

Laying the Foundations of Numeracy

A Comparison of Primary School Textbooks in Britain, Germany and Switzerland

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Would better textbooks help raise the schooling attainments in mathematics of British pupils? That question motivated the comparisons reported in this paper based on textbooks used in primary schools in Britain, Germany and Switzerland. Textbooks both embody conceptual approaches on how a subject should be taught, and at the same time reinforce those approaches.

The Continental published schemes include as each pupil's main resource a *single* textbook that covers what is to be learned in a whole year. The English schemes provide between two and four thinner textbooks and/or workbooks as a pupil's main resource for the year. But the Continental textbooks are printed more densely: there are about three times as many exercises and activities in the Continental schemes (around 4500 on average) as in the English schemes. The Continental view on mathematics teaching seems to be that about three-five times as much time should be spent on practice and consolidation as on the introduction of new concepts.

While there is a fair similarity in the mathematical topics in the textbooks from all three countries, there is a major difference between Continental and English textbooks in relative emphasis. In both the German and the Swiss textbooks, basic arithmetical procedures are paramount; they require eight-year-old pupils to acquire a thorough grasp of whole numbers up to 100, including the relationships between them and arithmetic operations with them. In contrast, the five attainment targets in the English national curriculum (using and applying mathematics, number, algebra, shape and space, handling data) by implication have been understood by teachers to carry equal weight, so that only a fifth of the curriculum time for mathematics is ostensibly intended to be devoted to number work.

In England, children are expected to develop their "own methods," making extensive use of concrete material. In practice, this encourages English pupils to continue too long counting one by one, using their fingers, counters, etc. Counting as a strategy to solve arithmetical problems is regarded on the Continent as a proper early and "primitive" stage.

A major difference between English and Continental textbooks lies in the way topics are sequenced. English textbooks are characterized by relatively rapid changes between topics, whereas the Germany and Swiss textbooks devote larger continuous blocks to one topic. The more segmented structure of English textbooks is coupled with much repetition and less distinct progression, reflecting an acceptance of less thorough consolidation at each encounter. Basic concepts reappear again and again, while more advanced concepts (which require the mastery of the basic ones if they are to be understood) are often introduced before basic concepts are assumed to be fully mastered. This is very different from the Continent: in the German and Swiss textbooks, once a concept has been introduced, it is consolidated thoroughly.

Mental calculation is regarded on the Continent as a priority, to the exclusion of formal pencil-and-paper calculations until the age of nine. This reflects the widely-accepted Continental view that mental calculation promotes pupils' conceptualization of number and that mathematics provides a unique subject for training the *minds* of pupils in extended chains of reasoning. It is thus not surprising to find that the use of calculators is a relatively minor feature in the teaching of arithmetic there: calculators are not usually used during lesson time until pupils are aged 13-14, and are hardly to be seen at all in primary schools.

Proponents of such practice in England do not appear to take into account its detrimental implications, which are clearly in the minds of teachers and educationists on the Continent. Pupils' activity in obtaining results by using calculators consists solely in pressing buttons — in other words, in re-stating the problem. When using calculators, pupils contribute to the process of finding the result hardly more than if it were dictated to them by the teacher. The underlying process is totally concealed from them, and the calculator does not help pupils understand *why* the result is true. To put it another way: it is difficult to see why the use of calculators is advocated by many educationists in England who emphasize that children's own activity leads them to learn well, when in reality they are "told" results by electronic calculators. By using calculators, children come to learn that "something is true because the calculator says so." English pupils have the added disadvantage that they often do not recognize a "very wrong" result by automatic intuition, in the way Continental pupils recognize errors on the basis of their acquired facility with numbers.

The differences between British and Continental primary mathematics textbooks are clearly far from negligible. At present, when more serious efforts than ever before are being made in Britain to spread mathematics competence to a much greater fraction of school-leavers, it seems advantageous to seek to benefit to the full from what Continental experience has to offer.

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