SCIENCE IN EARLY CHILDHOOD

3rd edition

Science education is crucial to young children's discovery and understanding of the world around them. This third edition of *Science in Early Childhood* has been substantially updated to include the most current research, bringing together an author team of respected science education researchers from across Australia.

New chapters address changing priorities in early childhood science education, introducing coverage of STEM, inclusivity, Indigenous understandings of science, science in outdoor settings, intentional teaching and reflective practice.

This text complements the Australian Early Years Learning Framework and the Australian Curriculum: Science. Concepts are brought to life through detailed case studies, practical tasks and activity plans. Instructors can further supplement learning with the extensive materials located on the new companion website.

Renowned for its accessible and comprehensive content, *Science in Early Childhood* is an essential tool for all pre-service early childhood educators.

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CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781108436755

First published 2012
Second edition 2015
Third edition 2018 (version 2, December 2018)

Cover and text designed by Leigh Ashforth, watershed art + design
Typeset by Integra Software Services Pvt. Ltd
Printed in China by C & C Offset Printing Co. Ltd, October 2018

A catalogue record for this publication is available from the British Library

A Cataloguing-in-Publication entry is available from the catalogue of the National Library of Australia at www.nla.gov.au

ISBN 978-1-108-43675-5 Paperback

Additional resources for this publication at www.cambridge.edu.au/academic/scienceearlychildhood

Please be aware that this publication may contain several variations of Aboriginal and Torres Strait Islander terms and spellings; no disrespect is intended. Please note that the terms 'Indigenous Australians' and 'Aboriginal and Torres Strait Islander peoples' may be used interchangeably in this publication.

Foreword

When I was five years old, an engineer named Jack Kilby demonstrated the first example of an integrated circuit: a computer chip. It was 1958, and I suspect that very few of the grown-ups noticed.

And who could blame them? Computers were in their infancy. Physically, they were enormous, filling entire rooms with heavy, hot and flammable equipment. In every other sense they were practically invisible, locked away in defence agencies or closely guarded university labs.

No-one looked at a young Alan Finkel and imagined that he would one day dictate this message to a device that he stores in his pocket, by the miracle of chips.

How different the world looks to the loving parents of a five-year-old today.

In just five years of life, she has been photographed on five generations of iPhones.

She has lived through the first ever detection of gravitational waves, a feat so stupendous that Albert Einstein himself thought that humans could never achieve it.

She was there for the arrival of technologies that make it possible to edit our basic coding, our DNA, cheaply and precisely.

Perhaps she's already travelled in an electric car. Perhaps her first car will be capable of driving itself. Perhaps she'll be able to travel into space as a tourist.

She can expect to live a full ten years longer than a baby girl of my generation. And however long she lives, we can say for certain that her world will be rich with opportunity, filled with humankind's great unfinished projects, and ripe for her contribution.

It would be easy to conclude that after thousands of years of raising humans, we know everything there is to know about education. It would also be easy to take the opposite position, and give up teaching science completely, thinking that nothing we know today could possibly be relevant to the adults our children will become.

Between the two extremes is the position that the thoughtful society adopts: to learn from the past, adapt to the present and strive to be even better in the future.

For that, we need great teachers, and inspired teaching. And the learning should begin from Day One.

From nought to eight in the lifespan of a human is a time of astonishing growth. As our hundred billion brain cells branch out into perhaps a quadrillion neural connections, we launch into our lifetime of learning.

We have done right by our children in those precious early years if we fire them with passion for that journey: if we help them grapple with questions and bring the role of science and mathematics to the fore.

To our present and future educators, I wish you every success on the path you have chosen. May this book help you to guide our children – and may science guide our nation into the future.

Dr Alan Finkel AO

13 December 2017

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Contributors

ELAINE BLAKE works with postgraduate students in early childhood studies at Edith Cowan University in Western Australia. Her doctorate, from Curtin University, investigated the sociocultural aspects of learning and teaching science in early learning centres. Elaine's career includes contributing to early childhood science as a consultant with the Association of Independent Schools Western Australia, teaching children in early childhood classrooms for 25 years, and being principal of an independent junior school. Her current research investigates how science can assist the development of literacy for young children. Elaine is a Fellow of the Australian College of Educators and her published work includes the teacher resource *Planting the Seeds of Science*.

CORAL CAMPBELL is Associate Professor in the School of Education at Deakin University. She has contributed significantly to the fields of science, education and educational research over three careers which span forty-six years. She is on the editorial board of the *Journal of Emergent Science*, and is the European Science Education Research Association's Early Childhood Science Special Interest Group Coordinator. In 2017, she received a Fellowship from the Association of Graduates of Early Childhood Studies to undertake a research project studying Science/STEM in early childhood. With a sustained interest in early childhood science education, Coral's research focus is on young children's learning in science and teacher professional learning which is reflected in her current projects.

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CHRISTINE HOWITT is an Associate Professor in Early Childhood and Primary Science Education at the Graduate School of Education at the University of Western Australia, Perth. Her research has focused on young children's science learning in informal contexts, and methodological and ethical approaches to including young children in research. Christine is co-editor of the science resource *Planting the Seeds of Science*, the product of a two-year nationally funded project to develop science resources for early childhood educators. She has been awarded various teaching excellence awards at the state and national level.

WENDY JOBLING is a Lecturer at Deakin University's Burwood Campus in Victoria. Prior to joining Deakin, she taught for more than twenty years in Victorian primary schools. Her doctorate focused on the factors affecting the implementation of science and technology curricula in Victorian primary schools. Wendy has a long-held interest in teaching and learning in science and technologies education and has published extensively in these fields. Since joining Deakin, Wendy has taught undergraduate and postgraduate primary and early childhood teacher education students in science and technologies (design and digital) units. She has also been involved in research into early childhood science and technologies teaching and learning.

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ANDREA NOLAN is currently Professor of Early Childhood Education, in the School of Education, Deakin University, Melbourne, Australia. She holds Bachelor, Master and PhD degrees in early years education and before entering the university sector taught extensively in early childhood education settings as well as in primary schools. Andrea has conducted research in both schools and pre-schools and has worked on a number of state, national and international projects concerning transition to school, literacy development, mentoring and professional learning for teachers. She has researched the impact of the current Australian reform agenda on professional identities and educator practice, mentoring, inter-professional work, and reflective practice as a means to better understand practice.

KATHRYN PAIGE is a Senior Lecturer in science and mathematics education at the University of South Australia. She taught for seventeen years in primary classrooms in a range of schools, rural, inner city and in the United Kingdom. Kathryn's research interests include pre-service science and mathematics education, eco justice and place-based education. Current projects include citizen science, water literacies, connecting children to the natural world, and STEM and girls. Past projects include Redesigning Pedagogies in the North, and the Distance Education Project in the Eastern Cape, South Africa.

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Acknowledgements

Each chapter of the original edition of this book was submitted to a blind review by two members of an independent review panel. For this third edition of the book, Cambridge University Press instigated independent academic review processes. The editors would sincerely like to thank all contributors whose input was invaluable in refining the content of this book. We are confident that the scholarly content of each chapter reflects contemporary research in the area and will assist educators in understanding science education for children aged from birth to 8 years of age.

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