

Introduction

Kei hopu tōu ringa ki te aka tāēpa, engari kia mau ki te aka matua.

Cling to the main vine, not the loose one.¹

Mathematics and statistics are keystone areas of the primary school curriculum. All children will spend many hours developing their understandings, skills and knowledge of these two areas. As mathematics educators, we have the pleasure, privilege and responsibility to help them enjoy wonder, excitement and develop confidence through their engagement in and persistence with mathematical and statistical explorations. Towards these goals this book is designed to inform, stimulate and challenge teachers' thinking regarding how they provide children with mathematics and statistics learning opportunities.

Through mathematics and statistics, children are better able to understand, examine and describe the worlds in which they exist. Their ability to select from a deep kete (basket) of strategies and knowledge to solve mathematical and statistical problems provides a crucial foundation for everyday life and further learning. Our job in all this is complex; ensuring children are mathematically well

¹ Ministry of Education. (2007). *The New Zealand Curriculum* (p. 26). Wellington: Learning Media.

equipped, developing their belief that they can work on and solve challenging problems and nourishing their desire to do so.

This book is written by people with rich experience and knowledge about teaching primary school mathematics and statistics, leaders in their fields. All chapters discuss practices suitable for learning within the New Zealand curriculum and preparing children for assessment of their learning against the New Zealand national mathematics standards. Each offers research-led practical information for developing teachers' pedagogical content knowledge—knowledge about the teaching of mathematics and statistics. Many have been written in consultation with classroom teachers and you will find examples of their children's work included.

The publication of this book is timely given the recent curriculum change and the introduction of national mathematics standards. The curriculum is the key tool that teachers have to inform their planning and teaching decisions. The chapters in this book provide ideas consistent with recent research and other classroom-focused literature that illustrate how the curriculum's vision, values, key competencies, principles, and mathematical and statistical content can play out in children's learning.

The national mathematics standards are useful tools for assessing, monitoring, and reporting students' learning, achievement, and progress. Making decisions about students' progress against the standards requires quality teacher professional judgement applied through collecting evidence of students' learning using a range of informal and formal assessment tools. The authors provide many ideas that support teachers' versatile and flexible use of varied assessment opportunities to gather evidence of learning, which will help enable sound assessor judgement against the standards.

The book is in two sections. Chapters 1 – 12 focus primarily on aspects of mathematical and statistical content (within Number, Algebra, Measurement, Geometry, Statistics and Probability). Pedagogical strategies have been embedded within each. The remaining chapters concentrate on strategies towards child-centred learning and assessment (e.g., argumentation, reflecting children's cultures, using literature and written recording and incorporating technological tools). These chapters are interwoven with mathematical and statistical content. The two main

sections of the book help reflect the interplay between who and what we teach that we face as teachers of both children and content.

You will find the first four chapters of the book's first section describe ways of teaching number knowledge and skills. The main focus areas are counting (Chapter 1), ways of enhancing children's sense of place value and handling numbers (Chapter 2), multiplicative thinking (Chapter 3), and developing understanding of fractions and decimals (Chapter 4). The next two chapters include ideas for teaching and learning algebraic ideas. Chapter 5 helps make links between number and algebra through discussing ways to developing children's reasoning about number patterns. Chapter 6 focuses on how the concept of equivalence can help children develop algebraic skills across curriculum Levels 1 to 4.

The first section then moves to consider the teaching of geometry, measurement, statistics and probability. The focus areas this time are ways of developing understanding and experience of two- and three-dimensional shapes (Chapter 7), ways to teach practical measurement skills (Chapter 8), and one way to integrate geometry and measurement through a class activity of making a map of the school environment (Chapter 9). The emphasis within the statistics chapters in this book is on carrying out investigations that are meaningful to students. Chapter 10 uses a playground equipment scenario to illustrate how children across the primary school levels can develop statistical thinking. Chapter 11 provides further ways to consider what comprises statistical thinking and how it can be fostered. The final chapter in this section provides ways to help senior primary school students explore probability.

The second section of the book holds three areas targeted at: developing children's skills towards being members of mathematical communities, considering particular groups of learners and examining tools for helping teach mathematics. Developing a sense of community is addressed through foci on cultural dimensions (Chapter 13), activities that promote higher order thinking (Chapter 14), and mathematical inquiry and argumentation (Chapter 15), and written recording methods (Chapter 16). Chapters 17 and 18 consider the needs of particular groups of students, those learning mathematics in ways consistent with *te reo me tikanga Māori*, and those gifted and talented in mathematics.

The final group of chapters provide examples of tools that can be used to enhance mathematics teaching and learning by interrogating the meanings of the key competency *using language, symbols and texts* within primary school mathematics and statistics (Chapter 19), and using children's literature (Chapter 20), WebQuests (Chapter 21), digital technologies (Chapter 22), and assessment tools (Chapter 23).

Specific information about mathematics and statistics teaching, reflection points, classroom ready activities, and ideas for further reading and resources are included within each chapter. We invite you to read, reflect, try things out, and read again ... As you read, you may encounter similar ideas, proverbs, or activities in different places allowing you to make connections between chapters and reinforce key concepts. In each case, a different point is being made about the items previously met.

Most of the additional and other readings and resources listed in the chapters should be fairly easy to locate, either through the Internet, or from NZCER, the Ministry of Education, mathematics education resource specialists or university libraries. Journal articles and conference papers published by the Mathematics Education Research Group of Australasia can be accessed through their website, at <http://www.merga.net.au/publications/index.php>

This book is the third in a series; the first two are targeted towards teaching secondary school mathematics. However, chapters in this book are relevant to secondary school teachers just as the chapters in the secondary books are to the primary sector and we hope all will be used to inform practice across both school levels.

The books have been written for teachers, those becoming teachers and teacher educators. However, they are really for the children we are so fortunate to share our work with. Please keep these precious people, and developing their passion for mathematics and statistics, at the forefront of your mind as you read. Help them find many strong vines to cling to and swing from as they discover, play with, learn, delight in and use mathematics and statistics.

Robin Averill and Roger Harvey