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## Mathematics in the Early Years: a bolder start

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**ABSTRACT** With the publication of *Bold Beginnings*, Reception teachers and educationists felt their principles and practices were under attack. The main focus of the debate that ensued targeted the formality of learning, and especially teaching writing sitting at desks. The comments about the mathematics practices of the good schools incorporating Year 1 expectations into Reception classes largely went unchallenged. This article offers a commentary on the findings from *Bold Beginnings* in relation to mathematics and contrasts them with the recent announcements for the draft expectations at the end of the Reception year.

### Views from Ofsted

The debate created by the publication of Ofsted's *Bold Beginnings* (Ofsted, 2017) was extensive, particularly on social media, with polarised views about the learning and teaching approaches to be employed in this phase of education. Previous reports by Ofsted focusing on the early years covered the whole of the Foundation Stage (FS) age group – for example, 'Teaching and Play in the Early Years: a balancing act?' (Ofsted, 2015) – yet *Bold Beginnings* focused exclusively on the Reception classes. In schools with no nursery class attached, Reception classes are isolated in being the only providers of early years practice, following a separate curriculum to the rest of the school (which comes under the National Curriculum from Year 1). This can make the teachers in these classes feel vulnerable as the weight of numbers favours those teaching the National Curriculum. This article seeks to explore the increasing pressures felt by – and in some cases exerted on – Reception teachers to prepare children for working within the National Curriculum, with a focus on the aspects of mathematics learning and teaching suggested in the Ofsted report. These included a narrow focus on number and an increase in formalised learning situations, with the need to sit at tables, though this latter idea was related more to learning to write.

Since children in Reception also learn to write numbers, this stipulation could be seen to apply equally to both writing and mathematics. I will argue that it is possible to offer stretch and challenge within a play-based environment that allows children and teachers opportunities for deepening mathematical knowledge through exploration and discussion. This way of working is integral to the mastery approach now popular within primary schools, enabling a smooth transition into Key Stage 1 (KS1) without the need to move to more formal desk-based teaching and learning.

The relationship between the different areas of learning in the early years and the impact of this on learning contradicts the Ofsted that in 1997 claimed a positive set of practices in relation to personal and social development. By 1999 concerns were expressed that an increased emphasis on language and literacy and mathematics would be at the expense of the personal and social skills; however, another Ofsted survey (1999) suggested that these concerns were unfounded. The balance of emphasis is often an issue at the beginning of the year when settling new children, when early years practitioners position the development of social and literacy knowledge and skills above the development of mathematical knowledge and skills. When placing student teachers in nursery settings at the beginning of the academic year, I have been told more than once that 'we only concentrate on the personal, social and emotional development before engaging with other areas of learning'. This can partly be a result of a lack of both subject knowledge and confidence among those working in the early years, but also a result of the dominance of phonics teaching and the importance of the social and emotional skills required specifically on entry to an early years setting. As a result of the lack of confidence, mathematical activities are often reduced in their scope. In the early years environment, this can be seen with number lines without zeros and ending at 10 or 20, rather than acknowledging the infinite nature of the number system. There can also be a lack of 'noticing' the mathematical opportunities in other activities in an early years setting if adults do not have the subject knowledge to recognise the connections between overtly non-mathematical activities and mathematical concepts. The discipline of 'noticing' was developed as part of mathematics education by John Mason (2002), and the idea is to become more aware of noticing specific events, incidents or other phenomena that occur, why you have noticed this specific thing and how you respond. So, as a practitioner in the early years, you can become attuned to noticing opportunities to explore mathematical aspect of tasks. This can be through activities which are set up to be more adult led, such as turn taking, and sharing can be a key aspect of a mathematics-based activity such as fishing in a tank for items to collect and count. Or it can be in the daily routines of snack time that mathematical concepts can be explored as a natural part of the process. Although the process of 'noticing' appears straightforward, developing the depth of focus to explore your actions as a teacher can take time and practice.

For those lacking confidence, a return to formal delivery of mathematics offers an easy route to follow (i.e. to meet the Ofsted requirements), with

worksheets and task completion seen as the totality of learning. This may appear a harsh indictment of teachers within this phase; however, utilising a formal approach is understandable if teachers are unsure about how they might move forward. One way forward may be to support early years practitioners in reconceptualising apparently 'new' requirements in terms of embedded and accepted good early years practice. For example, the mastery agenda currently sweeping primary school mathematics brings with it the idea of concrete, pictorial and abstract (CPA) representations. The CPA approach is actually already embedded in early years (and primary) mathematics, carrying strong synergies with Bruner's (1966) principle of three modes of representation: enactive, iconic and symbolic. Children need experience at all three levels to develop understanding of any particular mathematical concept, something which has been a consistent feature of early years practice for decades. For example, across their time in the early years environment, children encounter numbers enactively (counting three apples, three wheels on a trike, three children wearing hats), iconically (being directed to the image of the three bears, being supported to mark make three buns in the café role-play area) and symbolically (introduction to the symbol '3' on number lines and other classroom displays). Through interaction and discussion with adults, young children are helped to bring these representations – and the understanding they glean from each – together to develop their understanding of the concept of 'three'.

### **Gaining Experience Teaching Reception Classes, and Transition Issues**

Newly qualified teachers (NQTs) are only likely to have had a substantive placement in Reception classes if they are on a 3-7 programme. As a result, when primary teachers move to a Reception class having taught in other year groups, their experience of teaching is based more on teaching the National Curriculum rather than the Early Years Foundation Stage (EYFS). Ofsted (2017) suggests that the best practice in Reception classes in relation to mathematics extends into the Year 1 programmes of study, yet there are gaps between the knowledge expected at the end of the FS and the Year 1 curriculum. Good practice in Reception classes in the learning and teaching of mathematics should feed through into Year 1 for a smooth transition. Is it appropriate to teach children the content of Year 1 in the Reception class? And if so, what happens then in a Year 1 class as the range of attainment widens? Teachers in Year 1 may need to adapt teaching further if children think they have done the work on these topics already and respond accordingly. With the introduction of maths mastery, the focus is on depth of understanding rather than acceleration. It can be the formality of the approaches in Reception that potentially widen the attainment gap into Year 1 as a result of accessibility issues with the teaching and learning approaches. In literacy, the notion of 're-reader' is used to describe someone meeting the same text on more than one occasion; although

there is a similar aspect to revisiting topics in mathematics, this is usually seen as reflecting the spiral nature of the curriculum structure rather than as being a re-maths issue. The notions of differentiation and possibly accelerating the most able children's learning are not new for teachers, but what are the implications across curricular phases, in this case between the FS and KS1, which can have two quite distinct pedagogic approaches in English schools? There are a few exceptions, where schools have shifted early years practice into KS1 or even beyond, though these are the exception rather than the norm. These schools have chosen to work more with 'free-flow' approaches to learning and teaching, allowing greater choice for children as learners. They value the children's independence and an exploratory approach to learning and teaching, as well as using the outdoor environments for learning throughout the primary school.

The current mathematics expectations at the end of Reception require children to:

- estimate a number of objects and check quantities by counting up to 20
- solve practical problems that involve combining groups of 2, 5 or 10, or sharing into equal groups
- estimate, measure, weigh and compare and order objects and talk about properties, position and time. (DfE, 2017, p. 55)

In Year 1, the topics build upon activities in the FS (e.g. an introduction to time within 'knowledge of the world' and daily routines), but the National Curriculum broadens content to number and place value, addition, subtraction, multiplication and division, fractions, measurement and geometry (DfE, 2014). In the transition document for 2018, practitioners are given the following advice: 'Early years practitioners should make sure children's experiences in the final year of the EYFS are valuable in themselves, and prepare the ground for Year 1. It is important that Year 1 builds on the successful principles and approach encapsulated in the EYFS' (DfE, 2017).

Does a focus on stretching and challenging children's mathematical development have to mean a shift towards more formal learning sessions? In the summer term of a Reception year, many teachers begin an English and maths lesson format as part of the transition process of getting children ready for Year 1 practice. There appears to be little evidence to support this strategy. This concern about children managing the transition in relation to the teaching approach appears to come from further up the primary school rather than from Reception teachers. This is partly because of the focus on value-added measures for primary schools against Year 6 SATs results and narrowing the gap for the disadvantaged children. Roberts Holmes and Bradbury (2016), in their research on accountability and datafication of the early years in England, identify some of the data pressures perceived by heads in primary schools. They conclude their article by suggesting that early years has been drawn into what they term the school's 'delivery chain'. As an alternative perspective, Caroline Sharp's (2009) research for the National Foundation for Educational Research (NFER)

described the challenge as making ‘school ready for children, rather than on making children ready for school’. The ideas about ‘readiness’ are not new, as they formed the basis of Piaget’s stages of development (Piaget, 1926), and although these have been heavily criticised as an overriding approach to development which doesn’t allow for mapping of individual differences, this is still the political mantra for early years education. From a government point of view, early years education is about preparing children for school, and this is emphasised again in the *Bold Beginnings* report (Ofsted, 2017).

In relation to mathematics, the notion of school readiness raises the question about what this preparation for school and the National Curriculum should consist of for teachers and children. Should this purely be about the mode of delivery or should it be about the knowledge, skills, understanding and attitudes that young children should be developing in order to allow them to develop as effective mathematicians? I argue that there are alternative ways of increasing the engagement with mathematics in preparation for Year 1 but that these are alternatives which can be achieved through creative resourcing of the environment and developing discussion about mathematical concepts with children, rather than through formal maths sessions. For example, the environment for the children must include number lines that go up to at least 100 either indoors or out so that children can explore counting independently or with adult support, identifying digits, looking for patterns in the digits and asking questions. All of these combine to develop a sense of number that will be so important for arithmetic and algebraic skills later in their school lives. Always have a well-positioned maths area in the setting. ‘Well-positioned’ means it should *not* be in a location where children won’t stop as they are passing through to other areas. This maths area must have activities which invite all learners, which engage them in exploring mathematical concepts and which can be demonstrated by adult involvement in this area. It is a key area in the setting where adults should be modelling exploration and learning for the children to encourage a positive attitude to maths. An area like this should include storybooks about counting and patterns (e.g. *How Big is a Million?*, *We All Went on Safari*, *The Greedy Triangle*). It should also include collections of sorting items and containers to sort them into, alongside numbers, shapes, dominoes and other equipment. A mathematics area could also be centred around a play environment such as a delivery service, which would encourage children to take roles, check parcels, deliver items, and produce tally sheets or other kinds of recording. Young children have made their minds up about their attitudes to the subject very early on and this has an impact on their future success in the subject, so a range of different opportunities to engage with mathematics is really important. Adults should be modelling a positive approach, overtly demonstrating engagement with and interest in mathematical activities. In addition, there needs to be a collection of books about mathematics or related topics which are again a good source of stimulus for the children’s curiosity, with the positive impact of picture books in primary and early years environments on mathematical progress and engagement increasingly

recognised (e.g. Van den Heuvel-Panhuizen & Van den Boogaard, 2008). Practical starting points for discussion about mathematical topics are key to developing children's ability to speak mathematically (Pimm, 1987), which supports their understanding of mathematical concepts.

### From 'A Balancing Act' to *Bold Beginnings*: a content analysis

When looking at the two recent documents from Ofsted related to the EYFS, there appear to be some contradictions in the guidance being offered to teachers. In order to look at this issue, I undertook an analysis of the word-use frequency in each document, using the Word Cloud function of Nvivo 11.[1] The process requires uploading the documents to the application, and then this produces the word frequency either as a table of words or as a picture. It is then possible to continue a deeper analysis following up the use of the words in context in both documents. This latter task is not explored in this work. In the *Bold Beginnings* report (Ofsted, 2017), the main focus is on children, with the addition of Reception and schools, curriculum and teaching. Mathematics, reading and knowledge appear in the document to a similar extent. The positioning of knowledge relates to the direction of travel for policies in education since the last revision of the National Curriculum (DfE, 2014).



Figure 1. *Bold Beginnings* Word Cloud produced from Nvivo 11.

In comparison, the focus in the 'balancing act' report (Ofsted, 2015) was on children, but the next group of words highlighted centres on learning, schools and parents, with no subject-specific language. Play and development feature in the next layer of word frequency, giving a quite different feel to the direction of travel compared with the more recent *Bold Beginnings* report.

Word frequency does not indicate the full intent behind the reports, but in this case it demonstrates a significant shift in thinking about early years practice.



- Automatically recall number bonds for numbers 0-5 and for 10, including corresponding partitioning facts;
- Automatically recall double facts up to  $5+5$ ;
- Compare sets of objects up to 10 in different contexts, considering size and difference;
- Explore patterns of numbers within numbers up to 10, including evens and odds. (DfE, 2018)

Now this raises questions about the findings from the *Bold Beginnings* report and the criticism of its stretch and challenge for all children in Reception as the draft detailed above proposes a much more narrowly focused curriculum and reduced expectations. Instead, echoing the mastery agenda in KS1 and KS2, the focus is now on keeping the children together. The emphasis is on repetition of the selected knowledge, harping back to a more behaviourist view of learning. Far from increasing challenge, this draft appears to be reducing the mathematical content of the ELGs and the reporting requirements. This reduces the knowledge to key facts about number limited to 10. In fact, however, children need to understand that counting includes numbers beyond 10, even if they are not actively working with the amounts. Through simple number line displays children can spot patterns emerging in the numbers and ask questions that will support the development of their overall number sense. In this way, the children become familiar with numbers and so, when meeting them again in KS1, they do not see them as something different, and this will assist in reducing mathematics anxiety at an early stage. Although it might be argued that this proposed curriculum aims to deepen children's understanding of a small range of mathematics, this is only possible if the adults working with this age group have the depth of subject knowledge to underpin their teaching. On the other hand, it implies a hierarchy of mathematical knowledge, placing number at the top, and ignores the fact that young children naturally encounter other aspects of mathematics in their everyday lives, particularly measures and geometry. The proposed changes take no account of the language that children acquire about capacity, time and geometry through their play activities which underpin the study of the subject throughout their primary education. Indeed, shape, space and measures no longer appear to feature in the ELGs. This slimming down of expectations appears to be more a reaction to teacher workload related to assessment rather than a well-considered review of an appropriate curriculum for Reception classes, particularly in relation to mathematics. As this is a draft, there is an opportunity for a systematic and thorough review of the needs of some of our youngest mathematical learners to be conducted in order that we offer this age group an appropriate view of what mathematics is to help them develop a positive attitude to the subject. Our youngest children and their teachers deserve the answer TO the request for a review to be a definite yes.



## Note

- [1] For Word Clouds produced using NVivo 11, see the following weblink:  
<http://www.qsrinternational.com/nvivo/nvivo-products/nvivo-11-for-windows>

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