



Briefing note: Understanding How We Can Raise Attainment in Mathematics

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Summary

- Raising standards in maths attainment at primary school has been highlighted as a UK Government priority. But there are several challenges to supporting all children to reach their potential in maths, which needs to be addressed.
- Children with dyscalculia and mathematical learning difficulties experience specific barriers when learning maths and specialised support for teachers is required.
- When helping children's maths learning at home, there are significant socio-economic inequalities and efforts to support families need to go beyond parent-school communication.

Recommendations

To help raise standards in maths attainment at primary school, there needs to be:

- Further investment in specialised support for understanding and supporting children with dyscalculia and mathematical learning difficulties.
- A national campaign for raising awareness and standards in the home mathematics environment.

What is the Issue?

Estimates suggest that children's maths attainment has been significantly impacted by the disruptions caused by Covid-19, much more so than reading (DfE, 2022). This reflects trends seen in data prior to the pandemic, where a maths-reading attainment gap emerges in the first years of school, with reading skills significantly exceeding those of mathematics (Outhwaite et al., 2022).

As part of the recently released Schools White Paper "Opportunity for All", the UK government are aiming for "90% of primary school children to achieve the expected standard in reading, writing, and maths for Key Stage 2 by 2030" (DfE, 2022). To achieve this goal, the UK government have proposed increased continued professional development for teachers and increased parental involvement.

In response, this briefing note summarises the empirical evidence specific to these proposals and some of the challenges relating to raising standards in maths attainment at primary school. This includes understanding and supporting, 1) dyscalculia and mathematical learning difficulties, and 2) the home mathematics environment.

Dyscalculia and Maths Learning Difficulties

Research shows teachers are largely unaware of specific learning difficulties relating to mathematics, including dyscalculia and mathematical learning difficulties (MLD). Teachers also report a lack of understanding of how best to support their pupils in these areas (Dimitriadis et al., 2021), as well as holding their own anxieties when encountering a maths or spatial problem (Costa et al., 2021; Gilligan-Lee et al., 2022).

Dyscalculia and MLD impact children's basic maths skills, such as reading and writing numerals, remembering number facts, calculation, or mathematical reasoning. Estimates suggest up to 14% of primary school children have dyscalculia or MLD, which often manifests during the early school years (Geary, 2015). Importantly, these learning difficulties are unique and specific to maths and cannot be attributed to other areas of special educational needs, including intellectual disabilities, developmental disorders, or neurological or motor disorders. Research shows children who experience these difficulties are at a greater risk for lower educational, employment, financial and health

outcomes in the future, compared to their typically developing peers (Butterworth et al., 2011; Davis-Kean et al., 2022).

As part of the White Paper, the government highlight that they will include numeracy as part of the training investment for the early years workforce, which will also focus on literacy. The current offering of specialised support, such as the new National Professional Qualification for Leading Literacy and the SENCO National Professional Qualification does not appear to include a specific focus on mathematical learning and development.

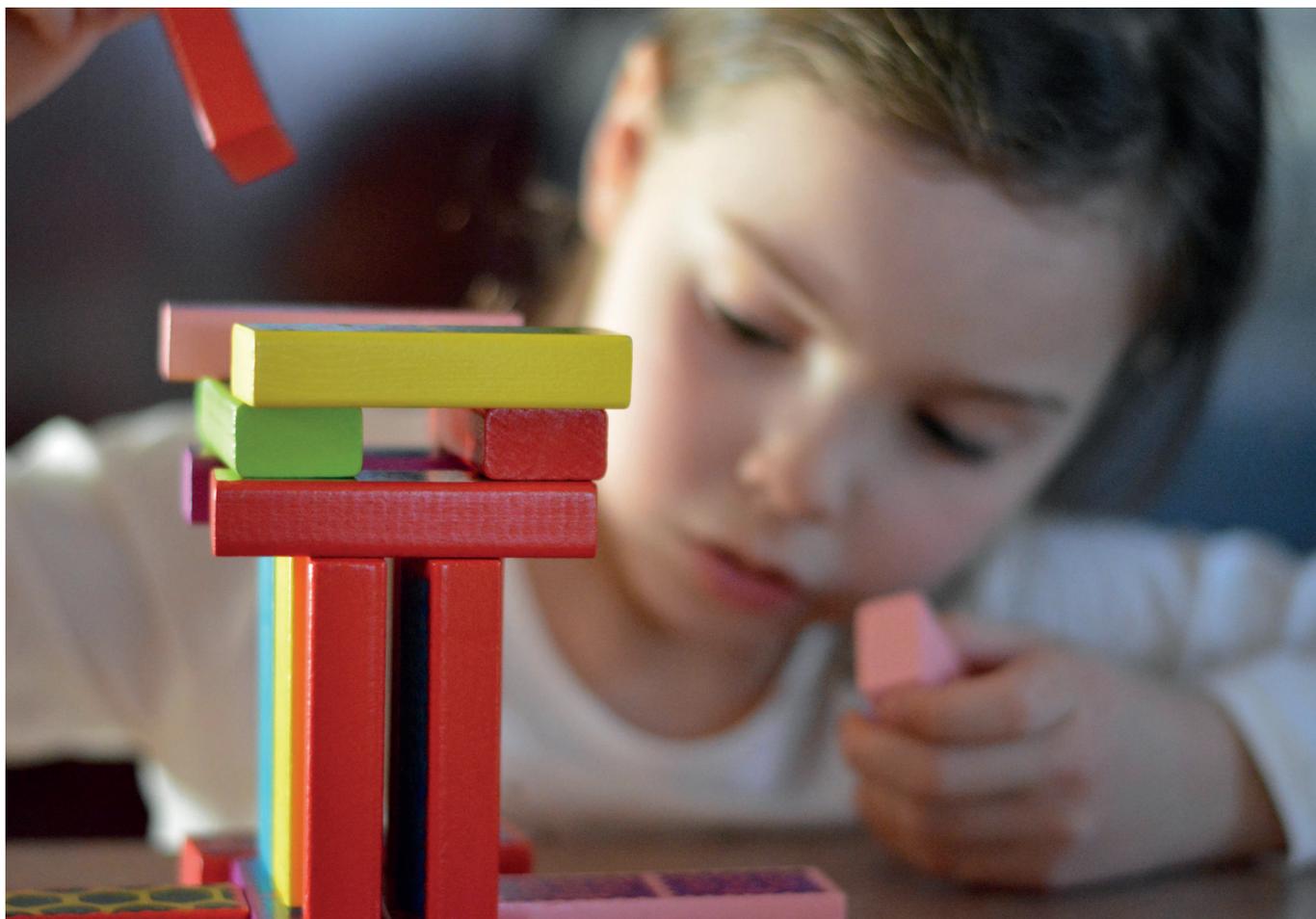
Overall, this means that supporting children, particularly those with these difficulties learning maths will be a significant challenge and more specialised support for teachers specific to maths is required.

Home Mathematics Environment

To help raise attainment levels, the White Paper also outlines a 'Parent Pledge', in which schools will communicate to families, if their children are falling behind in maths (or English) and provide targeted support. However, recent data suggests 88% of primary school teachers already do this and questions have been raised about how effective this strategy will be in practice (Roberts, 2022).

Research shows there are a limited range of effective maths interventions that can be used at school or at home, which are available in the primary school years (Simms et al., 2019; Outhwaite et al., 2022) and when involving parents, communication alone is not enough (Eason et al., 2020). Instead, active parental engagement with children's maths learning at home, particularly for advanced, rather than basic maths skills, is required to increase attainment (Mutaf-Yildiz et al., 2020).

However, there are significant inequalities in opportunities for active parental engagement with children's maths development. Research shows children of graduate parents have higher attainment (mathematics, problem-solving, and reading combined) scores, compared to parents with secondary school qualifications, followed by no qualifications (Sullivan et al., 2013). Research shows higher levels of maternal education supports higher family incomes, which in turn supports increased parental investments in educational resources at home, and consequently increased maths skills for primary-school aged children (Macmillan & Tominey, 2019).



Similarly, 47% of parents report feeling anxious towards maths (Akribian, 2022) and research shows parental maths anxiety combined with well-meaning home engagement is negatively related to young children's mathematical learning (Maloney et al., 2015).

To help parents to support their children, there is some emerging evidence of promising interventions. For example, parent-based educational apps that provide parents and caregivers with resources and ideas for engaging with their child's maths development have shown positive and sustained benefits for child outcomes (Berkowitz et al., 2015; Schaeffer et al., 2019) and parent confidence (Outhwaite, 2021).

Lessons can also be learnt from national campaigns promoting parent engagement with children's literacy and reading development, such as the Hungry Little Minds Campaign in 2019, which signposted parents to accessible and evidence-based literacy resources (DfE, 2019). A similar campaign to raise awareness of the home mathematics environment would also be beneficial, particularly as estimates suggest parents' engagement is lower in maths compared to literacy activities at home. Figures show parents in England typically read

to young children five to seven days a week, compared to maths-related activities only once a week. These engagements have also been shown to be associated with stronger mathematical outcomes for young children after accounting for socio-economic status (OCED, 2020).

Summary and Implications

Strong mathematical skills play a crucial role in children's educational, economic, social, and health outcomes (Davis-Kean et al., 2022; Reyna et al., 2009). Therefore, efforts to raise maths attainment throughout primary school is vital.

Based on the summarised evidence, this briefing note recommends expanding the training investment committed in the Schools White Paper to include specialised support for understanding and supporting children with dyscalculia and mathematical learning difficulties.

Policy makers should also support a national campaign for raising awareness of the importance of the home mathematics environment, which encourages and supports active parental engagement.

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