INTRODUCTION

Teachers’ knowledge of mathematics has become a central focus of educational researchers and policy makers with conceptions of teacher knowledge continuously being transformed. Intuitively, we have known for some time what research now provides an evidence base for—that “teacher knowledge matters” (Sullivan, 2008b, p. 2). But exactly what knowledge matters more, and why, are more significant and vexing questions for researchers and educators to address. Consequently, attention has moved beyond looking solely at what knowledge teachers possess to why different types of knowledge are important and how that knowledge is acquired, studied and impacts on the quality of instruction.

While historically unquestioned in importance, it has become politically as well as educationally necessary to provide an evidence base as to why knowledge of mathematics content by itself is insufficient for effective teaching of mathematics. For instance, in a recent report commissioned for the Go8 universities on mathematics entry requirements for Australian primary teacher education programs, it was found that many accreditation bodies now required entrants to have studied mathematics to the final years of secondary school (G. Brown, 2009). The report recommended that knowledge of mathematics content should become a major focus of primary teacher education programs. Mathematics educators and researchers are aware that while such recommendations help to emphasise the importance of specific content knowledge, they can also be damaging when a full picture of teacher knowledge in all its complexity is not portrayed. Accordingly, theorising and research surrounding teacher knowledge has escalated, resulting in expanded notions of some aspects of teacher knowledge and the emergence of new conceptual frameworks informing and fuelling research on teacher knowledge (e.g., Chick, 2009a, 2009b; Hill, Ball, & Schilling, 2008).

This chapter provides a critical review of research and theoretically informed perspectives on knowledge in mathematics education and development of practising teachers published by Australasian researchers from 2008–2011. Previous four-yearly reviews published by MERGA have dealt with the
professional learning of practising teachers of mathematics (Anderson, Bobis, & Way, 2008), and as a consequence, have considered teacher knowledge. However, never before has there been an entire chapter specifically devoted to this topic—an indicator of the increased attention teacher knowledge has attracted in the past few years. While there is some inevitable overlap of content and issues relevant to the study of pre-service teachers’ knowledge of mathematics, it is beyond the scope of this chapter to address that body of research. Research relevant to pre-service teachers is discussed elsewhere in this volume.

Our review has five sections. We first consider the situated nature of teacher knowledge, thus reflecting the growing recognition by researchers that knowledge for teaching mathematics is not only mediated by sociocultural contexts, but also by teachers’ beliefs, their conceptions of mathematics and the confidence they have in their own mathematical knowledge. The second section introduces various frameworks for researching teacher knowledge and includes the emerging notion of what many researchers now refer to as the mathematical knowledge for teaching. We then examine the various domains of teacher knowledge that have most recently dominated research in the field. This includes investigations of specific content areas of mathematics, the expanding domain of pedagogical content knowledge and knowledge of curriculum. The fourth section considers the mechanisms and processes by which teacher knowledge is acquired. It also critically reviews approaches used for researching the knowledge of teachers of mathematics. Finally, the chapter distils the information emanating from this body of literature and suggests how it can inform emerging research agendas, policy debates, continuing teacher education and, most critically—classroom practice.

THE NATURE OF TEACHER KNOWLEDGE

The situated nature of teacher knowledge has come to greater prominence among Australasian researchers in recent years. During the period under review (2008–2011), there has been a growing recognition that teacher knowledge is filtered through the social and cultural context of teaching and mediated by teachers’ beliefs, their conceptions of mathematics, and their confidence in their own mathematical knowledge.

In his introduction to a plenary panel discussing the possible role(s) of theory in the context of mathematics teacher education, David Clarke (2009) emphasised the situated nature of teacher knowledge, and in particular attended to teaching as a culturally situated activity. With such a perspective in mind, Owens and Kaleva (2008) addressed the issue of how primary school teachers in Papua New Guinea (PNG) could use their cultural knowledge to improve their students’ understanding of measurement. They used everyday examples of mathematical applications drawn from indigenous communities around PNG to help teachers understand how their cultural knowledge can be used in mathematics instruction by communicating to students the mathematical thinking behind the activities, thus making tacit teacher knowledge more explicit.