

# CHAPTER 1

## AN EMERGENT SOCIAL, CULTURAL, POLITICAL APPROACH:

### *Sketching a theoretical landscape*

#### 1. MATHEMATICS EDUCATION AFTER APARTHEID?

*“Education after Apartheid.”*

*“Education after Auschwitz.”* And what of *“Education after Colonialism”*; or *“Education after Genocides and Ethnic Cleansings”*? Indeed, what about an education for living in a world of terror and of war. In juxtaposing these, a global sketching is made of humanity's continuing inhumanity toward each other. Our joint project must surely be to work toward a world that will never see another Auschwitz, another Apartheid - a world of peace, of fairness, of freedom, respect and dignity for all. We assume that education can and must participate in this larger project. But what of *mathematics education*?

Now, in South Africa, more than a decade since the dismantling of apartheid began, we remember and tell our children of the atrocities of a social engineering that caused huge suffering and that touched the lives of every South African as perpetrator or as victim, as activist or as silent observer. Today, for the children - those in this study and my own, apartheid has to be explained. That explanation can be offered in many ways and from many perspectives. Here is but one:

“... what it means to be born into an apartheid society where there is a ruthless social stratification and caste system. Depending on your pigmentation, you are placed high or low on the social pyramid; and where you are or, rather where your parents are, determines so many things for you. It will decide with a rigidity unknown even in the strictest Calvinistic predestination, where you are born and where you can live. It will determine what sort of health care is available to you; indeed, it will determine your chances of survival or whether you become part of the dismal infant mortality statistic. It will determine the probability that you will succumb to kwashiorkor, be pot-bellied, or suffer from easily preventable deficiency diseases. It will determine what sort of education you are likely to get and how well you are likely to perform at school (assuming you are fortunate enough to get into one, if you are at the bottom end of the scale). It will determine whether you can in fact hope to have a decent, stable home environment where father is not a migrant worker separated for eleven months of the year from his loved ones, who are expected to eke out a miserable existence in poverty-stricken, barren ‘homeland’ resettlement camps. It will determine whether you can ever hope to be treated as a human person of infinite worth because you have been created in the image of God.”

These words were written by Bishop Desmond Tutu in 1986 during some of the most brutal years of apartheid, in the foreword of an aptly titled volume of papers studying the lives of children in South Africa "*Growing up in a Divided Society*" (Burman et al., 1986, p. xv-xvi).

I too have been born and brought up in this divided society.

As a society still struggling with deep inequalities and continuing injustices, a question that must be asked is, could (or should) mathematics education participate in moving us toward more humanitarian goals - democracy, equity, social justice, non-racism, non-sexism? Indeed, is mathematics and mathematics education in fact innocent in the production and perpetuation of injustices and inequalities, both overt and covert found everywhere, in wealthy and poor countries? How did mathematics education participate in apartheid education and apartheid society? There is a growing and widespread development in theory, practice, curricula and research in mathematics education exploring such questions in a wide variety of contexts. This book hopes to contribute to and become part of this endeavour. Specifically, the concern is about what role, if any, could mathematics education have in an education for post-apartheid South Africa? I began to explore this fundamental question through mathematics teacher education curricula that I offered to prospective teachers. Working with student teachers, we embarked on a research journey which took us, with our theoretical ideas and practices related to what I have called *a social, cultural, political approach* to the school mathematics curriculum which integrates a *critical perspective*, into a primary mathematics classroom in a school, and then back into the domain of theory, and reflections on practice.

As part of my work in mathematics education courses with student teachers, I introduce them to a wide variety of new and controversial ideas both in theory and in practice in their preparation to become teachers of mathematics. I am interested in how student teachers understand a particular theoretical perspective and related practices within the context of mathematics teacher education, but the question which constitutes the main inquiry for this study is: what happens in a mathematics classroom when student teachers attempt to realise a social, cultural, political approach to a school mathematics curriculum, particularly one that integrates a critical perspective? What is the nature of the participation and interaction of the different actors: the pupils, the class teacher, student teachers and researcher-teacher educator? What kinds of practices are produced and engaged by these different participants and what are their consequences? What theoretical reflections emerge from these classroom practices and settings? And how do these link back to the theoretical ideas and practices that inspired this situation in the first place?

The research sought to describe, understand and explain what was transpiring in classrooms during that time set aside for school based teaching practice, the intention being to critique and develop a social, cultural, political approach to a mathematics curriculum, both in practice and in theory. In taking a broader look into the classroom, a main focus on student teachers is retained because they played a key role as co-teacher-researchers, but the class teacher and especially the pupils are also given prominent positions. As the researcher-teacher educator I enter the classroom via the student teachers and it is through their understandings and actions that we jointly come to look

at the approach in reality. Our concern was with both the theoretical and practical meaning given to the approach, both before and once student teachers entered a mathematics classroom. It includes issues of how the opportunity to work with the approach is negotiated by student teachers within the school setting; the nature of their engagement within this setting; how that is related to the curriculum approach; and the form it comes to take in the school setting. Through the effort of mainly one student teacher, I explore how and why student teachers give meaning to this curriculum approach in particular ways, and what their reflections are as a consequence of trying out the approach. I chose to take a closer look inside one particular classroom, and to do this, student teacher Sumaiya Desai is given a lead role in telling the story as a co-teacher-researcher. The research participants are introduced later. First I sketch the theoretical landscape of a social cultural, political approach.

In essence this is a study of the relation between theory and practice in mathematics education. By theory I refer to a landscape of theoretical ideas that I bring together<sup>1</sup>. It is an emergent theory, serving as background to what I have called a social, cultural, political approach to the mathematics curriculum to which I want to give substance and meaning. It is an emergent theory also because I bring together ideas that have their roots in contexts outside South Africa but which I interpret in particular ways with reference to the South African context. However, I demonstrate also their connection and that this is not a complete importation because similar or related ideas have also arisen here in South Africa. I harness these ideas by elaborating some aspects of practice associated with this landscape. In particular, I discuss project work. Throughout I attempt to contextualise both theory and practice in the broader educational concerns, challenges and conditions of post-apartheid South Africa.

## 2. FOUR STRANDS OF A SOCIAL, CULTURAL, POLITICAL APPROACH

The emergence of this social, cultural, political approach can be traced in two ways. In the first instance it can be traced to its development in the literature in mathematics education, and secondly, it can be traced back to the teacher education programme I offered to student teachers within the context of mathematics education in South Africa (Vithal, 1997). These are, of course, connected. The purpose of sketching this landscape is therefore, first to make explicit the theoretical basis underpinning the mathematics curriculum approach – referred to as a social, cultural, political approach. Second, it is to create a landscape of theoretical ideas with which to confront the data produced in the study. Both are used as a lens through which to look at what is happening in the classroom, and to reflect back on the emergent theory, and its associated practice, to critique and seek further development of both.

The roots of a social, cultural, political approach to the mathematics curriculum in the international literature may be found in writings considered seminal and through the work of mathematics educators who have made a substantial contribution both in theory and in practice. Possibly one of the earliest and best argued papers that puts culture in the centre of mathematics education debates was that of Munir Fasheh (1982) in

## CHAPTER 2

# METHODOLOGICAL “THEORETICAL TOOLS” FOR RESEARCHING A SOCIAL, CULTURAL, POLITICAL APPROACH

### 1. A RESEARCH JOURNEY

The story that I tell is about a student teacher, and it is told through her attempt to give meaning to a particular approach to teaching and learning mathematics in a classroom. A second underlying hidden story that often remains largely untold is the researcher’s journey and her struggle in all that comprises the research endeavour. It is the “messiness” of classrooms and the successes and failures of teachers’ and learners’ lives in those classrooms that is usually revealed but seldom the parallel scenarios played out in the work and lives of researchers. Just as the theoretical landscape developed through the research, so too did the methodology. As I write this chapter, I do not want to present what I did and why I did it in a way that implies that it was all clearly thought out methodologically and theoretically. What I know now is so different from what I knew when I planned and produced the data. So in this chapter, I try to chart my own growth and journey as a researcher with respect to this emergent methodology, as I work through the many conflicts and dilemmas of doing research in South Africa and try to ground the methodology theoretically.

Like most researchers I attended research methodology courses and seminars. Moreover, I was involved in developing an education masters programme in the faculty, and I was centrally involved in its research training component while I was involved in conducting the main part of this study (for e.g. Jansen and Vithal 1997; Vithal and Jansen, 1997). Yet when asked what research methodology was I using (Is it a case study, an action research, or an ethnography?), I struggled to answer. When I tried to think of the way in which I had planned and was doing the research in terms of specific methodological criteria, I experienced a disjuncture from the research questions and felt constrained. My research simply did not make sense to me when I tried to follow guidelines set in the different methodologies. Besides, the methodologies are not clearly demarcated themselves as the underlying theoretical debates rage not only across different research paradigms but also within a single methodology, such as, for example, ethnography.

Advised and encouraged to be creative and to go with my best judgement and thoughts, I took this to mean that I could use my intuition and common sense. This

did not always feel comfortable, I did want to do rigorous and scholarly research that was methodologically and theoretically sound and supported. My fears about approaching research this way were assuaged by fellow researchers who pointed out that since I was reading and thinking about what I was doing in the research that my intuition was in fact methodologically and theoretically informed. Much of my experience of education and research was in terms of being a consumer of the ideas of others. It was not easy to feel comfortable with simultaneously trying to produce theoretical and methodological ideas relevant to my own context and concerns.

Developing a research design and producing data raised several methodological questions: What is an appropriate research *methodology for researching a critical perspective in mathematics education*? Does one exist, could it be appropriated or was there a need to invent a methodology? The problem of methodology from the perspective of theory is two fold: the first was that of finding a research design and process that allows one to investigate theory-practice relations, in contexts in which practices associated with particular theoretical ideas are not widespread in the current mathematics education system; and the second is the question of requiring an appropriate methodology for researching an approach that embeds a critical perspective. This chapter addresses the first of these two questions. I offer a way of examining a theory and related practices by constructing a set of relationships between three “situations” – *the actual current situation, the imagined hypothetical situation and the arranged situation*. The description of the methodology developed in the study is outlined and contextualised in terms of these situations. In the next chapter, I address the second question as I locate this description in terms of existing research paradigms, methodology, methods and criteria.

A main underlying concern in this study is the theory-practice relation in mathematics education (see Chapter 4), but for now I focus on that relation in research. I have used the term theory rather broadly to refer to several ideas and concepts pulled together in a theoretical landscape which in particular, refers to and explains an approach to the school mathematics curriculum that focuses on social, cultural and political aspects and integrates a critical perspective. The problem essentially is, what are the means for one to say anything – critical or supportive - to this approach and its theoretical basis, and to any related practices, especially when these do not exist widely in the system?<sup>i</sup> Once produced, what are the sources for developing any theory and associated practices further? To discuss this problem, especially with specific reference to my study, I develop these three “situations” to describe and clarify a process of researching innovative theoretical ideas and related practices in mathematics education, particularly in seeking to emphasize and retain a critical perspective in the research in resonance with the theoretical landscape<sup>ii</sup>:

I take these situations to offer “theoretical tools” for thinking and talking about researching a theory-practice relation when a particular theoretical landscape and associated practices are deliberately introduced into a context because these are not dominant in the mainstream educational setting. The following visual representation in Figure 1 assists in the discussion.

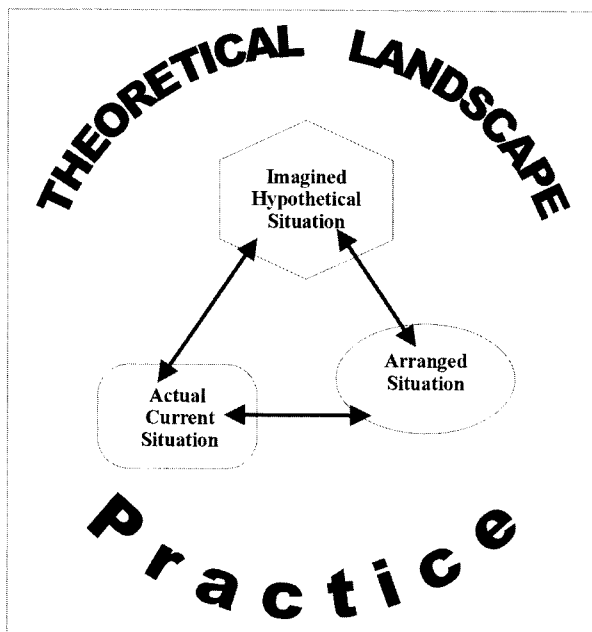


Figure 1. The actual current, imagined hypothetical and arranged situations.

## 2. THE ACTUAL CURRENT SITUATION

This is the situation that actually exists: in a classroom, a school, a teacher education institution or even the educational system as a whole. It represents the current situation in which the research is taking place. In a significant amount of research in mathematics education, some aspect of the current actual situation is researched: the learners, the teachers, the curriculum and so on.

There are at least two ways in which the theory-practice relation in this research could have been investigated by referring to the current actual situation, different from the approach I took. First, I could have searched for an existing actual situation in which, for example, teachers are working with the curriculum approach I am interested in studying (for e.g. Boaler, 1997). This would have been quite a challenge given the dominant mode of “traditional” mathematics teaching and learning in South African classrooms. A second approach may be to study and interpret the actual current situation as it occurs, through the lens or theoretical framework of a critical perspective in mathematics education (for e.g. Cotton, 1998; Valero, 2003). In this latter approach to the research I could consider issues of democracy, equity, social justice, etc. in actual situations as they are currently played out in mathematics classrooms.

The focus in my study is not on the existing actual situation per se but rather on some new and different situation that is organised and created with ideas from a particular theoretical landscape. My research interest lies in making a concerted effort to introduce prospective teachers to this theoretical landscape and its associated practices and then to examine collaboratively its recontextualisation when

## CHAPTER 3

# METHODOLOGICAL CHALLENGES AND CRITERIA FOR RESEARCHING A SOCIAL, CULTURAL, POLITICAL APPROACH

### 1. INTRODUCTION: RESEARCH PARADIGMS

In this chapter I address the question of what is an appropriate methodology for researching an approach which foregrounds a critical perspective. I raise several issues which I consider to be necessary (but by no means sufficient) in seeking such a methodology and do so by referring to three broad well-known categories, which serve as a map for the rest of the discussion and for locating the research process and description. These distinctions quite commonly made between different research approaches in educational and social science research literature are: i) the empirical-analytical, logical positivist or behaviourist paradigm; ii) the interpretive, hermeneutic, phenomenological or symbolic paradigm; and iii) the critical paradigm, drawing from earlier work by Habermas (1972) (e.g. Bredo and Feinberg, 1982). Such classifications are not in any way exhaustive, we need only refer to the growing research debates related to feminism, postpositivism, postmodernism and poststructuralism (e.g. Neuman, 1997; Guba and Lincoln, 1998), and these categorisations have themselves been critiqued (e.g. Carspecken, 1999). Nevertheless, they have been variously imported into research discussions in mathematics education<sup>i</sup> (e.g. Ernest, 1998; Romberg, 1992; Nickson, 1992; Kilpatrick, 1988). Further, it is possible to observe and argue that the first paradigm has dominated mathematics education research, though in recent years, with the strong emergence of constructivism, the second paradigm has also gained much ground (Vithal and Valero, in press).

However, if the research journals and the recent handbooks published in mathematics education (e.g. Grouws, 1992; Bishop et al., 1996; Sierpinska and Kilpatrick, 1998; Kelly and Lesh, 2000; English, 2002) are taken as indicating the state of the art in research in mathematics education then it is reasonable to conclude that the critical research paradigm and related research approaches are under-explored and under-represented in mathematics education research. Hence, it is necessary to ask what exactly is a critical research paradigm, and what, if any relation, could it have to a critical perspective in mathematics education?

In this chapter I discuss what may be considered to be a serious problem in researching a critical perspective in mathematics education – that of a researcher

trying to find resonance between her research approach and her educational approach. The search for a research methodology for investigating a critical perspective in mathematics education takes two routes – one into mathematics education and the other outside it – which is then reified in the discussion of the relationship between the researcher, the research participants and the research process. This leads to questions about criteria for evaluating quality in critical research such as validity and generalisability where some alternative suggestions are made for consideration. Finally, I return to issues of context and the problems of change and disruption so characteristic of educational settings like South Africa and question assumptions of stability and continuity built into imported research methodologies.

## 2. A CRITICAL APPROACH TO RESEARCH VERSUS A CRITICAL APPROACH TO EDUCATION

An educational approach has been described and a particular research process constructed through which its realisation into mathematics classroom practice is being explored. From the description of the research method given in the previous chapter it might be asked, what is the underlying theoretical base supporting the empirical work and methodology? Further, what is the relation between any theoretical assumptions upon which the research process rests, and the educational theory that is being examined in its interpretation into practice? Indeed, what could or should be the nature of the relation between an educational theory under investigation and the “research theory” supporting the research process and relationships within a study?

Typically, the theoretical framework set out in a study provides some of the theoretical tools by which the data will be analysed. But is it possible to explore a deeper, more broader link between the theory underpinning educational practices and the research enterprise in all its facets: such as in the nature of the question asked, the relation between the researcher and the researched, the involvement of the research participants in the activity of data generation, and so on. Such an assertion itself is founded on the assumption that there is no neutral and value-free research just as there is no neutral and value-free mathematics education. The problem then is to not only understand the assumptions which (dis)connect theory and practice but also to make explicit and interrogate the theoretical perspective that informs the research methodology through which that link is explored and understood.

In the way in which the above questions are framed, one could posit a possible separation in the theoretical considerations within an empirical study. That is, a possible disjuncture between the educational theory and the theoretical framework upon which the research rests. The research paradigms distinguished above will assist, as we will see, in making visible the theoretical assumptions in the research process and the fundamental ideological differences in how research is understood, engaged and its goals achieved.

Let me clarify and illustrate this issue of the link or disjuncture between theoretical considerations in a research methodology and theoretical considerations in



educational practice through an example from my research. In seeking to explore the theory-practice relation with respect to a critical perspective in mathematics education, perhaps an approach to the research could have been to develop a set of criteria or prescriptions from the theoretical landscape to guide the student teachers, to follow this with classroom observations and interviews with them, and then to analyse the data against a predetermined set of indicators of this critical perspective to mathematics education. The idea that a set of criteria or indicators can be found and applied in the research process comes into a serious and significant contradiction with the theoretical positions within a critical mathematics education and conflicts with the educational process. That this is observed as a conflict, of course, depends on how a critical perspective in mathematics education is understood. Taking a critical perspective in mathematics education cannot be equated to, as Skovsmose and Nielsen (1996, p. 1260) point out, “a sort of methodological principle”. They argue that critical mathematics education does not refer to a particular form of mathematics education but rather to a perspective in an educational landscape which involves mathematics. As such, it cannot be outlined as a set of rules for action and content and then followed in order to realise a “critical mathematics education” because the researcher does not know apriori the exact nature of the transformations that may take place in a particular arranged situation. For Skovsmose and Borba (2000), although critique and transformation are central to both the educational and research endeavour, they include uncertainty and doubt, and therefore are rooted in collaboration. A main issue here, is that of *resonance*, a complex notion, representing a complex relationship, well beyond a simple one-to-one relationship between a set of education perspectives and a set of research methodologies<sup>ii</sup>

The problem can be concretised more sharply with reference to classroom research. In the educational theory, a particular educational relationship is argued for between teachers and pupils, for instance, pupils cannot be “forced” to become critical. The question to be considered is then similarly, what should the research relationship be between the researcher and teacher? Teachers too cannot be “forced” to take a critical perspective in mathematics education. Hence, the difficulty is that whilst the educational theory is located in a critical paradigm, the theoretical underpinnings in the research, could be described as becoming lodged in say, a positivist paradigm. My experience in trying to explore a critical perspective in mathematics education is that this conflict arises quite easily if the theoretical assumptions on which the research is based are not deliberately considered by the researcher in the research process and their connection to the educational theory is not identified and maintained. What needs to be understood is how and what mediates the way in which a researcher understands the theory-practice relation and chooses to act in particular ways as a researcher (e. g. observer or interviewer) and in constructing research relationships. In this research it has to do with my views about what constitutes a critical perspective in mathematics education versus the research paradigm in which I locate myself as a researcher.

One difficulty in grappling with these problems is that the literature on critical mathematics pedagogy seldom makes its research methodology explicit. In the review of research and literature on ethnomathematics Gerdes (1996) admits that “Ethnomathematical-educational research, including the study of possible