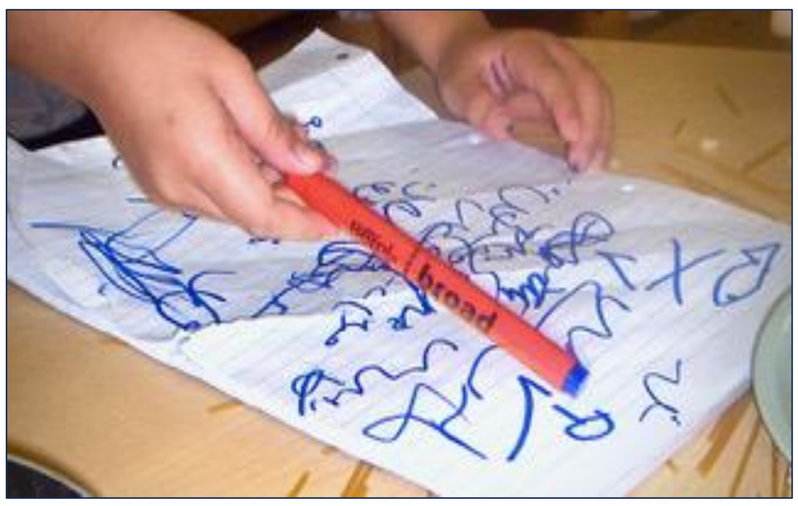
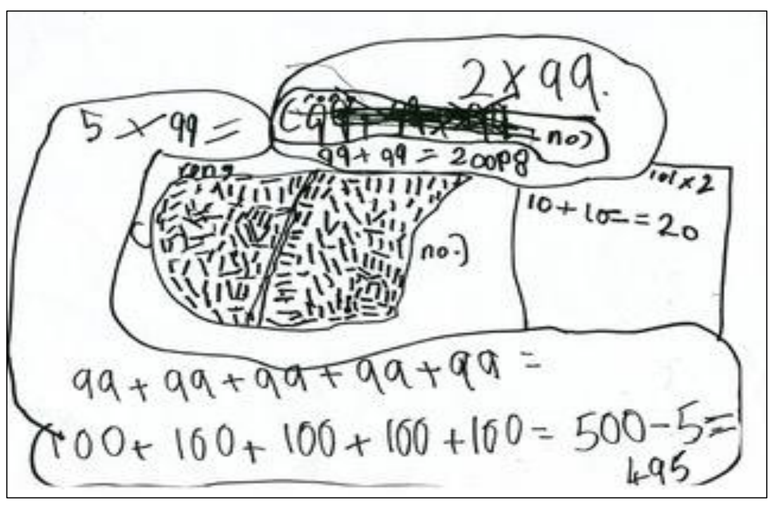
Young children and the abstract symbolic language of mathematics

Dr Maulfry Worthington - The international Children's Mathematics Research Network

- Symbol-use in mathematical contexts is essentially a literacy. However, meanings of standard symbols and their purposes makes this challenging for children: many of their difficulties point to failure to connect existing understandings with those they are expected to learn. This can limit children's confidence, resulting in mathematical anxiety that continues throughout their schooling.
- Practitioners, teachers and school leaders often perceive children's own marks and signs as early 'mark making', lacking knowledge of the potential of children's personal mathematical notations throughout the Foundation Stage and Key Stage 1. Children's own mathematical graphics enable them to go beyond superficial understanding, make personal sense, build confidence and enjoy learning mathematics.
- Research by Carruthers and Worthington into Children's Mathematical Graphics over more than 30 years (e.g., 2006), highlights children's intuitive use of personal signs to communicate their thinking, strengthening all aspects of 'written' mathematics. Teachers and practitioners report new insights they have gained into children's mathematics. *Child-initiated* pretend-play is especially valuable, enabling children to make cultural sense of the mathematics arising in their play. The findings of our research are dependent on democratic classroom cultures, enabling children to make their own decisions and choices.





Research pointers:

Both Hiebert (1984) and Hughes (1986) identified the difficulties children experience with the abstract symbolic language of mathematics, Hughes recommending that practitioners respect and build on children's own strategies.

'Mathematical anxiety is one of the causes of school failure' Sagasti-Escalona, (2020, p. 1) asserting that children's use of graphicacy in early childhood can increase understanding and prevent mathematical anxiety.

Merkley & Ansari's research (2016) found that symbolic number knowledge predicts subsequent achievement in mathematics. They highlighted this knowledge as a key mediator between children's early informal understanding and formal mathematical capabilities.

Policy Recommendations

- **Emphasise the importance of supporting children's mathematical thinking through their personal signs and representations in curriculum documents.**
- **Establish the benefits of high quality and meaningful *child-initiated* pretend play for children's mathematical understanding, in curriculum documents.**
- **Support the 'Numeracy for Life' committee in developing Children's Mathematical Graphics and its pedagogy - from the Foundation Stage through Key Stage 1.**

References

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