

'Mathematical semiosis in pretend play: situated, mediated and meaningful'

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Research Aims:

The aim of this research is to trace the genesis of young children's *mathematical graphics* in their social pretend play, and to identify cultural and social influences on children's representations, and how these contribute to their developing semiotic modes and mathematical thinking.

Background

Education has become highly politicised in England, resulting in considerable narrowing and distortion of the curriculum, inappropriate and damaging to young learners. Particularly problematic is the diminishing status and understanding of play, and of mathematics which the fail to acknowledge young children's needs and the understandings they bring.

In contrast, research shows children's developing understanding of mathematics and the visual semiosis they use to represent and communicate their mathematical thinking (Carruthers and Worthington, e.g. 2003, 2005).

Research Methods:

Current longitudinal and ethnographic doctoral research outlined here draws on cultural-historical and social-semiotic studies (e.g. Vygotsky, 1978; Kress, 1997). It investigates the emergence of symbolic languages in social pretend play for children of 3-4 years in a nursery, revealing their personal 'funds of knowledge' (Moll et al. REF) and how effective and sustained pretend play provides rich and meaningful contexts for young children (Worthington and van Oers, *forthcoming*).

Using longitudinal, ethnographic case studies of young children (aged 3-4 years) I have gathered data in an inner-city nursery in the south west of England. BERA's ethical guidelines underpinned this research.

Data include written observations and photographs of the children's pretend play and graphicacy. Analysis is supported by computer assisted qualitative data analysis software (CAQDAS) - 'ATLAS-ti'. Analysis of the visual data is within an interpretative paradigm, drawing on social semiotic research including Vygotsky's (1978), and Kress's research on multimodality (1997).

Research Findings:

Paradoxically the findings reveal how in rich learning cultures children freely explore many aspects of mathematics within their play narratives without adult intervention (although they mediate learning in other important ways). They also choose to use graphicacy to communicate (i.e. drawings, abstract symbols, maps, writing and *mathematical graphics*), supporting early spontaneous concepts (Vygotsky, 1978) and providing effective foundations for 'scientific' concepts in school. The findings highlight the diverse genres the children used when writing and communicating their mathematical thinking, showing the relationship between marks and symbols young children use in their drawing and the symbolic languages of maths and writing, and how learning is mediated.

1. Analysis of the data showed that the culturally situated contexts of the children's play narratives provided rich opportunities for children to explore their 'funds of knowledge', (Moll et al., 1992).
2. Play episodes were often lengthy and complex: children frequently revisited their play over several days or weeks, and sometimes over more than one term.
3. The children spontaneously explored a wide range of graphics including mathematical, to communicate to their peers.
4. They explored a diverse range of genres in their writing and *mathematical graphics*.

These findings reinforce the view of young children as curious and successful learners from birth, emphasising the importance of play, democratic learning, post structural cultures and relational pedagogy. They have important implications for all those working in early childhood education.

Implications:

1. Children's social pretend play and graphicacy need to be better understood
2. Recognition should be given to the spontaneous mathematical concepts children develop within their play
3. The social and cultural aspects of writing and mathematics are best understood in play, than in the current 'skills-based' teaching

The concluding sections of this research will explore the heterogeneous nature of *children's mathematical graphics* and investigate the social and behavioural features of the children's play that contribute to their success.