Early childhood mathematics pedagogy: *exploration, apprenticeship & making sense*

All children are entitled to a strong mathematical foundation, enabling them to show the Characteristics of Effective Teaching and Learning (para 1.18 in the link document) in mathematics.

Early years teaching is underpinned by practitioners' understanding of children's possible mathematical learning trajectories and a belief that all children are effective mathematical learners, although their previous experiences may differ.

Early mathematical understanding is achieved during both child-initiated play and adult teaching through meaningful contexts, so that all children have daily moments where they explicitly engage with mathematical concepts and language.

Adults provide:

- exploration with shape, space, measures and numbers, e.g. construction
- outdoor learning- 'huge & outdoors'
- routines – snacktime, tidying up
- number rhymes, books and stories – linking fingers and symbols
- games – tracks, targets, hiding and counting
- puzzles and challenges- models and patterns
- familiarity and investigation with mathematical tools eg calculators, timers, scales

Adults engage children individually and in groups with:

- choosing and following their own mathematical interests
- 'low floor, high ceiling' problems to solve creatively
- a repertoire of mathematical communication, including personalized recording

Adults use teaching strategies:

- being playful with mathematical ideas- making deliberate mistakes, testing ideas with ludicrous suggestions
- 'sustained shared mathematical thinking' with children- e.g. 'What if..'
- ongoing observation and diagnostic assessment of learning trajectories

Adults are disposed towards:

- being curious about children's reasoning & expressions of their thinking
- supporting children to be resilient and take risks, spot patterns and make connections
- collaborating with parents and families
- being enthusiastic and interested in maths

Adults provide opportunities for children to engage in a range of mathematical learning over time

Adults provide opportunities for exploration with shape, space, measures and numbers

Adults provide opportunities for children to learn mathematics outdoors ('doing it huge and outdoors')

Adults establish everyday routines which are rich in mathematics, such as registration, snacktime and tidying up

Ofsted (2011)

Adults provide number rhymes, books and stories, linking fingers and symbols

Scottish Book Trust

Adults provide games which encourage mathematical thinking such as counting, track, target and hiding games

Ofsted (2011)

Learning Trajectories

Adults provide puzzles and challenges so children create models and patterns

Erikson Early Mathematics Collaborative

Adults encourage familiarity and investigation with mathematical tools

NRICH

Adults engage children with mathematics

Adults support children in choosing and following their own mathematical interests

Adults engage children in 'low floor, high ceiling' problems to solve creatively

'Share the coins between 2 bears – then another bear comes and wants some too...'

'Who has captured the most water? How will we compare and measure it?'

'What if this was someone's footprint? How tall would they be?'

Adults engage children in using a repertoire of mathematical communication

Using manipulatives and drawing

Movement and language patterns

DCSF (2009)

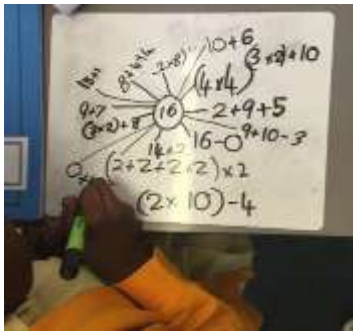
Using symbols and gestures

Ofsted (2015)

Programming

Hawes et al. (2017)

Using talk to describe and reason



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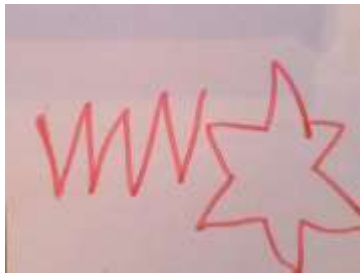
Free recording with symbols

'I drew infinity. It's a number… the biggest number ever. It never stops. 100 is not where it stops, it's not the biggest number.'



Representing mathematical ideas in their own way

Adults use teaching strategies that encourage mathematical thinking

Adults teach mathematics by being playful with mathematical ideas, including making deliberate mistakes and testing ideas with ludicrous suggestions

Shall we use the teaspoon to fill the paddling pool?
Listen- what might be in the box? I think there are a million elephants!
What might a dinosaur want and how would they pay in the dinosaur café?
Can you show the teddy how many there were?

Adults engage in 'sustained shared thinking' conversations with children (after observing and listening)

NRICH

Adult: *So it looks like we're going to read the Animal Bop at story time*
Child A: *But there's more children outside – so the Great Goat will win!*
Child B: *No it won't.*
Adult: *Why do you think so?*

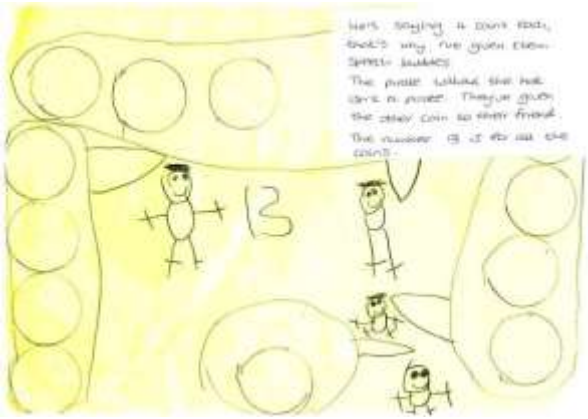
Adult: How could we make more spaces?
Child: We could put another stick here…
Adult: What will happen to the number of spaces?'

Adults use knowledge of typical learning paths to interpret observations and to inform their provision and interactions

Learning trajectories

Adults are disposed towards behaviours and ways of thinking that promote positivity and success in mathematics

Adults are curious about children's reasoning and expressions of their thinking



Simon Lewis

Adults support children to be resilient and take risks, spot patterns and make connections

Adults collaborate with parents and families

Tickell (2011)

Adults are enthusiastic and interested in mathematics

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Ofsted (2011) *Good practice in primary mathematics: evidence from 20 successful schools*
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The Early Childhood Mathematics Group (ECMG) is a UK based group of early years mathematics enthusiasts and experts that includes teachers, researchers and teacher educators. We work together to promote early childhood mathematics.