CAPTURING OR MISSING MOMENTS: AN ANALYSIS OF HOW TEACHERS RESPOND TO MATHEMATICAL 'MOMENTS' IN THE CLASSROOM

Alison Borthwick
University of East Anglia

***Abstract**: The nature of a teacher's response to a pupil answer can have a strong influence on the learner. Yet some answers are not fully explored, and some may even be missed. It is this notion, which I call 'missing the moment' that is at the heart of this research and was the focus for my MA dissertation. This paper examines some of these 'moments' and begins to suggest alternative ways of teacher response for their existence and also ways in which to respond. While this research was in itself complete, it also stands to serve as the beginnings of further research in this area, my doctorate, now in development.*

Background

Having spent many hours in the Primary classroom, both as a teacher and as an observer (in my capacity as a Numeracy Adviser), I began to notice the difference an answer can make. Some answers were fully explored, with questions going back to the children for clarification, but occasionally opportunities, where an answer could have made a difference, were seemingly ignored. I called this opportunity a 'moment'. Some teachers would notice these 'moments', and a few would deal with them, resulting in learning being extended in some way. Others would not. From these observations my research was borne. There were two main questions I wanted to address. What do these 'moments' (as I had dubbed them) look like? What do we do with them once we have learnt to recognise them?

The introduction of the National Numeracy Strategy has encouraged a high proportion of 'whole class, direct, interactive teaching' (DfEE 1999) as part of the daily mathematics lesson. For many teachers this is a new way of working, and is very different to the worksheet or text book they may have been used to using. The

teacher's role is altered from being a facilitator, a criticism levelled by the Numeracy Project (1999), and is re-assigned in the role of a teacher, teaching the subject. Although a new initiative, this pedagogy relates well to the theory of knowledge developed by Polanyi (1958). He suggests that knowledge is not a static body from which learners simply absorb information, but where the learners have "personal participation". While not explicitly supportive of either transmissive or constructivist models of learning (see Von Glaserfeld 1984), the Strategy supports the belief that we do not passively receive all our knowledge from our environment, but that we construct it and then learn from experiences. Each new experience draws on a previous one or attempts to challenge it, and we then learn to adapt and add to our existing knowledge. This 'interaction' (DfEE 1999) is central to the philosophy held within the Strategy.

Through the Strategy children are encouraged to listen and talk as much as the teacher, contributing and challenging the mathematics where appropriate. This research began just as the Numeracy Project was launched. While it is hoped that most teachers reflect upon their practice, the Strategy aims at enhancing this skill through the altered pedagogy. I began to look more closely at what teachers were doing in this 'direct, interactive' part of the lesson, particularly with regard to the increase of subject knowledge for many teachers (Numeracy Project 1999), the various calculation strategies offered and the high level of discussion the Strategy encourages. From these observations emerged the notion of 'moments'.

The first part of the research was concerned with examining these 'moments' as they occurred in the classroom. I concentrated on two types. Those which are visible, and could be observed, and those which are invisible. The latter ones I called potential 'moments', as they have the potential to develop into a 'moment'. The second part of this research deals with how we might respond – should we want to respond – to these 'moments'. Having identified a 'moment', I then began to offer alternative

interpretations, suggesting what may have happened to both teacher and pupil in terms of teaching and learning.

This study is still very much in progress as is the research for relevant literature. For example Barbara Jaworski's work on the nature of investigative work in mathematics teaching examines some of the teacher-pupil interactions that have begun to emerge in my own research. For example, she talks about "the teacher actively investigating the teaching process" which could result in "increasing their teaching knowledge and teaching wisdom" (Jaworski 1994). I believe this begins to describe part of the central theme to this research; the quest to develop classroom practice.

The Evidence

The evidence presented in this paper is drawn from a small scale case study conducted as part of the work towards my MA dissertation and class based observations and discussions with individuals. Over one hundred lessons were observed within my role as Numeracy Adviser over a period of one year. During these observations a number of incidents were noted that I believed to be significant. At this point I had not defined what 'significant' meant. From this observation process a number of examples were selected and a few are reproduced here. All observations were centred around children from Key Stage One and Two and led to several questions that provided the basis for the ensuing research.

I was present during all observations and made notes by hand during the lesson. I began by observing the whole class, and then moved around the classroom to hold single and group conversations with children. Sometimes the observations would be followed up with discussions with the teachers, depending on time and relevance.

Having studied the notes made from the lessons, I then asked questions about them. I began to concentrate on the teacher's questions and the children's responses. For example, I analysed questions against whether they were open or closed ones, the

type of language used (everyday or mathematical) and the context in which the questions were placed (for example, have clear rules been established for answering questions and joining discussions?). As well as questioning the data, I began to offer alternative interpretations against it, posing hypothetical scenarios for events that may have followed, had a different response been given from the teacher to the pupil. The nature of the final MA thesis was heavily influenced by the early work on these observations. It was through the completion of this study that I began to consider the possibility of further research in this field, leading to a higher degree.

1. Captured and Missed 'Moments'

One example of a 'moment' came from a Y3 class where the focus of the lesson was on number bonds (example 1). In this example the target was fifty. The teacher wrote the number twenty and the children calculated the answer to be thirty. Following this display of correct number thirties, the teacher asked Ben how he knew the answer, to which he replied, '*It's a perfect number*'. The teacher instantly replied "*no*" and requested another explanation from a different child.

Was this potentially a 'moment' that had perhaps escaped? The teacher made a decision to ignore this moment, instead of asking the boy what he meant by a perfect number. I have heard several Key Stage One teachers refer to multiples of ten as the red or special numbers because they have coded them like this on their hundred squares (a grid of a hundred numbers, usually starting at one and ending at one hundred). In mathematics a perfect number is one whose factors add up to the number itself. What did the boy mean here? Did the teacher assume he had invented the word, or used it from hearing it in a different context? Did the teacher even realise it is a mathematical word? What is the consequence for Ben in terms of his learning?

A second 'moment' appeared in a Year 4 class that I was teaching, where the focus of the lesson was on triangles (example 2). Several triangles were drawn on the board,

but in unusual positions (e.g. upside down). I wanted the children to tell me what type of triangles they were. As we reached the last one – the right angled triangle – Chris put up his hand and asked, '*If you turn the triangle around, does it become a left- angled triangle?'* Choosing to pursue this 'moment', I asked Chris to explain what he meant. It became clear through this that he understood the properties of a right-angled triangle, but had begun to wonder about the word 'right' and where it had originated from. His query was of a linguistic rather than a mathematical nature. The teacher, and the pupil, gained this understanding through pursuing this 'moment'.

2. In Pursuit of Potential 'Moments'

These 'moments' are those which are barely noticeable and quite unlike the two presented above. Usually they are hidden away, and we may not be aware they ever existed except that occasionally they leave us feeling dissatisfied, curious and wondering about a situation that has occurred. Sometimes this feeling is simultaneous with the moment occurring, but on other occasions it will be long after the event.

Example 3 comes from a Year 6 lesson on multiplication methods. The children had been given a calculation to work out using whatever method they preferred. The calculation was 37 x 6, and as usual the children used "standard, vertical methods" (DfEE 1999) or the long winded counting ones (6,12,18 …). Just as I was about to move onto demonstrating the grid method – where partitioning the numbers is key – Anne caught my eye. This request from Anne revealed that she had partitioned the numbers into tens and units, using exactly the method I was about to demonstrate, although at the time her explanation was very long winded and quite time consuming. In the research I refer to this as being 'ambushed' (Stenhouse 1976). For Stenhouse, this is in the 'sense of being surprised' by something. At the time I was convinced

that pursuing this 'moment' had been worthwhile, both for the teacher and for Anne. However I then began to question alternative scenarios to this moment. I started to wonder what would have happened if I had responded differently, or perhaps not even at all. After all, I had let myself be ambushed – would somebody else have?

Alternative Scenarios

In the case of Anne, if I had not responded to her two situations could have then followed. She may have remained silent but alternatively she may have spoken up from her own admission. This is the alternative scenario I would like to examine first.

In this case, I considered whether my initial analysis of the 'moment' was wrong. What if Anne was just about to speak when I asked her to? Recent research indicates that the wait time teachers give when asking questions is usually too low (Ofsted 1995). Evidence from this report indicated that the average time is between one or two seconds, in comparison to the recommended time which is between three and five seconds. Dominant peers could be a further reason for Anne not yet having had the chance to speak, or perhaps she had only just finished the calculation and was in the process of checking it. These examples are all possibilities in suggesting that Anne would have spoken had she had the chance.

The other alternative interpretation is that Anne may have remained mute. Reasons put forward were that she was shy; the teaching style was unfamiliar to her; pressure from both peers and teachers watching her; she did not wish to contribute; she did not know the language to use. Having offered several alternative interpretations to the ones originally made, this part of the research concluded with the opinion that pursuing 'moments' is still valuable.

Missing a 'Moment'

One of the aims of this research is to explore whether missed 'moments' could have been recognised. But in order to do this, presumably you need to know what you are looking for. The notion of missing something is quite unique: to be aware of missing something presumably you have to know it is there. A lost object can be easily identified and action to search for it is measurable in the outcome of finding it. However to notice that a look, a thought, a feeling or a 'moment' has been lost is rather hard to explain and even harder to understand.

I approached this difficulty by asking 'what if?' For example what if you ask this child to explain something? It could prove fruitless but at least the opportunity was recognised and taken.

Attempting to collect evidence for this part of the research was difficult. Finally I pinned it down to searching for occasions where the teacher had the feeling of surprise. The line of enquiry followed that if a feeling of surprise was felt, this may prove to be an indication that a 'moment' has occurred. Stenhouse (1976) talks about "escaping surprises." He argued that:

> *An understanding of historical context does not yield predictive generalisations; but it improves our estimate of situations and hence our judgement of possibilities, thereby helping us to escape being surprised – in the sense of ambush – in the future.*
>
> *(Working Memo No.4)*

For Stenhouse these surprises or ambushes can be improved by critically studying our own professional histories. One point that arose from the research was the notion

that if you reduce the possibility of being ambushed, does this in turn reduce the possibility of missing a 'moment'?

The Importance of Not Missing a 'Moment'

Preventing a 'moment' from being lost emerged from my observations as being important. I then asked why and two reasons emerged from the analysis.

The first was curiosity. Once curiosity has been stimulated, I find it difficult to ignore and usually pursue whatever it is making me curious. However, you do not know what you are looking for and this can be a difficult process.

The second reason was concerned with the process rather than the product. To take an example, consider the mathematics behind multiplying by ten (example 4). I hear many children talking of adding zeros to achieve the answer. For certain questions the answer would not change whether or not the children understood the mathematical process. Yet, if a different question were asked, such as to include decimal numbers, then the strategy of adding a zero is not valid any more. Pursuing a 'moment' allows the process to be examined, as well as the product. Barber (1996) also considered the different views between process and product saying,

> *The fans of process are those who believe that the journey is more important than the destination.*

Faced With a Dilemma

Some of the examples collected (e.g example 1) highlight 'moments' that were visible but were deflected or ignored. Explanations offered in the research suggested a link to values. For example, how much do we value the contributions children

make in the classroom? Personal values, as well as those held by the school continually influence what we do in the classroom. The school may value marking through written feedback, and expect teachers to adhere to this, but the teacher may value feedback through discussion with the child. Here, in the argument two values come into conflict because they are held by different bodies.

An example of a gap between personal values and actual classroom practice could be that I value discussion from the children but then proceed to talk all lesson! An example of agreement between personal values and actual classroom practice is in example 3 where children's contributions are valued, as is fairness for all children. Despite the amount of time Anne was taking to explain it would appear that both of these values were upheld.

The evidence in this research suggests that if we value children's contributions, 'moments' should be seized. However as Schon (1995) says, "*we show ourselves to be knowledgeable in a special way*" but not in an identical way. I use this to suggest that not every teacher regards his or her profession in the same way as I do. For me, part of being a teacher is to stimulate imagination and promote positive discussion, but other teachers may see their role different to how I see mine. Schon goes on to say 'it seems right to say that our knowing is in our action' (1995). This is where we discover if our values match our actions or not.

The Path of Learning

The research involved a great deal of reflection and a deep level of enquiry. This led to many issues evolving rather than pre-conceived ideas being dealt with and as Jaworski says the "early stage of tentativity is an important one where recognition of issues is vital to decisions about the most appropriate ways to proceed" (Jaworski 1994). Being ambushed by a multiplication strategy was one of these examples, but this only served to lead to more discoveries. Upon reflection and further scrutiny of

the evidence it was revealed that the reason for the ambush was partly due to judging Anne before she spoke. Feeling surprised at her explanation is testament to this.

Many values were called into question as 'moments' arose. On the one hand the development of children as thinkers is upheld, and yet the need for an instant response was evident.

I also considered what Labbett calls (in Schostack 1988) 'Skilful Neglect'**.** This is the idea that there are at least two reasonable ways to view a situation. One way may be the preferred way, but the alternative must be a reasonable one too. To demonstrate the art of 'skilful neglect', a reasonable choice is rejected for a preferred alternative. To fail it in an act of unskilful neglect may reveal blind spots[1] in my values. Did this occur in example 3?

In this example, I chose to pursue Anne's response, but the alternative would have been to ignore her and continue with the lesson. Therefore, I can conclude that I did demonstrate the art of 'skilful neglect'.

No conclusion has been reached on the best approach to recognising a moment within the classroom, and then pursuing it. This area of teacher-pupil interaction is one that I believe merits further research, and the MA has served as a trigger for further developments. It is hoped to pursue these now in more detail, within my doctorate, currently in development.

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[1] By these I mean those issues which are hidden away and we often do not face up to

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