

**Excerpts from:** [BERA-TACTYC Early Childhood Research Review 2003 – 2017](#) relating to pretend play, mathematics and children's mathematical graphics,

#### **Chapter 4. Play and Pedagogy** - Elizabeth Wood and Liz Chesworth

Play enables communication through symbolization and representation via drawings, models, constructions, paintings, and artefacts (p.50).

Rogers and Evans (2007; 2008) report a small-scale ethnographic study of children's perspectives of role play in Reception classes in England, and contrasted teachers' provision for role play and children's responses. Where possible, children exercised their choice and agency as forms of resistance to the provision. The findings reiterate the common theme that some pedagogical practices prevent children from realizing the benefits of play (p. 54).

#### **3.3. Play and Mathematics**

Similar issues [to play and literacy] are evident in play and mathematics. Carruthers and Worthington (2006) document children's engagement with mathematical concepts through their play and freely chosen activities, using observations, conversations with children and adults, and analysis of children's drawings and mark-making activities. Children communicate their understanding in multi-modal ways, and pretend play reveals the cultural foundations of early mathematical knowledge in ways that connect home and pre-school experiences (Worthington and van Oers, 2016) (p. 51).

Social pretend play in particular places greater demands on children to co-ordinate their roles, to jointly plan and maintain their play with their co-players and to develop complexity. Knowing what you know, and being able to communicate this in peer contexts is fundamental to social pretend play... Play as the natural activity of childhood is revealed to be socially and culturally complex, which requires children to learn repertoires of skills in order to participate successfully (p. 53).

Research that foregrounds the existential qualities of play (play for its own sake) provides contrasting narratives to 'educational play', whilst paying attention to children's funds of knowledge, working theories, and enquiry-based interests (p. 57).

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#### **Chapter 5. Learning, Development and the curriculum** - Janet Rose and Louise Gilbert

#### **5. Theme 3 Mathematics**

The Early Years Learning and Development Literature Review (DCSF, 2009) reviewed the literature related to problem-solving, reasoning and numeracy and noted, for example, the importance of providing opportunities for problem-

solving within social contexts as a primary medium for mathematical learning. Mathematical language, multi-modal forms of representation, and play were also identified as significant in supporting conceptual development (see Chapter 4 Play and Pedagogy) (p.66).

### **Mathematical graphics**

Carruthers and Worthington's (2005/ 2016) taxonomy of mathematical graphics has contributed significantly to raising the profile of early years mathematical development. Their analysis of children's mathematical graphics builds on the work of Hughes and identifies five common forms of graphics - dynamic, pictographic, iconic, written and symbolic – and five dimensions - early play with objects and exploration marks, early written numerals, numerals as labels, representation of quantities and counting early operations. In another paper (Carruthers and Worthington, 2004), they analyse how numeracy develops, particularly in relation to children's thinking, from counting, to separating sets, to exploring symbols and the representation of operations. They identify the wide variety of mathematical graphics utilised by children. Carruthers and Worthington argue that teachers must allow and actively support opportunities for children to freely explore how they represent their mathematical understanding. They consider that bi-numeracy allows children to relate to symbols and algorithms at a deeper level and develops their mathematical thinking (p. 66).

### **Maths and culture**

Worthington and van Oers's (2016) study into the relationship between children's pretend play and the emergence of cultural mathematical understandings and communications showed how, as with literacy development, children draw extensively on their personal cultural knowledge in pretend play, exploring and elaborating their mathematical knowledge within the context of their unstructured pretence and imagination. This research concurs with Dunphy (2006) regarding the development of young children's number sense through participation in sociocultural activity, in which play, multi-modal engagement and reciprocal relationships are embedded (See also Chapter 4. Play and Pedagogy). The importance of cultural context and mathematical understanding is highlighted by Gifford (2014) who suggests that generalising results of children across countries is potentially problematic and that the effects on the nature and rate of mathematical development may be context dependent on, for example, parental expectations and culture that values mathematical success. She cautions against making assumptions within international developmental comparisons and performance measures (p. 66).

The curricular tensions of the Reception class have also been identified by a recent doctoral study by Carruthers (2015), which highlighted the significant difference in the teaching of mathematics between nursery school and reception. It noted that, as children enter school in England in the last year of the Foundation Stage, political and organisational pressures take over, generating uneasy pedagogies. Reception teachers find it difficult to encourage children's own enquiries and mathematical play is misunderstood. Her study discusses important aspects of potential pedagogies that enable

children's own mathematics to thrive (p. 74).

Young children's utilisation of resources, and the wide variety of multi-modal representations of children's thinking and understanding, have also been explored more widely (p. 75).

An enduring emphasis on the role of play is a golden thread that runs through much of the literature related to learning and development and the early years curriculum continues to be hindered by controversy related to its increasing formalisation and the role of the adult within it (p. 75).

**Selected references** from these excerpts of BERA-TACTYC Early Childhood Research Review 2003 – 2017:

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\* For an up-to-date version of the taxonomy, see <http://www.childrens-mathematics.org.uk/taxonomy.pdf>

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<http://www.tandfonline.com/doi/abs/10.1080/1350293X.2015.1120520> Accessed 1<sup>st</sup> August 2017.

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