CHAPTER TWO

TOWARDS RECONCILING INSIDER AND OUTSIDER PERSPECTIVES

1. INTRODUCTION

A key assumption at the commencement of our study was that there are many influences on trainee and new teachers' conceptions of mathematics. These influences emerge from a variety of culturally based assumptions as to the nature of mathematics and the associated forms of accountability they produce. We shall be suggesting that a number of difficulties arise from inconsistencies between alternative constructions of mathematics, the teaching of it, the perspective we assume in describing this teaching, and the issues underpinning the teacher training process. A central issue, as we shall see, relates to how such trainees and new teachers begin to reconcile their own sense of what mathematics is with how it might be taught, within the external demands they face from a variety of sources.

There are, in this respect, two journeys being undertaken simultaneously during the training process. The first journey is the path the teacher follows in constructing her way forward into being a teacher, pursuing the quest of meeting personal aspirations. The second journey is how the official story portrays this developmental sequence as a set of criteria to be fulfilled. How do these stories co-exist and in which ways do they intersect? How do they knowingly and unknowingly support each other and resist each other? In particular, how do understandings of mathematics emerge from each? Mathematics, understood in a more traditional way, we shall later suggest, has had a tendency to be drowned out in the bustle of different agencies selling their wares to trainee teachers as they pass through their training.

In the first journey the survival of mathematics as a discipline must depend to a large extent on the trainee wanting it to survive in her story. It could be all too easy to downgrade mathematics to "just one of the subjects that I have to teach". For those with uncomfortable memories of mathematics in their own schooling, this might be an easy option. A key motivation of this research was to address questions such as: how then might the trainee be assisted in advocating mathematics a little more strongly? How might the training process, with its multiple objectives and attendant budgetary and time constraints, impact a little more on the students' inner motivations to work with the subject?

In the second journey the trainee is rather more like a passenger insofar as the government, in allegiance with schools and universities, is delineating the route to be taken, and the things to be collected along the way. Recent reform has seen the British government wrestle with teachers and teacher education providers generally in deciding the content of the curriculum and the style in which it is delivered. The resulting package, to be outlined in Chapter Four, is a set of prescriptive guidelines that specify that school mathematics should be called numeracy and legislate what must be taught according to a highly specific National Curriculum (Department For Education, 1995, revised Department for Education and Employment, 1999). They prescribe how lessons should be administered in the National Numeracy Strategy (Department for Education and Employment, 1999) and they issue statutory guidance on how trainees should be trained to administer them (National Curriculum for Initial Teacher Education (Department for Education and Employment, 1998c, updated Department for Education and Skills, 2002). In addition there have been supplementary tests in mathematical content for teachers entering the profession (Numeracy Skills Test (Teachers Training Agency, 1999)) over and above those specified in the university entry requirements. It seems that the government in policing the teaching of school mathematics is taking few risks. Or, at least, there has been much investment in policies that adopt top-down prescription for teachers in the classroom and the universities that train them for that job. The government then increasingly sees itself having a role in guiding, if not regulating, teachers in meeting the government's own criteria in defining educational objectives. The promotion of mathematics as a school subject is largely down to official conceptions of what that is and held in place by regulation. It may be, for example, that the government's promotion of mathematics as a discipline is a result of its perceived economic benefit - a criterion that does not necessarily lead to a version of mathematics that pleases everyone. From this perspective our research was motivated by the question: how might government policy be constructed to embrace a broader understanding of mathematical learning?

These two journeys presently appear to be happening at a time when new understandings of professionalism and managerialism are impacting on public conceptions of the teacher's role in English schools. Presently, external descriptions are being privileged over personal motivations. The personal motivations, characteristic of the first journey, seem, ever increasingly, to be expressed in terms of fulfilling the social requirement of the second journey. In this book we seek to examine these two journeys, or perhaps alternatively, account for "the" journey undertaken by trainee teachers from two perspectives. But in centring itself in a project concerned with sharpening the definition and objectives of research in mathematics education it sides with the teacher pursuing the development of her own professional voice. It thus privileges creating a better understanding of how teachers might be equipped to undertake the first journey and thus assert their own voices rather than being concerned with saying how guidance should be framed to steer the second journey.

Nevertheless, we do not see ourselves as liberators of oppressed teachers seeking release from totalitarian structures. Rather, we recognise that the structures often meet the demand of teachers themselves, providing support in areas where they lack confidence. Also, the official version of events can easily become the common sense of the day. Yet, we do see our research task as being to challenge the boundaries of this. We, for example, investigate the claim that the teachers' acceptance of the rulebook is a consensual downgrading of professional ambition. The very fantasy of a quick fix in "raising standards", "redefining professionalism", securing an "evidence base" in research, seems to appeal to teachers and their employers alike. We shall later consider Žižek's work on psychoanalysis (e.g. 1989) where he argues that the seduction of an overarching rational structure guiding practice can provide a fetishistic displacement for the desires we wish to satisfy. Such compliance, he argues, can give rise to particular forms of enjoyment. Teachers, for example, may secretly like the rules they have to follow as it can give them a clear framework to shape their practice. Similarly, even though people may know that their actions do not make sense that does not stop people doing them in the absence of clear alternatives. Žižek argues that a culture of cynicism prevails where there is an acceptance that actions by individuals do not make much difference (Myers, 2003). Laclau and Mouffe (2001) argue that there are now too many versions of life for one centralised rational structure to have credence, but that this very complexity activates the desire for simple solutions. Governments in particular need to be able to present policies in clear terms no matter how unclear or contradictory the underlying premises might be. How might researchers in mathematics education develop a language that resists the onslaught of simplistic solutions and drape common sense over a more complex composite of rationalisations?

We commence with an outline of three dualities that offer alternative perspectives on mathematics, its teaching and how teachers are trained. This is followed by an outline of the hermeneutic theory that will underpin aspects of the study. The remainder of the chapter deals with a more detailed account of the dualities.

2. THREE DUALITIES

In Chapter Three we shall seek to present a theoretical approach that will assist us in considering how the individual trainee teacher manages this transition in terms of how they see their own emerging sense of identity as a teacher. We shall consider how the multiple demands might be combined in moving towards a coherent account of professional functioning. We shall later seek to shed light on the way in which school mathematics is derived through this process. But for now we seek to lay the ground for this later discussion. We shall tackle this by introducing three dualities through which we shall open our analysis:

a) Duality One - phenomenological/ official versions of mathematics. The possible conflict between the trainee teacher's perspective on the mathematics they are engaged in and the way in which that mathematics is specified in curriculum documentation. The distinction between "what you see" and "what you are meant to see".
b) Duality Two - discovery/ transmission conceptions of mathematics teaching. The possible conflict between seeing the teacher's task as enabling children to build their own mathematical thinking or seeing the task as ensuring that pupils attain requisite skills.
c) Duality Three - perceptual/ structural conceptions of the training process. The possible conflict between the trainee's personal aspirations in respect of their professional training and the official demands they face.

Each of these three dualities can be seen as potentially dichotomous or conflicting and may often be experienced as such. They each comprise a first item rooted in an individual insider's perspective and a second item implying a more socially constructed overview. In each case, the first item is spoken of in qualitative terms, whilst the second requires a more "objective", or structural style of analysis. For each duality we shall explore how possible dichotomies might be resolved through adopting a hermeneutic perspective. This will be achieved by highlighting how the first item can be seen in the second and vice versa. We shall discuss these in turn shortly. We shall commence, however, with a brief account of the hermeneutic approach we intend to follow.

3. UNDERSTANDING AND EXPLANATION

An approach to using hermeneutics in mathematics education has been developed extensively elsewhere (Brown, 2001). An introductory account of alternative models of hermeneutics for educational research is also available (Brown and Heggs, 2004). For our purposes here now our pursuit of this will be modest. Essentially hermeneutics might be understood as the theory of interpretation as exemplified in the work of Paul Ricoeur (e.g. 1981). A central concern is with how we, as humans, make sense of the flow of our experience. What difficulties, for example, do we face in seeking to encapsulate experience in a set of words? Within mathematics this could be the difficulty of representing mathematical thought in some symbolic or linguistic expression. Ricoeur (1984) has written extensively about time and narrative, arguing that time is a function of the way in which experience is organised through narrative accounts of this experience. Hermeneutic analysis is often oriented around the notion of the *hermeneutic circle*. An example of such a circle offered by Ricoeur (1981) relates to the interplay between understanding and explanation. Understanding is continuous in time, forever susceptible to temporal disturbance. Meanwhile, explanation is often encapsulated in a form of words and as such is fixed in time and discrete. How does our understanding (of our experience) get translated into an explanation? Similarly, how do our explanations then condition subsequent understandings?

In the situation we wish to examine here we are concerned with how individual humans interact with social structures. Specifically, how do teachers interpret social structures and enact them in their own "individual" teaching practice? Social understandings of school mathematics and its teaching, we suggest, are reified in the apparatus of schools, policies and associated practices. Individual teachers are obliged to "speak" understandings of these social structures through their own voice. That is, their individual practices as teachers are recognised and assessed through the filter of more collective understandings of the teachers' professional task. Thus collective social practices shape the practices of individual teachers. But the summation of individual practices comprises the collective social practices. Policy directives offered by government will seek to impact on collective practices but this impact will always be a function of how those collective practices are currently understood and how that understanding might be influenced. A strictly rule-governed apparatus only works if it is in touch with normative practices. Meanwhile normative practices are generally accountable to some agreed regulative framework. Such circularities underpin the dualities we offer now.

4. PHENOMENOLOGICAL/OFFICIAL VERSIONS OF MATHEMATICS

Alternative views of mathematics are dependent on where their proponents are positioned in any educative process. As indicated, the "noun" mathematics has multiple usages. It is easy to slip between numerous or conflicting versions. For a tutor charged with the initial or in-service training of teachers, qualitative concerns are clearly of importance. There is a need to equip one's students with particular mathematical insights, to prioritise a positive attitude to the subject, to value personal understandings and to develop these. Meanwhile, a policy maker promoting effective performance in public examinations or tests to be used in international comparison is likely to be motivated differently. Here, perhaps, formats of learning and assessment rather than more personal notions of mathematical understanding underpin the hard currency required to make such quantitative comparisons possible. And so the emphasis is on the pupil being required to describe particular mathematical ideas in an acceptable language and to filter any personal insights through this language. The teacher in school is increasingly governed by such concerns and such pressures to change have been manifest in the recent policy initiatives to be discussed. As a consequence university training programmes have, through both choice and obligation, changed to be more in line with these moves.

University training offered a view of mathematics that valued the learner's own point of view and emphasised mathematics at primary level rather than the student's own level. As such mathematics, in early training at least, was seen primarily as a learning experience centred on the learner rather than being defined by external criteria. This mirrors a widespread view among educators as to how the learning might best be seen, where the quality experience of the student in learning mathematics is perhaps privileged over objectives defined in terms of mathematical content. The Association of Teachers of Mathematics in England has provided a home for such thinkers for many years. Within such a view of school mathematics there is an emphasis on mathematical processes and application. This, however, does not provide a comprehensive picture of the style of mathematics faced by student teachers when they return as teachers to a school based environment. Here they encounter again mathematics not unlike that which they faced in school as pupils. Not only the style of learning but also the style of regulation move away from the learner centred focus encountered in university. This version of mathematics is predicated on rather different aspects of the mathematics. Here cognitive ability is understood more in terms of performance of prescribed procedures. We suggest that these two aspects of mathematics display a certain amount of incommensurability but nevertheless coalesce under the same heading of "mathematics". Thus we have two sorts of mathematics that tend to get confused:

Mathematics 1 (phenomenological perspective):
In this perspective emphasis is placed on the student exploring mathematics, making connections, seeing structure and pattern and the teacher's task is understood more in terms of facilitating learning from the learner's current perspective rather than didactic teaching. Such an approach, which is often seen as being more "student centred" or "discovery" oriented, emphasises process and the "using and applying of mathematics", but a mathematics that is understood fairly broadly. Assessment is often targeted at the student's attempts at articulating their perspective. As an example of teaching strategy, electronic calculators are seen as an effective aid for developing numerical understanding, since they encourage mental calculation in place of mechanical and tedious pencil and paper methods employing poorly understood algorithmic procedures.

Mathematics 2 (official perspective):
In this perspective, mathematical achievement is understood more in terms of performance of prescribed mathematical procedures. This is quantifiable through diagnostic testing, and broader understanding is anchored around test indicators in a statistically defined environment. Mathematics itself is understood as being describable as a list of mathematical content topics, and thus a transmission approach may be favoured. The teacher's task is to initiate students into these conventional procedures perhaps by demonstrating them and assisting children while they are practised. Proponents of such a view of mathematics are often opposed to calculator use since they perform the very procedures featured on the preferred forms of diagnostic test.

The two sorts of mathematics are governed by different criteria; the phenomenological focuses on the learner's experience, the official on the production of pre-defined and quantifiable mathematical output. We risk getting caught in what appears to be an irreconcilable conflict between nurturing personal experience and utilising measuring devices. This apparent conflict, we suggest, can be softened through recognising that both perspectives are oriented around the same social phenomena. The individual cannot claim a wholly personal perspective. The space s/he occupies, the mathematics being studied cannot be observed except through socially derived filters. Personal insights (understandings) are relatively meaningless unless they can be hitched to common forms of expression (explanations). Meanwhile criteria-referenced metrics are dysfunctional unless they are derived from careful examination of normative practices. This social derivation of mathematics will be assumed throughout this book. The implications this has for teaching are briefly discussed next.

5. DISCOVERY/ TRANSMISSION CONCEPTIONS OF MATHEMATICS TEACHING

The potential dichotomy between phenomenological and official versions of mathematics is to some extent mirrored in some supposed alternative teaching orientations. The choice between discovery and transmission appears as an apparent conflict between valuing what children "do see" and measuring what they "should see". It is interesting how these perspectives have become polarised in so many debates (e.g. on the use of the calculator, on the importance of *Using and Applying Mathematics* (e.g. Simon and Brown, 1997)) and there have been attempts to efface this apparent polarisation. For example, Askew, Brown, Rhodes, Johnson and Wiliam (1997) seem to dichotomise what we are calling Mathematics 1 and 2 as being associated respectively with discovery (learner perspective prioritised) and transmission (teacher/ official perspective prioritised) styles of teaching. The notion of "connectionism" was offered by these authors as a reconciliation of the two perspectives. The feature of connectionism we would highlight here, in particular, is its suggestion that teachers draw links between alternative perspectives as offered by children and discuss how these "connect" with the curriculum topics being addressed. Personal insights (understandings) are sought but of shared phenomena, a sharing that takes place in explanatory forms and develops during lesson time with children and teacher working together. Mathematical meanings are socially constructed at the level of classroom activity through attempts at achieving shared understanding of ideas derived from curriculum topics (cf. Cobb, 1999). It is this sort of hermeneutic reconciliation that motivates us in this chapter in suggesting possible theoretical frames for combining apparently incommensurable perspectives. As we shall see later, however, certain perspectives refute the possibility of such reconciliation and insist on recognising the choices being offered and being made.

6. PERCEPTUAL/STRUCTURAL UNDERSTANDINGS OF TRAINEE'S TASK

How might we seek to reconcile the individual trainee's experience of their own training with the way in which that training process is conceptualised by schools, training providers and government agencies? In presenting our account of the phases student teachers pass through in making the transition from learner of mathematics to teacher of mathematics, we shall be developing two perspectives on how conceptions of mathematics emerge in students' minds in line with the two journeys that we pinpointed at the outset of this chapter. One the one hand, we shall focus on how students report on the affective or perceptual aspects of mathematics and its teaching, and how this moves to a formatting of the structural space they inhabit. On the other hand, we consider how this shapes perceptions of the teaching task. These might be seen as two complementary hermeneutic arcs, from perception to structure and from structure to perception.

In carrying out empirical research in the teaching of school mathematics there has been a tendency over the years for work to gravitate to one or other of two perspectives (McLeod, 1992, see also McLeod and McLeod, 2002). The first of these comprises work based around individuals' perceptions of their situations discussed in qualitative terms, whether these individuals are children learning mathematics (e.g. anxiety about mathematics) or teachers engaged in teaching mathematics (e.g. teacher beliefs). The second perspective concerns work focusing on the measurable achievements of such individuals in relation to the structure in which they are working (for children this might be National Tests; for trainee teachers this might be Initial Teacher Training standards). McLeod (1992, p. 590) for example, asserts a dichotomy between cognitive and affective styles of research. He has suggested research in affective issues of mathematics education, that is the insider's perspective, is fairly extensive but rather weakly connected to work on focusing on the outsider's analysis of that insider. As we shall show later, in reflecting on their own experiences of mathematics, the students in our study generally seemed unable to articulate their understanding of the subject except in affective terms (see also Grootenboer, 2003). For those prior to initial training it was generally conceptualised as a bad school experience. For those later on in the course the cognitive dimensions of mathematics were subsumed within the social practices of teaching as perceived within the broader primary education space. Recent theoretical work in mathematics education research, however, has questioned notions of the individual cognition (Ernest, 1998; Brown, 2001). This theme will be explored in detail throughout this present book. We agree with McLeod that research on the affectivity of learning mathematics is under theorised. This, however, will not be corrected by connecting this to theoretical work centred on cognition unless it is recognised that cognitive issues in mathematical learning are a function of the social environment and how it evaluates itself. For example, at different times mathematical learning is shaped through the filter of diagnostic testing and by the control principles of classroom organisation. Similarly, it seems that often affective or perceptual concerns have dominated the training discourse while structural accounts dominate the discourse of policy. Resolution of these alternative perspectives requires a softening, or compromising, of each within the life of the perspective of the individual concerned, towards demonstrating how the individual's understanding of mathematics is generated through social activity and regulated through socially defined parameters.

7. CONCLUSION

For the time being these hermeneutic dualities will shape our analysis, although our analytical frame will be extended in the next chapter. The key point is that mathematics, its teaching and the process through which teachers are trained are not singular entities. They depend for their existence on the perspective being taken of them. And there are good reasons as to why different agencies view them differently.

In subsequent chapters, we shall pursue this analysis further. This will be addressed through the route that we have already identified: namely the teachers' construction of self and of mathematics will be considered in relation to the external demands they encounter. We shall provide a more theoretical treatment of how trainee teachers understand their own training process and the mathematics within that in particular, as an attempted reconciliation of the diverse demands they encounter in a social sphere, defined through explanatory apparatus. At this point, however, we shall focus on the third duality that we have identified and turn to a more theoretical discussion of how we might frame our understanding of how teacher identity evolves through the training process. This theoretical apparatus will then inform some discussion of our data in Chapter Ten.

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