Fundamental problems with the 2014 Primary National Curriculum for Mathematics

Rebecca Hanson   6 January 2014

I recently published "The Challenges of Implementing the New Primary National Curriculum[1]", which compared the 2014 English Primary National Curriculum for Mathematics (PNCM) with the curricula it replaces as well as those of Finland and the US. This report raised particular concerns regarding the high proportion of abstract mathematics our teachers are required to deliver to 6-year-old children, an age at which it is very widely recognised (through research and in curriculum planning) that many children will still need to work with concrete and visual mathematics. It also questioned whether the claim that the PNCM is based on the curricula of high achieving nations, which has been repeatedly used to justify the development of this curriculum, has any validity.

During subsequent correspondence I asked Tim Oates (who led the National Curriculum Review) and Stephen Rogers of the DfE (Team Leader responsible for the Mathematic Curriculum) why we are to be required to teach abstract content to children who are six. Both replied stating that the key influence for our curriculum was the Singapore Curriculum[3].

I have therefore examined the Singapore Curriculum for evidence of abstract content being taught to children who are six years old. I found no such evidence. The analysis which follows demonstrates the differences between the ways in which the core aspects of calculation (which must be successfully mastered for children to build mathematical competency) are required to be taught by the PNCM and the Singapore Curriculum.

Addition and Subtraction
In Year 2 (age 6-7) the PNCM requires that students are taught to mentally add and subtract two digit numbers. This skill requires students to mentally manipulate numbers using the base 10 number system.

In Singapore students are taught the base 10 number system in their Year 2 (age 7-8) and are not expected to be able to mentally add and subtract two digit numbers until their Year 3 (age 8-9).

Multiplication
In Year 2 (age 6-7) the PNCM requires that students are taught to count in steps of 2, 3, 5 and 10 (forwards and backwards) and to recall and use facts in the 2, 5 and 10 multiplication tables.

In the Year 1 (age 6-7) Singapore curriculum the use of multiplication tables is specifically excluded. Multiplication is restricted to cases of repeated addition where the answer is less than 40.

Division
In Year 2 (age 6-7) the PNCM requires that students are taught to recall and use division facts for the 2, 5 and 10 tables, to show that division is not commutative and to use the division sign (÷).

In Singapore children in Year 1 (age 6-7) learn to split quantities (not greater than 20) into equal sets and to find the number of objects in each set. The use of tables and the division symbol are specifically excluded.

Fractions

In Year 2 (age 6-7) the PNCM builds on the concepts taught in Year 1, requiring that students are taught to recognise, find, name and write the fractions $\frac{1}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}$ of a length, shape, set of objects or quantity, to find simple fractions of quantities (*e.g.,* $\frac{1}{2}$ of 6 is 3) and to recognise the equivalence of $\frac{1}{2}$ and $\frac{2}{4}$.

Fractions are not mentioned in Year 1 (age 6-7) of the Singapore Curriculum. Fractions are extensively explored in Years 2 and 3 (age 7-9) so that students are ready to first study finding a fraction of a set of objects in their Year 4 (age 9-10).

Conclusion

The Singapore curriculum pays careful attention to the established research which shows that most young children need to work with concrete and visual mathematics before attempting abstract mathematics if they are to progress to be confident learners and competent users of mathematics. The PNCM is unique in ignoring this research evidence and demanding students are taught substantial quantities of abstract mathematics at the age of six.

Consideration of these issues leads to the conclusion that the 2014 Primary National Curriculum for Mathematics will seriously damage children's learning and therefore contravenes Section 78 of the Education Act 2002, which requires that the National Curriculum must promote the mental development of pupils.

The evidence presented here demonstrates that this curriculum is so far from being fit for purpose that its implementation should be immediately suspended at the national level.

References

1. The Challenges of Implementing the New Primary National Curriculum (Hanson, Dec 2013)
http://authenticmaths.co.uk/report-primary-schools-new-national-curriculum/

2. Primary National Curriculum (2014):
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239129/PRIMARY_national_curriculum_-_Mathematics.pdf

3. Singapore Primary Mathematics National Curriculum (2007):
http://www.moe.gov.sg/education/syllabuses/sciences/files/maths-primary-2007.pdf

The Singapore Primary Mathematics Curriculum is currently being updated; however, only Year 1 has been published thus far. The content is little changed from that of the 2007 curriculum.

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