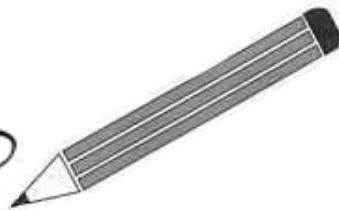


to jot or not to jot?



by Ian Thompson

A discussion paper that appeared on the National Numeracy Strategy (NNS) consultants' web site asked *Are jottings what we need?* The paper quoted the argument, outlined in the *Framework for Teaching Mathematics from Reception to Year 6* (DfEE, 1999), that when children find it difficult to hold the intermediate steps of a calculation in their heads they should make informal pencil and paper notes. The Framework sees these notes, or jottings, as important staging posts on the way to obtaining correct solutions, even though it may well prove difficult for others to decipher or interpret them. The consultants' discussion paper, however, asks whether it is time to move on from just encouraging children to decide the nature of their own jottings (described in the paper by loaded adjectives such as 'messy', 'unstructured' and 'scribbled') to *teaching* them how to jot.

Consultants are asked to discuss the following question:

Instead of referring to jottings, should we refer to children recording in a way that supports their mathematical thinking ... ?

For me, the key word in this question is 'support'. Surely, the whole raison d'être of a 'jotting' is to provide support for the individual performing the calculation. Consequently, given the range of strategies that people use to execute such calculations, we would expect any individual's jottings to be a function of the mathematical operations involved; to be influenced by the size of the numbers; to relate to the (perceived) relationship between these numbers; and, inevitably, to be extremely personal, variable and idiosyncratic. Jottings need to be seen as a personal record of any intermediate steps in a calculation that the person doing the calculating feels the need to record in order to facilitate the execution of the calculation. If asked to work out 144×4 , I would probably want to jot down 400; calculate 44×4 as 88×2 , giving 176; and then mentally add this to the 400, writing down the answer 576. The only numbers written down in my case would be 400 and 576. Katy, on the other hand (Fig. 1) would probably want to jot down a little more!

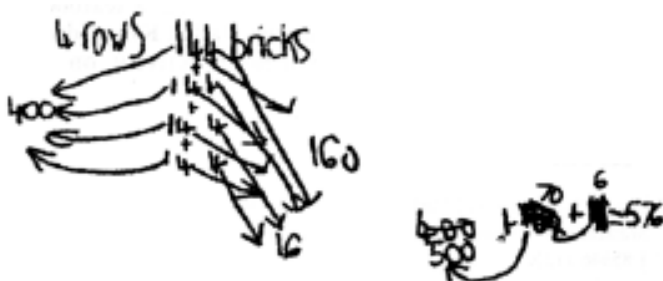


Fig. 1

The NNS outlines an approach to calculation that involves six stages. The third of these stages is *working with larger numbers and informal jottings*. To argue for the teaching of specific, taught jotting techniques rather than letting children choose their own methods appears to contradict the

whole NNS approach to the early stages of the acquisition of calculation skills and strategies, where the emphasis is clearly on the development of a range of mental methods from which children are expected to choose those that best model their own ways of thinking. What in the NNS are appropriately described as *informal jottings* would now become *formal jottings*; to my mind, this latter phrase is an oxymoron!

The paper also includes the following statement:

Unfortunately, we too often see the results of children's unstructured jottings reflected in children's thinking.

I believe that the opposite is actually the case: we see the results of children's thinking reflected in their unstructured jottings. Now, even though there is no explicit reference in the consultants' discussion paper to National Curriculum tests, it is difficult to avoid the suspicion that this is really the context for the appearance of the paper. The sub-text seems to be about children needing to jot in such a way that examiners can follow their reasoning, and as a consequence award them appropriate method marks.

One approach to teasing out what is involved in an 'informal versus formal jottings' debate is to make use of an idea taken from the teaching of literacy, namely, the concept of *audience*. The National Curriculum for English (p. 49) requires that children in Key Stage 1 write for 'their teachers, other adults, children and the writers themselves', and for Key Stage 2 children this audience widens to include 'their teachers, the class, other children, adults, the wider community and imagined readers' (p. 58). In the teaching of English it is expected that children will be taught techniques for adapting their written and oral communication to suit their audience. If we extend this concept to the teaching of mathematics, it seems reasonable to accept that when the children themselves are the sole audience for their work they should record in their own way, writing down those things that support them in their thinking; these are what we currently call *jottings*. With a different audience, for example, other children, teachers, or markers of National Curriculum test questions, children need to be taught how to ensure that this audience can make sense of their recording; this is what we call *working*. For 'supporting' thinking we use jottings; for 'explaining' thinking we show our working. So, we still need the term 'jottings', but we also need to develop children's explanatory skills, helping them to make their thinking explicit to a wider audience.

Whereas Kate's work is clearly a 'jotting', in that its purpose is to support her thinking throughout the calculation, and is not meant for an audience other than herself, Andrew's (Fig. 2) on the other hand, would be classified as 'working', since it clarifies his modus operandi to a wider audience.

$$4 \times 100 = 400$$

$$4 \times 40 = 160$$

$$4 \times 4 = 16$$

$$400 + 160 + 16 = 576$$

Fig. 2

In a detailed report focusing on the teaching of calculation HMI (Ofsted, 2002) state that:

Pupils make too little use of personal jottings to support and record mental strategies or explain their methods of calculation.

By suggesting that children's personal jottings be used to 'explain their methods of calculation', HMI appear not to be differentiating between *jottings* and *working*.

The Empty Number Line: *Jotting* or *Working*?

It could be argued that as use of the Empty Number Line (ENL) has to be taught, this removes the informal aspect of calculation and makes it a formal process. However, one strength of the ENL is that once children become proficient in its use, it can be used extremely flexibly. For example, there are at least three different ways in which the model can be used to support a subtraction calculation, and that does not take account of jumps of different sizes. A further strength is that it can be used for both of the purposes described above, functioning either as a jotting or as working. However, the ENL needs to be taught carefully and systematically (cf. Rousham, 2003), as there are many sub-skills that children need to acquire before they can use it with confidence and flexibility. It is unfortunate that the first introduction to the empty number line in the context of subtraction in the Framework involves calculating with pairs of two- and three-digit numbers using compensation – a strategy that the Dutch, who invented the model, consider to be fairly sophisticated, and consequently introduce at a later stage. The NNS needs to provide detailed, rather than sketchy, support for the structured integration of this model into the teaching of calculation.

It is encouraging to see that discussion papers questioning some of the original nostrums of the Framework are surfacing within the NNS (after all, much of it was written seven years ago!). Future papers might address important issues such as the role of the calculator in teaching children in Key Stage 1 about the structure of the number system; the use of lesson structures with more or fewer than three parts; the development of investigational approaches to the teaching of mathematics; and the place of standard (or 'compact') algorithms in the 21st century, with particular reference to the need for the 'short division' algorithm (see *Mathematics 3 plus 2 day course*, p. 62 [DfES, 2003]). Hopefully, papers on such topics would be discussed in a forum somewhat wider than the consultants' web site.

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Author

Ian Thompson, Woodlands, Millfield Road, Riding Mill, Northumberland NE44 6DL.

Ian Thompson is Visiting Professor at Northumbria University. He may be contacted at ianthompson.pi@btopenworld.com

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