

Maulfry Worthington: Focus for doctoral research (*Free University, Amsterdam*)

Doctoral supervisor: Bert van Oers.

Draft title: 'The genesis of mathematical semiosis in early childhood'

Aims

The aim of this research is to trace the emergence of *children's mathematical graphics* in imagination and symbolic play. It aims to further understanding of the ways in which 3 – 4 year-old children use a range of visual 'modes' to represent, explore and communicate their mathematical thinking and meanings, and to identify the cultural and social influences on the children's representations and how these contribute to their developing semiotic modes and to their mathematical thinking. It is based on a Vygotskian, cultural-historical perspective and informed by a social-semiotic, multi-modal perspective of young children's appropriation, creation and understanding of symbolic tools, with consideration of their communicative potential (Vygotsky, 1978; Kress; 1997).

Background

This study builds on previously conducted research into *children's mathematical graphics* over the past two decades by Carruthers and Worthington, showing how children's own symbols and visual representations support their developing understanding of the abstract symbolic 'written' language of mathematics.

Data

Using longitudinal, ethnographic case studies of children, I have gathered data (from 3-4 year old children) in an inner-city nursery in a Children's Centre nursery school in England. Data includes written observations and photographs of the children's play and graphicacy; scrapbooks with visual data from the children from home and nursery; field notes made during research visits; notes from informal discussions and interviews with the teachers and home visits including informal discussions with children and parents.

Multimodal analysis (Kress, 2010) supported by discourse analysis (e.g. Gee, 2010) will be used to analyse the data, helping to identify patterns of behaviours and semiosis that supports children's earliest mathematical representations. The findings will add to our understanding of the ways in which children communicate meanings through their signs, 'texts' and symbols within their play and graphicacy, and the relationship between these multiple modes and their *mathematical graphics*. It will provide greater understanding of children's symbolic development over time and the affordances of various features of their chosen visual representations that support their understanding.

Professional understanding and pedagogy

I am sincerely grateful to the teachers who have collaborated with me in this research project. Though not a central aspect of the research, evidence gathered is contributing to a deepening of professional knowledge about effective learning cultures.

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