



## Calculators Update - Val Warren & Jonathan King

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Recently a group of new B.Ed students were discussing the teaching of number. The debate inevitably moved to calculators and their place in Primary School. The students were initially wary about calculator use and their reasons included:

- the need to teach 'the basics' first
- the danger of children becoming over-dependent on them
- the possibility of a reduced facility in written and mental methods.

The discussion went on to consider ways of using calculators to reinforce number work and to develop mathematical thinking and mental facility; these themes are revisited throughout the B.Ed course. The question for us as teacher educators is what will these students see when they get into schools on teaching practice?

What are calculators being used for?

We asked 200 primary teachers in Hertfordshire this question in a recent survey. The most common uses were investigations, reinforcement and checking answers to written calculations; these familiarised younger children with the calculator and its operation. At Key Stage 1 free play was the most common use. Infant teachers frequently referred to the importance of teaching basics first but calculators did not appear to have a role in this. At Key Stage 2 calculators were widely used for difficult calculations and awkward numbers, enabling children to work with real data. Some use was made of calculator games to develop mental facility.

How frequently are calculators being used?

The latest Ofsted review [1] has stated that calculators are not over-used in schools, even though schools in the UK take a more liberal stance towards their use than most other countries. Reassurance was given that the Assessment of Performance Unit 'did not find any evidence that the widespread use of calculators was associated with lower performance' [2]. An earlier Ofsted report [3] was more specific in noting, 'The skills of using a calculator were neglected in a high percentage of the schools; in only a tenth of the lessons seen were calculators used.' The Hertfordshire survey painted a more encouraging picture, although these results cannot be applied more widely. Calculators were being used in 92 per cent of the classrooms in the sample. Frequency of use varied, but they were being used at least weekly in nearly half the classrooms.

The use of calculators in the Primary School is certainly far more widespread since the introduction of the National Curriculum in 1989. Calculator use had been advocated earlier by mathematics

educators and in official documents, but HMI [4] noted that it was rare to find calculators in infant classrooms and they were used in only two-fifths of upper junior classes. Calculators were specifically mentioned in the Attainment Targets, the Non-Statutory Guidance recommended their use at all four Key Stages and they were used in the Key Stage 1 standard tests. A reconsideration of their use in primary schools was therefore essential. Consequently, advisory teachers appointed to assist with the implementation of the National Curriculum received many requests from schools for advice about calculator use.

Nevertheless, the impact of calculators in the primary school has not been as great as was predicted by many mathematics educators in the 1980s. Teachers clearly still have some reservations about their use. One of the aims of the Hertfordshire survey was to ascertain teachers' attitudes and views about calculators. The reasons they gave for not using calculators provide some insight into their reservations.

<b>Categories of Reasons for Not using Calculators</b>	<b>Item Frequency</b>	<b>Category Total</b>
<b>Reducing Number Facility</b>		<b>150</b>
Mis-use (cheating, unnecessary use, dependence)	86	
Reduces mental agility	23	
Basics first	29	
Discourages learning of tables	9	
Must be able to estimate first	3	
<b>Discouraging Understanding</b>		<b>32</b>
Get answers without understanding	30	
Discourages learning, causes confusion	2	
<b>Availability and Technical Considerations</b>		<b>30</b>
Not enough available	7	
Easily broken, lost, unreliable	14	
Wrong button, frustration, buttons too small, display too complex, digital display	9	
<b>Classroom Management</b>		<b>11</b>
Too teacher intensive, cannot check correct use	7	
Time	4	
<b>Miscellaneous</b>		<b>4</b>
'Fiddling', time-wasting, children too young	3	
Parental opposition	1	

Interviews with teachers suggested that underlying these reasons are two fundamental conflicts about calculators and their use in primary education. Firstly, their use appears to be inconsistent

with the traditional role of the teacher as one teaches the 'basics', especially at Key Stage 1. Teachers are genuinely worried that inappropriate use of calculators will hinder children's written and mental calculation facility. Secondly, the calculator is viewed as a device for quick calculations, an easy, lazy option, rather than a tool which can be used to help children understand the number system and calculation.

The use of calculators to enhance understanding

In 1993, Ofsted's [3] recommendations to raise the standard of number work included the need to make greater and more effective use of calculators and computers to assist children's understanding of number. This has now become a key issue. Of course, many teachers already use calculators in this way. The following reasons may help to explain why such practice is not more widespread, and to suggest action for the future.

- Evidence from the Hertfordshire survey suggests that teachers are far from convinced that calculators do enhance understanding. Less than half the sample thought that calculators increased understanding, and a third were 'uncertain'.
- Many teachers in the survey expressed a lack of confidence and knowledge about ways of using calculators, and two-thirds of the respondents wanted to attend a course. Ofsted [1] has highlighted the need to increase teachers' confidence in teaching mathematics, and recommends 'strategies for enabling science and mathematics teachers to refresh and update their knowledge and understanding'.
- There has been a marked increase in the use of commercial schemes in recent years; Ofsted [3] stated that there was an over-reliance on them in more than a third of classes. Most commercial schemes place little emphasis on the use of calculators to enhance understanding.

The Way Ahead

The majority of teachers who took part in the survey had positive attitudes towards the use of calculators in the primary classroom, and were keen to increase their knowledge about ways of using them effectively. Subject specific in-service training, like the very successful twenty-day courses, contributing to professional updating, is essential; there are increasing opportunities for accreditation of such courses through Higher Education. Mathematics co-ordinators will continue to play a key role in influencing and developing practice in their schools. Working alongside colleagues has been found to be particularly effective when this can be arranged and timetabled.

Current research taking place at King's College London is more encouraging about the way commercial schemes are now being used. It is suggested that 'scheme-assisted' teaching is replacing the 'scheme-driven' approach so that teachers are using schemes more selectively and are more actively involved in planning. The Dearing Review of the National Curriculum may further support this. Less rigid adherence to schemes should leave more room for aspects such as the use of calculators to enhance understanding. There may also be a place for new schemes which whole-

heartedly follow the approaches to calculation recommended in the National Curriculum. More high quality written materials providing teachers with ideas would be welcomed.

Finally, perhaps we should end where this article began - with the B.Ed and PGCE students undergoing Initial Education. The DfEE [5] has stipulated an increase in the time to be spent on mathematics. This should enable students to focus more closely on the teaching and learning of number and the approaches to calculation recommended in the National Curriculum. More time will be available to consider ways of using calculators to enhance learning and understanding, and the rationale for calculator use. Student teachers' views about calculators, determined by their experience as pupils in schools must be examined and challenged. Course content is only part of the picture. They will be influenced by the practice they see in schools and by the opinions expressed by class teachers. Above all students need to try out activities with children and see the benefits for themselves, so that when they begin their careers, they will regard calculators as a valuable tool to enhance children's understanding of number.

Val Warren and Jonathan Ling work at the University of Hertfordshire.

### References

- [1] Ofsted, 1994, *Science and Mathematics in Schools*, London HMSO.
- [2] APU, 1987, *Assessment Matters 3, APU Mathematics Phase 2*, SEAC.
- [3] Ofsted, 1993, *The Teaching and Learning of Number in Primary Schools*, London HMSO.
- [4] DES, 1989, *Aspects of Primary Education: The Teaching and Learning of Mathematics*, London, HMSO.
- [5] DfE, 1993, *Circular 14/93: The Initial Training of Primary Teachers: New Criteria for Courses*.

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