

*Excerpt from pre-publication chapter:*

Worthington, M. (2012) 'Children becoming expert symbol users' In McAteer, M. (Ed.) *Improving Primary Mathematics Teaching and Learning*. Maidenhead: OUP. (To be published later this year.)

---

*This chapter draws on research from the Netherlands and the UK into children's developing understanding of the function of symbols and their use in mathematics. Through three case studies of children 3 – 7 years it explores the relevance of this research for Mathematics Specialist (MaST) teachers and for teachers and practitioners in the Foundation Stage and in Primary Schools in England.*

### **'Becoming successful symbol users in mathematics'**

Graphical marks and representations that 'may at first appear as casual or insignificant – at first intuitive, personal and informal marks and representations - have an important role to play in learning the abstract symbolic language of mathematics.

The philosophy underpinning our approach is rooted in the belief that children have a significant role to play in their learning, both in the understandings they bring and in their active engagement with graphical representations and symbols. From this perspective children's potential is realised through their social contexts and in learning cultures rich in graphicacy and meaning making.

Rather than drawing, maps, writing and mathematical notations being isolated 'activities' separated from personal meaning, or 'products' embedded in teacher-planned tasks, graphicacy becomes an integral and significant aspect of children's and adults' daily experience. In graphically and meaning rich contexts, children *choose* to use symbolic representations to support and communicate their thinking. As the case studies in this chapter show, immersion in such contexts support powerful individual and shared understandings of the abstract symbolic language of mathematics, leading to flexible use of calculations and problem solving.

Children's understanding of symbols and their functions are central to this perspective and align well with FSP profile point 8 'uses developing mathematical ideas and methods to solve practical problems' and 'using and applying number' of the National Curriculum. Children's invented algorithms and notations support later understanding (Thompson, 2008) as shown by research evidence from Terwel et al. of children of 10-11 years (2009).

The adults' role is pivotal in their learning. Adults create a rich learning environment that includes interactive displays of texts and children's graphics; adults model graphical representations and symbols for authentic purposes

arising from children's play and every day experiences. Above all adults show that they value children's thinking and their graphical marks and representations by taking a close interest in their meanings and ideas.

The perspective explored in here rests on a belief that all children can be curious, competent and confident learners of mathematics. The aspect of mathematics [symbol use and understanding] explored in this chapter is one in which teachers can make a very real difference, and where there is potential for children to become expert symbol users and powerful makers of mathematical meanings.'

### **References:**

Terwel, J., Van Oers, B., Van Dijk, I. and Van den Eeden, P. (2009) 'Are representations to be provided or generated in primary mathematics education?' *Educational Research and Evaluation*, Vol. 15, No. 1, February 2009, 25-44.

Thompson, I. (2008) 'What do children's mathematical graphics tell us about the teaching of written calculation?' in I Thompson (Ed.) *Teaching and Learning Early Number*. 2<sup>nd</sup> Ed.

---