

Special Issue: Mathematical Thinking in the Early Years

Guest Editor's INTRODUCTION

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Much popular thinking regards literacy as more important in everyday life than mathematics. The low value of mathematics can be seen in the way that (often Western) people brag about their personal lack of competence with mathematics (Paulos, 1988). Whereas illiteracy is usually a source of deep shame to people and hidden at all costs, the perverse pride taken by people over their mathematical ignorance reflects a general failure to recognise how vital mathematics is for a successful life. Contrary to this popular view, longitudinal research with birth cohort participants has shown that learning mathematics is probably even more important for later success in life than reading and writing (e.g., Bynner & Parsons, 1997, 2000). The people studied who struggled with mathematics when they were young, later had a much greater likelihood of experiencing unemployment, poor pay and prospects, homelessness, and health issues, particularly if they were female. On the other hand, poor literacy on its own had minimal impact on people's life chances in adulthood, and this was equally true for both men and women (Parsons & Bynner, 2005). This evidence indicates that mathematics learning matters a lot in the long term for people's health and wellbeing.

Moreover, mathematics learning matters right from the earliest years of children's lives.

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This is evident from the findings of longitudinal research with school-aged children showing that their mathematics achievement on entry to school often sets them on a relatively stable path towards later success or difficulty (e.g., Claessens & Engel, 2013; Duncan et al., 2007; Wylie & Hodgen, 2011). These findings have important implications for those of us who work with children in the early years, and who need to take responsibility for supporting their mathematics learning. This is not always straightforward as some teachers of young children, reflecting back on their own experiences of learning mathematics at school, recall strong emotional responses such as feelings of shame, humiliation, alienation, and disengagement, which have had a damaging impact on their confidence, wellbeing, and identity (e.g., Bibby, 1999, 2002).

In recent decades, international mathematics education reform has called for a greater focus on building conceptual understanding within the context of mathematics problem-solving, instead of taking a traditional approach to teaching mathematics by emphasizing memorisation of procedures, facts, and rules (e.g., Buchholz, 2004; Skemp, 1978). The reform approach to mathematics teaching stresses the importance of thinking, reasoning, and argumentation as a way to develop deeper understanding of the structure and properties of mathematical concepts and processes (e.g., Franke & Kazemi, 2001; Mulligan & Mitchelmore, 2009; Scharton, 2004). It acknowledges the important role of learning communities (e.g., students and teachers) in collaborating over strategies for solving problems that are presented (Franke, Kazemi, & Battey, 2007). Getting the “right answer” is no longer a major goal, nor is being the quickest person to come up with an answer. The purpose is far more about collaboration as a team to develop problem-solving strategies and understanding together.

This special issue of the Asia Pacific Research Journal of Early Childhood Education focuses quite deliberately on mathematical thinking. The first paper, by Murphy, focuses on the value of discourse among children in developing their mathematical thinking and reasoning, in particular their deductive and inductive reasoning about number relationships related to ideas of ‘more’ and ‘less’. She found that the children grew in their sense of mathematical authority as their reasoning skills developed within the context of the game. The paper by Young-Loveridge and Bicknell investigates the development of children’s

number-fact knowledge before and after an intervention program that used multiplication and division problem-solving contexts to support children's part-whole thinking. Children acquired an extensive repertoire of number facts, but did not always use these to solve word problems. White and her colleagues explored the relationship between executive function and number processing, contrasting the responses of five-year-olds with those of eight-year-olds. Zöllner and Benz's paper looks at developing understanding of length measurement using indirect comparison tasks. Their focus is on children's understanding of measurement units, and the way a length can be decomposed into units, which can then be counted. McDonough and Cheeseman's paper also looks at measurement, but the focus is on a less commonly studied attribute, mass. They used individual diagnostic interviews in conjunction with children's drawing and/or written recording to explore their understanding of mass. The final paper, by Sinclair and Pimm, explores the possibilities provided by mobile digital devices such as iPads, using a piece of software (*TouchCounts*) designed to take children's finger responses and connect them with a picture of objects, the numeral representing the quantity, and the spoken word that names that numeral and quantity. By using familiar actions such as swiping, pinching, spreading, children can move quantities about, joining them together and splitting them apart. A particularly exciting aspect of this application is the way that it can take a multiple-fingers response (e.g., five fingers all-at-once), and create patterns by incrementing the quantity on the screen by groups of that size (e.g., 5, 10, 15, 20, ...). Each of these papers addresses some important aspect of mathematical thinking and reasoning with children in the early years.

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