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**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*, 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.

The research is based on a Vygotskian, cultural-historical perspective informed by a social-semiotic perspective of young children’s appropriation, creation and understanding of symbolic tools, with consideration of their communicative potential (Vygotsky, 1978; Kress; 1997). Research into children’s ‘funds of knowledge’ informs the study, showing how children’s interests underpin their pretend play and support concept building (Vygotsky, 1978; Moll, 2000; Hedges et al, 2011).

### **Background**

This study builds on previously conducted research by Carruthers and Worthington over the past two decades, into *children’s mathematical graphics* (e.g. 2003, 2005, 2011) and Worthington (e.g. 2009, 2010), 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 young children (aged 3-4 years) I have gathered data in an inner-city nursery in a Children’s Centre nursery school in the south west of England. Data include written observations and photographs of the children’s pretend 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.

Analysis is supported by computer assisted qualitative data analysis software (CAQDAS) - ‘ATLAS-ti’, helping to identify behaviours in pretend play episodes (role-play) that support children’s earliest mathematical representations and communications. The findings are expected to add to our understanding of the ways in which children explore, make and communicate meanings and their thinking about ‘signs’, ‘texts’ and symbols within their play that support their symbolic development of mathematics over time.

### **Acknowledgement**

I am sincerely grateful to the children, parents and teachers who have collaborated with me in this research project.

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