PowerPoint
- Investigate, design, produce and evaluate a reptile home
- Exploring materials to make a reptile home
- Investigate, design, produce and evaluate oven mitts to assist ‘What was hot and what was not’ investigations

Society & Environment
- At home: how do families heat water, cook, heat/cool the house
- At home: energy saving devices used eg. shade cloth, solar hot water
- Camping: using natural environment to warm, cool and cook
- Cultures: compare own cultural methods of cooking, body protection and uses of natural environment with other cultures
- Investigate places/people/clothing/homes/food that relate to conditions in very hot or very cold climates
- How can we save energy for a sustainable future eg. turn off switches
- What influence does solar energy have on our environment?

The Arts
- Sing ‘Five fat lizards’
- Hot paintings – hot colours
- Make a coiled ‘convection’ snake
- Paint a Rainbow Serpent
- Role play ‘solar chocolate melt’ or ‘snake skin shedding’
- Dance to ‘Here comes the Sun’ or ‘You are my sunshine’
- Torn collage using ‘hot colours’ to fill a lizard shape
- Interpret Dali’s painting The Persistence of Memory
- Produce own ‘melted’ pictures
- Make clay sculptures of a lizard
- Investigate ‘hot’ and ‘cold’ music
- Move like a reptile
The five Learning Outcomes of the Early Years Learning Framework provide broad and observable outcomes of young children’s learning and development. Examples of these outcomes in relation to The sun changes everything! are presented below. As there are many ways that children express their learning, these should be considered a guide only.

### Outcome 1. Children have a strong sense of identity

<table>
<thead>
<tr>
<th>Children feel safe, secure and supported</th>
<th>Children develop knowledgeable and confident self identities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• responds to a warm and caring environment</td>
<td>• use home language or standard Australian English construct meaning of being warm and cold</td>
</tr>
<tr>
<td>• openly explores personal feelings associated with being warm and comfortable</td>
<td>• able to express when feeling hot or cold and ask for help to adjust if needed</td>
</tr>
<tr>
<td>• listen to and respond to ideas about alternative ways to warm up on cool days/cool down on hot days</td>
<td>• share extremes in weather that other cultures may experience</td>
</tr>
</tbody>
</table>

**Children develop their emerging autonomy, interdependence, resilience and sense of agency**

- explore collaboratively to find Freda a new home
- acknowledges that some animals need assistance from the Sun to warm up
- confidently demonstrate how they warm up when cold

### Outcome 2. Children are connected and contribute to their world

<table>
<thead>
<tr>
<th>Children develop a sense of belonging to groups and communities and an understanding of the reciprocal rights and responsibilities necessary for active community participation</th>
<th>Children become aware of fairness</th>
</tr>
</thead>
<tbody>
<tr>
<td>• cooperate with others to show community responsibility and respect for reptiles</td>
<td>• discuss and demonstrate choices about playing safely in the Sun</td>
</tr>
<tr>
<td>• explore possibilities to use the Sun’s heat for sustainable energy</td>
<td>• recognise that it would be unfair to keep a lizard in captivity in an unnatural environment</td>
</tr>
<tr>
<td>• allows others to join in constructing a home for Freda</td>
<td>• think critically about the fairness of sharing cooked muffins from the solar oven</td>
</tr>
</tbody>
</table>

**Children respond to diversity with respect**

- explore stories from other cultures about the use of the Sun
- respond with care to people with food allergies
- respect that some people cannot tolerate the Sun’s light

**Children become socially responsible and show respect for the environment**

- express an opinion about the usefulness of the Sun for our survival
- observe and comment on the affect of the Sun in the natural environment
- explore how the Sun can affect the feel of objects within the playground

### Outcome 3. Children have a strong sense of well being

<table>
<thead>
<tr>
<th>Children become strong in their social and emotional wellbeing</th>
<th>Children take increasing responsibility for their own health and physical wellbeing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• make choices about not touching hot items</td>
<td>• demonstrate confidence, yet remain careful when dealing with reptiles</td>
</tr>
<tr>
<td>• demonstrate confidence applying sun screen, sun glasses and clothing to protect self when playing</td>
<td>• awareness of personal allergies</td>
</tr>
<tr>
<td>• celebrate the success of cooking using a solar oven</td>
<td>• being aware of dangers with hot objects, direct sunlight and reptiles</td>
</tr>
</tbody>
</table>

---

120
Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity
- express curiosity about the scales of a reptile
- express growing patience and persistence when melting ice
- persist when cooking with solar ovens until achievement is reached

Children develop a range of skills and processes such as problem solving, enquiry, experimentation, hypothesising, researching and investigating
- research information about reptiles
- experiment cooking sun-bread using solar ovens
- investigate melting ice using a variety of conditions

Children transfer and adapt what they have learned from one context to another
- repeat chocolate melting experience using ice or other food stuff
- use knowledge of making sun-bread to make muffins for a reptilian party
- role play a candle melting in the hot sun

Children research their own learning through connecting with people, place, technologies and natural and processed materials
- use their senses to describe differences between objects placed in shade and direct sunlight
- investigate the Dali painting *The Persistence of Memory* to find whether other unusual objects will melt
- talk to an engineer about building effective solar ovens

Children research their own learning through connecting with people, place, technologies and natural and processed materials
- use their senses to describe differences between objects placed in shade and direct sunlight
- investigate the Dali painting *The Persistence of Memory* to find whether other unusual objects will melt
- talk to an engineer about building effective solar ovens

Children interact verbally and non-verbally with others for a range of purposes
- describe the sequence of cooking solar bread using the Sun
- listen to stories of others’ experiences using solar ovens, for instance on camping holidays
- design a plan to build a home for Freda the frilled neck lizard

Children engage with a range of texts and gain meaning from these texts
- construct a class book of information about Australian reptiles
- contribute ideas to making a mind map about the Sun and its functions
- share story books about reptiles

Children express ideas and make meaning using a range of media
- tessellate paper representations of scales onto the outline of a lizard
- relate tales of feeling very hot through dramatic play
- tell a reptile story using puppets

Children begin to understand how symbols and pattern systems work
- construct a sign that directs others to where Freda lives
- create very long patterns using outlines of snakes
- begin to understand that weather maps have symbols to help predict the weather

Children use information and communication technologies to access information, investigate ideas and represent their thinking
- using a PowerPoint presentation show and tell the a sequence of melting objects in a solar oven
- using information and communication technologies find a variety of reptiles from other places in the world
- using information and communication technologies draw their favourite reptile
The Australian Curriculum: Science (Version 1.0, 8/12/2010) consists of three interrelated strands: Science Understanding, Science as a Human Endeavour, and Science Inquiry Skills. Examples of these strands in relation to The Sun changes everything! are presented below.

### Science Understanding

#### Biological sciences
- Energy from the Sun is essential for all living things
- The characteristics of reptiles
- Similarities and differences between people and reptiles
- Protection from the Sun

#### Earth and space studies
- The Sun is a star
- Hot, warm, cool and cold places at school
- Describing the weather
- Measuring and recording the weather

#### Chemical sciences
- Objects heat up in the Sun
- Materials that can be used to keep cool or to warm up
- Natural and processed materials to build a lizard home
- Melting: what does it mean and what objects melt?

#### Physical sciences
- The Sun as a source of heat and light energy
- Food as a source of energy
- Reptiles obtain energy from the Sun
- Heat and light energy from the Sun can cook food

### Science as a Human Endeavour

#### Nature and development of science
- What does an engineer do?
- How do engineers help develop solar cooking?
- How do scientists find and record important information about reptiles?
- Develop simple questions about melting to explore as a class

#### Use and influence of science
- Awareness that the Sun’s heat can be dangerous
- Being careful around hot objects
- How to protect the body from the Sun
- How people warm themselves without the Sun

### Science Inquiry Skills

#### Questioning and predicting
- How can you warm up when you are cold?
- What is a reptile?
- Which objects around the school will warm if left in the direct sunlight?
- How long will the ice blocks take to melt?

#### Planning and conducting
- Classify places around school as warm or cool
- Research different Australian reptiles
- Investigate what happens when butter is placed in direct sunlight
- Make a solar cooker and cook sun-bread
- Observe and describe dough and sun-bread

#### Processing and analysing data and information
- Was a certain place around school expected to be warm or cool?
- Develop a simple colour scheme to record the temperature
- How long did it take to melt an ice cube? How close was this to the predicted time?
- Compare changes in sun-cooked dough with predictions

#### Evaluating
- How is dough and sun-cooked bread similar and different?
- Which places around school are warm and which are cool?
- Why are these warm and cool places?
- Compare and discuss class times on how long it takes an ice cube to melt
- Compare class results to determine what everyday objects are best for blowing bubbles

#### Communicating
- Use positional language to describe objects placed in the Sun
- Describe objects and what they are made of
- Draw a sequence of pictures that tell the process of solar-cooking
- Contribute associated ideas to a Sun Word Wall
Background
Hannah (a pseudonym) is a Pre-primary teacher of 27 children in a large K-12 independent school in Perth. She has been teaching for 4 years. Hannah is enthusiastic about teaching science and is always looking for new ideas and resources to assist with her teaching and the children’s learning.

How was the book used?
Hannah had originally planned to study Space for the term. Upon reading *Is the grass still green at night? Astrophysics of the dark and The Sun changes everything!*, however, she could see clear links between these two modules. Thus, she decided to use the Sun as the basis of her program, shifted the emphasis from ‘day and night’ to ‘light and dark’, and utilised ideas and activities from both modules.

In planning her program, Hannah decided to start with the science concepts presented in the modules and from there integrate across the different learning areas. This was an approach to programming that she had not used before, but could see it being very applicable with *Planting the Seeds of Science*. Hannah placed her trust in the book to provide the necessary ideas for literacy and numeracy, along with the other learning areas, and was very satisfied with the program she developed.

Her program included day and night and a comparison between these, light and light sources, shadows (inside and outside), shadow puppets, observing how an object heats up in the Sun over time, and performing an environmental walk around the school to feel how hot or cold various objects were.

How was the module modified?
Apart from the program being an adaptation of two modules, Hannah included light and light sources in her program. She decided to send a journal home with the children to encourage them to think about light and light sources at home, and to incorporate parental involvement. The children had to look around their home and draw the light sources they found, write the name of the light source or have their parents write the name, and then report their findings back to the class. At another time the children had to look for nocturnal animals with their parents, and report this back to the class.

An overview of the book
Hannah believed that the modules as a whole assisted programming in many ways and provided the majority of the information needed to meet her programming and the school’s requirements. She was very impressed with the wide range of practical ideas and activities presented in the modules, and could see that these would assist many teachers with their science programming. The activities in the modules were very easy to organise with her Education Assistant, and to conduct with the children. Hannah also found the progression through the activities an excellent way to build children’s understanding of the topic.

As already mentioned, Hannah embraced the suggestions for integration across the learning areas. She felt these integrated ideas allowed early childhood teachers to teach in the holistic manner in which they had been trained. Hannah was also very impressed with the depth of science content knowledge that was presented within each module. She believed the modules allowed teachers to not only learn a scientific concept, but also provided suggestions about how to teach that concept in an early childhood context.

Overall, Hannah viewed *Planting the Seeds of Science* as a practical, child-friendly, classroom-based resource that actively encouraged early childhood teachers to teach science to young children.
CASE STUDY 6. MORE THAN “JUST RUBBISH”: KINDERGARTEN SOLAR COOKING

Background
Martina, the third author of this module, is an engineer who has a special interest in solar energy. She had wanted to visit her daughter’s Kindergarten class and share some of her knowledge on solar energy with them. Assisting in the development of this module provided Martina with the teaching ideas and strategies she required to make this visit a great success.

The aim of Martina’s visit to the classroom was to provide the children with an introduction to solar energy and how it can be used to cook food. She also wanted to assist them in building their own solar cooker and bake mini-muffins. On a beautiful sunny day, Martina took along her own solar cooker and all the materials/ingredients required for the 22 children to make cookers and mini-muffins. Not having access to a frilled neck lizard, as suggested in The Sun changes everything!, Martina used a snake puppet.

Introducing the children to solar energy
Martina started her visit in the same manner as outlined in the module. She introduced the children to the snake puppet and invited them to name the puppet. They came up with the name Mr Snake, after being informed it was a boy snake. Martina talked about the need for Mr Snake to find a sunny spot to warm up, and how the Sun can warm up objects. She also explained that the Sun can help to cook food. As a class, they explored outside the classroom to find a sunny sheltered place to warm up Mr Snake and to set up the solar cookers.

Martina set up her large cooker alongside Mr Snake to demonstrate to the children how a solar cooker can heat objects. She placed butter inside her cooker, and as a class they watched the butter melt. She also placed a thermometer in the cooker. As the thermometer’s dial moved up to the higher numbers, the children could see how hot the oven was getting.

Because Martina had an engineering background, she asked the children what they thought an engineer does. Their general response was, “build something.” Martina informed the children that engineers also work in teams and have to communicate when they design and build things. She added that engineers sometimes make solar cookers, and that today the children were going to act like engineers as they would be making and testing a solar cooker in teams.

Making the solar cookers and mini-muffins
The following equipment was needed to make the solar cookers:
six A4 paper boxes, extra cardboard, scissors, aluminium foil, glue, oven bags, aluminium pie dishes, muffin mix (along with any other required ingredients) and mini patty cases.

Martina pre-cut the A4 boxes removing the lid and cutting one side out as a flap. Another foolscap-sized piece of cardboard was bent in half. This piece of cardboard would act as a ‘concentrator’ to direct the Sun’s light.

In small groups outside the classroom, the children glued alfoil to the insides and the flap of the boxes, and to the concentrator. Once made, the cookers were placed in the Sun, next to Martina’s cooker and Mr Snake, to warm up.

The children then placed small quantities of muffin mix into the mini patty cases. More muffins than required were prepared, with additional ones being cooked in Martina’s solar cooker. Each mini-muffin was placed on an aluminium pie dish. The pie dish with mini-muffin was then placed inside an oven bag and tied off. This was then placed into the solar cooker. The flap and concentrator were adjusted to direct more light (and heat) onto the mini-muffin. To make this adjustment, bricks or wooden blocks were placed underneath the flap. Instead of an aluminium pie dish, Martina placed the muffins in a large dark ceramic bowl in her solar cooker.
Given it was a perfectly clear, sunny day the mini-muffins took about 45 minutes to cook. While waiting for the muffins to cook, Martina continued talking about how the sun can warm up different objects, but this time emphasising the colour of the object. She asked the children about the clothes they wear when they are hot and cold. She also talked about how hot or cold you can feel on a sunny day when in black or white cars, or wearing a dark or light T-shirt. Martina found that relating heat transfer to everyday objects assisted the children in trying to understand this very abstract concept.

During lunchtime, while the muffins were cooking, children from the Pre-primary class visited to observe the solar cookers. Referring to the children’s solar cookers made out of boxes, one boy commented, “That’s just rubbish! You can’t cook in rubbish!” Unfortunately, this boy didn’t get to taste the muffins to see how useful rubbish can be.

Overall, Martina found the day to be very special for her daughter, herself and the Kindergarten community. The children farewelled Mr. Snake and eagerly shared the solar cooking experiences with their parents, who realised you could actually cook a roast in summer without heating up your house while saving on your electricity bill!

The science of solar cookers
There are three basic principles associated with how solar cookers work.

- The conversion of light energy to heat energy. Dark surfaces get very hot in sunlight, whereas light surfaces do not. Food cooks best in dark, shallow, thin metal pots with dark, tight-fitting lids to hold in heat and moisture. In the children’s solar cookers, dark patty cases and chocolate muffin mix absorb and convert light energy to heat energy, cooking the muffins. Martina used the dark ceramic bowl to achieve the same effect.
- The ability to retain heat. A transparent heat trap around the dark pot lets in light energy, while trapping the heat energy. Examples of this include a clear, heat-resistant plastic bag; a large inverted glass bowl; or an insulated box with a glass or plastic window. In the children’s solar cooker, the mini-muffins were placed inside an oven bag. This oven bag trapped heat energy, assisting in cooking the muffins. Martina’s cooker was an insulated box with a glass window.
- The ability to capture extra light energy. The use of one or more shiny surfaces to reflect the light energy onto the pot will increase the heating potential of the solar cooker. In the children’s solar cooker, the sides and flaps of the box were covered in alfoil to produce shiny surfaces. The concentrator was also covered in alfoil. Both the flap and concentrator could be adjusted to direct more heat onto the muffins. The aluminium pie dish into which the mini-muffins were placed acted as an additional concentrator. Martina’s cooker had alfoil on the inside, along with two large flaps that were covered in alfoil to act as concentrators.

Solar cooking saves resources such as wood, gas, and electricity. In summer, solar cookers are used outside of the house to avoid heating the house. Solar cookers can be used on camping trips, at the beach and when there is a fire ban. Solar cooking cooks food gently and healthily and (unless using a concentrator cooker) it does not burn the food. In some countries in South America, Asia and Africa, solar cookers are widely used. In these countries solar cooks have additional benefits as they reduce deforestation and erosion problems, protect people from possible dangers if they have to collect wood from the bush, allow blind people who cannot use open fires to cook and earn a living, and provide the cheapest means of cooking.
REFERENCES


ARTICLE


Christine Howitt
Dr Christine Howitt is a Senior Lecturer, researcher and postgraduate supervisor in Science Education at the Science and Mathematics Education Centre at Curtin University in Perth, Western Australia. Christine is actively involved in research with pre-service and in-service early childhood teachers that ultimately increases the amount of science taught in the early childhood classroom. Her innovative and inspiring science teaching methods have been recognised through university, state and national teaching excellence awards. Christine is also involved in research on young children’s science learning in both formal and informal contexts.

Sandra Frid
Dr Sandra Frid is an Associate Professor in the School of Education at Curtin University in Perth, Western Australia. Her background and expertise span early childhood through to tertiary teaching and learning, curriculum development, and research. Sandra has been recognised nationally through several university teaching excellence awards for her innovative, learner-focused teaching practices. Her research focuses on enhancing the professional capacities of pre-service and in-service teachers, particularly in mathematics. She is Hub Coordinator for the Western Australian Hub of SIMERR, the National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia.

Elaine Blake
Elaine Blake has more than 20 years of teaching experience in early childhood education, including Head of an Independent Junior School. She is the past president of two professional associations in Western Australia: The Australian College of Educators, and the Association of Literacy Educators in Australia. Elaine has studied the Reggio Emilia philosophy in Italy, and awarded an ASTA/ASE science fellowship to study interactive science for young children in Australia and Europe. She is currently engaged in doctoral research at Curtin University which investigates science in early learning centres for children under 5 years of age.

Yvonne Carnellor
Dr Yvonne Carnellor is the Coordinator for the Bachelor of Education (Early Childhood Education) program at Curtin University. She has an international reputation in early childhood teaching and learning, curriculum, and research, and has worked in partnerships with schools and school systems in WA, NSW, and New Zealand on a wide range of early childhood oriented teacher professional development programs. She worked for more than 25 years in early childhood education before moving into the tertiary sector. Yvonne’s early childhood education expertise includes: mathematics and science learning, gifted and talented education, learning difficulties, and young children’s social and emotional development. She also has strong interests in working with parents and children in the prior-to-formal school years to enhance language, cognitive, social and physical development.
**CONTRIBUTORS**

**Marjan Zadnik**
Dr Marjan Zadnik is an Associate Professor in the Department of Applied Physics at Curtin University. He has worked for many years on improving students’ learning, and colleagues’ teaching of Physics and Astronomy through research and the application of innovative ideas. He is passionate about teaching and welcomed the opportunity to work with pre-service teachers to improve their understanding and confidence in teaching Astronomy. He was the inaugural Dean of Teaching and Learning in Science and Engineering at Curtin. He has won numerous university and national awards for teaching excellence, including a National Fellowship in 1996, and the Australian Institute of Physics Medal for Physics Education in 2005.

**Mauro Mocerino**
Dr Mauro Mocerino is an Associate Professor and Director of Undergraduate Studies in the Department of Chemistry at Curtin University. His chemistry research involves the design, synthesis and study of molecules for specific applications, including control of crystal growth and treatment of diabetes. His education research focuses on improving the understanding of how students learn chemistry and what can be done to improve their learning. He is a participant in the Scientist in Schools program and is the scientist at his children’s primary school. Mauro’s contributions to teaching have been recognised by university and national teaching excellence awards.

**Simon Lewis**
Dr Simon Lewis is an Associate Professor in the Department of Chemistry, Curtin University, and leads the Forensic and Analytical Chemistry Research Group. His research is focused on chemical techniques applied to forensic analysis, focusing in particular on fingerprint detection, decomposition chemistry and the crime scene. Simon is enthusiastically involved in outreach programs, using forensic science and analytical chemistry as vehicles to engage children of all ages in science. His activities in forensic science and chemistry education have been recognized by a number of awards at the university and national level.

**Martina Calais**
Dr Martina Calais is a Senior Lecturer at the School of Engineering and Energy at Murdoch University in Perth, Western Australia. At Murdoch University, Martina coordinated the development of Australia’s first Renewable Energy Engineering Degree and she now teaches in the Renewable Energy and Electrical Power Engineering areas. She is closely associated with Murdoch University’s testing laboratory for photovoltaic system components and is actively involved in research on solar (photovoltaic) system technology. Martina has a keen interest in renewable energy education including developing renewable energy engineering training facilities. She also enjoys solar cooking.