A re-examination of reflective practice: Is it a viable frame for mathematics teacher education at the present time and was it ever?

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This paper explores the question, 'What can reflective practice as a conceptualisation of the formation of professional knowledge offer mathematics teacher education with socio-political concerns today? We give an outline of our long-term work in re-examining the forming of teacher professional knowledge and of what the notion of reflective practice has offered us as mathematics educators and researchers who foreground the social, cultural and political nature of our work. We have included examples of contexts in which we have explored strategies for reflective practice, including extracts from the writing of students with whom we have worked. These are offered to provide illustration of concepts and issues that are important to us. We also discuss the competence-based discourse that is prominent in the UK at the present time and discuss whether teacher education premised on the centrality of learning through reflective practice can survive in this climate. From this we identify questions and concerns that continue to engage us and offer these for discussion.

Why is a rethinking of reflective practice relevant to this conference, Mathematics Education and Society?

The societal practices associated with the cultural construction of school mathematics are often taken as given and common sense. For example, where mathematics is taken as having right and wrong answers, teachers' interpretations of children's mathematical activity are often in terms of correct answers and methods, errors and misconceptions. The learners themselves are attributed with ability (or a lack of it), with having the appropriate language (or not), with appropriate and inappropriate previous experiences and so on. The presentation of mathematics as a self-defining, internally justifying subject outside of human creation is astonishingly persistent and has significant and often violent effects of learners' construction of themselves.

Understandings of the formation of teachers' professional knowledge, those given through government policy and those formed within teacher education activities, effect not only the specification of teacher education courses but also more profoundly, teachers' sense of agency and governance. From this teachers establish what is possible; that is, how their practices might develop and change. As schooling has been well documented as replicating inequity and division in society (e.g. Bourdieu and Passeron 1977), teachers' sense of how professional knowledge and practices can be re-examined is of crucial importance.

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Our work

Understandings of the nature of reflective practice have been the concern of much of our researches and writing, and vehicles for our own professional development, our course design and teaching. We have both worked in universities where there was a documented commitment to deriving teacher education practices that were oriented towards the development of 'reflective practitioners'. Course descriptions referred to models of developing professional practice that brought together theory and practice, where students work on one in the context of the other through reflection on aspects of their experience. These underpinnings aimed to dislodge the segregation of university elements and school based elements in these courses. As tutors and researchers we have worked with strategies and exercises that centralise this bringing together of theory and practice in a reflexive move. We have drawn from the work of John Mason in devising our systems of reflective practice (e.g. Mason 1994, Mason 2002). In these writings on a systematic approach to professional development, John Mason makes clear that reflection is more than 'just thinking a bit', that it involves the breaking of habitual thinking (as well as habitual responses).

> Yet we all know that it takes more than the mechanical and superficial carrying out of tasks for most learning to take place. The student has to participate in an action, not merely go through the motions. So too with reflection, professional development, and research. (*Mason 2002 p.16)*

He also says that this is anything but straightforward and outlines particular exercises that are important to disturb and break out of existing frames of interpretation. One significant feature of our own teaching was that the intentions and the benefits of such strategies were discussed explicitly and frequently with the students.

However, in these higher education courses, obvious difficulties remain in linking school-based and institution-based parts of these courses. This reflective approach to teacher education was not necessarily well received by students, being variously seen as irrelevant, a distraction of the practical concerns of the classroom, or, not least, obscure. Yet, despite the complexities that we have indicated, we have persevered in foregrounding reflective practice in our work. What then does this paradigm offer us? We have put this simply: it implies more than just 'doing' and more that 'thinking'. Further, it does not relieve a practitioner of the responsibility of working on more than these. It insists on the acknowledgement of the social, situated nature of this professional practice, it insists that power relations and desires are seen as present. It offers tactics for valid generalising but warns of the provisionality that must be kept in mind.

We have written about our explorations in working with such strategies in a variety of contexts and about the joys and difficulties we have experienced. We describe now examples that illustrate our key conceptions of professional development and concerns. These cover 'What are the characteristics of reflective writing?' and 'Working from the inside with theory from the outside'.

Over the period from 1993 to 1995, we developed our teaching on a four-year undergraduate primary education degree course[1] to promote students' articulation of their experience and knowledge of teaching, and of their concerns and awareness as part of their development of a reflective attitude. When the students arrived, we needed to convey some flavour of the complex ideas that permeated the course. They understood that they needed to develop as practitioners. We introduced the notion that in order to do so they must make connections between aspects of their continuing experience in their course at university and in school, and learn to talk and write about this in particular ways. Students were expected to learn to use professional language, for example, that employed in the UK National Curriculum documentation, when they described their planning and teaching in school. They also needed to become familiar with the language associated with analysis, of 'being reflective' and 'being critical'.

With first year students we asked for reflective writing on themes drawn from university sessions and from school-based work We highlighted the need to describe the teaching that they had observed and their own teaching in the professional discourses that they had encountered. As the course progressed, we encouraged students to recognise that their writing should change, that they should move away from offering only narrative or over general accounts and begin to identify strands of concern. We also had specific strategies to help them consider and reconsider their writing, using tutor written feedback on their writing, and whole group verbal feedback. We invited students to read each other's writing and give peers written and verbal feedback as well as contributing to whole group discussions arising from these readings.

Over this two year period we collected students' writing and our written responses and, from our re-examination of these writings, we have considered the role of written articulations and descriptions for students in initial teacher education (Hardy & Hanley 1995). We found that articulation itself had an impact on students' sense of their experiences and the meanings that they made of interactions in classroom scenarios. An interpretation is involved here and their written articulations, together with peer and tutor responses, can force attention on this interpretation and so open up these experiences to examination and reinterpretation.

The following extract taken from a piece written by a first year student in response to the prompt to relate her recent school observations to reading of government reports and curriculum guidance

> In one school they took a very practical approach to the work providing the children with multi-link, peg boards with elastic bands, counting aids, shapes etc, allowing the children to work out the problems practically. Using this approach I

[1] This was a course for intending teachers of 5-11 year olds. All subject areas in the primary national curriculum are crammed into these courses, and all students take core units on the teaching and learning of mathematics. There are also one-year postgraduate courses available with the same aims.

> noticed that the children had a greater understanding of the work they were doing and were able to understand the underlying mathematical concepts. Rather than constantly asking the teacher for help they could use mathematical equipment to work out their problems e.g.: in a year 4 class I observed a boy named Sam working on area, he was asked to find the area of a diamond/kite shape. He wasn't sure what a kite shape was so went to the teacher, instead of the teacher telling him what to do she told him to look in a shape book. On finding the shape he made it on his pegboard using an elastic band then drew the shape on to spotty paper and could work out the areas…The children are given the choice of whether they need to use the equipment or work the problem out in their head.
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> As the Cockcroft report states, 'Practical work is essential throughout the primary years ... for most children practical works provides the most effective means by which the understanding of maths can be developed'. It also states, which I found quite interesting when thinking back to my primary school experience of maths, 'It is a mistake to suppose that there is any particular age at which children no longer need to use practical material'. *(Cockcroft 1984 – our insertion)*

On close examination this extract provides an example of possible characteristics of reflective writing. She gives a recognisable account of an incident that captures a moment that she sees as characterising this teacher's practice. The teacher's role and child's response can be identified easily from her writing. She is selective about what to tell and produces a vivid description. (However, she has said that the children's responses indicated greater understanding without describing what the children did to lead her to this interpretation.) She is alert to connections between her experience and the professional description of practical work. Through this she illustrates the issue she goes on to discuss (the role of practical work in children's learning), an issue through which identifies her developing professional beliefs.

We should say that not all students at this early stage in the professional course were able to report with clarity and make connections between their experiences and the documentation they encountered. But, our examination of reflective writing did confirm the complexity that is involved in the development of professional knowledge and practice.

In the context of a Master's course, 'Enquiring into the mathematics classroom', we explored the possibility of inserting 'theory' to add potency and rigour to Masters teachers' classroom researches (Hardy & Hanley 1997). We had found that theory/practice polarisation gave inappropriate frames and an inauthentic voice for thinking about the forming of professional knowledge and for working on the professional activity and life of a teacher. We employed strategies intended to diffuse the stagnating effect of a theory/practice polarisation on teachers' investigations. We give now an example of a successful bringing together of these.

Throughout sessions the process of anecdoting was used. Briefly, tellers and listeners are identified. The teller reviews an anecdote; the listener seeks resonance with her own experience. The listener also assists the teller in identifying where the significance of the moment lies. The teller may then

consider systematically other incidents from her practice, consult relevant literature, tell and re-tell these anecdotes to colleagues, discussing similar experiences and seeking recognition.

Alongside anecdoting, we offered readings outlining others' theoretical notions of teaching and learning of mathematics. For a particular session later in the course we gave out readings related Brousseau's notion of the didactic contract and Bateson's more generalised double bind (Mason 1988, Melin-Olsen 1987). These we intended to have a jarring effect, making over-familiar practice less familiar and so open to re-examination

The students' first task was to highlight a section from the readings that resonated strongly or jarred in some way with their sense of classroom dynamics. John Mason describes the 'didactic contract' as

> '...between teacher and pupil although it may never be explicit. The teacher's task is to foster learning, but it is the pupil who must do the learning. …. Acceding to the pupil's perspective reduces the potential for the pupil to learn; yet the teacher's task is to establish conditions to help the student to learn. Put another way, the more the teacher is explicit about what behaviour is wanted, the less the opportunity the pupils have to come to it for themselves and make the underlying knowledge or understanding their own…To stay alive as a teacher, it is necessary to be aware of the variety of perspectives (that students and teachers have as to the nature of learning and the role of teachers) and the fact that they are very deeply rooted…I believe that it is important to be open to these dilemmas, to take opportunities to talk about them with colleagues, to try to become precise in our articulations, because then it is possible to unlock the blocked energy and exploit it positively' (*Mason 1988 pp.168-9)*

We followed a discussion of highlighted sections by setting the task of jotting down an incident from their teaching over the coming week that contained within it some kind of double bind and bringing it to the next session for anecdoting.

Judith offered the following anecdote.

> A lively, enthusiastic year 7 class 'bounce' into the classroom, buzzing with questions and answers for challenges from previous lessons. Kevin comes in two minutes later looking at the floor and walks up and down from the front to back of the classroom. Eventually he picks up a chair and drags it to the back of the classroom and sits on his own. I set a few questions for the class to occupy them and avoid too much attention on Kevin.

'Kevin, what's happened? I can see you are upset, what's the problem?'
'Nothing, nothing!' came the forceful reply.
'Kevin, let me help if I can - who do you want to sit next to?'
'Nobody wants to sit next to me'
'Why Kevin, why is that?'
'I don't know but I can't do maths, french, anything'

> We continued in this vein for a few minutes where I tried to be positive. Kevin had produced some excellent work in the last few lessons in percentages. He agreed to start afresh after a lot of praise.

The group worked together on the incident against the theoretical notions of double bind and didactic contract. The group was able to identify a range of interpretations of the incident in terms of the double binds in which the parties in the interaction were caught. For example for the teacher working with a mixed ability class:

> I believe that confidence is important for all children to work successfully at mathematics. I am especially concerned that Special Needs kids develop this confidence. I want to help them break out of the demotivating failure cycle and break their self-image as failures and of maths as 'too hard'. This would lead me to give separate (not too hard) work that they can succeed at. (In practice such tasks prove unengaging and being given this sort of work rarely boosts children's confidence – rather it stigmatises.) At the same time I believe challenge is important and so think that they should 'hang on' with the rest of the class and that I should offer them the support they need to stay with the group and engage in this work.

Melin Olsen has said that the method of avoiding the double bind damaging effects is to loosen it by communicating at the metalevel as often as possible, thus releasing the contradictions that determine it. Some of the teachers in this group, by using such strategies to bring together theoretical notions and their practice, felt this double bind had been loosen to some extent. These strategies also offer the possibility of using the theory of others as 'thinking tools'.

> Bateson's conception of…double bind is useful for a full understanding of learning behaviour ...what are being offered are thinking tools which help to understand the pupil's predispositions for learning' (Melin Olsen, 1987 p.189-190)

In earlier sessions it was striking that group members often approached readings and others' anecdotes as problems to be solved and responses to readings were offered the form of attempted solutions. However, the double binds identified show a thinking differently and to some awareness of the social and power relations operating.

As with all our other teaching (as tutors who assess students work) we were caught up in a double bind ourselves; of being clear to students about what a reflective approach is, and of generating a desire in students to produce what we seem to desire of them. This could lead them to replicate the symptoms of reflection – rendered it in a technical form, a trainable behaviour.

> Teacher and pupil are thus all the time busy inventing ever new forms of behaviour and interaction, which they hope can be in accordance with the contract, which are either interpretations of it or tolerable evasions. (Melin-Olsen 1987 p.185)

Whilst we said that the strategies that the strategies we worked with contributed to lessen the immobilising effects this bind, we do find that unenergising replications and a sense of contradictions are astonishingly persistent in our students and teachers and discuss this aspect next in relation to the prevalent

'competence-based' descriptions of teacher education that we have worked with (or against) in the UK.

At the present time - an impetus for re-examination

In the UK, an astoundingly detailed National Curriculum for Initial Teacher Training was introduced in 1998 (DfEE 1998). This specifies the competences, referred to as 'the standards', that must be demonstrated for the award of qualified teacher status. (Evidence of achieving these standards is often manifested by listed competences ticked off in an audit file supported by extensive documentary evidence).

Here are some examples of these standards:

> trainees must be taught the importance of ensuring the pupils progress from: i. Using informal mathematical vocabulary, to precise and correct mathematical vocabulary, notations and symbols;
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> trainees must be taught: k. how to lead oral work while teaching whole classes or groups which: has pace and variety, and flows well from one section of the mathematics lesson to the next;
>
> trainees must be taught: a. to recognise common pupil errors and misconceptions in mathematics, and to understand how these arise, how they can be prevented, and how to remedy them, including, among others: iii. Misunderstanding the order of the subtraction operation *e.g. 3 – 7 = 4;*
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> all courses must ensure trainees are taught: a. how to use formative, diagnostic and summative methods of assessing pupils' progress in mathematics, including how to: i. Make effective use of assessment information on pupils' attainment and progress in their teaching and in planning future lessons and sequences of lessons;
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> all courses must ensure trainees are taught: how inspections and research evidence, and international comparisons on the teaching of mathematics, can inform their teaching. (DfEE 1998)

This document is an embodiment of a technical-rationalist approach to teacher preparation and has particular effects on the identity of beginning teachers. Beginners have always had to 'talk the talk and walk the walk'. However, this technicist approach sees teachers as 'deliverers' of the curriculum, and the standards gives very little space to notions of intellectual growth. Beginners are constructed as the embodiment (or not!) of the subject knowledge and pedagogic knowledge as itemised in the standards. Beginning teacher development is measured by the 'thickness of the file of evidence' that they amass throughout their training course. *"I am a successful student because I am able to demonstrate, through a multiple monitoring programme, that I have become a material version of 'the document'; a fully ticked off member of the profession."*

We find great discomfort in living with resultant remnants of what we have known as teacher education and our seeming impotence to intervene in the implementation of such regulatory policies. This seems particularly distressing

for those of us who work on primary mathematics education. Courses are short, over-crammed and can seem fragmentary. Reflective practice requires sustained engagement and takes time that tutors are unable or unwilling to prioritise. There have been claims from government education officials that this is just more whinging from 'reactionary higher education'. Perhaps we should examine our own reluctance to change and we will. However, at the least, we feel that in our own teacher education practices we have identified and explored a number of paradigms from which to consider the acquisition and development of professional knowledge, and from this we are clear that our preferred paradigm would be other than the bullet-pointed competences of the National Curriculum for Initial Teacher Training of 1998.

A significant aspect that we miss from the current UK specification is that of adopting a 'critical' perspective (for beginning and practicing teachers and teacher educators), which involves a shift to consider not (only) 'what knowledge?' but 'why this knowledge and for what purpose?'. In this paradigm it would be legitimate for teachers to ask, 'Can I acquire an identity as a teacher outside of such assertively expressed and given descriptions? Is there another language relevant to my practice which will help me re-search my practice and my context?'

Questions for a practitioner-based teacher education paradigm should include those about the nature of the subjectivity and of the self 'in practice'. For example, we ask ourselves as tutors, 'What sense of a decision-making self is implied when we are focussing on practice?'; 'Can we function with a sense of fractured and multiple selves?'; 'To what extent as practitioners do we need to recover a sense of ourselves as centred and not atomised as a subject, with purpose and agency?'; 'And if so, how is this to be achieved (to some extent)?'. In our current work these continue to be valuable questions for us.

Are there forms in which reflective practice can re-emerge?

Currently, alternatives to the dominant competency discourse are unusual, under-funded and are forced onto the periphery. Theory continues to be a dirty word for policy makers and teachers alike (see e.g. Griffiths and Tann 1992).

We have said that the professional way of life that we have promoted is not easy to articulate or to act out. The students and teachers with whom we work also find this. They need to acquire unusual habits, for example to discuss their practice from a personal perspective, to articulate this precisely and to learn to analyse this. They also need to generate time and motivation to do this. They need to work on personal awareness, a sense of their own 'voice' as practitioners and suspend the belief that 'getting it right' is just a government document away. Adelman (1993) points out that for practitioner research to involve a

sense of development[2], teachers not only need to acquire a researcher's habits and a fine-tuned sense of their professional context. Practitioner research also needs to include tactics for theorising that practice. This might, for example, involve engagement with tools from social and cultural theory to examine the social interactions of the classroom.

We have discussed whether the paradigm of reflective practice can offer something special, especially for MES concerns, and what might constitute valid uses of this paradigm. In our work we have found potent strategies and tactics that offer the possibility to break habits (never underestimate how hard this is!) and to think differently. There is the possibility to live with the contradictions and dilemmas that are so much part of our own teaching and learning, to avoid seeing these all as problems to be solved and to resist the search for an overly easy solution.

However, in the UK teacher education, reflective practice has never been a dominant frame but it has been speakable. Now it feels silenced (and so do we) by a technicist- rationalist discourse. This paradigm is losing out to 'training' discourses. We find ourselves asking again, 'Why are we attracted to it and feeling so deeply aggrieved at its nearing death?'. It could be argued that reflective practice could itself be seen as a master discourse. Has the time come to abandon it and look elsewhere for some healing of our professional wounds?

Identifying enduring concerns and questions

From our reflection on reflective practice we can indicate some enduring questions and concerns:

As a conceptualisation of knowledge formation in professional practice we find a theory/practice polarisation gives an inappropriate frame and inauthentic voice for thinking about the forming of professional knowledge and for working on the professional activity and life of teachers. So we have drawn on reflective practice. However, who gains from our working with reflective practice? Do we just produce knowledge in another form; still divisive, elitist, still driven by a privileging of theory and demeaning to teachers' work?

All our experience shows that reflection is hard. Much that is produced is sloppy and unprovoking. Can it be made 'doable'? It takes considerable time and effort. There is a double bind for us as teacher educators; that is, succumbing to demands of students for clarification and the pinning down of this hard and elusive thing. By doing this, we may generate a desire and a possibility in students to replicate the symptoms of reflection. It becomes

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2 We are concerned that there is an implied value judgement in discussing 'effective' practitioner research in terms of 'improvement', 'development' and 'growth'. There is no direct link between re-thinking, acting differently and 'improvement' per se. We try to bear this in mind.

rendered in a technical form, a trainable behaviour. Can it be appreciated as rigorous AND authenticating?

When discussing teacher education we may be seen to describe teachers' practice in terms of its practical concerns and lack of reflective spice. Does this result in professional practice rendered into a hierarchy of categories and levels, a deficiency model of teachers' meanings of their work? Does work such as Carr and Kemmis describing reflection as technical, strategic and emancipatory (Carr & Kemmis 1986), and Elliott's seven levels of reflection (Elliott 1992) contribute to this? Can it be described clearly in other terms?

We have found that practitioner research based on systematic reflection can allow an authentic and authenicating account of the struggle for professional identity and growth (e.g. Hardy and Wilson 1996). Today, is this version of professional growth and life unspeakable in UK? Are we revealing our madness by hanging on to it? However, could reflection also act as a challenge and disruption to a rational order, offering a place where the self lives with contradiction and multiplicities and opposing identifications? Is it the healing salve we seek? Why are we so loathe to abandon it? What is it we desire (to hide)?

These concerns form the products of our re-examination, setting out prompts for our future considerations and re-searches. They may present dilemmas and dangers that we cannot eliminate but that we must work in the awareness that we will encounter them in our work and strive to find ways to work through them.

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