

**Maths and Numeracy APPG: Early Years Event, Tuesday 25th
November,
House of Commons, Westminster**

**Children's mathematics, and the abstract symbolic 'written'
language of mathematics**

Young children are highly capable learners; able to comprehend difficult ideas provided they make personal sense.

In England one of the biggest blocks to effective learning (and to adults' understanding of mathematics in early childhood), is that *rather than understanding and building on what young children already know and can do*, adults work from the Early Learning Goals, teaching and assessing mathematical 'skills' in relation to these. This approach shows only what children *cannot* do, and fails to recognize and value children's rich and diverse mathematical thinking and understandings (5).

'Written' symbols and representations are critical features of mathematics, but children find them the *most difficult* aspect to learn due to their highly abstract nature (e.g., 1, 2, 3), and without suitable support will fail to develop their full potential in mathematics.

There is currently no official acknowledgement or guidance on teaching the abstract symbolic language of mathematics for children in the Foundation Stage or Key Stage 1, a matter that should be of considerable concern. OfSTED repeatedly raises concerns regarding written mathematics including calculations, emphasising,

It is of vital importance for pupils of all abilities to shift teaching and learning in mathematics away from a narrow emphasis on disparate skills towards a focus on pupils' mathematical understanding (4: 3).

- Young children benefit from high quality mathematical experiences and rich learning cultures to support all aspects of mathematics (5).
- Research¹ has focused on the educational concept of building on young children's informal signs and representations, children representing their mathematical thinking in their play and in adult-led groups and classes (e.g. 2, 6, 7).

¹ Evidence from research by Carruthers and Worthington throughout England during the past two decades: includes doctoral research (University of Bristol, and VU University, Amsterdam).

- Children's informal mathematics (*children's mathematical graphics* - CMG²) have been found to support creative thinking, reasoning and problem solving, supporting children in *using and applying* their mathematical understandings, and highlighting their significance for calculations, problem solving and wider aspects of mathematics (2, 6, 7, 8, 9).
- This concept has considerable value in building mathematical confidence and establishing strong and effective foundations for written mathematics in primary schools (2, 10, 11).
- Early Years practitioners need to ensure that they understand children's early symbolic representations as part of a continuum throughout the birth-8 year age range³ (12).
- Where this has been a focus of professional understanding it has had a positive impact on children's mathematical achievement (e.g., 13,14, 15), contributing to raising standards in mathematics in schools and authorities.

Recommendations

- Promote professional development in Early Years mathematics (including Early Years Mathematics Masters modules), and in play.
- Establish a network of experienced *Early Years Mathematics Specialist⁴ leaders* throughout England, to lead *Early Years / Key Stage 1 Maths Hubs⁵*.
- Support longitudinal research into children's understandings and use of informal mathematical symbols and representations (CMG), from nursery through to Key Stage 1.

Maulfry Worthington, VU University, Amsterdam / *Children's Mathematics Network*: <http://www.childrens-mathematics.net/> / TACTYC⁶

References:

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² Carruthers and Worthington developed the educational concept of *children's mathematical graphics*.

³ Taxonomy based on analysis of 700 children's examples (9).

⁴ For example, Early Years Maths Masters module: Bath Spa University and Redcliffe Nursery School, Children's Centre and Research Base, Bristol.

⁵ Not to be confused with existing Maths Hubs that focus on Primary and Secondary mathematics.

⁶ TACTYC: The Association for the Professional Development of Early Years Educators.

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