A Sense of Wonder

Science in early childhood education

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TEACHING SOLUTIONS

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Preface

As science teachers in both higher education and TAFE, we enjoy a shared passion for play-based science learning and the provision of meaningful and inviting opportunities for young children.

The idea for this book arose from our commitment to providing annual science expos for early childhood student educators. Our students would incorporate these ideas on placement and return as inspired science educators, glowing with stories of children's wonder and curiosity about the simple principles of science in the world around them. We are appreciative of their anecdotes as they have inspired us to create this book.

We hope our book will invite educators to tap into and extend on the innate sense of wonder that children possess as they delight in exploring, experimenting and discovering in the natural world. Each chapter includes carefully chosen images to make visual connections to play-based science learning and the Early Years Learning Framework to empower educators to confidently implement science with all age groups in early childhood settings.

Many educators are already involving children in rich learning experiences so this book will validate existing practice; however, it is hoped that the ideas presented will inspire further science learning. When educators embark on a journey of discovery with children there can be a profound impact on each child's future interest and learning of science.

Every educator can do science!

Jenny Aitken, Jan Hunt, Elizabeth Roy & Bess Sajfar

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Chapter One

what is Science?

If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused — a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love — then we wish for knowledge about the object of our emotional response.
... once found it has lasting meaning.

Rachel Carson

What is the place of science in early childhood?

Science is all around us in our everyday lives. Put very simply, science is the study of our natural world. 'Engaging with science starts in early childhood as young children explore their environment and start to make sense of the natural world that surrounds them. It is important for early childhood educators to tap into and extend upon the innate sense of wonder that children possess as they delight in their discoveries about the natural world' (ACARA 2011).

In early childhood settings, enthusiastic educators encourage children to engage with the natural world and build science concepts, understandings and science language.

What is science?

'Science is an intellectual activity ... designed to discover information about the natural world in which humans live and to discover the ways in which this information can be organized into meaningful patterns.' — Dr Sheldon Gottlieb, University of South Alabama

'Science comes from the Latin word scientia meaning knowledge.' — Oxford Dictionary

'Science is a dynamic, collaborative and creative human endeavour arising from our desire to make sense of our world through exploring the unknown, investigating universal mysteries, making predictions and solving problems.' — ACARA 2011

Every educator can do science!

Through this book we hope to inspire early childhood educators to 'have a go' at science. Albert Einstein said 'science is having fun with ideas', which means that the science ideas introduced in each chapter, with their simple scientific explanations, convey that early childhood science curriculum is easy to implement in early childhood settings.

In many instances, the book will validate what educators are already incorporating in their practice. However, we hope that the closer investigation and finer detail we have provided will enhance science learning opportunities for children and will also begin a wonderfully exciting journey for early childhood educators.

Where does science learning fit in an early childhood curriculum?

In early childhood settings, science learning can occur indoors and outdoors ... in the sandpit ... in the block area ... in the home corner ... in the vegetable patch ... on a swing ... coming down a slide ... when caring for a pet ... watching rain ...

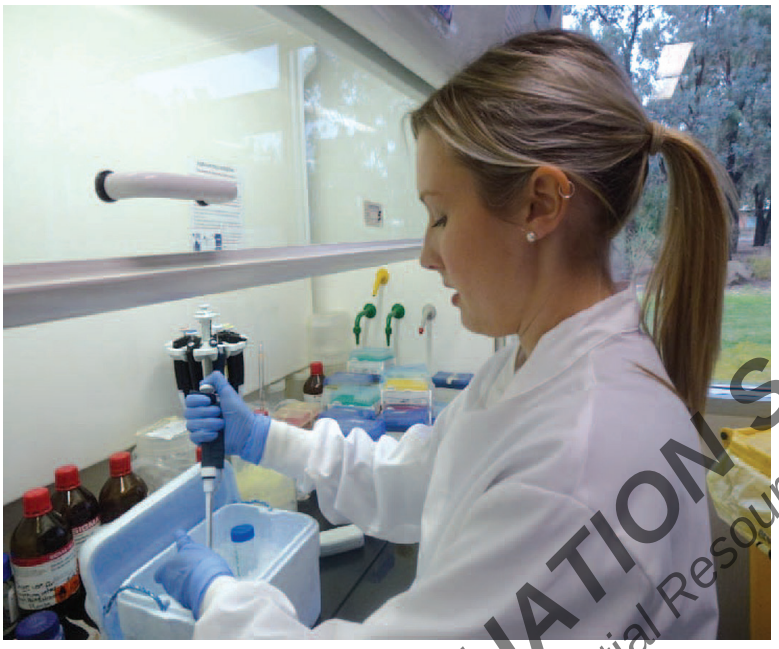
An exploration of science can start with the excitement of discovering a spider's web glistening with morning dew, which might lead to the creation of a spider's web made from twigs and wool see p.33.

'Science involves more than the gaining of knowledge. It is the systematic and organised inquiry into the natural world and its phenomena.' — Multicultural History of Science Page, Vanderbilt University

Scientists at work

What does a scientist look like?

We might think of an older male with a white coat working in a science laboratory. However, if we open our eyes we can see that adults and children of both sexes, of all ages and all cultural backgrounds can be scientists.



This scientist is conducting research into a drug that could help people who are obese and diabetic to control how energy is used within cells.

How exciting to think that, as educators, we may be inspiring the world's future scientists simply by showing excitement at their ideas and enthusiasm in their inquiries and wonderings. When educators join children in their science learning journey they will be developing all the necessary science processes to sustain them for life.

> Childhood is a time to be, to seek and make meaning of the world. — EYLF p. 7

This baby is conducting research by using his senses to explore the properties of a lemon in his search for new science understanding about the natural world.

This two-year-old is organising her science understanding about reflections through conducting research into the properties of the mirror.

Early Childhood Science Learning Framework

Through the provision of a play-based program, educators are able to incorporate meaningful science experiences into their existing programs. The photograph below shows how children are able to investigate the growing cycle of seedlings which have been placed at their level, while the thoughtful set-up of the environment invites participation, inquiry, research and exploration with the provision of magnifying glasses and drawing materials.

Investigating the growing cycle of seedlings at Cornish College

The inspiration for this book

The authors have drawn inspiration from both the Australian Early Years Learning Framework (EYLF) and the Australian Curriculum for Primary School Science when forming this Early Childhood Science Learning Framework, and have attempted to provide clear links from early childhood science to primary school science curriculum.

Efforts have been made to link science language and science processes to assist early childhood educators to put the EYLF into practice in a science context. It will also ensure the formation of a strong and relevant foundation for children to continue building their science learning in primary school.

Links to the EYLF

The book will help educators to make valuable connections between the areas of science and the principles, aspects of practice and learning outcomes of the EYLF. During early childhood science learning, young children are seen as confident, capable, involved learners, eager to observe and explore the world around them. This can be supported by creating an inquiry approach within a play-based program that promotes positive dispositions for science learning.

During science learning, children develop a range of skills and engage in science processes. As identified in the EYLF, these science processes are problem-solving, inquiring, experimenting, hypothesising, researching and investigating.

Science learning areas

The authors have divided early childhood science into four learning areas: biological science, physical science, earth science and environmental science.

Links to the school curriculum

Our Early Childhood Science Learning Framework includes the science learning areas identified in the Australian Curriculum for Primary School — biological science, physical science, chemical science, and earth and space science (ACARA 2011).

In order to keep the information and ideas at a level suitable for early childhood we have included chemical science under physical science and have not provided a focus on space science because it is such an abstract concept for children. We have included environmental science because we believe sustainability and environmental education should underpin science learning for young children.

When researching, you may encounter different names and grouping for the areas of science. For example, 'biological science', might be called 'life science' and 'earth science' might be called 'nature science'. Regardless of the terminology used, it is important to recognise the science learning possibilities and then support children to use science terminology and explore science learning.

Biological

Physical

Science Learning Areas

Earth

Environmental

What is biological science?

Biological science is the study of living things.

Chapter five explores biological science and how it can be investigated in early childhood settings with a focus on:

- plants
- the importance of gardening
- animals
- the human body

Key question: What is alive?

Growing plants is a practical way of investigating biological science at Dame Nellie Melba Kindergarten.

Exploration of biological science in early childhood can include:

- plants and animals are living things
- living things have certain characteristics
- living things have parts that do different things
- living things change as they grow
- living things have basic needs
- plants need food, sun and water
- plants grow from seeds
- animals need food and water
- some animals eat plants
- some animals eat other animals
- living things have lifecycles
- a habitat is a home
- living things live in a variety of habitats
- animals have babies
- my body is a living thing
- my body has parts that do different things

What is physical science?

Physical science is the study of materials and energy in the non-living world.

Chapter six explores physical science and how it can be investigated in early childhood settings with a focus on:

- the nature of materials
- physical and chemical changes
- forces and movement of objects
- energy

Key question: How does it move?

Exploration of physical science in early childhood can include:

- some things melt when heated
- water is hard when it freezes
- food changes when it is cooked
- some things go rusty
- burning wood makes charcoal
- mixing colours makes new colours
- objects fall when dropped
- magnets push and pull each other
- some things float and others sink
- sound is made in lots of ways
- we can see reflections

A ball can provide science learning about forces and movement of objects.

What is earth science?

Earth science is the study of the earth and its materials.

Chapter seven explores earth science and how it can be investigated in early childhood settings with a focus on:

- non-living earth materials such as water, soil, rocks, sand and mud
- day and night
- weather and seasons

Key question: What are non-living things?

Exploration of earth science in early childhood can include:

- rain comes from clouds
- wind makes things move
- weather can change every day
- earth's materials have lots of uses
- in the day we see the sun in the sky
- we can see shadows on a sunny day
- water and soil make mud
- rocks can be different shapes and sizes

Drawing children's attention to the setting sun raises their awareness of day changing into night.

What is environmental science?

Environmental science is the study of caring for the natural world.

Chapter eight explores environmental science and how it can be investigated in early childhood settings with a focus on:

- composting
- worm farming
- environmentally sensitive early childhood programs
- using recycled materials

Key question: How can we care for our world?

Visual representations of the children's work can consolidate learning in environmental science.

Exploration of environmental science in early childhood can include:

- we can reuse things
- food scraps can be used as worm food
- worms can make food scraps change into compost
- worm tea and worm poo help plants to grow
- plants need our care
- waste can be managed
- animals need our care
- weeding helps to give plants room to grow
- some plants can be eaten as food