

# PROLOGUE

The main part of this book, **Chapters 3-8**, consists of dialogues between two characters M, a mathematician, and RME, a researcher in mathematics education. These dialogues focus on a range of issues regarding the learning and teaching of mathematics at university level. Each dialogue starts from a discussion of a sample of data (students' writing or speaking) that exemplify these issues. Both the samples that M and RME discuss as well as their discussions are grounded in data collected in the course of several studies that I have been involved in since 1992. In **Chapter 1** I outline the studies that formed the raw material for the book as well as the wider area of mathematics education research these studies are embedded in and the book aims to contribute to. In **Chapter 2** I outline the processing that the data collected in these previous studies has gone through in order to reach the dialogic form in which it is presented in Chapters 3-8. **Chapter 3** focuses on students' mathematical reasoning and in particular their conceptualization of the necessity for Proof and their enactment of various proving techniques. **Chapter 4** shifts the focus towards the students' mathematical expression and their attempts to mediate mathematical meaning through words, symbols and diagrams. **Chapters 5 and 6** offer accounts of the students' encounter with some fundamental concepts of advanced mathematics – Functions (across the domains of Analysis, Linear Algebra and Group Theory) and Limits. **Chapter 7** revisits many of the 'learning stories' told in Chapters 3-6 in order to highlight issues of university-level pedagogy. Finally, in **Chapter 8** M and RME, starting from the experience of working together in the context of the studies on which the book is based – and as showcased in Chapters 3-7 – discuss their often fragile relationship as well as the necessary and sufficient conditions for a collaboration between mathematicians and researchers in mathematics education. The book concludes with: a brief **Epilogue** in which I reflect on the experience of engaging with the research behind this book, and with its production, and I outline some steps that, at the final stages of writing, this research was beginning to take; and, with a **Post-script** in which I offer a chronological and reflexive account of the events that led to the production of the book.

**Note to the reader regarding Chapters 1 and 2.** Chapter 1 describes the theoretical background and previous studies on which the book is based and Chapter 2 the method through which the dialogues in Chapters 3-8 came to be. Readers less interested in these may wish to skip these chapters and go directly to Chapter 3. For minimal familiarisation there is a one-page summary at their beginning.

**Note to the reader regarding Chapters 3-8.** Each of these consists of Episodes which I recommend that you read as follows: engage briefly with the mathematics in the Episode (problem, solution and examples of student response); reflect on the learning/teaching issues these may generate; and, read and reflect on the dialogue between M and RME. There is a more elaborate version of this recommendation between Chapters 2 and 3 and a one-page summary of the issues covered at the beginning of each chapter.

Amongst Mathematicians

Teaching and Learning Mathematics at University Level

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