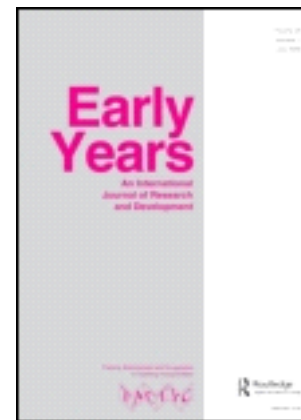


Book Review:

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Children's mathematics, making marks, making meaning, by Elizabeth Carruthers and Maulfry Worthington, London: Sage Publications, 2006.



Once in a while, a very long while, there emerges a book about the education of young children which has the power to transform how teachers teach. The two which come to mind are Margaret Donaldson's 'Children's Minds' and Liz Waterland's 'Read With Me', both of which changed my – and I'm sure countless other teachers' - thinking and practice. *Children's Mathematics: Making Marks, Making Meaning* (2nd edition) is such a book and it comes not a moment too soon.

For far too long educators have seriously under-estimated the challenge posed to young children by symbol systems. The authors highlight the parallels between the development of literacy and numeracy through children's graphicacy noting that the latter is more difficult to chart. The development of children's early literacy has become increasingly well documented over the past thirty years yet the symbol system of mathematics has been far less well explored. The authors' journey of discovery begins exactly where it should, at the very beginning, with an exploration of graphicacy, the primary symbol system which is all too often underdeveloped in practice yet from which the other two must grow. At long last this void in research has been addressed and this book provides practitioners with the wherewithal to nurture young children's introduction to mathematics and ease the transition from informal to formal mathematics in a way that is consistent with how they learn.

It succeeds in de-mystifying the development of children's mathematical thinking and gives comprehensible and unambiguous direction to the careful reader about how to do this. The authors pinpoint the central importance of children's exploration of mathematical graphics in order to understand its abstract symbolisation and examine in detail how this can be achieved using effective illustrations from their own considerable practice. Its achievement is remarkable, that of tracking the progress of children's thinking by analysing their mark-making from their earliest examples to sophisticated visual representations which indicate both a very high level of understanding and creativity. The authors offer a model for educators which include the introduction of mathematical mark-making. Critically, it bridges the yawning gap between informal mathematics and the introduction of the increasingly formal mathematics of KS2 when children

returning from their summer holidays are expected, as if by some process, osmosis perhaps, to have developed the ability to engage in formal mathematics by unknown means during the vacation.

The success of the book lies in the way the authors have applied their considerable knowledge of theory and research to their practice, reflected on the outcomes and developed hypotheses which have generated a philosophy of mathematical teaching. This, in turn, has influenced their pedagogy and resulted in an alternative model for the teaching of mathematics to young children. It is a book which has the power to motivate teachers to become extended professionals by reflecting critically on their own practice in order to derive their own theories to inform their pedagogy. The importance of the role of teacher as researcher is well-documented and there is no better illustrative model than this book and the journey made by its authors.

The importance they place on the fifteen years they have spent exploring the theories underpinning their research and in reflecting on and developing their practice is confirmed by their thorough treatise of the subject and their comprehensive exploration of all its attendant issues together with the well annotated examples they provide; nothing is omitted. The book highlights the importance of analysing children's own mark-making in order to track development and thence inform teaching. Examples taken from the authors' practice such as 'Jay's eight', 'Scott's addition', 'Elliot and Charlene and Carl at role play', 'Tommy and the elephant' and, my favourite, 'Frances and the train' (was there ever a better example of the potential of young children's creative thinking when given the right context?) illustrate clearly the hypotheses made in a very accessible way to the reader, thus strengthening further the book's place as an essential tool in the good teacher's repertoire.

One of the book's many strengths is its thorough and concise analysis of learning theories and the way in which they are applied to the authors' hypotheses. Mathematical schemas, for example, are not merely explored but are developed by the advice given on supporting schemas and ways of opening further pathways to explore with children.

Bridging the gap between children's informal understanding and school mathematics is central to this book. The authors emphasise the importance of building on children's early marks and representations. This is crucial for teachers because it highlights how young children make meaning of mathematics and gives a valuable insight into their understanding. They demonstrate how difficult these transitions are for children and illustrate this well by charting the traditional journey of mathematics through worksheets using abstract symbolism. The authors develop this further by outlining a well-illustrated and cogent alternative model based on using children's own mathematical graphics. Most importantly this book presents a well-argued and strongly supported challenge to the precipitate introduction of symbols and formal recording by providing an exciting and logical alternative based on children's mathematical graphicacy.

It addresses well how to provide rich mathematical environments for learning which, critically, encompass pedagogy itself and, in particular, child-initiated learning. One of its best features is that it contains so much rich and well-contextualised information about pedagogy that can be applied not only to mathematics but to children's learning in general.

Assessment of mathematical representations is well addressed and refreshingly and rightly described as 'tuning into children's thinking'. Worksheets and their domination in recording are analysed to demonstrate how problematic they render both summative and, most importantly, formative assessment. This analysis is both timely and sobering and should encourage teachers to reflect critically on the use of worksheets. Again the authors take things further by giving a lucid rationale for assessing children's own mathematical graphics which they illustrate comprehensively with annotated examples.

Central to this book is the involvement of parents and families in their children's learning and the chapter on this is clear and very accessible in its analysis of the mathematics in which children engage incidentally at home. The significance of this lies in its de-construction of the received wisdom among parents in general that mathematics, unlike reading, is confined to the school and they have no useful role to play in its nurturing at home. The authors emphasise the importance of discovering and using the mathematical knowledge children have acquired at home in order to inform practice. The comprehensive list of questions and answers for parents is particularly readable and useful and the glossary ensures that all terms used can be easily understood.

At the very heart of the success of the book is the authors' ability to see mathematics through young children's eyes by listening to and reflecting on the constant efforts made by children to make sense of their world. In the medium lies the message and this book has the potential to reach out to teachers and inspire them to look at the learning experiences they present to children through their eyes rather than from their adult - and invariably more convenient - perspective.

This is a liberating book which proposes that the teaching of mathematics could and should be a highly creative and enjoyable process. Its greatest achievement is that it offers a paradigm for a socio-culturalist mathematical pedagogy of the very highest quality in an inspiring way; no practitioner will fail to be encouraged and motivated by it at a time when the teaching of mathematics to young children urgently needs a radical review. This is destined to be a seminal text and those who have not yet read it are certain to have their thinking challenged.

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