IMPROVING STUDENT TEACHERS' UNDERSTANDING OF MULTIPLICATION BY TWO-DIGIT NUMBERS

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It was apparent that many of my primary school student teachers (STs), and practising teachers on in-service courses, had not much conceptual understanding of the mathematical content they were supposed to teach. An action research was performed with the main aim of investigating ways of improving STs' conceptual understanding of mathematics. A teaching programme was designed in an attempt to: (a) improve STs' subject matter knowledge (SMK) of most of the mathematical content they would have to teach and (b) help them to acquire some initial pedagogical content knowledge (PCK). The teaching strategies used to improve STs' conceptual understanding were similar to the ones suggested for their future use in teaching primary school children. So the re-teaching of mathematical content (SMK) was integrated with the teaching of pedagogy (PCK) by asking the STs to perform children's activities which have the potential to develop conceptual understanding of the subject.

The area representation for multiplication by two-digit numbers (e.g., 38 x 47) proved to be one of the hardest topic for the STs. Therefore, this paper only describes the changes made in the programme in order to help STs overcome their difficulties with the area representation which were thought to be partly because:

- They did not seem to have much conceptual understanding of area. Their main recollections of the school work with area of rectangles appeared to be related only to the formula "b x h".
- They were not familiar with the idea of using rectangles to represent small multiplication sums like 3 x 8. So they had not developed the pre-requisite knowledge to extend the representation to multiplication by two-digit numbers.
- They had memorised symbolic ways of performing multiplication by two-digit numbers which seemed to be interfering with their learning of conceptual representations for these operations. A sum like 38 x 47 was verbalised by all STs as "8 x 7, 8 x 4, jump a place, 3 x 7 and 3 x 4". They did not interpret the three in the tens' place as 30 times and the four as 4 tens or 40.

After achieving automaticity learners seem to become more reluctant to connect their well practised symbolic procedures to other mathematical representations that could provide further links to conceptual knowledge. The steps in a procedure may become tightly connected and fixed in the learner's mind, not allowing a more flexible way of thinking about them. In a post-test response one ST wrote: "I would not let them [her future students] to get addicted to saying '5 times 7, 5 times 4, 5 times 1' [talking about the steps in the multiplication algorithm 53 x 147]. In truth, the 5 means 50 and 50 times 7 is 350, so this place is not blank but has a zero".