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PROMOTING PARTICIPATORY TEACHING AND LEARNING IN THE SENIOR PRIMARY CLASSROOM

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ABSTRACT

Educational change is perhaps one of the most difficult processes that teachers might experience in search of democratising their classroom practices. Being a traditional mathematics teacher who resorted to autocratic modes of teaching, I had come to realise that my mode of teaching was probably not facilitating the learning of mathematics by my pupils in the primary school.

This thesis traces my attempts, via three projects, to change my style of teaching from a traditional to a more interactive and democratic mode of teaching. In an attempt to improve upon my own teaching practice I also wanted my pupils to benefit in the process. In my first project, I thus set out to improve my pupils' understanding of mathematics and to encourage them to verbalise their thoughts freely and confidently. For this purpose, in order to counteract a pupil passivity, I employed a collaborative process approach to the teaching of mathematics. In my second project I set out to learn from the failures of the first project. Project three, which was done at a different school, was largely a replication study of project two but deliberately carried out in a different setting.

Wanting to democratise my classroom practice I needed to resort to a mode of research that was in line with democratic

practices. I chose Action Research, which by its very nature of reflecting and acting within a collaborative process, tends towards a democratic practice. It offers me the opportunity to do research in the class on those aspects of my classroom practice that I felt needed to be investigated. Action Research allows the teachers, together with other significant participants, to share their experiences with colleagues and in so doing to generate their own theory which will be open to scrutiny and change. In doing project three at a different school I also wanted to establish the possibity of duplicating this study via an Action Research approach in another setting.

Through the process of Action Research I had undergone significant personal transformation in that I have developed critical thinking skills such as the ability to analyse, synthesize and not to take things for granted but to ask appropriate questions. My pupils, it seems, have also benefited from the process. The collaborative process approach which I employed towards the learning and understanding of mathematics served to empower the pupils in the classroom to voice their opinion and to substantiate their arguments. In the process I also discovered that educational change was a painful but positive process for both participants and myself.

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CHAPTER ONE

TOWARDS TRANSFORMATION: A CRITICAL REFLECTION

INTRODUCTION: EXPOSURE TO THE POLITICS OF SCHOOLING

Active involvement as a final year student in the political activities that shook South Africa during 1976 proved to be formative in the development of my political thinking and conscientisation. A great deal of what was learnt through experience and collaboration with fellow student activists in that year was to influence my thinking and teaching practice. Committed towards change after becoming aware of how education in this country was manipulated into becoming a political tool of oppression, I was motivated to work hard against the dominant order of the day in the hope that the beginning of the end of apartheid was in sight.

Inevitably much of our classroom activity during that year was influenced by the politics of the day. Very often we (the students) initiated forms of protest, such as rallies or marches, to show that we supported what teachers and students across the length and breadth of South Africa were saying: we were not satisfied with "gutter education". My exposure to and involvement in politics during this year made me more sensitive to other issues as well. I became more aware that religion, education, sports and many other facets of our culture were dominated by politics. An enquiring look

at the infamous "No Blacks, Coloureds, Indians and dogs" signs which were visible at many public places such as parks and beaches, soundly convinced me of this fact.

This chapter is an exposition of my reasons for undertaking an investigation of my own teaching practice and for looking at the problem of mathematics teaching in our schools. I started my teaching career in 1977 as a mathematics teacher at primary school No.8 with the expectation that education could serve a liberatory function. The school, a prefabricated building, was situated in Hanover Park and, like so many other schools on the Cape Flats at the time, was not even accorded the dignity of a name. It was identified by a number, either because people of colour in the area were deemed to be politically insignificant or because it was located in one of the worst crime ridden areas on the Cape Flats. Areas such as these were created through the eviction of people from their homes under the Group Areas Act to promote separatism, and resulted in people becoming more oppressed than they already were.

In schools such as these education controlled by the state was skilfully employed to oppress the masses. As early as 1950, Dr. Verwoerd, the architect of Bantu Education, had even proclaimed that there was no reason for blacks to do mathematics, as he did not foresee them using it in practice (Slammert 1991:71). To me, apartheid education gave credence

to the assertion of Freire (1984:13) that, " ... education is also a political act. That is why no pedagogy is neutral."

The mode of achieving what the state had set out to do was by way of an educational curriculum which in the South African context was dominated by apartheid ideology. Through what is referred to as the `hidden curriculum'- a curriculum not found visibly written, yet used as a powerful mechanism for maintaining the status quo - educational institutions, and their teachers, subtly coerced pupils into submission. Shor (1984:11) describes this process as follows: "The official curriculum asks them to submit to texts, lectures and tests, to habituate them to submitting to authority." Education in the South African context, then, has helped to acculturate people to be subservient to the dominant discourse of the day. So, if we are set upon change, education is one of the most significant tensions that needs to be addressed at all levels, since it is firmly controlled by the apartheid regime to make us subservient. One of my profound concerns was to uncover how the educational curriculum in the South African context had been dominated by apartheid ideology. Aspects that I thought needed to be scrutinized, of which I was at first not fully aware, were the principal, teacher, textbooks, syllabi, schools and colleges of education and all their functions.

Thus trying to get a grasp of how the educational curriculum was operative made me realise that a characteristic of the structure of schooling in South Africa is that teachers do the talking and thus remain in control of the knowledge and power that pervade the classroom situation. Not surprisingly, we find that many of our pupils find it hard to understand mathematics as taught by our teachers. This mode of schooling, not an uncommon phenomenon in our schools, largely perpetuates the teaching of knowledge in certain ways which teachers find familiar and comfortable, "even if it doesn't `work' in class," as was perceived by Shor (1984:7). In effect the role of the pupil, in most classes, is to remain the hushed recipient, subservient to the "expert" or teacher. Davidoff and van den Berg 's (1990:10) concern about this type of schooling is that:

> This mode of schooling seems to encourage students to accept the information they receive from teachers without questioning it. This means they become passive receivers of knowledge, and do not challenge or discuss the teacher's interpretation of a subject.

Based on observations that I have made over the years I am inclined to believe that our schools are so structured that the relations of power remain unequal. Taking the political milieu into account this could prove to be problematic especially with a view towards a post-apartheid reconstruction of education.

Considering the educational curriculum, one of the reasons

for my saying so is that schools, as well as colleges of education, are institutions which very often serve the interests of the government. In these institutions, education is skilfully employed to control and oppress the masses - and one could conceivably find reasons for what teachers do in their teaching practice in the way that we are educated at training colleges under the system of apartheid. Much of the educational activity that takes place at the colleges under the Department of Education and Culture (House of Representatives) is comparable to that which takes place in high and primary schools. The transmission mode of teaching, with its underlying philosophy of what is to be learned as well as the learning process, is firmly entrenched. South African colleges, as Davidoff and van den Berg (1990:24) remind us, " ... are institutions built into our political and social fabric for very specific reasons."

At our primary schools, much of what takes place is directed at making them more manageable. Teachers and pupils basically have to do what they are instructed to do - most of the time in a very undemocratic way - by the school's hierarchy which maintains rigid control over every aspect of the school. Principals, by way of the power vested in them through apartheid education, autocratically control schools by perpetuating these oppressive apartheid policies. Together with inspectors, they are often perceived as demi-gods by teachers who prize being `loyal' and `subservient' to

them, frequently to the detriment of education. This is also how the authorities expect teachers to conduct themselves. As Davidoff and van den Berg (1990:15) put it:

> Teachers, of course, in turn are expected to follow the instructions of senior persons in Education Departments, not really to take decisions by themselves!

In this way, autocratically controlled procedures become perpetuated as a central component of the transmission mode of operation of primary schooling. As I entered the teaching profession I could not help but be concerned about the fact that our pupils are being left exposed to such a mode of education, and one of my profound fears was that I would become like other teachers in operating in this way.

Another worrying fear was that like most of my colleagues I too would become enslaved to the prescribed syllabus and text books which also served as important sources of control and which are expected to be conformed to rigidly and covered for exam purposes. Teachers are generally pressurised by principals and inspectors to cover the whole syllabus irrespective of whether the pupils have actually understood the content. Adler (1991:58) comments that teachers are:

> ... bogged down by the created need to `finish the syllabus'... the result of this is students who are able to calculate area and perimeter from formulae learnt off-by-heart, but unable to see the relationship between area and perimeter nor appreciate the context into which it may fit.

It seems that few teachers are willing to view the syllabus as just a guide or tool which, when used effectively, can play a vital role in making knowledge meaningful. The same is true of the way teachers use text books too. Many teachers tend to rely heavily on text books as the only form of instructional material. In research done in the U.S.A. Goodlad (1976:14) found that:

> The text book predominated throughout as the medium of instruction ... With each advance in grade level, dependence on the textbook increased ... As other studies have documented, the textbook was the dominant instructional medium.

What seems to be worse is that some teachers rely on `particular' text books without due consideration of their relevance, authenticity and discourse, especially in content subjects such as geography and history. For this reason Slammert (1991:75) raises this concern that we need to scrutinize all aspects of subjects like maths and science too. And, I want to agree with him when he says that these subjects, too, need to be contextualised, so that they can be "... formulated out of the everyday needs of people and must be seen as part of the political programme of a people's education." Whether these textbooks are appropriate and valid in terms of a political and historical perspective is a question often ignored by many a maths teacher.

Du Preez (1983:19), in an analysis of the character of school textbooks in the South African context, argues that in our

schools both pupils and teachers rely on text books which have been written in a way that

> ... reflects the symbolic system of whites. As black and white children live in different worlds, the white symbolic system in the textbooks has very little relevance for black children.

Subsequently, it becomes imperative for teachers to investigate their own teaching practices and for maths teachers especially to scrutinize the content of current textbooks cautiously before selecting from them exercises for use in class. Slammert (1991:76) says that all mathematics textbooks need to be scrutinized because:

> It is important to ask where a concept in maths is true and where it is not, where it comes from and why it is important. Where it is used and where it is abused.

MATHEMATICS TEACHING IN THE PRIMARY SCHOOL

A classical early morning mathematics period, for example, may commence with drilling and recitation of multiplication tables as well as mental speed tests. Often children are allowed a very limited time to think during speed tests. A pupil who gives an incorrect answer could get caned, insulted or could be forced to perform the needless task of writing out multiplication tables several times.

A period of 30 minutes could eventually end with only about 15 minutes of mathematics teaching time left. When there is

marking to be done, pupils normally stand in a long queue, while the teacher sits at the table marking work. This performance is often accompanied by a shrieking voice and a lash at the pupil with a ruler. This type of activity, common to most mathematics classes, is modelled on a phenomenon that many teachers might themselves have encountered during their primary school days, and so the cycle is repeated. So we have a form of an authoritative instruction which is frequently accompanied by shouting instead of talking.

The fill-and-drill method of teaching mathematics prevalent in the primary school is still narrowly associated with the use of the cane, which serves to subjugate and control pupils. The drilling and senseless reciting of multiplication tables without comprehension, to the beat of a cane, could be one of the reasons why our pupils have developed an aversion towards the subject. As a mathematician, Lionel Slammert (1991:69) raises concerns about the fact that teachers still prefer to drill pupils to know their work by heart in favour of comprehending the work:

> ... they were convinced that the drilling method of teaching is still the best in that their pupils will then know their work better and by heart.

Thus it is often that our primary school pupils are drilled and compelled to know mathematical formulae and laws by heart without even understanding the basic concepts underlying them.

Sheila, even though expounding her high school experience, cited by Davidoff and van den Berg (1990:11), seems to have captured the essence of this when she says that:

> I learned to do all the mathematical functions through constant repetition of the formulae, ... yet I never understood the fundamentals of geometry, algebra, or trigonometry ... They had no meaning for me beyond what I learned to do, and, as a result, they had no application or use for me.

The application of mathematical concepts without any conceptual grasp renders such mathematical knowledge worthless.

Another characteristic of mathematics teaching is the persistence of teachers in applying methods which do not take into consideration the abilities and backgrounds of the pupils. Many teachers at the primary schools where I have taught were persistently employing "quick method" modes of teaching maths, although the abstract nature of maths means that there are no such "quick fix" methods to teaching it. It is very likely that teaching takes place in this way as a form of "protection" for the many teachers who themselves do not know the basics well enough to teach the subject conceptually. Many teachers at primary schools have a limited knowledge of mathematics. Jill Adler (1991:50) attests to this by saying:

> ... mathematics teaching by and large is tackled bravely by teachers barely one step ahead of their students. As a result, authoritarianism and rote-learning methods predominate.

Many parents, pupils and teachers are under the misconception

that the quicker that you get to an answer, the "brighter" you are - hence the promotion of "quick methods". Quick methods often lead to mystification and fail to ensure a conceptual understanding of an abstraction in mathematics.

Another area of concern is where pupils are given large quantities of similar or repetitive work with the hope that it will constitute a form of consolidation. I have found such methods to be mechanical as they do not mean that the pupil will eventually be able to make meaning of the work in the first place. This mode of teaching mathematics seems to favour the tendency to neglect quality work in favour of quantity. Learning through practising large quantities of work, rather than getting pupils to understand smaller quantities of work better, seems to have become the dominant mode of teaching in our primary schools. Many teachers, having been schooled in the transmission mode, have been found to be product-orientated and believe that the end product or answer is the most significant part of the mathematical problem - hence the promotion of mechanical modes of maths teaching. Taylor (1991:27) expresses it in this way:

> Maths is taught as a teacher centered, answer oriented discipline with little or no room for discovery, group work or discussion of alternative answers and processes.

Thus a conceptual understanding of mathematics gives way to "productiveness".

My enquiry and study into the subject and my attendance of workshops convinced me very early on that, in maths, the answer is not everything. Jill Adler (1991:52) reflects upon her experience in teaching mathematics by saying that there is

> ... little doubt that mathematics in all our schools is presented as a body of knowledge that must be absorbed, and the object of study is to get each answer right. This technicist approach to scientific knowledge, produces students who are expert in memorising and applying rules, but who struggle to step out of this narrow frame to make meaning of `knowledge'.

Much depends on how we arrive at the answer. The thinking through and working through, the trying to make meaning of the elementary concepts and trying to understand the question - these processes are what seem to make the finding of the answer meaningful.

Perhaps maths has been seen to be a formidable tool or filtering device of capitalism, for the purpose of securing the status of the dominant order in South Africa. From my observations I am inclined to believe that mathematics has left many a pupil poorly equipped to handle the world beyond school, essentially because of the abstract way in which it is taught and its lack of relevance to the activities of daily life. People's Education, striving towards making education relevant to the needs of people as well as to empowering them to be able to take responsibility for their own lives, has sought to break down the aura built around subjects like mathematics and science.

In a study done in England to assess the attitude of teachers towards the teaching of mathematics, Biggs (1983:17) established that there were far more teachers who had negative attitudes than positive attitudes. Their attitudes were apparently related to their own exposure to mathematics as pupils. In my experience I have found that teachers often seem to be subtly coerced into teaching the subject by senior personnel responsible for the school's time table. What is more, many teachers state that they don't feel self-confident and sufficiently competent to teach the subject and this may be another reason for teachers' apparent loss of interest in teaching mathematics.

MY TEACHING AND CONCERNS ABOUT EDUCATION.

Concerned that teachers allow themselves to be pressurized and autocratically controlled, I felt that little possibility for exercising initiative was allowed to primary school teachers. I was of the opinion that some teachers willingly, and in other cases unknowingly, condone such forms of autocratic control. Not surprisingly, the control mechanisms used by the authorities are often in turn wielded by teachers over pupils in their classrooms. Prescriptive and autocratic modes of doing things seem to dominate the ethos of our primary schools, serving to disempower rather than to empower both teachers and pupils.

Traditional educational practices thus inform us that schools have become places where pupils, rather than being empowered to become autonomous thinkers, are being thought for. When teachers find it easier to transmit and control knowledge rather than to teach with understanding, thinking skills are rarely promoted. The shortage of mathematics teachers during the seventies and eighties left many a mathematics pupil at the mercy of mathematics teachers who believed that they were the controllers or possessors of knowledge and experts in the classroom. The implications of such attitudes towards the teaching of mathematics were found not to be conducive to the promotion of thinking skills, and it comes as no surprise that our pupils have become accustomed to being passive learners. Not realising what they have done, teachers in defence of their way of teaching simply express the opinion that "our pupils are not able to think", not seeing their part in creating this situation.

Thus my teaching of mathematics to senior primary and junior secondary pupils revealed to me that by the time pupils reach these classes most of them have indeed become habituated to, and as a result dependent on, teachers informing them how to execute their class work. Besides, Fish (1989:51) raises the concern that one of the tensions in education that needs to be addressed urgently is the dependence of pupils on their teachers. Teacher dependence is a reality that cannot be ignored, as it contributes to a

culture of pupil passivity, silence and a lack of thinking skills. Shor (1984:9) expresses it thus:

> The worst thing is to be in classrooms where students are silent or where they speak and write phoney defensive language ... We also spend countless classes listening to student repeats of our own teacherly language. If I don't hear or read their authentic thought-language, I feel frustrated ...

From the outset, my concern was aroused by the fact that pupils, besides revealing some misconceptions in making meaning of their class work, also appeared to be comfortable with becoming mere recipients of knowledge. It thus became apparent that hardly any interaction or mutual sharing of knowledge was being encouraged in the classrooms. So, in order to develop and encourage thinking skills, I decided to employ an interactive approach to teaching, in which critical enquiry into classroom discussion and conversation plays a fundamental role. In my quest to promote the idea that pupils generate their own knowledge by interaction and a thinking through process, I thus tried to counteract this pupil silence and passivity.

My attention was therefore more specifically focused on whether there was any teacher-pupil and pupil-pupil interaction which could encourage pupils to think more critically about their work. From my observations of, and discussions with, pupils concerning classroom activity, it seemed to me that this type of interaction appeared to be

rather insignificant in class. However, during my general classroom discussions to investigate this matter, I became convinced that teachers somehow underestimate the pupils, who are indeed able to reason and think logically. My concern as to why they were not able to do so in all subjects or classes gave credence to the view that the transmission mode of teaching is not conducive to the stimulation of thinking skills.

However, I must admit, coming from a transmission mode background myself, I also derived much pleasure from seeing the pupils executing their work by pursuing my instructions and working in the mode that I had prescribed. My intentions, even though geared towards upliftment, were clouded by my perspective as a traditional teacher. Yet, I did not realise then that teaching could be approached differently. When I reflect on my teaching practice now, by looking at education from a changed perspective, I realise how entrenched I had then become in the transmission mode of teaching.

Working with, listening as well as talking to my pupils in class were some of the things I enjoyed doing most, since I consider myself to be a teacher first. I realised that I had to try to understand them - where they come from, how they think and speak. So, listening to them intently discussing classroom activity and topical issues regarding the socio-

political conditions which confronted them revealed to me how much anguish was being imposed upon them. Since I candidly endeavoured to know my pupils in class as well as to interact with them, I anticipated that this was akin to what Shor (1984:9) had meant when saying: "The first researcher, then, in the classroom, is the teacher who investigates his or her students." And this revealed to me as to Shor (1984:11), that, "When I listen intently to my students early in the term, I learn how dominated they are by old ways of schooling."

Being concerned about these problems facing teaching and learning of mathematics, I decided to reflect more systematically on my own teaching practice, by attempting to gain further insight into these issues in my classroom in terms of three research projects. I conducted my research through the process of Action Research which is grounded in the essential principles of involvement and improvement.

AN ATTEMPT AT INNOVATIVE TEACHING

To me, learning means understanding and making meaning of what one has learned in mathematics. It also means that what one has learned in class should be applicable in the social arena.

In my endeavour to do things slightly differently as well as

to find some way of stimulating my pupils to think, I decided to do less teacher talk and to encourage the pupils to interact. To this end I decided to employ the process of collaborative learning in the classroom because the transmission mode of teaching allowed for far too little pupil-pupil and pupil-teacher interaction and participation. Another reason for employing the process of collaborative learning was that I saw it as favouring interactive and participatory learning. This approach also allows for a more open-ended mode of mathematical investigation, within which, as Adler (1991:55) puts it,

> The social organisation of the classroom is seen as a fundamental part of this work and involves small groups who work together on the task on hand ... In addition because the work is done in groups, and because there is no single way of progressing through the task, the children can learn to co-operate, share ideas and discuss amongst themselves what they think and why.

In such an approach I saw my role as that of facilitator.

I also had some fears, that my attempts to do things slightly differently at school would be perceived as trying to "create an impression" or being "too progressive". Interaction with colleagues has informed me that such efforts are usually repudiated by those who are adherents of regimented class control - the "old school" - fearing the diminution of teacher control. From my perspective, however, doing things slightly differently in class did not necessarily imply a loss of classroom control, but rather that classroom control

could result in a form of mutual sharing of responsibility between pupils and teachers by way of participatory action. From this practice I perceived that the pupils were able to enjoy the work and this helped them to remember it for longer periods.

This thesis focuses on the process of transformation that I underwent in my pursuit to distance myself from the transmission mode of teaching. It deals with some of the experiences that I had while teaching mathematics at primary schools from standard four to standard six. In addition, I reflect on the political influences that are exerted on schooling in South Africa and how they affect the educational process.

The thesis deals with three projects that I conducted during 1991 and 1992. These projects were conducted through a process of emancipatory Action Research. I specifically chose this mode of research because it is grounded in the essential principles of involvement, improvement and empowerment. Also, unlike an empirical mode of research, Action Research does not divorce itself from the social realities of life. Freire (1984:8) attests to the fact that too much knowledge is generated by authors of texts and people doing research who are far removed from school classrooms and pupils. Through Action Research as a mode of teacher or classroom research I wanted to see not only how I

could transform my own practice, but also how I could empower the pupils to have voice, to participate more confidently, to question my work critically and to contest any unequal relations of power that existed. This, to me, involved more than just meaning making in mathematics. Action Research, unlike empirical research, allowed me to do research with and not on my pupils and as such all of us were involved in a process of learning. I did not want my students to be passive recipients of knowledge, nor did I want to present myself as a teacher who perpetuated an education of oppression and control. I wanted my pupils to enjoy what they were doing in mathematics by looking at their work critically and by questioning themselves and my work willingly and purposefully.

Two of these projects were conducted at No.44 primary school, while the last was conducted at No.8. The two schools were different in many ways, yet there were also many similarities. Like No.8 primary school, No.44 is situated on the Cape Flats, in Tafelsig, a suburb of Mitchell's Plain. Tafelsig has been described as the most economically deprived area in Mitchell's Plain, itself a sprawling underdeveloped city, which came into being as a direct result of the forced removals from District Six. The same apllies to Hanover Park, a suburb of Athlone, another place where unemployment is rife and the crime rates are high.

Considering that the inherent nature of both my mode of research and my teaching method to be researched - collaborative learning - was based on participation and interaction, I set out to empower my pupils so that it would be possible for them to take more responsibility for their actions and decisions. By way of collaborative learning we also attempted to:

- break down the competitive, individualistic nature promoted by the traditional mode of teaching;
- get the pupils to learn to respect the views of others;
- get the pupils to present their arguments in logical and appropriate ways in class; and
- get the pupils to listen to each other and to realise that they could generate their own knowledge and so learn from each other.

Adler (1991:55) sees collaborative learning as a means through which:

> Children are encouraged to develop ways of communicating their findings verbally and symbolically, so that they are intelligible ...

The notion that teachers and pupils should jointly generate knowledge in class by way of a participatory mode seemed to have captured and influenced my perspective of education.

In our schools because teachers rely on their text books and syllabi too much because they are examination orientated and

some even perpetuate an education conducive to the policy of apartheid, we find education is reduced to a form of learning in which knowledge is committed to memory without its being understood. The teacher in this process becomes a technicist, simply making the text transferable to memory. Much of what the pupils are supposed to learn through understanding the conceptual work in mathematics simply becomes committed to memory and so they see rote learning and memory work, rather than the process of understanding, as their task. By the time the pupils reach the senior primary classes, such techniques of learning have become habituated and accepted by pupils as the correct and only way of learning.

With a view towards empowering the pupils to stand up for what they believe to be legitimate, mathematics has to be democratised in the classroom. Mathematics has for too long attempted to declare a neutral stance by evading its educational emancipatory obligation. No subject or individual functions in isolation and mathematics should not be exempted. The democratisation of mathematics (Adler 1991: 53) "includes attacking authoritarianism and it implies questioning the curriculum." Crucial to this issue is also the contesting of any unequal relations of power that exist in classrooms between pupils and pupils and between teachers and pupils. With a view towards a changing South Africa, much needs to be done with regard to the unequal relations of

power that exist in this country. Teachers in contemporary classroom situations will have to reflect upon their teaching practices if they are to contribute towards the transformation, not only of education, but also of the political structures and processes of this country. It seems as though teachers are gradually becoming concerned about the autocratic way in which things are being done, but that generally they are either cautious or unable to liberate themselves from the reins of autocratic control and subjugation. Transformation is going to be a slow and arduous process. The system of apartheid has left indelible blemishes on the lives of all those who have indeed suffered under it and also those who have campaigned against it.

Action Research afforded me the opportunity to look at my own teaching practice critically. I built up my practitioner theory from my field notes, tape recordings, diaries, triangulation reports and reports kept from meetings and interviews with pupils and other observers. It made me a student, as well as a researcher, of my own teaching practice.

In chapter two I describe the process of Action Research and trace its origin by referring to those people who proposed Action Research as a mode of teacher research. I also refer to the various models of Action Research that have been put forward by some of its proponents.

In chapters three, four and five I give an exposition of three projects that I had attempted - the first two at No.44 primary and the latter at No.8 primary. The final chapter comprises my reflection on the projects as a whole and will also provide tentative proposals of how one might minimize or overcome the areas I have described as "concerns" in this chapter.

CHAPTER TWO

ACTION RESEARCH AS A MODE OF TEACHER RESEARCH

An introspective investigation into my own teaching practice made me realise that there was much more to education than just applying educational theories or just doing a job in the class. The educational literature I had read had not provided me with any compelling answers either. Knowing that I wished to do something about my practice, I found myself focussing on the character of traditional schooling which, I realised, stifled any momentum towards change for me. Goodlad (1976:130) had gone so far as to say that "schools have failed to respond to changing conditions" and thus proposed that "schools should be completely reconstructed." The profound nature of traditional forms of educational institutions was still firmly entrenched in the chalk and talk methods of education. Pupils' voice was discouraged, and textbook education and the "banking method" of educating pupils were still very prevalent. I subsequently realised that for the pupil, as Goodlad (1976:130) puts it, there was "too little pleasure or excitement in learning."

I also realised that, together with a political system which served to entrench the interests of the dominant culture, schooling in South Africa was geared towards maintaining the status quo. The mode of accomplishing this was by way of

employing an educational approach called Christian National Education (CNE) proposed by the Institute of Christian National Education in 1948. This educational approach was geared towards oppression, separatism and the control and manipulation of society, starting in the classrooms. The CNE ideology was intent that education for black people:

- be organised and administered by whites;
- should not prepare blacks for equal participation in economic and social life;
- be based on Christian National principles through which black people could be Christianised so that they could be `protected' against all kinds of `foreign' ideologies; and
- through the Bantu Education apparatus, should educate black children to accept the racial superiority of whites and submit to the rules of the dominant order.

The educational ideology that consolidated and legitimated Christian National Education was Fundamental Pedagogics, perceived by its adherents to be the only `valid' educational science. Enslin (1984:144) investigated the close ideological relationship between Fundamental Pedagogics and CNE towards maintaining the status quo, and puts it thus:

> ... the science of Fundamental pedagogics can offer us a means of establishing "universally valid" knowledge about education ... the practice of this science is to legitimate the CNE ideology ...

Purporting to be an educational science free of promoting ideology and dogma, Fundamental Pedagogics helped to maintain

and serve the interest of CNE. Thus Enslin (1984:146) finds Fundamental Pedagogics to be masquerading "an ideology rather than a science".

On the whole this educational theory had very far reaching effects in that not only did it function to oppress black people but it also served to indoctrinate whites. Fundamental pedagogics thus became operative in most Afrikaans universities. Enslin (1984:141) names a few - "mainly at the University of South Africa and the University of Pretoria" but including the University of the Western Cape, then referred to as a `Bush College' and created specifically to indoctrinate `coloured people'. However, the University of the Western Cape, after years of struggle by resident academics and students, managed to liberate itself from promoting an apartheid ideology. Together with other institutions it played an important role in the struggle against apartheid and towards change in this country.

Most educational institutions, including those for training teachers, were subtly compelled to propagate this policy of the dominant order to make the already oppressed further subservient to Apartheid ideology. In this way, teachers were socialised into becoming formidable tools of the state to be used for the production of a subservient society, without even being aware of it. Enslin (1984:145) says that to this end

> Students of education are provided, by means of syllabuses, prescribed readings and examinations in Fundamental Pedagogics, with the ideology which suits the roles which they will fulfil as teachers ...

Fundamental Pedagogics sought to ensure that the teacher was viewed as the authority in the class and as the expert in the generation of knowledge. By this kind of education pupils were denied the right to share in the generation of knowledge, and as such they were also denied a voice, becoming mere recipients of knowledge in the class.

The nationwide educational crises which started in 1976 and which contributed largely to the rejection of apartheid education in terms of school boycotts and strikes, could easily be seen as a liberatory onslaught against the doctrine of Apartheid. The sequence of events which emanated from this crisis contributed to the spirit of resistance and solidarity and made many people aware that change was imminent. Although education was the springboard, the emphasis began to shift towards transforming and liberating the society as a whole from a non-democratic towards a democratic society.

This situation called for the commitment of teachers to the process of liberation and transformation. Taking into consideration that most of the teachers were schooled under the very policy from which they were trying to liberate themselves, transformatory change would prove to be a

difficult process. Perhaps what had to be done first was for teachers to take a reflective look at themselves and their teaching practices in order to promote a transformatory educational process. This would entail teachers' abandoning the oppressive teaching practices through which the hegemonic process is perpetuated by means of strategies such as transmission teaching, insults, caning, denying pupils a voice through undemocratic teaching practices, and racist and sexist remarks. McClaren (1989:174) puts it thus:

> The challenge for teachers is to recognize and attempt to transform those undemocratic and oppressive features of hegemonic control that often structure everyday classroom existence in ways not readily apparent.

Through encouraging democratic and liberatory teaching practices, teachers could share in the generation of knowledge with the pupils so that the voice of the pupil, as Giroux (1988:143) argues, will be promoted.

ACTION RESEARCH: HISTORY AND RATIONALE

Searching for an approach which might enable me to improve upon my teaching practice, I came to believe that Action Research could be the vehicle for developing my own pedagogical theories and practices through my own classroom research. Oberg and McCutcheon's (1989:117) description of Action Research for teachers made me realise that this mode of research was in line with what I wanted to do:

> ... any systematic enquiry, large or small ... focussing on some aspect of their (teachers') practice in order to find out more about it, and eventually to act in ways they see as better or more effective.

Action research became a formal research tradition soon after the Second World War, when Kurt Lewin, a social psychologist, introduced it as a method of intervening into the social problems of the day. Lewin designed a model to enable the effective management of the social situation in order to achieve the objectives set. This model was arranged into cyclical spirals which made provision for planning an action, acting upon it, and then going on a fact-finding mission in order to improve upon the results. Lewin is thus often considered to be the founder of Action Research. However, McKernan (1989:8) argues that Collier, the Commissioner of Indian Affairs from 1933-1945, used the term Action Research and employed the process well before Lewin did.

Lewin, it appears, came out strongly against traditional research modes. According to McKernan (1989:5) Lewin's contention was that "Research that produces nothing but books will not suffice". For him, it seems, an educational theory that was grounded in practice was more tangible than one generated by traditional quantitive research modes.

Although Lewin's approach was geared towards improving social situations it was later incorporated into an educational

context. Subsequently, the purpose of Action Research was seen as a means of providing insights for teachers, by showing them ways in which to act so that they could bring about transformatory change in their own classrooms.

Due to technological developments after World War II, Lewinian Action Research, after a decade of influential impact, had to make way for a technicist mode of research. A revival of the Action Research approach was brought about later when Lawrence Stenhouse, in the Humanities Curriculum Research Project in Britain, sought to persuade teachers to adopt Action Research as a mode of teacher research. Stenhouse (1981:143) argued that teachers should become the researchers of their own practice: "It is not enough that teachers' work should be studied, they should study it themselves." With this notion, Action Research re-emerged strongly, argue Carr and Kemmis (1986:167), "as a viable approach to improving practice through reflection."

Up to that time much of the research done in the educational sphere had adopted the psycho-statistical model which is strongly embedded in empirical research. Shirley Grundy (1987:12-34) argues that this mode of research is informed by a technical interest which is directed towards controlling knowledge. Knowledge is regarded as a set of rules, laws and unquestionable truths that has to be strictly adhered to in order to achieve the desired goals. Michael Apple (1980:16)

refers to this as the positivistic approach to education, and says that:

> Not only does it pre-specify nearly all a teacher should know, say and do, but it often lays out appropriate student responses as well.

Giroux (1981:52-3) refers to this as a culture of positivism in that knowledge becomes

> ... objective, `bounded' and out there. Classroom knowledge is often treated as an external body of information, the production of which appears to be independent of human beings.

Unlike Action Research, which considers theory and practice to be inextricably linked, this positivistic mode of research tried to maintain a separation between theory and practice. Rosemary Webb (1990:3) believes that much of the research literature produced by traditional researchers is not accessible to teachers as it is too far removed from the subjective realities of the classroom. It also seems as though educational theory derived from traditional research is transmitted to teachers much more than alternatives, so that their understanding of the implications for putting it into practice in a class probably goes unrecognised or becomes distorted. Anning (1986:57) argues that traditional researchers and practitioners therefore

> ... seemed to live in separate worlds. A prestigious research industry seemed to be thriving at the expense of school practitioners rather than in support of them.

It therefore comes as no surprise to hear that traditional research, based on the psycho-statistical model, has little

meaning and effect for teachers as classroom practitioners. The reason for this, it seems, is that traditional research findings are of little use in assisting teachers to analyze their classroom practice and to provide suggestions on how to improve upon a situation in class. It is for this reason that many scholars of Action Research (such as Carr, Ebbutt, Elliott, Grundy, Hopkins, Kemmis, Stenhouse, van den Berg, Winter and others) have made an earnest appeal to teachers to become involved as investigators of their own teaching practices.

Common amongst all their definitions of Action Research is the request that teachers should try to look at their class teaching practices critically and try to improve upon them. Also coming through in their writing is a move away from traditional methods of research because, as Arthur Bolster (1985:26) informs us,

> ... formal research on teaching appears irrelevant to classroom teachers - not necessarily wrong, just not very sensible, or useful.

Action Research, on the other hand, is research into the actual process of classroom practice. This mode of research seeks ways of presenting findings in a way that is eclectic, pragmatic and readily accessible to classroom practitioners. It also seeks to find ways of improving upon a teaching practice through a pedagogic theory generated by teachers themselves and not by outside experts. It is geared towards the improvement of a situation that needs to be improved, and

not for the ultimate justification of inaccessible bits of scientific research.

The idea of such research is to give rise to a theory which is grounded in practice as well as a practice that is theoretically informed. In this way teachers can obtain information which is relevant to their teaching practice and which can sharpen their awareness of conditions that determine and prevail in their daily classroom practices. This, then, could help them to take a critical look at their own teaching practices and lead them to improving upon them.

According to Habermas (Grundy 1987:10) there are three modes of fundamental human interest viz, the technical, practical and emancipatory modes "... by which knowledge is generated and organized in our society." Grundy (1987:11-19) speaks of these in the following terms:

- The technical interest, corresponding to the positivist paradigm, is based on theoretical and empirical-analytical laws formulated to control and manage our lives.

- The practical interest, corresponding to the interpretive paradigm, is inclined towards understanding a situation through interaction, based upon the consensual interpretation of the situation rather than to act upon it.

- The emancipatory interest, corresponding to the critical paradigm, strives towards action, empowerment and liberating people in schools and society, to take responsibility for their own lives.

Habermas's theory informs us how and why these fundamental human interests influence the ways in which knowledge is constructed. Action Research can, in fact, operate within all three of these modes.

For example, Webb (1990:17) argues that Lewinian Action Research still adhered to technicism, as "Lewin's model was functionalist and prescriptive." Accordingly, Lewinian theory had a deterministic relationship with practice and as such did not aspire to be open ended and democratic.

Similarly, Stenhouse's Humanities Curriculum Project, Grundy (1987:72) argues, was "consistent with the practical interest." In his projects, Stenhouse placed high value on personal judgement, and the practical knowledge constitutive interest was clearly perceivable in his work. Paul Ernest (1991:203) also argues that it did "not fully address and achieve its aims with regard to issues on social change and political aims" and therefore it did not lend itself to an emancipatory focus. The same could be said for the Ford Teaching Project which was directed by Elliott. Grundy (1987:83) argues that the prime objective of this

project was focused on acquiring teacher knowledge, and that (1987:102) it lacked a critical focus. Grundy (1987:85) puts it thus:

> ... this project can be identified as being informed by a practical cognitive interest ... The project was not about imparting knowledge ...

Emancipatory Action Research, on the other hand, goes beyond what was proposed by the other two interests. It suggests a total transformation in the way teachers act, think and perceive things in general. It aspires to maintain a critical intent and critical consciousness, fundamental to what Freire has proposed in his notion of praxis (explained below). It demonstrates, as Grundy (1987:154) puts it, "political as well as practical action to promote change." Emancipatory Action Research thus aspires to venture beyond an individual or micro context to a social and macro context. Entrenched in emancipatory Action Research, then, are also the ideas of socio-political justice and equality. Some of the guiding principles of emancipatory Action Research embody symmetrical communication which, through a concerted effort to reach consensus, is made rigorous via interaction with participants in the group.

In this way emancipatory Action Research finds implicit the notion of a critical pedagogy which is akin to the work of Freire (1972:96). Unlike the `banking' or transmission mode of education, critical pedagogy is geared towards a

`problem-posing' mode which strives towards involving both teacher and learner in generating their own solutions to problems through interaction. Ultimately the responsibility for learning is shifted towards the participants in the group rather than to the control of knowledge by an outside source.

Grundy (1987:104) argues that in this way a critical pedagogy, which embodies the notion of praxis or "action and reflection," serves to be liberatory and emancipatory. It is thus that teachers, through a critical reflection upon their practices, could engage in the transformation of consciousness. Grundy (1987:157) in relating the elements of a critical pedagogy to Action Research says that

> Action and reflection are dialectically related in the Action Research spiral. Moreover, it is recognized that practice is the realm in which truth is contested, not the realm of theory.

Inherently related to what has been said above is the notion of empowering participants through making meaning of the situation with which they are confronted. To this end mathematics must lend itself to empowering pupils to be confident problem solvers and posers of mathematics problems relevant to their social and political contexts. If the pupils are allowed to solve and pose problems freely in a collaborative situation, mathematics then can serve as emancipatory and empowering. Thus, by being empowered, as McClaren (1989:186) puts it, the pupils would be able to

question and in this way learn to

> ... critically appropriate knowledge existing outside their immediate experience in order to broaden their understanding of themselves, the world, and the possibilities for transforming the taken for granted ...

In this way the pupils' consciousness could be raised to levels of critical awareness and their critical thinking skills become developed. By then trying to develop their faculties of independent critical thought, any received knowledge may be questioned with confidence. Pupils then become empowered to participate in a democratic classroom practice through which they could learn to take responsibility for their decisions.

Action Research assumed a collaborative nature as it grew out of the efforts of Collier and Lewin to solve social problems by advocating a participatory mode of Action Research. Grundy (1987:145) argues that

> Action Research is not only a participatory form of research; it is also collaborative. Both history and theory of Action Research support its collaborative character ... Moreover, its consensual epistemology means that it is inherently collaborative.

There is often a close connection made between collaborative Action Research and a collaborative approach to teaching and learning. Collaborative learning embodies the process of interactive participation in the construction of knowledge. Earnest (1991:197) argues that mathematicians who are proponents of emancipatory Action Research insist that knowledge is socially constructed, culture bound, value laden

and based on human activity and enquiry. For this reason he maintains that the construction of knowledge does not take place in isolation. Edith Biggs (1983:10) argues that because collaborative learning is narrowly associated with informal, open and progressive teaching as opposed to closed and traditional transmission teaching, it encourages freedom of expression and it promotes a democratic learning strategy. As a result, it seems as though one of the most important elements operant in collaborative learning, through the process of communication, is the development of a pupil's voice.

There is no universally agreed definition of what Action Research is. I have tried to include some definitions here to indicate the broader scope of Action Research, including those which capture the participatory, reflective mode of Action Research. Perhaps the most commonly known definition is that provided by Carr and Kemmis (1986:162):

> Action Research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices and the situations in which the practices are carried out.

Hopkins (1985:32) sees Action Research as

> action disciplined by enquiry, a personal attempt at understanding whilst engaged in a process of improvement and reform.

This definition is not far removed from that of Ebbutt (1989: 5), whose view is that Action Research

> is a systematic study of attempts to improve educational practice by groups of participants by means of their own practical action and by means of their own reflection upon the effects of those actions.

Elliott (1981:1), on the other hand, sees Action Research as "The study of a social situation with a view to improving the quality of action within it." Davidoff and van den Berg (1990:28) write about Action Research as

> ... a way of taking a systematic, close, critical look at the way in which we teach, with a view to changing it so that the classroom experience becomes a more meaningful one for all those involved in it. It provides a way for teacher improvement. Action Research is a way of trying out ideas in action, understanding those actions and then attempting to make some improvements or changes in the classroom setting.

A critical study of the above definitions shows an appeal by those writers to practitioners to improve upon or transform their teaching practice in order to bring about a fundamental change in education which could be significant for society. Lawrence Stenhouse, who made a great contribution to action research, stressed that teachers should regard themselves as researchers. He argued that teachers were "the best judges of their own practice." In order to bring about significant transformation, practitioners would have to try to make sense of and understand what they were doing in their classes.

In essence the proponents of Action Research want to make classroom research accessible to all teachers by guiding them

along and by making them aware of the fact that research is not something which can be done by experts only. Thus they want to inform classroom practitioners that it is possible for them to do research in the class with their pupils and colleagues.

At the same time Action Research also lends itself to a democratic ethos because of the collaborative approach inherent in the process, and because there is a mutual sharing of knowledge for a common good. It becomes an emancipatory practice when it has to do with empowerment of the teacher and the class. As Davidoff and van den Berg (1990:50) put it,

> Action Research offers us a way of ... developing a critical understanding of our teaching practices and our students, of ourselves as people beyond the classroom and of the environment and society in which we are working. All this helps us to develop our political understanding.

Action Research could therefore offer to practitioners a way of reflecting upon themselves and their practices in order to break away from positivist educational theory and practice. Action Research also claims to find a way of relating theory to practice by informing us that theory and practice are not two separate entities but that the one informs the other.

The whole process of Action Research does not merely end in the class or school but can become entrenched in a personal enquiry into one's own philosophy of education and life.

THE CYCLES OF ACTION RESEARCH

One of the requirements for Action Research is that it should follow through a spiral of cycles of planning, acting, observing and reflecting. Each step in the cycle is related to the other and each step informs the other. Through these cycles one learns to make sense of an action. Grundy (1987:145) sees the `moments' of acting and reflecting as being strategic in determining a better understanding of what is happening and of carrying out an action with a view towards improvement. These two moments are related to each other through the two organisational moments called planning and observation. The whole process should be seen as an integrated whole. Action Research, then, has various dimensions, which will be discussed below.

The General Idea

When one wants to improve upon one's teaching practice, the plan need not be elaborate, nor does there have to be a major problem in the class as such. According to Davidoff and van den Berg (1990:33), "There may simply be something which you might like to see happening differently."

I, for example, wanted my pupils to be more actively involved in my mathematics lessons as it appeared to me that they were

too passive. On the other hand, I looked at my own style of teaching which I thought could perhaps also have been a reason for them being too passive. I therefore had to find ways of doing things differently in order that the problem could be addressed. I then went on a fact-finding mission, carefully taking notice of what happened in my teaching before I set out on a plan of action.

Since Action Research is participatory and democratic in character I negotiated with my inspector (in one project), and with the principals and pupils, to gain their approval for doing the project with them. I also obtained the help of a triangulator to help me clarify my practice and to inform me from another perspective.

Implementation of Action

During this stage one puts one's idea into action. In my case, the initial action step or steps stretched over a number of lessons. My students remained in the groups in which they found themselves in class. I had to teach, facilitate and interact with the pupils. Since the process was new to us all, I also had to get the pupils in the groups to interact. Moving from a transmission to a participatory mode proved to be exhausting. There were times that I had to change my plan of action during the lesson if it did not seem

to be working too well.

Observation

During observation one has to take a close look at what is happening while one is putting one's plan into action. Careful observation by all parties is of prime importance as it is inherently related to data analysis. Critical observation can provide invaluable information which can, I think, help one alter a plan of action for further improvement if need be. Observation takes place throughout the lesson and one needs to focus on specific aspects which are directly related to one's plan of action to look for the effect it might have. The triangulator can be briefed ahead of time to get a better perspective.

Data Gathering

Data gathering plays an essential role in any form of research, and also in Action Research, where we continually try to make sense of what we are doing through the process of action and reflection. Data gathering does not stand in isolation from what we do in class. In order to authenticate our research findings we should be informed by as many perspectives as possible. The data needs to be analysed and reflected on. It is often rigorously contested through interactive collaboration with participants in order to reach

clarity about the findings. The following are some of the procedures and techniques that can be employed to gather data:

1. Keeping diaries and field notes. Observations of reactions and responses that have taken place during a lesson can be recorded. These could be done after or during lessons. The idea is to make notes as close to an event as possible to avoid forgetting or misinterpreting a situation. Both teachers and pupils can keep diaries in order to compare notes.

2. Questionnaires are basically a list of questions given to pupils and teachers through which one can quantify opinions about how the pupils perceive a situation or an event in class. One needs to be aware of the danger of putting ambiguous questions to the pupils as this can result in distorted information.

3. Holding interviews with pupils and teachers. Through interviews it is possible to ascertain how people perceive a situation. Recordings can be made of such interviews to capture the essence of what was being said. It could happen, though, that pupils might not reveal everything during the interview, but with a trusting relationship built up during the process of Action Research, this need not be so.

4. Audiotape recordings of lessons or group interactions are often a very insightful form of data gathering. A small pocket recorder facilitates recording the interactions of each group, although the analysis of the data can be time consuming. The audio recorder helps one to capture and recapture certain events that can easily be forgotten.

5. Video recording of actual lessons is probably one of the best forms of data gathering because it captures the actual situation visually and audibly. This is, however, a very expensive piece of equipment and one needs to make sure that classes have electricity. Analyses of audio recordings can be time consuming as well.

6. Triangulation: through this method, data from three different parties or sources are compared, in order to reach clarity. For example, the teacher's field notes can be compared with the diaries of the pupils and with the triangulator's notes. During the process of triangulation, a participant observer casts a critical eye on the Action Researcher's teaching practice. The data gathered by this person, whom I call the triangulator, then serves as a means of viewing the situation from a different perspective.

A Plan Of Action.

All data has to be collected from the various sources and

collated so that sense can be made of it. Through reflection on the data one can reflect on one's action. One can then critically analyse what has happened during the implementation of one's plan. To authenticate one's findings one has to confer with the triangulator as well as the pupils about all that has been noted. Critical reflection is necessary because the data comes from various sources and may result in differing opinions. Thus, if one reflects critically upon what has happened one may be able to achieve greater clarity on what has been noted. I, for example, discovered that I gave the pupils too much time to discuss certain issues of less relevance than other issues. Besides, I also discovered that I had to get a little more structure into the lessons. I thus became more aware of what was happening in the class as well as how to replan the revised plan of action.

A Revised Plan Of Action

A revised plan of action allows for an ongoing process during which one tries to improve upon any area concerned in the previous cycle. The advantage is that one can amend one's plan of action from one cycle to another.

I have included a few examples of Action Research models. The first is that proposed by Kurt Lewin and cited by Elliott (1981:1). (See Fig 1, p 50)

According to McNiff (1988:24), "Lewin did not intend his ideas to be used in a specifically educational setting." However, his work made a great impact and his ideas became widely used especially for social issues and later also in education. Elliott (1981:2) commends Lewin's model as being "an excellent basis for starting." Elliott later devised his model for the purpose of education, as he thought that Lewin's general idea could be taken to be a fixed idea rather than one that had to be allowed to shift. Also, for Elliott, reconnaissance meant more than just fact finding, and implementation was not merely as straightforward as might be thought in terms of Lewin's model. Following this we also have Elliott's model (ibid:3). (See Fig 2, p 51)

Kemmis has also elaborated further on the model of Lewin by refining it and proposing the model (see Fig 3, p 52) given below and cited by Hopkins (1985:34). Elliott has levelled criticisms against the Kemmis model, saying (ibid:34) that:

> The General Idea should be allowed to shift. Reconnaissance should involve analysis as well as fact finding, and should recur in the spiral rather than occur at the beginning.

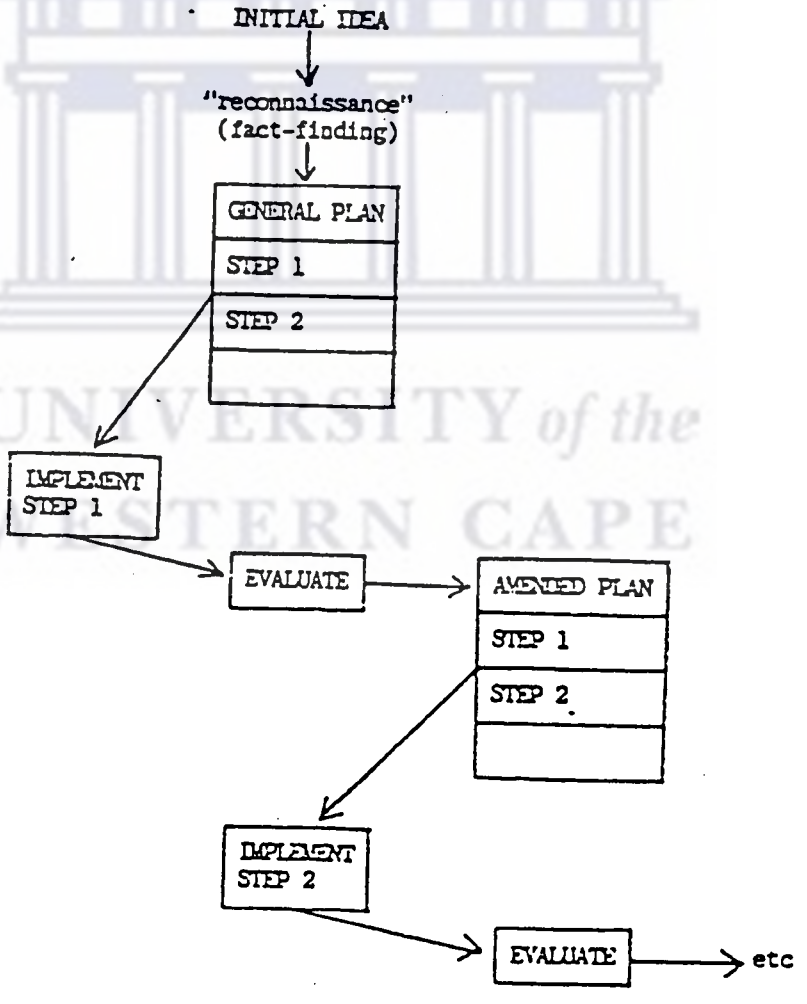
Davidoff and van den Berg (1990:46), as well as Grundy (1987: 147) give us very simple diagrams (see Figures 4 and 5 on p 53) of the Action Research spiral model. The two are very similar and depict clearly the inherent relationship between action and reflection which, as Grundy (1987:145) puts it, is concerned with the "developing of understanding

and carrying out action."

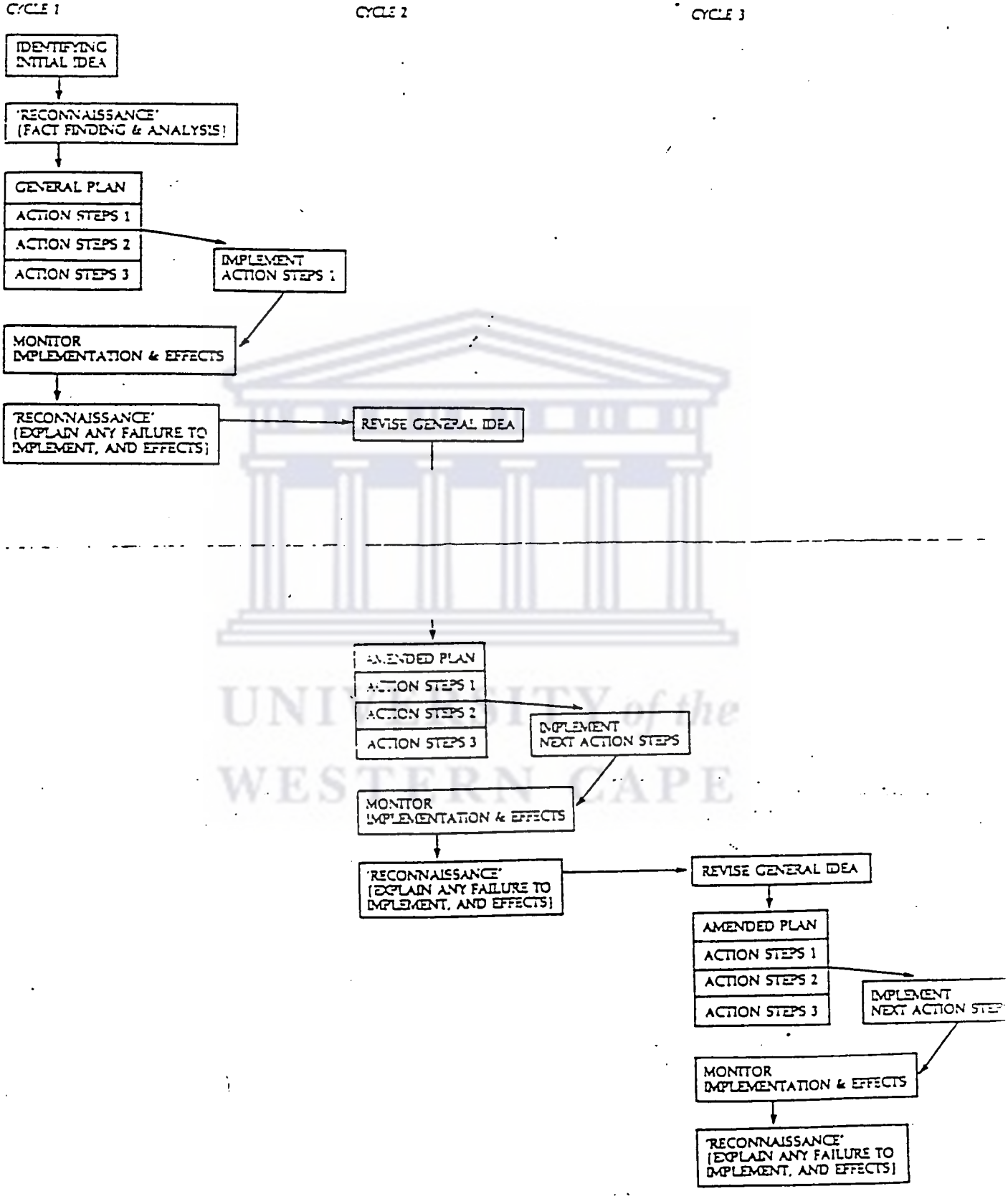
There is no overloading in the diagram, yet a detailed and more comprehensive explanation of the steps is given in their books. The Davidoff-van den Berg model could perhaps help to make Action Research more understandable and clear to a potential Action Researcher. Their model also clearly adheres to the notion in Action Research of the "teacher-researcher-student." Clearly coming through in this model, is that the initiative to develop emancipatory action is left with the teachers who are investigating their teaching practices. Thus it tends to move away from other, more prescriptive, models of Action Research. The models proposed by them are provided in Figs 4 and 5 on page 53.

[For diagrams see overleaf]

Kurt Lewin's model: Elliot (1981:1): FIG. 1

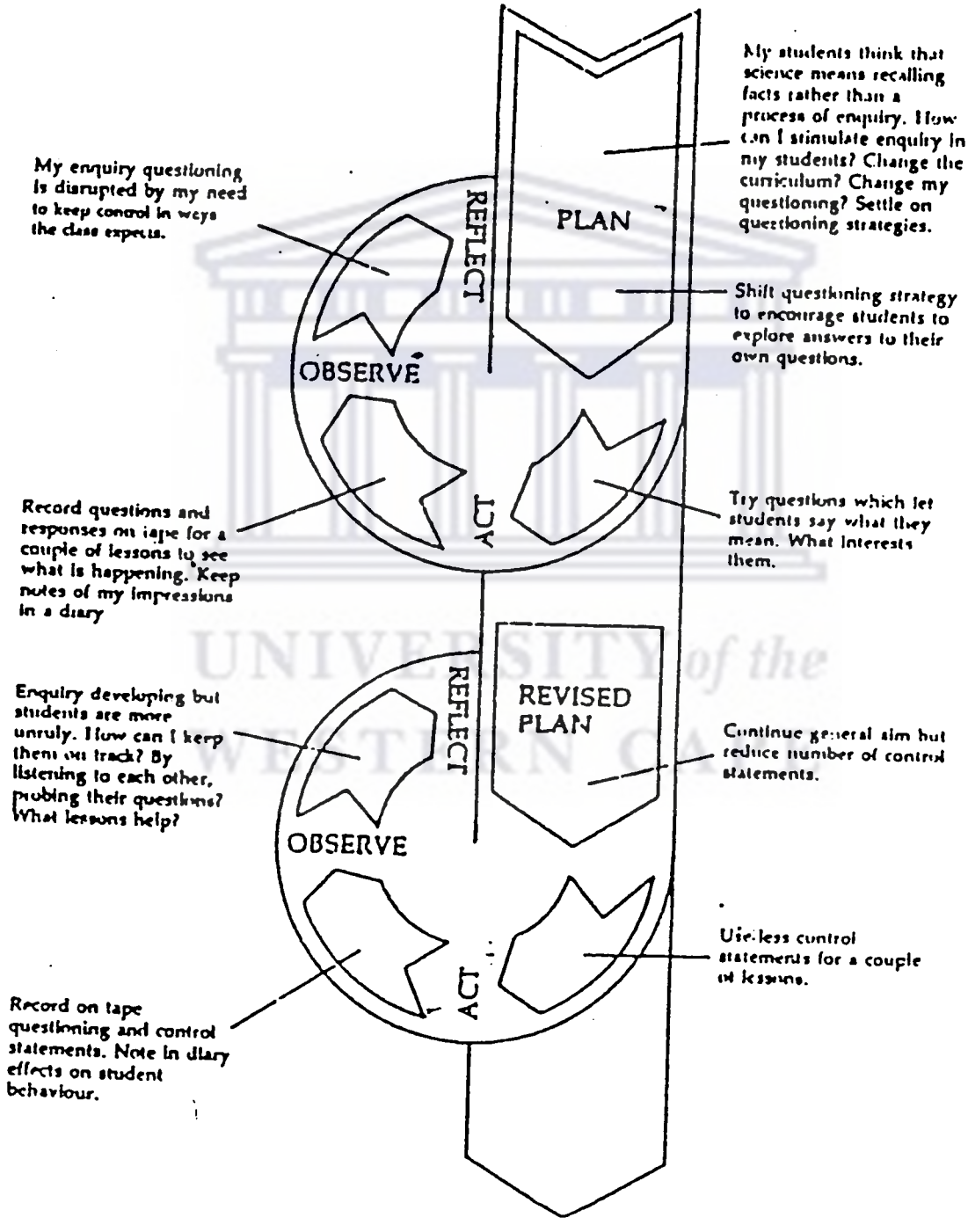


Elliott's model (ibid:3) FIG. 2



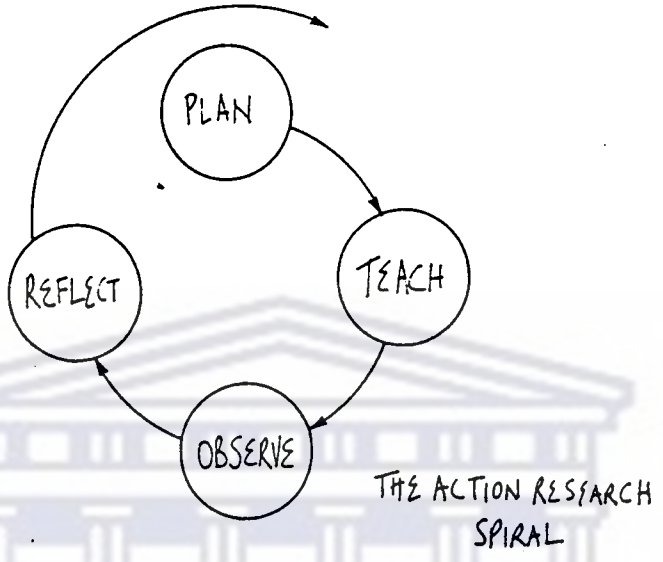
Elliott's action research model

Kemmis's model (FIG. 3)- cited by Hopkins (1985: 34)

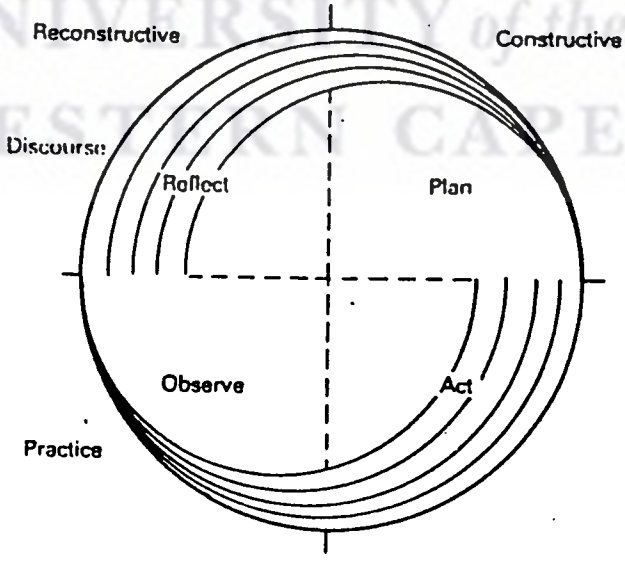


Action Research spiral proposed by Davidoff and van den Berg

Davidoff and van den Berg (1990:46) FIG. 4



Action Research spiral proposed by Grundy: (1987: 147) FIG. 5



ACTION RESEARCH FOR THE SOUTH AFRICAN CONTEXT

Action Research seems to me to be appropriate to the process of change currently taking place in South Africa. The very fact that we have to look towards a country which will sustain the rights of all people is enough to encourage engagement in an emancipatory form of research. Action Research could render a great contribution towards changes in education since it strives to promote emancipatory as well as transformatory thought and action. Much of the education in our schools is geared towards the reproduction and perpetuation of the status quo. According to Giroux (1987: 109),

> ... reproduction is a complex phenomena that not only serves the interest of domination, but also the seed of conflict and transformation.

Teachers should, then, become engaged in emancipatory Action Research if they are committed to an educational practice which is transformatory, instead of focusing on domination and conflict. Teachers should then also realise the potential inherent in Action Research as a means for liberation and empowerment in classroom research while they themselves act as researchers. Action Research as an emancipatory force therefore has a potential role to play in the dismantling of an oppressive education system. Action Research as emancipatory action cannot be divorced from a political agenda because it has political implications in the classes where we teach and are being taught.

The next three chapters will provide descriptions and analyses of each of the three projects I undertook, followed by chapter 6, which provides an overall reflection on the three projects and on my experience of Action Research in relation to what I have written in this chapter.

CHAPTER THREE

PROJECT NO.1 AT NO.44 PRIMARY

When I embarked on the Masters course in Action Research at UWC, part of my course work requirements were that we embark on projects in which we attempted to bring about improvement in our work situation. At the time that I embarked on my first project, we had very little theoretical input about Action Research (although we had copious reading material on the subject). The report that follows is a report and reflection on my first attempt to improve on some of the aspects of my work situation.

The purpose of my first project was to improve my pupils' understanding of mathematics and to enable them to verbalize their thoughts freely and confidently. I hoped that I would be able to create an atmosphere in the classroom that would make the pupils feel safe enough to risk expressing their opinions, challenge statements made by the teacher, and even have the courage to acknowledge the fact that they did not understand some aspects of the work. With these intentions in mind I hoped that the programme would lead to the empowerment of the pupils in mathematics as well as to the improvement of communication skills.

I had to attempt to bring about change within the constraints of the prescribed syllabus. The work that I covered was:

long division; order of basic operations; properties of numbers; basic mathematical laws; factors/multiples; and the numberline.

Some of the activities which I employed were:

- Interactive learning groups (the pupils had to discuss work presented to them). I had both inter- as well as intra-group discussions.
- They were given worksheets which I had constructed myself. I did not use any text-book material. Work sheets which had not been completed at school, had to be completed at home.
- They also had to work on the board. In this way I hoped to see how well they understood the work through explanations that they had to give to the class as a support for what they were doing.

DATA COLLECTION

The following modes of data collection were employed:

- field notes and diaries;
- triangulation: triangulator's reports; interviews with the triangulator; interviews after school and during intervals with pupils as part of the process of triangulation;
- teachers who had come as observers and whom I either interviewed or asked to write a report on their observations;

- reports (verbal and written) by teachers who taught these classes but who did not come in as observers;
- interviews with these teachers;
- pupils' diaries and notes taken in;
- audio recordings;
- questionnaires;
- tests and test results;
- classwork books taken in regularly to assess progress;
- listening to group discussions and compiling notes at the end of the day on the activities.

TIME AND SETTING

This project (Project 1) ran for approximately seven weeks, starting in the second week in February 1991 and ending by the end of the first school quarter in late March 1991. I saw the pupils for seven periods per week at the school where I was teaching. The school is situated in a sub-economic area, a suburb of the larger Mitchell's Plain area. I started off with one class but eventually ended up having three classes involved in the project.

The negotiation phase of the project brought home to me the reality of the bureaucratic nature of the school and how naive I was in believing that, when things that I thought were wrong in education were pointed out, every one would agree to change them. I realised that principals, too,

are subject to constraints and regulations. Davidoff and van den Berg (1990:5) put it thus, that "you must always recognise the realities of your school context, and what is and is not possible there." The short contact with the course readings on Action Research and Radical Pedagogy in the UWC Masters programme made me more aware of the evils and constraints of our education system.

Determined to effect change, I had to find ways of working within the rigid but real parameters within which I found myself.

CONTEXT

The school is dual medium and is situated in one of the most densely populated sub-economic residential areas in the Cape Peninsula. The houses are in close proximity to the school and often give me a claustrophobic feeling. Many of the parents are unemployed and many pupils at school are sustained by civil grants. Pupils often come to school sparsely clad and without having had anything to eat. A free daily feeding scheme operates for such cases.

The crime rate in the area is very high: many pupils are involved with gangs. These pupils fall prey to drugs and other related social problems. Over the last two years the

school has had one of the highest incidents of vandalism recorded by the Education Department. In 1991, the school had a low enrollment of 1200 pupils with an average class size of 38 pupils and a staff of 48 teachers. Every available room is used as a classroom, even the staffroom and a storeroom. Glue sniffing, drug abuse and truancy is rife. The school has a full time social worker on the premises to help with the social problems in the area.

It is often a problem to reprimand the pupils for not completing their homework. The reasons for this are numerous, the most common perhaps being parents fighting, electricity cuts, limited space or constant noise at home. In order to help the pupils, the school had to implement homework and remedial periods at school.

THINKING ABOUT WHERE TO START

I did not know where to begin as there were so many aspects of my teaching practice that I wanted to improve upon. Kemmis and McTaggert (1984:18) state that one does not have to begin with a "problem". All one needs is a general idea that something might be improved. Similarly Davidoff and van den Berg (1990:33) advise:

> Action Research does not mean that ... you have to undertake a vast plan of action ... Also, there need not be a `problem' in your classroom as such, in order to justify doing Action Research. There may simply be something which you might like to see happening slightly differently.

Since my long term goal was intended to democratise the classroom situation, I felt I had to interact with my pupils more frequently and share with them in the generation of knowledge. I had a notion that because of the lack of pupil-pupil and teacher-pupil interaction, our pupils find it extremely difficult to make meaning of mathematics.

My plan of action was to divide the class into manageable groups in order to promote pupil-pupil and pupil-teacher interaction, in an attempt to facilitate independent, constructive and analytic thought in the pupils. Subsequent to this, with the same kind of interrogation as in the intra-group debate, the ideas had to be collectively shared in terms of an open intergroup discussion. I hoped that this would allow the groups to reach consensus by sharing their ideas towards resolving the relevant maths problem. I considered my role to be that of the teacher-researcher as well as facilitator.

NEGOTIATING FOR A TRIANGULATOR

I considered it wiser to ask someone to triangulate my work by casting a critical ear and eye over what was transpiring during the process. Elliott (1981:72) sees the purpose of triangulation as follows:

> The basic principle underlying the idea of triangulation is that of collecting observations/accounts (or some aspect of it) from a variety of angles or perspectives, and then comparing and contrasting them.

At first I approached the principal to act as the triangulator, thinking that if the project ever showed promise of success, he might support the idea of implementing it throughout the school. The principal declined, citing the nature of his job as a reason for his not being able to act as triangulator.

I decided next to approach an outspoken mathematics colleague. This teacher, who for this purpose I shall call Mrs Sadge, had also previously been involved in other projects and workshops. After I had explained what I intended to do, she agreed to come in as a triangulator.

I requested that she observe the nature of the group interaction for any signs of sexist remarks that I might make and also to see whether I was fulfilling my role as a facilitator. One other very important aspect that I wanted to have observed was whether the pupils showed any signs of comprehending the concepts.

Mrs Sadge, coming from a transmission mode-background, experienced some doubt as to whether collaborative or interactive learning would be suitable for mathematics classrooms at all. At this stage I was more than ever prepared to open my classroom door and to expose myself and my teaching practice to scrutiny. I wanted to learn through the whole process. I informed the principal that Mrs Sadge

would be in my class during her non-teaching periods and he had no objections.

THE RECONNAISSANCE PHASE

Prior to negotiating with the pupils, I decided to have an impromptu session with them to gauge what their perception of the role of mathematics was in the education process. To encourage them to be honest in their comments, I suggested anonymity, that is, that they did not have to sign their names on the papers on which their comments were to be written. Surprisingly, many of them wrote their names on their pages. Many of the pupils said that they did not like maths. Caning and failing to understand the work were amongst the most common reasons given. Other reasons included:

-"Dit leer ons om ons geld te tel as ons winkel toe gaan."
-"My ma sê ek moet wiskunde doen want dit maak jou slim."

Others wrote that they needed to have maths to get a good job or for admission to university.

In a double period that followed I discussed with them the views that they had expressed about mathematics. I felt it essential to do so, since what they had written was interesting and I wanted to authenticate their statements by questioning them on what they had said. One of the things

that they detested most was the reciting of the multiplication tables. As one pupil puts it, "Die tafels is nie die problem soveel nie, maar as die teacher skielik vir jou vra, na (dan) word jy sommer blank." Another pupil mentioned that teachers just present one or two examples, after which they expect pupils to understand the work. Also, "Ons is te bang om te vra want som onderwysers hou nie daarvan om weer te explain nie. Hulle sê jy's stupid ... ons is mos nie almal slim nie." When I asked why it was that so many teachers complain about pupils not doing their homework, they acknowledged that there are many pupils who are lazy too. I think my suspicion that the mode of education was particularly authoritarian and instructional was somehow confirmed during this discussion.

As I thought that I was wasting time on this lengthy discussion, I was pleasantly surprised to realise that I had underestimated my pupils' perception. I realised that the pupils were actually aware, albeit only to a certain extent, of what was happening in our schools. The exercise was very illuminating. It cautioned me to heed their statements and to look upon them with increased respect, and it also brought me closer to them.

NEGOTIATING WITH THE PUPILS

From the information gleaned from the pupils when asked to verbalize their feelings about mathematics, I became

convinced that they, too, were used to the transmission mode and that the concept of collaborative learning was new to them. From what they voiced, they believed that what the teacher says should not be challenged. They also believed that a teacher should be a guide and be capable of displaying empathy and be sympathetic towards pupils. In spite of this, it seems as though they also condone oppressive modes of teaching and class control by the teacher.

I told them about the project and how it aimed to improve on most of the things that they felt strongly about. I asked them to participate in the project, highlighting that through the process we were likely to get a better understanding of our work. I explained in detail how we were going to work in groups and why we were going to do so.

They were eager to start. I cautioned them that, since we were going to share in the learning process, we needed to set conditions which all of us, including myself, had to adhere to. I explained that while I was going to do preparation for the lesson at home, I expected them to do their homework when required and to cooperate in class at all times too.

PARENT INVOLVEMENT

In an attempt to follow the suggestion of McKernan (1991:249), that "Action Research should not proceed unless

permission has been obtained from parents ...", I asked the pupils to discuss the project with their parents. I also decided to follow this up with a very simple letter, requesting permission to carry out the study (see Appendix A). There were no negative responses out of a class of thirty five pupils, whose parents all responded.

IMPLEMENTING THE PLAN OF ACTION

Before teaching a lesson I realised that I had to do extra preparation since the programme of collaborative learning which I was about to employ as a learning strategy was relatively new to me. I thought that it would be more convenient for each pupil to have their own work sheet and thus prepared these ahead of time to facilitate the programme. Mathematical problems were structured and graded so as not to be too difficult for the pupils and were structured on the work sheet in such a way that it would encourage the pupils to talk through difficulties. For this I had to make sure that there was an element of challenge to each exercise and that the questions asked were clear and also such that the concept being dealt with could be clearly understood in the end.

Owing to the fact that the whole concept was going to be something new to the pupils, I decided not to introduce too many new things at the same time, other than to get them to work in their respective collaborative groups. By the end of

the first week they were divided into nine "friendship" groups consisting of four pupils. The reason for this arrangement was that I hoped each pupil would get a chance to speak in the group.

Initially, I left the desks in the traditional transmission mode way - in rows. The pupils adapted well - turning towards each other and by sitting closer to each other, occupying two desks when they had to discuss the work. At that time I did not think it necessary to rearrange a classroom or to inconvenience other teachers who had willingly agreed to share a space with us.

When the groups had settled in, I spoke to them about the purpose of keeping diaries and how they had to note things that happened in their groups. I suggested that they decide who was going to keep diaries in the groups as I did not know them that well. I informed them of the following:

- I was going to keep a diary and make field notes but that I was going to ask them for permission to refer to their diaries so as to compare notes;
- that some teachers might want to come and see what was being done in the project, and that I did not want them to feel inhibited when this should occur; and
- that the triangulator, whose function I explained, would visit our class and would like to interview them at times.

Lastly I asked them to discuss in their groups whether I could interview some of them after school or during intervals, take photographs and videos, and make audio recordings of them while we were actually working in groups. They appeared to be quite excited about such activities taking place.

In general a lesson started off in the traditional way. I would ask the pupils to sit in their groups before I could begin with the introduction to the lesson. I worked through the introductory part of the lesson, asking questions while the pupils had to put up their hands before answering. When necessary I would instruct them to discuss the work. After about fifteen minutes of this kind of interaction I would hand out the worksheets and ask the pupils to do the exercises in their workbooks. Pupils were directed to first discuss each mathematical problem in the group.

I moved around from group to group facilitating the process. Each group had to go through its own mathematical problems and answer them as best it could. I listened in to whether the concept was coming through clearly but would interject when I thought necessary. When I felt that they had discussed the work sufficiently, I would tell them to start doing the mathematical problems in their work books. I would continue to go around to each group and help with any further problems that they encountered. Sometimes I would stop the

lesson to re-explain some general aspect of the concept that they appeared to have problems with, on the board. Pupils were required to complete the unfinished mathematical problems for the following day as I also thought that it was necessary for them to get exercise in working alone.

I soon realised, however, that I had a time problem and that the arrangement of nine groups was not practicable since there were then too many groups to facilitate in a single period. It became difficult to give each group equal attention. By the Wednesday of the second week, I had decided to restructure the grouping so that instead of nine groups we had six manageable groups of six pupils per group.

There were other pitfalls which I encountered at this stage with regard to group dynamics. For example, I discovered that too many pupils wanted to speak at the same time, causing so much noise that we had to stop the lesson. I also had complaints from some pupils in the groups, as well as a warning from the triangulator that some pupils needed to be checked for using abusive language, and for misbehaviour.

I suggested to the pupils that we try to find a solution together. At this stage I felt we had to speak about environmental conditions conducive to learning - like their homes and libraries. We also included other important aspects such as talking decently, listening skills and

respect for others in the group. Each group consequently decided to appoint a different person for every session to coordinate the discussion in order to keep things under control. One group suggested that we rather do it this way in order to avoid some pupils bossing others around. They put it thus: "Ons het besluit dat ons nie iemand wil hê wat ons gaan in die rondte baas nie."

From what the triangulator and I observed, it seemed as though we were making headway in getting the pupils to work in groups in a more orderly manner towards the end of that second week only. We agreed that in spite of the fact that the process was slow and by no means easy, there seemed to be some improvement in the way that they had started to work collaboratively in groups each day. Many problems were sorted out in this way as we progressed through this project. Perhaps one of my problems at this stage was that even though I had the greatest respect for my triangulator, both she and I came from a transmission mode background. This limited our ability to think critically about whether I was succeeding in empowering the pupils as we shared a common frame of reference in which the teacher is regarded as omnipotent. I now realize that I was not sufficiently empowered to tackle the problem: I had a long way to go before I developed critical thinking skills.

The notion of empowerment and emancipatory Action Research

was never far from my mind. Even though I had no clear conception of what emancipatory Action Research really was, I thought I was empowering the pupils. McLaren (1989:182) describes empowerment as

> ... not only helping a student to understand and engage the world around them, but also enabling them to exercise the kind of courage needed to change the social order where necessary.

Consulting with the triangulator made me realize that I was undertaking the project in the context of a dynamic political milieu if one considers political occurrences at the time in the Soviet Union, Germany, Iraq and the Middle East as well as in South Africa.

In an attempt to conscientize the pupils, I made it my concern to ask them about the local and international news and was very surprised to learn that those who had access to television, radio and newspapers showed little interest in political issues. It was only after we had started to discuss newspaper articles which I deemed to be relevant, that they actually started to show some interest. Through this we came to speak about rather loaded concepts which came up frequently in the news such as democracy, consensus, negotiations, tolerance and respect. Although at the time these discussions might have appeared to others as unrelated to the syllabus and therefore a waste of time, I realized that it actually contributed to their understanding of how to work together in collaborative groups. I started to use words

with political connotations in class because I saw it as being relevant to the emancipatory mode.

During these discussions I informed the pupils that they need not hesitate to question statements which were not well substantiated. However, we had to work towards reaching consensus in the groups through providing well substantiated reasons for coming to a conclusion.

I realized that the process of facilitation also plays a very important role in collaborative interactive groups. During the programme, whilst doing the section on long division, which the pupils had much difficulty in understanding, we specifically focussed on what the concept `division' meant and how to work and think through a mathematical problem. I supplied materials which I had prepared in advance and on which they had to work. I facilitated the groups by listening to the discussions and guiding them if they needed it. I was concerned about the noise level as I felt that it might be interpreted by my colleagues as lack of class control.

When I facilitated the groups I insisted they substantiate their arguments. The question `why' played a fundamental role in the process because they realized that they had to think before speaking. Where I saw that some pupils had a grasp of how to work together in a group, I split them up, letting them link up with other existing groups. It is

probable that as a result of this diffusion of knowledge and problem solving techniques the pupils started to understand the work better and the class settled down sooner.

One group suggested choosing an alphabetical arrangement for selecting the group coordinator for every session. I must say I was impressed by the way in which they made it work. When I discovered a commendable idea such as this, I would ask the group concerned to inform the class about the group dynamics so that all could share in the benefits of the process. In this way we learned from each other. I realised then that if I prescribed a way of choosing group leaders, I would have stifled the pupils' ability to be innovative.

Long division, it seems, became a little easier as they learned that nothing had to be taken for granted and that every aspect of the mathematical problem had to be worked through. One student's comment was that "Dit lyk langer die way maar dit is eintlik makliker. Ons het deur elke stap gepraat." Another said: "Ons verstaan die werk nou eerste. Die shortcuts werk nie uit vir my nie."

I originally started out with one standard five class. As a result of teachers being absent, the project took an unexpected turn as I was expected to supervise two other standard five classes (5c and 5e) in the same classroom. Due to limited seating I had to fit them in with std 5b. I

somehow always managed to find a teacher to supervise one of these classes while I worked with the other two. Surprisingly the other two classes caught on well and got into the swing of things sooner than I had expected. This I believe occurred due to peer interaction. The std 5b class, who were then my `project class', literally sold the idea of inter-group discussions to the other two std 5 classes by demonstrating their newly acquired problem solving skills and by means of the confident manner in which they could interact with, and even challenge the teacher. Representatives of all three classes came to negotiate with me for the inclusion of std 5c and 5e classes in the project. I thus felt compelled to give the inclusion of these classes some serious thought. This was how all my classes gradually became involved in the project, but I had not realized that it might happen so soon and in the unexpected way in which it did.

I consulted the principal about the inclusion of these classes and he had "no objections provided that it pushes up the results." I discussed the matter with my triangulator who comprehended my fears of the constraints, viz. time, as well as limited classroom space. She felt that it would be better to include 5c and 5e at this stage instead of later. With her help, I discovered that we had a needlework room which the needlework teacher was willing to share with us. This classroom, which was much bigger, could then be used for the morning session.

I became very excited at the thought of transforming my classroom teaching practice without holding on to traditional methods of teaching in some classes. Serious consideration of the request at hand made me realise that, if I was to transform my teaching practice, I could not at the same time hold on to traditional methods in some classes while practising emancipatory methods elsewhere. Besides, std 5b soon reminded me "Meneer het gesê dat ons dinge met meneer kan bespreek en dat ons 'n sê gaan hê in ons opvoeding." Surprisingly the other two classes caught on well and got into the swing of things sooner than I had expected.

I experienced moments of self-doubt when confronted with issues such as noise, apparent chaos in class as well as the occasional disorientation of pupils and sometimes myself, due to the adaptation process we were experiencing (from transmission to collaborative teaching). I experienced self-doubt, for example, when I realized how much I appeared to be lagging behind a colleague teaching mathematics to the other std 5 class. Speaking to my triangulator helped me to see things in perspective. During these moments she would remind me that we were indeed busy doing Action Research and that the process is one of learning, reflecting on what has transpired, and acting upon that reflection with a view to improvement. I had to start off this way but understood when I spoke about the fears that I had at the time.

At the end of a day I would sometimes think, "If only we had discovered this or that at the beginning instead of at the end of the lesson, then the lesson would have run smoother." During such moments when you are left with your own thoughts reflecting on and analysing what had happened during the day or week, you sometimes think that things are not working. You think of the noise, disorientation on your side and the pupils' side, you see chaos confronting the class, then you can't help but to wonder what your colleagues, the "transmission moders", are going to say about your liberatory approach. Speaking to my promoter and triangulator when I felt like this brought me to my senses. During such down moments, they would remind me that we are indeed busy doing Action Research and that the process is one of learning - reflecting on what has transpired by acting upon it with a view to improvement.

ENCOURAGING INDICATIONS

I identified a number of encouraging signs that suggested we were progressing. The pupils seemed to be engrossed in what they were doing and would frequently fetch me for the maths period when I was delayed. Some of the shy and introverted pupils often made their appearance to remind me of my task. I enjoyed the programme but was happier to see the pupils both enjoying the work while also finding meaning in it. At the end of the school day, while I was still busy in the

administration area, some groups would approach me for help with maths. Often pupils would come to me to speak about domestic problems too. I felt good when I realised that I was being trusted and taken into confidence by my pupils even though I was not their class teacher.

With weekly and unitary tests (a test covering work for a number of weeks) taking place regularly, it became clear that they were looking forward to seeing how well they understood their work. From what the triangulator, some pupils and I noted, there was a progressive improvement in the results that they attained. In a class session one day, one of the groups suggested that they would like to form a study group. Their reason was that in this way they could encourage one another to work together and that it would be easier for those who did not understand their work too well to get support. I thought this view of encouraging one another to learn and help was an excellent idea. I myself had not thought about it but this was one of the things that also emanated from the program. It became evident that a sharing with, and a concern for others, was emerging. Towards the end of the quarter one could hear pupils speaking more frequently of "our group" instead of "I".

SOME CONCERNS OF THE PUPILS

It became clear to me that they were enjoying working in

collaborative groups in the class. This led to questions like the following coming up in all three classes:

- "What is going to happen next year when we are in standard six?"
- "Kan ons nie weer so werk volgende jaar nie, meneer?"

This was something that I had not thought about. We concluded that we could not be sure that teachers at the high schools would apply such methods. Eventually they came up with the answers themselves, viz. that if they were to be at the same school the following year, they could form study groups based on this year's group sessions. Some of the pupils wanted to know why this method could not be applied throughout the school. I reminded them that this was our project, and that only if we could make it work would other teachers want to apply it.

When I interviewed some pupils to find out whether they thought that collaborative learning was working, all of those interviewed replied in the affirmative. Even the group evaluation discussions suggested this strongly. Suggestions that we revert to the traditional method were robustly opposed. Typical comments: "Meneer het gepromise dat ons 'n sê gaan het" and, "Sir, how can you do this when even the weakest pupils are doing so lekker in the tests?"

The pupils, it appeared, were now comparing the traditional

methods used by my colleagues with what we were doing in class and had approached them to adopt the method throughout standard five. Some of my colleagues appeared concerned and asked, "Wat gaan aan in jou wiskundeklasse dat die kinders nou wil hê ons moet ook jou metode toepas?" I invited ten of my colleagues, over a period of time, to come and observe the class. In this way they came to know about the project. Others became aware of the project when they visited my room to discuss something urgently. I asked the teachers to make either verbal or written comments. Some teachers made verbal comments on what they observed while others decided to report in writing.

At the time of the project it was customary for the senior staff to evaluate the junior teachers. I saw this as a means of autocratic control, and so I asked one group of junior teachers who had come into my class to observe and to evaluate the lesson. They seemed reluctant at first, which I interpreted as being due to the fact that I am a senior teacher. They verbalized that they did not think that it was proper for a junior teacher to assess a senior teacher. It appeared to me that they were under the misconception that senior staff members were `experts' and therefore could not learn from them.

These teachers decided, out of interest in what had happened in the lesson and what had been spoken about evaluation,

however, to spend the interval in the maths class talking to me. I entered into a debate with them concerning the power relations at schools and they seemed to feel relieved to learn that we were trying to work towards a participatory democracy. Unfortunately up the present, it is departmental policy that senior staff members are duty-bound to evaluate assistant teachers, while the latter are never afforded the opportunity to participate in this exercise. Having to do evaluation of senior staff members' work myself, listening to teacher complaints, and listening to the principal's reports regarding some of these senior teachers, it often comes across that, as evaluators, they themselves do not have much credibility, especially with regard to giving advice. As one teacher said, "They want to give advice but they are allowed to get away with exactly the opposite." Some of the teachers spoke out against this situation at workshops and in meetings. What seems to have been lacking was that the advice given by senior members of a hierarchy at a school was not sufficiently demonstrated by most of them in their daily practice.

RESPONSE FROM OBSERVERS

The teachers who had observed some lessons in my class, and who had made either written or verbal comments, knew most of the pupils in the standard five classes, because the majority of the pupils had been in their classes previously. In their

written comments they noted:

- the apparent enjoyment the children experienced;
- the active involvement in learning and in educating one another;
- that nothing was taken for granted and even the most basic aspects were taken into account;
- that I would never give the pupils the answer directly; and
- that the question "why" played an important part in our mathematical vocabulary.

Verbal comments included the following:

- it was encouraging to see that the children were being educated for change and that they were sharing in their education;
- this is what I call active learning because the children were educating themselves actively; and
- it really was an enthusiastic noise. The children understood the work and they were enjoying their maths.

In one report a teacher mentioned that she saw my role during the lesson as being involved all the time and of giving guidance and facilitating the process in class. One teacher also mentioned that this was a good way of activating the children`s minds, since they are encouraged to think all the time. One of the older staff members mentioned that, "This

was the first time that I had witnessed this method and it had refreshed me." This teacher also said that weaker and shy pupils were also now actively participating in the group discussions.

Junior staff also appeared to enjoy evaluating a senior member for a change. One teacher concluded by saying, "This is what we want and this is the way it should be."

EVALUATION

The purpose of my first project was to improve my pupils` understanding of mathematics and to enable them to verbalize their thoughts freely and confidently. By the end of the quarter I set out to do an assessment in order to establish whether this purpose had been fulfilled. I also wanted to give the pupils feedback as to what had been achieved, the areas that were good, and the areas that needed to be improved on.

My own assessment of the project based on information I gleaned from my diary as well as from interviews with pupils, teachers as well as the triangulator, indicated:

- I had planned on having one class but ended up having three.
- The classroom space was inadequate.

- I did not have a clear understanding of Action Research, what my role as facilitator should be, or how to facilitat inter- and intra-group learning.
- I was firmly embedded in the transmission mode of learning, and, although my intentions were good, I ended up by confusing the pupils by being inconsistent in terms of teaching methods that I used.
- It seemed to me that I had succeeded in giving the pupils voice, and it appeared that their problem solving and communication skills had improved.

I also attempted to get some feedback from the pupils on their assessment of progress. I requested them to give me their opinions about what they had liked or disliked about the new way of teaching mathematics. The following comments were made in an open discussion in the classroom:

- "You were never satisfied with an answer you always asked `why'?, `why'?, `why'?. You really made our brains go like elastic all the time."
- "It was like stupidity was fading away."

When I asked what this meant I was told that by working the way we did, they could understand the work much better. They expressed the opinion that they preferred to be taught in this `new way'. I gave their request serious thought and came to the conclusion myself that I would now be unable to

revert to the traditional mode. I can only say that at that time I wished that I had been initiated into teaching in this way. Maybe by now I might have been a "good teacher" if I had started off like this.

Doing Project One was a humbling experience. I did not embark on my next project with the idea that I could simply enter a situation, identify what was wrong, tell people what needed to be done to improve the situation and then bring about this change single-handed. I had come to realize that I had a great deal to learn about Action Research as a method for investigating your teaching and that it is better to involve pupils in the teaching-learning process instead of always making top-down decisions.

CHAPTER FOUR

ACTION RESEARCH: PROJECT TWO

Project Two was also part of the prescribed course work for the Masters course in the Action Research programme. When I embarked on this project I had a better understanding of what Action Research was, as we had been required to make copies of the written account of each project we did for our mentors, as well as for our peers. Each project was critiqued by the group. In this way, I gained insight into the shortcomings of my first project. These shortcomings I will comment on in Chapter Six when I reflect on the shift in my initial perception of Action Research. However, there was an interim period between projects one and two during which important developments took place which were to have a bearing on project two.

DEVELOPMENTS BETWEEN PROJECTS ONE AND TWO

Although project one had ended at the end of the first quarter, I found it very painful to revert back to a mode of teaching which I felt had stifled my teaching practice. I thus intended to continue in that style of teaching throughout the second quarter, with the hope that the pupils would benefit and that I would be able to further improve upon what we had actually done in project one.

I was unaware at the time, however, of a number of factors that I would encounter en route to a major June examination that would somehow cause me to lose control of the situation and were to have a major bearing on project two. These factors included:

- the volume of work required to cover the prescribed syllabus within the existing time constraints (school terms are determined by the Department of Education);
- the need to cover the specific course content which had to be covered in the June examinations;
- my attempt to keep up with a colleague who was teaching mathematics in the other std 5 class in a traditional teaching mode and was way ahead of me at the time; and the fact that
- group work, I discovered, was more time consuming than I had anticipated.

For the first couple of weeks during that second term, it really appeared as if the pupils were coming to grips with the work. The group leaders co-ordinated the activities of the group and encouraged each participant to contribute to the analysis and solving of mathematics problems. If one of the groups presented their findings on the board - and was fired with questions by the pupils from the remaining groups - the amount of group support that the individuals received when they appeared to be uncertain about some aspects of how the problem was solved, filled the classroom with a `happy

noise'.

Faced with the realization that a great deal of work still had to be covered before the date of the ensuing examination, I soon realized that I had set myself an over-optimistic task. This problem was exacerbated by the fact that there would be about five days during which we would not be able to work, due to educational excursions that were to be undertaken. I found myself rushing to cover the work and unwittingly giving less attention to collaborative learning or to inter- and intra-group discussions. In the process, my role as a facilitator and `transformative catalyst' was minimized and overshadowed by the traditional modes of teaching.

The result of this need to cover the prescribed syllabus was that I did not check on the group dynamics and subsequently lost sight of what was happening in the groups as a whole. It seemed that what we had tried to build up through the first project initially, and also towards the middle of the second quarter, literally went to waste within a couple of days. I ascribed this to the fact that the students had become confused by the fact that I had reverted to my previous role of `dispenser of knowledge'.

For the latter part of the second quarter, we did not do as many tests as we had planned so there was no way really to

assess how we were progressing other than when I had to mark or evaluate their classwork, homework and tasks which they had to do for me. This did, however, give me a fair indication of their progress and of the quality of the work that they delivered.

I marked the June examinations, reflected upon them, and read through the students' diaries and the field notes that I had made over this period. My disappointment in the lack of improvement in the results was tempered by the fact that my attempt at innovative methods of teaching had at least not brought about any harm academically - and I would like to believe that the increased verbalism, assertiveness and inter-group inter-action were at least social benefits that developed, as a result of our joint efforts. The results, very disappointingly, were not much different from those of previous years:

YEAR	% Passed	% Failed
JUNE 1989	73,5	26,5
1990	77,3	22,7
1991	76,5	23,5

An evaluation of the pupils' examination papers, class tests and classwork books, showed that the pupils did not have a adequate grasp of the work covered in the latter part of the second term. This was confirmed later in a class test that we did on this section of the work. This inability to

grasp adequately the work covered in the latter part of the second term seemed to coincide with the period when I had reverted to the transmission mode of teaching. However, it seemed to me - but I was not completely convinced of it - that the collaborative approach that I had initially used had enhanced the pupils' ability to read, analyse and synthesize information.

On reflection I realised that my expectations had been too high. I had seen collaborative learning as the solution to the problem and not as merely a potential teaching strategy which could be used towards solving problems in class. As McNiff (1988:35) puts it:

> ... I had a naive view of the nature of the problem in education. I tended to think that having once identified a problem I could work towards its solution, on a once-for-all basis ... My practice showed me this was far from the truth.

I subsequently realised anew that change is not an easy process. As Fullan (1988:12) puts it: "... change is much more complex than had been anticipated."

Disillusioned about what had happened I consulted a colleague who commented: "Maybe what you were doing, you were doing badly." I realised, after much pondering, that this could be the case. I had often also discussed the project with a junior primary teacher. She had implemented a new teaching strategy in 1989 and I thought that I might be able to learn from her experience, while at the same time opening up my

project for scrutiny and comment. Her comment, "Maybe some of the pupils think that you are making jokes when you are trying to democratise your classroom," had me thinking hard. I then realised that I had to look at this aspect as well, because in my quest to democratise my classroom practice the pupils might have perceived me as not to be serious while I was doing the project with them.

Working with the pupils was not exactly easy. Although Reid (1982:134) claims that "students are responsible and trustworthy people," my experience coincided with the opinion expressed by Shor (1987:22) that "They are very clever in hiding from the teacher ... to confuse the teacher." I was filled with doubts, wondering whether the pupils would stick to what they had promised to do.

I expressed my disappointment to the pupils and said that I had been fooled into believing that they were all going to study in their groups for the June examinations as had been agreed. While I had hoped for more commitment from them as co-partners in the project, I discovered that very few class groups had studied together as they had undertaken to do.

Perhaps the fault did not rest entirely with the pupils. I realised that I had to be more consistent in my approach and that I should not confuse the pupils by alternating with different teaching strategies. I also realised that, had I

continued with collaborative learning instead of feeling pressurized to cover the syllabus towards the end of project one, the pupils might have understood more of the work that had been covered.

PROJECT TWO

The purpose of Project two was thus the same as project one. I used the same Action Research methodology as for project one as I wanted to improve on and gain confidence in the Action Research approach.

There were similarities as well as differences between the two research projects. The similarities included:

- The physical setting being the same (school, classroom, etc.). I used the same group of students for both projects.
- The purpose of the projects was basically the same, viz. an improvement in the pupils' level of understanding of mathematics and developing the voice of the pupils.
- The same subject was taught, namely mathematics.
- An attempt was made to use the same Action Research methodology.
- I still thought that I had to be in control of the situation.

Differences included:

- Having a better understanding of what was expected of me as an Action Researcher.
- Having a more structured approach in that I decided to encourage interactive learning by bringing more structure into the groups, such as by having group leaders.
- I was in a conflict situation in that I wanted to empower my pupils to be active participants in the learning process, yet I felt the need to be in control of the situation, and often, when it was expedient to do so, reverted to the transmission mode of teaching.
- Sometimes I consciously chose to use the transmission mode of teaching because of the need to produce results in keeping with the expectations of the students, the parents, the school and the Education Department.

The duration of the project was from the beginning of the third quarter to just before the September examination in 1991 (approximately seven weeks). I saw the pupils for 7 periods per week at the school where I was teaching. I now officially had three classes in the project although had initially anticipated having one only.

I employed the same methods of data collection which I had employed for project one with greater care, however, striving to record my data a little more accurately and carefully.

The work I dealt with during the run of the programme was common fractions; decimal fractions; percentages; rectangles and triangles. The basic structure of the lesson presentation was the same as project one in that I employed interactive learning groups where pupils had to discuss work presented to them. They were given work sheets and they also had to work on the board. I did not use prescribed text books as I preferred preparing my worksheets. I also changed the desks around so that they could face each other, to see whether this would enhance the interactive process.

I explained to the pupils that the purpose of project two remained the same. I wanted to be instrumental in assisting them to develop a better understanding of, and even a love for, mathematics. I acknowledged that fact that I had been inconsistent in my approach and informed them that the second project would be more structured, in that group leaders would be selected democratically, the lessons would be more structured and each member in class was to assume responsibility for the other members of the group so that any problems that were encountered or solutions that were evolved, could be challenged, and discussed so that everybody in class would be equally informed of the processes inherent in mathematics. I emphasised that in collaborative learning every single member of the group must be empowered to agree or disagree or to venture an opinion - that work that was not completed in class could be discussed with the groups but

would have to be completed at home. If necessary the parents' help could be sought.

As mentioned before, I had originally bargained for one std 5 class and ended up having three. Two of the classes were Afrikaans while the other was an English class. The former expressed the opinion that they would need more attention. Some of the comments which I had captured either on an audio casette recorder or which I had written down were:

- Daar is nog mense in die groepe wat die `fool' speel.
- In ons klas is daar nog mense in die groep wat nie hulle tuis werk doen nie. (These problems, it seems, were common to all classes.)
- Daar is nog 'n paar kinders wat nie wil praat in die groepe nie. (I knew about this but I did not want the introverted pupils to feel intimidated by forcing them to speak. I did, however, plan to work on this.)
- Meneer het nie vir ons genoeg tyd gegee om die werk te bespreek verlede kwartaal nie. (This was true.)
- Some pupils, especially the boys, just want to be right and some want to fight with us if they can't get their way.
- Some pupils use swear words and they don't want to listen to us when we talk. (This was also true.)

I anticipated a difficult period as a number of the above complaints appeared to be justified.

PLAN OF ACTION

My plan of action focussed on getting more structure and coherence into the groups for their optimal functioning. The idea was to get all the pupils to co-operate with each other, to listen to each other and to learn to respect each other in their groups. What was also important for us was that all had to be involved in the learning process. As facilitator and researcher, I intended becoming more involved with the groups this time round. I was intent on questioning their statements without providing any answers, I was also going to move around from group to group to ensure that all groups got equal attention. I intended involving the more passive pupils in this project by encouraging them to speak out and say what they thought was being said and as such share in the generation of knowledge. I hoped that this would be in keeping with what Mcniff (1988:4) said about Action Research:

> It is participatory, in that it involves the teacher in his own enquiry, and collaborative, in that it involves other people as part of a shared enquiry. It is research with rather than on others.

The ultimate idea, therefore, was to empower the pupils through what they learned in class. This meant that I wanted them to have not only a better understanding of the mathematics we did and more voice in matters that concerned them in class, but I wanted them to use the knowledge that they acquired in class to their advantage and challenge whatever they thought needed to be challenged. In order to

avoid previous problems that I had encountered such as disruptive behaviour and failure to co-operate, I decided, in consultation with the class and triangulator, to restructure the groups in a way that each had an equal number of pupils who could complement each other with regard to their work. For example I tried to organise a group in such a way that the more `able' pupils could help those who were weaker and I also tried to split the disruptive and unco-operative pupils up so that they did not find themselves in the same groups.

The pupils also suggested that we choose group leaders for this project. Though I had my reservations, I thought there would be nothing wrong in trying to find out whether group leaders could help us to bring about the much-needed structure in the groups. The pupils insisted that we formulate some guidelines for group leaders so that all would know what was expected of them. Thus it was decided that:

1) all of us must listen to other members (a problem that I knew needed working on);
2) we study for all tests;
3) after a member had stayed absent we offer our help so that everyone understands all the work;
4) we respect each other;
5) we do not swear;
6) we do not shout at each other; and
7) we all do our homework.

The last four were common, but very real, problems.

THE MATHS LESSONS FOR PROJECT TWO

The lessons in the second project were essentially geared towards making the pupils understand what they were doing. The syllabus for the quarter was reorganised into units that were conceptually linked and that flowed logically into one another. I spoke to the triangulator who agreed that I had to go over the section on fractions through which we had rushed before the June exams, in order to lay a foundation for the work that would follow. I decided to go over that work, fetching it from the basics and not teaching the concepts differently but more slowly.

The lessons were structured in the following way. During the first part of the lesson, we discussed how the concepts worked by involving the class at an intergroup and intra-group level. Intra-group discussions would normally take place after I had explained a mathematical problem on the board and asked the groups to discuss the work within the group. Inter-group discussion took place when I involved all the groups in the class to interact and exchange ideas. We carefully worked through each level of a mathematical problem to get a better understanding of it. During intragroup discussions, the pupils had to try to make meaning of each level of a mathematical problem which was based on what they had learnt in previous units. In other words I structured the work so that what they learned in, say, fractions at the

beginning of the year had a bearing on and could be used in later units. These units had been structured specifically with this idea in mind. The concept was then put together during inter-group discussion and then taken down as an example in their work books. I did as many different examples as I felt was necessary. The pupils had the right to stop us at any time to obtain clarity. I prepared all class exercises and weekly as well as unitary tests beforehand. I decided not to use the textbook (which I discuss in chapter one) because I found that it did not contain suitable exercises for our purpose.

DEALING WITH MATHEMATICAL WORD PROBLEMS

Mathematical word problems presented particular difficulties because many pupils, I discovered, do not like reading and as a result fail to build up a good vocabulary which often leads to their not understanding what they are reading. It is for this reason that I found it necessary to discuss with them how to work and think through the mathematical problems so that they could see how the numbers, words and sentences related to each other. Discussion of how they understood the mathematical problems in their own words helped them to get a better understanding of the mathematical problems, I think. It seemed to me that since most of them did not have a good vocabulary they found it difficult to make meaning of the mathematical problems. It appeared to get easier, though, as

they got used to the method. Questioning each other in the groups about why they had made certain statements seemed to bring out the essence of the mathematical problems. Six mathematical problems were prepared for the pin board which was attached to a wall in the class and which gave all the groups access to all the mathematical problems. Each group had to decide which mathematical problem they wanted to do and each pupil in a group got a copy of the mathematical problem that they had chosen to do.

After a group had worked through its mathematical problem it had to exchange that question with another group which had completed another one. My job was to facilitate the groups by guiding them along. At the end of the lesson each pupil received a page on which all the mathematical problems appeared. Any mathematical problem which had not been completed was to be worked through as homework either in their respective groups or alone. The following day each group had to send a representative to work the mathematical problem through on the chalk board. Since each group had covered all the mathematical problems by then, it made this session quite rigorous as some groups wanted to know why certain statements were made or why one approach worked better than the other. They got used to the idea of making rough sketches to bring a visual perspective to certain quantities as this helped them to see these quantities in more concrete terms. The triangulator expressed surprise at

the degree of interest that they showed in working through "this dreaded area of maths" and said that, even though we had struggled, one could see from the results of the weekly test at the end of August 1991 that they really understood what to do with the mathematical problems.

Just over half of all the pupils attained over 80% in the unitary test. In the English class 13 out of the 20 pupils attained at least 90% for the test. Although these improved results were, to a certain extent, due to the fact that it was the second time that we had covered the same work, I am convinced that ability to understand the mathematical problems and to transfer this problem-solving ability to new situations was mainly due to the critical approach that had been used as a teaching strategy instead of the traditional approach to which they were accustomed.

DEALING WITH THE HOMEWORK PROBLEM

Since we also had a homework problem to contend with (which occurred as a result of my lack of supervising these sessions when I rushed to cover the syllabus), the pupils were given six mathematical problems, most of which they worked on in class. They decided that what could not be completed in class they would complete as homework. The advantage of this decision was that they had discussed and analysed the mathematical problems in class in order to understand what

was expected of them, thus they were able to complete the mathematical problems at home. This brought about some improvement, as I could see that many of the pupils would have their work completed on the following day. Besides, I also found that there were more pupils who got the work correct, which seemed to indicate that they had a better grasp of the work.

TRYING TO CONTEXTUALISE MATHEMATICS

Some of these mathematical problems, especially the graphs comparing the salaries of workers, led to spontaneous discussions of the inherent political implications. The triangulator felt that while this was interesting it was quite a waste of time. I thought differently. To me it was heartening to see that the pupils were trying to link the micro perspective (mathematics) to the macro perspective, that is, the politics of everyday living.

EFFECTS OF GROUP LEADERS IN THE PROCESS

In the first project it appeared to me that the emergence of group leaders was suppressed by pupils who did not want group leaders. In the second project leadership emerged, it seems, because of the changes that we had made and also because they were getting used to learning collaboratively. I found that the girls emerged as group leaders in 13 groups out of the 17

that we had in the whole project.

It was quite easy for me, through my role as facilitator, to keep an eye on how the group leaders worked within their groups. Fatima and Paulina, concerned that some group leaders or pupils might not cooperate, requested that the "group leaders" should have regular meetings with me to discuss their concerns. We decided to meet every Thursday after school to assure the presence of all group leaders. The reason for this arrangement was that on a Thursday there were no inter-school sport activities. These meetings were very helpful and revealing, as we could exchange views towards solving problems. It also enabled me to measure the success of the groups in terms of the guidelines which we had agreed upon. I did, however, sound constant reminders that group leaders show respect to their group members and that they should not assume the role of the teacher. The triangulator noted and expressed concern that there were some group leaders, five out of the total of seventeen, who were "not leading by example." To this end one group leader cautioned that, "we should take care that the group leaders don't become lazy either." I therefore tried to eradicate this problem during personal interviews that I held with each group leader. The purpose of these individual interviews was to help me to find out from group leaders how individual pupils in the group were progressing. It also served the purpose of building up a better relationship with these

pupils and giving them some form of advice on how to try to solve problems that they had encountered in the group.

Through the group leader meetings, their concern and awareness of the problem of absenteeism and failure to do homework were also highlighted. They realised that the groups were not able to function maximally under such conditions. They felt that the group as a whole suffered and had a responsibility for the work missed through absenteeism or neglect.

The triangulator sat in on one of the group leader sessions where the pupils discussed how to solve the homework and absentee problems as well as the case of a pupil who had decided to leave school. As such they decided to consult the parents of those concerned. Many problems were solved in this way. Subsequently a pupil who had left school was readmitted. The triangulator said, "I never thought that they were able to come with solutions to problems of this nature." In an interview with the triangulator, I asked her whether she had thought that there were any signs of social upliftment and concern showed by these pupils towards improving themselves and one another. This was what she said: "I must say that I admired their eagerness and concern for their group members." Both of us felt that what had come through was a concern for each other. However, we differed on whether the pupils had been empowered. I felt that unless

there was effective change, and it was consistent, I would not feel satisfied that our pupils had been consciously empowered to effect social change. We agreed that the programme would be meaningless if the changes that we wanted to bring about were going to be cosmetic or short term.

ENCOURAGING OBSERVATIONS

It appeared to me that the pupils were now able to correlate certain mathematical concepts which had been taught earlier on in the year by applying them to concepts which they had learned about recently. The triangulator also noticed how excited they became when they wanted to stress or prove their point, often by referring to work which they had learned earlier on in the year. This form of seeking knowledge was very encouraging to see.

Their concern for each other can also be seen in what one pupil said: "Het meneer gesien hoe mooi kom Audrey nou aan? Ek voel nogal `proud ' van haar." Another pupil became equally excited about Lucinda's progress (one of the weakest pupils in the std 5B class), saying:

> Het julle vir daai stil Lucinda gesien, sy `surprise ' my nogal. Sy wil nou die meeste praat in ons groep. Sy het nogal nou baie `confidence' gekry.

Statements such as these were very encouraging as it appeared to me that they were now gaining more confidence and were enjoying what they were doing.

I had also noticed that there was more eagerness than before in most of the "lazy pupils". For instance, pupils whom I shall call Malia, Roger and Mariane of the std 5C class became more active in their groups. They easily volunteered to answer questions for their groups at the inter-group level. However, what was even more encouraging was that the pupils started to question me about the work more often, although the triangulator thought that the questions asked by the pupils delayed progress. I wanted the pupils to feel free to question me. As Wright (cited by Webb 1990:150) puts it:

> It is important to have a classroom atmosphere where children feel able to ask questions and express their uncertainties freely.

Interviews with pupils indicated that the pupils were feeling very positive about the experience. Safia commented:

> I think I am now getting the feel of it, Sir. I think I am really getting to understand maths now. I have really started to like maths for the first time.

Abigail, one of the most introverted pupils that I taught that year, spoke of her increased confidence, obtaining 73% in the September examination for the first time:

> I have really learnt a lot this year in maths. You know Sir, since we started with this way of learning at the beginning of the year I don't go to that remedial maths classes any longer because I understand the work now ... I feel I can speak much easier to teachers ... but what are we going to do next year in Std. 6?

The fears that Abigail had about what was to happen in the year that followed had also been raised by Paulina in the first project. The pupils realised that there might not be a continuation of the programme at high school.

THE PRINCIPAL AS OBSERVER

The principal, out of interest it seems, decided to attend one of our lessons on the last Wednesday of August 1991 just before the September examination. In a written report the principal, who had never been exposed to collaborate learning before, indicated that he was very encouraged by what he could see was transpiring in my classroom. He said that he was amazed at the fact that the pupils were teaching each other and that they had developed their problem solving skills to the extent that they were able to come up with logical answers to their work through their interaction with each other. He was of the opinion that their interpersonal skills had also improved as they appeared confident and unafraid during his interview with them. He also said that we should try to involve more teachers with the programme, not knowing that this was already happening at "his" school. I thought he would not entertain the noise level, but he said,

> I don't care. I can see that they are learning. I wish I had come in here earlier in the year. I really like what I have seen. I hope they will take whatever they learn from us and put it to use outside the school.

FACILITATING THE GROUPS

The role of facilitator did not come easily to me. I was used to dispensing knowledge. I had to curb the inclination

to give pupils the answers and instead allow them to work in their groups, to discover the possible solutions and different ways of deriving those solutions by themselves. As I facilitated, I inadvertently discovered that in the event that only one group solved the problem, this group could be split up to assist the other groups in solving the problem. I concluded these lessons with an open discussion so that those who had been unable to solve the problem could explain to the rest of the class why they did not get to an answer. I felt particularly pleased at the triangulator's comment: "You did not stay for too long at one group, nor was your input to their discussion superfluous," for she had pointed this out as one of my failings during the first project.

THE EFFECTS OF RESTRUCTURING THE GROUPS

Reflecting on project two, the triangulator and I agreed that it appeared that it was better to avoid friendship groups to minimize the possibility of them playing the fool as had been our experience during project one. Besides, it seemed as though this exercise had taught them to cooperate with all pupils in class and to understand their classmates better. Those pupils who were not very cooperative at first soon started to cooperate, probably because of the dynamics in their respective groups. Not only were they now forced to work with the rest, but they also had to speak and air their views when requested to do so. The triangulator mentioned

that it appeared that the pupils had started to show commitment in their groups. This could be gauged from the interest that they showed in the project and the enjoyment that they derived from it. So, in spite of the difficulties that we had experienced up to the June exams, the pupils surprisingly started to show that they were able to make meaning of their work as they became wiser and better prepared to handle working collaboratively.

Thus far, the triangulator and I noted, there appeared to be a definite sense of awareness of the value of working together, pooling ideas and listening to each other. I certainly wish to think that the changes that we made, such as the inclusion of group leaders, contributed to this progress.

CONCLUDING THE PROJECT

Class tests, unitary tests and classwork clearly showed that the pupils were performing much better than in the second quarter. An analysis of the results showed a 79% pass rate for the weekly and unitary tests. This was a significant improvement in comparison to the results of previous years, and seemed to indicate to me that the pupils were showing some interest in their work and that they had somehow started to understand their work. The September examination results also showed a definite improvement on the marks of the June

examinations.

We had an 84% pass rate in the September examinations, which I considered good, certainly better than in previous years. We continued with the programme up to the end of 1991. In the final examination we had a 95% pass rate. The project, it seems, did serve to empower the pupils in class because they learned through generating their own knowledge and they also showed more confidence in what they were doing. There were clear signs that they understood their work as they got most of their mathematical problems right. Some were also willing to oppose things that I said with which they did not agree.

Because I had repeated a portion of the syllabus during the second term, I was not sure whether the improved results were due to the second exposure to the same work, or whether it was due to collaborative learning. In order to establish whether Action Research was instrumental in changing the classroom situation, I resolved to see whether the changes that I had brought about through my `new methodology' which I developed - essentially as a result of my employing the research approach of Action Research - could be repeated at another school, where the students and staff would be unknown to me. This was to be the subject of project number three.

CHAPTER FIVE

THIRD ACTION RESEARCH PROJECT AT NO. 8 PRIMARY

Project Three was in effect a replication study of the previous projects but was conducted in a different school. This project was also part of the work required for the Masters course in Action Research. At the end of project two I knew I had a better understanding of Action Research. I felt more confident and certainly more empowered by what I had learned in practice through those projects and through the theoretical aspects of the course work. I also became more convinced that theory and practice could not be divorced but that the one facilitates an understanding of the other.

A critique on project two by one of the course coordinators lead me to realise that I should not try to tackle too many problems at the same time. When I thus attempted this project, I tried to keep this in mind. Whether I succeeded in doing so is something of which I am not sure - a topic to which I shall return in Chapter Six.

I used the same Action Research methodology for my third project. During this project I realised that, despite the confidence that I had gained, each project brought its own problems. I also learned that each school has its own ethos. Other factors that could not be ignored and which somehow

bothered me were:

- the attitude of some the teachers towards research and education;
- the risks that had to be taken when doing research at another school; and
- the fears of the subject teacher whose subject I was teaching had to be respected.

The project itself had many similarities to the two previous projects.

Similarities included:

- using a group of standard five pupils again;
- the purpose of the project was basically the same, viz. an improvement in the pupils' level of understanding of mathematics and encouraging the pupils' voice;
- the physical setting was very nearly the same (school, classroom, similar areas, etc.);
- the same subject was taught, namely mathematics;
- I again encouraged interactive learning by bringing more structure into the groups such as having group leaders; and
- to encourage the pupils to speak and gain more confidence, I also again allowed them to interact with each other more freely, yet within the confines of a structure.

However, one of the major differences was that the triangulator, I think, had a better understanding and more insight into his role as a triangulator.

PURPOSE

The intention of the third project was two-fold:

1. I wanted to see whether I could effectively implement similar interactive teaching strategies in a completely new setting, through what I had learned in the previous projects through Action Research.
2. I also intended democratising my classroom practice more by carrying out Action Research with an emancipatory mode.

Through this I essentially hoped to empower the pupils by encouraging voice and promoting a better understanding of the mathematics they were doing. In trying to achieve this I was also trying to see whether it would be possible for me to get the pupils to:

- participate in classroom activities more confidently,
- question my work more critically; and
- contest any unequal relations of power that existed.

TIME AND SETTING

1. Project three started from the second week in February

and ended by the end of the second week of March of the first school quarter of 1992. During this period I was on furlough.

2. I saw the pupils of a single class for seven periods per week at a school in a different area and setting from where I normally taught. The school which I chose to work in was situated in Hanover Park, a sub-economic area near my home.

ACTIVITIES

As before I employed interactive learning groups. Pupils had to discuss work presented to them. They were given worksheets and they also had to work on the board. All worksheets were prepared by myself and no exercises were taken from the prescribed text book. I encouraged both inter- as well as intra-group discussions. Worksheets that were not completed by pupils at school had to be completed at home.

WORK COVERED

The work covered basically the same areas that I had dealt with in project one, viz. long division; order of basic operations; properties of numbers; basic mathematical laws; factors/multiples; and the numberline.

DATA COLLECTION

I employed the same methods of data collection which I had employed for the previous projects. By now I think I had become much more aware of the cardinal importance of data collection as part of the Action Research methodology. I realised that I had to record my data more accurately and carefully and that I needed to do much more consultation with the other participants in the project.

NEGOTIATING THE PROJECT

The Inspector Of Education

I did not want to do the project at another school without the knowledge and permission of educational authorities, so I approached the Chief Inspector of Education. My negotiations with him were brief. I informed him about the previous Action Research projects that were based on an interactive approach to the teaching of mathematics and described the purpose and aims of the project. I made it known that I ultimately hoped to counteract pupil passivity in class. Permission was granted by the Inspector of Education for me to do the project at any school, provided the principal agreed and that teachers were allowed to have access to the classroom.

The Principal

I met with the principal, whom I shall call Mr Patience, explained the purpose and mode of the research and requested his permission to conduct it in his school. He was receptive to the idea and after informing the teachers about the purpose of my presence at the school, granted me permission. Some of his comments were:

> ... If I like what is happening in the class, then I would like you to help me implement the programme at this school. We have to do something about improving the education of our children. I want them to think for themselves.

He informed me that the school still functioned according to traditional modes of teaching and that he had experienced that the transmission mode of teaching was not conducive to empowering pupils.

As the principal wanted to bring about change in his school I thought that it would be a good idea if he could become more involved in the project by acting as a triangulator. When I had explained to him what was expected of a triangulator, he agreed to assist.

The Mathematics Teacher

I was introduced to Mrs Williams (not her real name), the teacher responsible for teaching mathematics to the four standard five classes to whom I explained what the project

entailed. During our first meeting she was very accommodating, and welcomed my presence at the school. I later detected that she felt threatened by the prospect of my working with her pupils, so I sought to reassure her that I was not there to criticise either her work or that of any other teacher. In an attempt to minimise her feeling of threat I invited her to assist me by acting as an observer during her free time.

From our discussions, it appeared that her approach to teaching mathematics was very rigid and conformed to " ... the traditional methods of chalk-and-talk mixed with repetitive drill-and-practice exercises", what Breen (1991:19) had found to be common in many classrooms. She also preferred doing most of the work according to the textbook, the rigid syllabus and a prescribed scheme of work. Taylor (1991:27) finds such approaches to mathematics teaching in South Africa as developing out of " ... technocratic tendencies which have come rapidly to the fore over the last decade or so."

I was given an option to work with any of the standard five classes, and chose to work with the standard 5c class which, I was lead to believe, was the weakest of the standard five classes. The weekly time table for mathematics included one double period and five single periods, two of these being in the last period of the day.

Class Teacher and other Staff Members

The std 5c class was organised in a traditional way like all the other classrooms in school. My interaction with the class teacher (not mathematics) was brief but interesting in that it seemed to reflect his attitude, and that of many others, towards education. It appeared as though he `liked' using the overhead projector, since he could draw transparencies from a thick file which he had been accumulating over the years. Often he would set one up and then leave the class to do something else.

On one occasion, the class teacher suggested that I might even take some of his periods as he was very busy with sport:

> You can have the 5th and 6th period on a Friday. There you can mess around. But during the 1st and the 2nd periods you can't mess. There I take the standard 5a and standard 5b together every Friday morning.

Talking to some other teachers I heard similar statements such as: " ... we are okay the way we are, we don't need to do things differently." I found such statements very revealing in that it made me realise that some teachers saw research as a waste of time and researchers as "messing around" or "playing the fool". I also realised that since so many teachers were set in the mode of transmission education and control, it was going to be hard for them to accept a change.

The Pupils of Standard 5c

My primary intention was to discuss the purpose and intentions of the project with the class and to seek their cooperation. I explained that my intention was to work towards an approach which would enable them to question the teacher and express themselves more freely in class. I discussed the collaborative learning process with them as well as my intention to empower them so as to promote a better understanding of mathematics. This evoked some reaction from some pupils, one of whom enquired, " ... hoe kan ons dan so leer as ons meer as meneer moet praat?"

Questioning them about their interest in mathematics revealed that maths periods were not their favourite. It also appeared as if the cane was often used on them during this period and, according to them, they did not have a clear understanding of the work. During the discussion it became clear to me that the pupils were mere recipients of knowledge and that the mathematics textbook was the source which played the fundamental role. It also appeared to me that the majority of the pupils were not acquainted with collaborative learning.

I had initially decided to seek their cooperation through a whole class discussion, but decided instead to divide them into nine groups, then and there, to discuss the issues

first. This move was unplanned but it provided me with an opportunity to give the pupils some practical understanding of what I was talking about and also for them to discuss the issue more intensely.

In seeking their cooperation, I briefly told them that they had to try to reach consensus on doing collaborative learning through group discussions. Through the previous projects I learned that one should not delay rectifying problems of a behavioural nature in class. Realising that I had a potentially noisy lot, I did not delay for too long before stopping the understandably noisy and, by this time, out of control discussion. I informed them that it was advisable that when someone talks that the others listen intently or even jot down a note if needs be. I thought that if I could introduce the idea of a spokesperson early on it could help in facilitating the process of interactive learning in groups. I therefore also asked them to choose a spokesperson to report what the group had decided. At the end of the first meeting - which lasted for two periods - they agreed to do the project with me.

I explained the need for thorough record keeping in research of our classroom activities and to this end arranged with them that I make audiotape recordings of discussions that they had in their groups. I also asked them to allow the triangulator and myself to do interviews with some of them.

I requested that they keep diaries of our sessions to help me with the gathering of data and asked them to allow me to read their diaries when I needed to compare my notes with theirs. I also sought their approval about teachers coming into the class to help with the gathering of data. I did not want them to be caught off guard by seeing the teachers or principal in class.

It seemed as though they were quite surprised at the teacher asking them for permission to do these things instead of simply telling them to do so. I stressed that we were all going to learn from one another as I wanted them to feel that they, too, were going to share in the ownership of the programme through their active participation in the project. I said that through what we learned from the project we might be able to help other teachers improve upon their teaching practice by sharing the information with them.

INITIAL FORMATION OF GROUPS: FIRST CYCLE 12-02-93 TO 14-02-93

The main idea of our first official working session was to get the pupils to work together in collaborative groups so that they could start learning through discussing the work. Drawing on the previous projects, this was how we went about our plan of action:

- I spoke to them about forming manageable groups on the basis of personal preference. The reason for this was

twofold - we were going to do something rather new and I had learned that at this stage collaborative groups can become quite unmanageable if they are too large. This resulted in six groups with six pupils per group.

- I spelled out clearly what was expected of the groups so as to avoid confusion and wasting time re-explaining myself eventually.
- I tried to do things as democratically as possible and so suggested that they, instead of me, choose a spokesperson to report back at intergroup discussion level. We decided on having a different spokesperson for every lesson that followed. I explained that we wanted to give all a chance to report back so that they could learn to express themselves.

THE WORK COVERED AND LESSON STRUCTURE

During the first maths lesson that we engaged in, we covered the introductory section to the number system - explaining the numberline, natural numbers, counting numbers, odd and even numbers and so on. Because of its historical perspective it was interesting to inform the pupils about ancient, Arabic and Roman numeric systems. Besides informing them about the relevance that it bore to our daily lives, this section of the work allowed the pupils to engage in discussion more easily. To make things more interesting, each group was given a resource book obtained from the school

or public libraries to which they could refer.

Worksheets with questions for pupils to work on were handed to the groups. Some of these questions were open ended as I wanted to get them interacting by discussing the work. I also hoped that they would realise through discussion that a single answer need not necessarily be correct.

During the project a typical lesson took on the following format. I encouraged the pupils to get to their groups as soon as possible. I would start off with the introductory part of the lesson and try to engage the pupils working through the mathematical problems with me from the word go. Often I would stop speaking while teaching and ask them to discuss the problem on the board further hoping that they would come up with a solution to the problem. In such instances I would often facilitate by giving them a little guidance when or where it was needed. During these introductory lessons, where I thought a concept was not too easy to understand I would simply just write the question and answer of the mathematical problem they were working on, on the board. This I would only do at the beginning with one or two examples. Through doing this I was hoping that they would be able to work through the mathematical problem and thereby gain a better understanding of the concept. Afterwards I would go further with the explanation until I decided that the pupils needed to discuss the work at inter-

group level. By listening into each group I would challenge certain groups to get them to substantiate their arguments. Often I would open the discussion at inter-group level especially when I thought one group had made a significant breakthrough towards understanding the mathematical problem. This sometimes brought the pupils to the front of the class to explain and substantiate their arguments. I would also always try to lure all groups into the discussion by asking them what they had to say. When I saw that individuals had a good grasp of what was being taught I would encourage them too to come to the board and explain a mathematical problem in their own words.

When I was sufficiently sure that they had some understanding of the concepts being dealt with, I would hand out the work sheets which I had structured so that it could be discussed in the group first. They were then left to work through the mathematical problems from the work sheets to the end. I would then go around again to facilitate. I tried to do as little talking as possible but rather to encourage them to speak. Whenever I thought it necessary I would ask a question. This helped to keep a focus. I would also sometimes stop all discussions when I found it necessary to raise a point that I thought might cause them to be mislead, especially when I saw too many groups going off the point. However, when I discovered that one group was going well in their discussion while the other groups did not understand I would split this one group up to help the other groups get a

better perspective.

To foster a better understanding of a concept, I challenged their statements and urged them to do likewise. I also encouraged them to make their statements rigorous by insisting that they be well substantiated and that the question `why' should play a fundamental role. In this way I tried to show them that a statement was not of much value if it was not well substantiated. I resisted the temptation to provide them with an answer, as I wanted to encourage them to think of possible answers and different ways of solving problems. The pupils seemed to derive some pleasure from the challenge. This, however, seemed to have contributed to the noise factor. By interacting with the groups in this way, it seems they started to get an idea of what was required of them during collaborative discussions.

I found that I was also able to handle the time factor in terms of lesson structure much easier. I did not allow for too much unnecessary or irrelevant discussion. Unlike before I found that the pupils were able to decide for themselves when to discuss the work, often without me telling them. Previously it had been quite a problem to deciding when it was necessary to engage them into discussion. I noticed, and so did the triangulator, that I did far less talking while the pupils on the otherhand just wanted to talk. When I found it necessary to contain them I would tell them that I too needed to talk. `Noise' became much less of a problem as

the pupils were discussing their work. One could see that each group was busy and the pupils, judging from the enthusiasm, enjoyed what they were doing.

OBSERVATIONS AND PROBLEMS ENCOUNTERED

Time

Although conscious of time I was unable to complete the intended task. Instead, I asked them to complete the work at home and to discuss both the project and the homework with their parents or guardians. The intention was also to inform the parents about what was happening at school.

The Noise Level

During the lesson the noise level in the class was understandably high as this class had had no previous exposure to collaborative learning. From their enthusiasm - indicated through their raised voices to make their point of view heard - it appeared as though the pupils were showing an interest in discussing the work. However, much guidance needed to be given and despite the noise level, I was relatively satisfied with what had been achieved thus far.

Discussions

Other areas of concern I had were that they were not

discussing the work thoroughly and they were also not questioning each other sufficiently in the groups so as to make the meaning of the concept stand out clearly. In addition I noted that no one had made notes of group discussions which I thought would help to facilitate inter-group discussions.

INTERVIEWS WITH PUPILS AND CLASS TEACHER

The pupils who came to me after the lessons gave every indication that they had enjoyed the sessions. The six pupils that I had interviewed after school also said that they actually understood the work better as they were allowed to think through and speak about the work in groups.

During an interview the class teacher who was present during the first maths lesson attested to the fact that the groups were functioning well. To her it was good to see that `all' the pupils were taking part in collaborative discussions. I, however, disagreed and indicated to her that there were some pupils in each group who for some or other reason were not interacting. I also said that this was a problem to me because I wanted all of them to make a meaningful contribution to the lesson. I then realised that in the first project I had a met with a similar situation where my triangulator in that case was not sufficiently empowered to look at these issues critically. The maths teacher, in this

case, I realised looked at what was happening superficially and so she missed out on the vital aspect of total interaction in the groups.

REFLECTING ON THE FIRST LESSON

During the lesson that followed I strove to improve upon the problems that I had encountered, with regard to group behaviour, during the first maths lesson. By the end of the first week, I observed that the pupils were becoming accustomed to my encouraging them, and to the questioning and challenging of each other in class. However, as we went through our first week I also encountered some problems in the way that the groups were functioning. Besides observing that some pupils in the groups spoke far less than others, there were also those who tried to dominate the discussions. Speaking to Mr Patience, the principal, about this problem after school, we thought that this could be the reason why the `quiet' pupils found themselves silenced. In subsequent interviews with the pupils during that first week, they indicated that some pupils indeed dominated discussions so that others did not get a chance to talk. I knew that I had to try to deal with this problem without discouraging those who wanted to talk. I felt that by somehow using the dominant speakers effectively we could change what seemed to be a problem into a situation of advantage. Through their excitement and the eagerness which I perceived in class, I

would want to believe that by the end of that week the pupils had started to get into the swing of learning interactively.

At this point, I also felt that, in spite of the fact that I was not a resident teacher at this school, I had a lot more confidence than in the first project and that I was getting into my plan of more goal directed action more easily. This was evident from the fact that I got my groups sorted out quicker, that I was able to guide the pupils with more ease and that I knew when to take a problem from group level discussion to an open class type of debate.

By the end of that week I had worked with std 5c for five periods, during one of which I had administered a fairly traditional test. During the test it came as no surprise to note how they shielded their work from others even though we had said that we were going to share in the generation of knowledge. The competitive nature as they compared results to see who got the highest marks was, however, ever present in class. The class average for the test was 62,3 % and most of them passed.

GROUP COORDINATORS TO GROUP REPORTERS: THE SECOND CYCLE

17-02-92 TO 21-02-92

On the last day of our first cycle, the triangulator and I

discussed the problems that I had encountered with the class during that first week before deciding on a plan of action. Areas of concern were:

- some pupils were not talking in the groups;
- some pupils were dominating the discussions; and
- pupils in the groups did not take notes to make intergroup discussion more effective.

I realised that if I was resolved on also encouraging voice and confidence, I had to try to procure some form of balance in the groups, to foster collaborative discussion. On the basis of experience that I had had while working on the previous projects the triangulator and I decided to introduce group coordinators and intergroup reporters into the situation. I decided that every pupil was going to fulfil these roles at some point during the programme. The idea of this was also to get all the pupils involved at all levels of the discussion. I discussed our problems and plan of action with the pupils before I decided on implementing the plan.

IMPLEMENTATION

To counteract the problems we had encountered I suggested that each group choose its own group co-ordinator and intergroup reporter. I informed them about the functions of these people. The role of the group coordinator was to encourage all pupils to become substantially involved in the

group by allowing all of them to make their voices heard in the discussions that were taking place. The role of the intergroup reporter was to report back to other groups in the class about what conclusion their group had come to and how consensus had been reached in that group.

I cautioned the groups to stick to the topic under discussion, and to give each member a fair chance to speak. I reminded them that they should continue questioning each other, to ensure that meaning was made of what was being said. To make it easy for them I gave each group some paper on which to take notes. I informed them that their notes should be very simple to serve as a reminder and help in the facilitation of inter-group discussions.

OBSERVATIONS

From what my triangulator and I subsequently observed I became convinced that the groups did not really function well with rotating group coordinators facilitating the situation either. We found that group co-ordinators often tended to lead to the controlling of groups, especially by the more dominant pupils in the groups. At the same time the pupils who we wanted to talk now seemed to become intimidated. I had to step in often to try to prevent this happening. I spoke to the class and tried to convince them that it would be better if all started to respect each other. In this way

I said we could learn to listen when others speak.

Discussing the problem with the triangulator we realised that we had to be patient as this mode of doing things was novel. These pupils grew up in a competitive, hostile environment, so there was the ever present problem of some pupils trying to be difficult and hostile towards one another in the groups. This problem was nothing new to me either as it happened in my previous projects as well.

After having given the process a chance until the third lesson, I consulted with the triangulator, who agreed that we drop the idea of group coordinators. I spoke to the pupils telling them that we were going to depend on the cooperation of all of them and to show respect when someone wanted to say something. I suggested that others take notes to keep the discussion focussed. This we thought would allow for more free discussion in the groups and might help ward off the problem of someone getting hurt. We thus decided that report backs for intergroup discussions still had to be made by the pupil that the group selected. I stressed that each pupil in a group had to get a chance to report at inter-group level. This, I thought, would expose the inter-group reporters to the rest of the class and hopefully encourage them to shed their inhibitions by making their voices heard in class.

As they discussed in groups I listened to them, gave some

advice where needed and then moved on to another group. Even though the process was not exactly easy for them to work through at first, I made it my duty then to sit in at each group on the Wednesday double period to show them how we expected it to be done.

During the discussion with the triangulator I mentioned that I had fears that I might have been too prescriptive, after we had dropped our group co-ordinators, when I showed them what was expected of them. We spoke it through and realised that since we had time constraints as well as behavioural problems to contend with, it was necessary for me to solve this problem. Reflecting on my previous projects, I realised that I did not tell the pupils what to do but tried to facilitate by being part of the groups so that they could get a better understanding of what was expected. My triangulator thought I might have slipped up by not sitting in on the groups initially, but he felt that it was better for us to have worked through the process in the way we had instead of running the risk of having been prescriptive from the start.

As we went through the rest of the week it appeared as though the groups had started to settle down. We noticed that there was less noise and that group members cautioned each other about shouting. The triangulator who now sat in on groups to listen to their interaction, noted that the pupils were often oblivious of his presence and that they were indeed becoming

engrossed in discussing the work. He attributed his concern that some pupils were not interacting sufficiently to their shy nature and not because they did not know their work: they were just " ... afraid to speak, they said." We both agreed that if we could get them to interact more frequently in the groups it would be to their advantage.

The shy, as well as weaker pupils, totalling more than half of the class, were drawn into discussions too. We tackled this problem this way:

- I worked on getting these pupils to respond individually, after they had worked through their mathematical problems with their groups.
- I engaged them in working through new concepts with me on the board.
- I encouraged them to tell us how they thought the mathematical problems had to be done as they had discussed them in the group.
- I encouraged the rest of the class to challenge or question any pupil representing a group or, for that matter, to question any group working through the examples with me.
- I urged them to question me, too, during the process.
- In order to get maximum participation of the target group of pupils I often redirected questions coming from other groups back to these individuals or to their groups.
- I tried at all times to encourage the rest of the class to participate freely.

Subsequent interviews with a member of each group revealed that they were starting to get to grips with the programme. These pupils also felt a little more comfortable in the groups but said that there were still intimidation and threats by some group members. With regard to the mathematics, all of them mentioned that they were seeing the benefits of discussing and talking through the work and that they understood the work better.

Interviews with some of our shy and weaker pupils led us to believe that we had made some progress. These pupils, six of whom I had interviewed, informed us that they soon realised that they need not be afraid of making mistakes as they were eagerly supported by their groups. They said that they soon learned that nothing was to be taken for granted, and it appeared as if they had started to answer the questions quite confidently and independently. They also said that since they were encouraged to speak and express their thoughts verbally, it appeared to give them confidence to deal with their work enthusiastically.

DISCUSSING THE CLASSWORK WITH THE PUPILS

With regard to the class work, it appeared as though the section on properties of 0 and 1 started to get more meaning for them then. I continued to give each pupil in the group a worksheet to work through and to discuss. This meant that each group had a different exercise based on the same aspects

of the work. They realised that the number 0 was not just a `place holder'. They realised, they said, that division and multiplication by 0 are real mathematical concepts that could not be ignored in mathematics. At the same time they also started to realise that if they had known earlier what the concept of an identity element meant, as in properties of 1, they might have had a better understanding of the work which they were then doing. They felt that they learned much more by questioning one another and talking about what they did or did not understand. The pupils seemed to realise that it is important to know the basics, which they seemed to think they had missed out on.

Pupils said that they were discovering that when they discussed and questioned each other on the work, they realised that they had to delve deeper into mathematical aspects which they had previously just accepted. That which had seemed to be familiar somehow became unfamiliar and as a result many questions were asked about the work that they were doing. The pupils also felt more comfortable with the arrangement of not having a group coordinator but rather choosing a person from the group to report back.

By the end of the second week we wrote a test, on properties of numbers. An analysis of the results, which I recorded and studied in consultation with the triangulator as well as the maths teacher, seemed to indicate that most of the pupils

understood the work. Most of the pupils, including the weaker pupils, achieved an 80% pass mark.

REFLECTION ON SECOND CYCLE

In spite of the fact that we had managed to get the pupils to interact in the groups and also that we had managed to get the shy pupils to talk in class, I realised that more had to be done, with respect to the empowerment of pupils in mathematics as well as improving their communication skills. Consulting with the triangulator on this issue made me realise that if I hoped to be successful, I needed to re-examine my role as facilitator and to work more closely with the pupils and get more involved with group discussions.

As part of an exercise in the third cycle I tried to improve and refine my role as a facilitator. I also included other exercises through which I tried to encourage the pupils to speak to each other about how they understood the work. I wanted those who had a better understanding of the work to share with those who did not understand or who did not as yet have a good grasp of the work. At the same time I wanted the weaker ones to gain more confidence by explaining to the rest of the class during intergroup discussions how they understood the work. Through this mode of working through the mathematical problems I thought the pupils would contest each other openly and in the process share knowledge, which I

hoped might help to encourage voice.

TEACHER FACILITATION AS AN INTEGRAL PART OF ENCOURAGING VOICE

THIRD CYCLE 25-02-92 TO 13-03-92

In spite of the criticism levelled at me by the triangulator, I felt that from the progress that we had made I was not doing too badly. As a teacher facilitator I mostly drew on my experience from the previous projects. I became more conscious, however, of the fact that the success of encouraging voice and self confidence was not going to depend on the pupils working alone only. I realised that with this class I was more than ever going to have to become actively involved in the collaborative discussions and that the questions that I asked the groups needed to problematise areas of concern. At the same time, I realised that I had to guide and not mislead them. I needed to listen intently to their discussions, make suggestions and ask pertinent questions that would lead to more coherent discussion. As the teacher facilitator, I had to cover all the groups during the lesson so that I could get a better insight into how discussions were going and, more importantly, to listen to what was being discussed. In this way I thought I might be able to ascertain whether the pupils were making progress towards uncovering the pertinent issues in a concept. I needed to urge them on constantly to contest one another so as to encourage voice. The task of the triangulator was to

observe intently whether I was implementing what we had discussed and to see whether it bore any fruit.

The following was observed:

- I was less apt to giving them the answers directly as they had previously expected me to do. This created problems for them but also encouraged them to think through their mathematical problems.
- We observed that they struggled but then tried to question statements and to answer them from various angles.
- As time went on, it appeared that they also became aware that you could not just make statements without thinking through the mathematical problems.

TRIANGULATOR REPORT BACK

The triangulator informed me that I had done less talking in class than previously, and that I had not spent as much time at any one group as before. He observed that the pupils in the groups interacted quite well. He also commented that the group discussions were now more coherent as I had helped to keep them more focused. The triangulator felt that, as a facilitator, I was doing much better than before. I had learned to get around to all groups to get them to focus and to encourage them. They responded well to the acknowledgment of their progress.

REFLECTION

Quite unintentionally I also refined, in the process of facilitation, other skills that I had practised in the previous projects. For example, it was brought to light that when some groups had made headway in solving a problem while others had difficulty in doing so, I had to open the discussion up to an inter-group level. This helped in getting the rest of the pupils involved. At the same time this also allowed for an open inter-group type of questioning which involved the class as a whole and which I think made them understand the work better. They also used the chalk board to substantiate their arguments.

Judging from their enthusiasm to answer questions and to challenge statements made in class, it seemed as though they were beginning to interact more willingly with each other at all levels. It was encouraging to note that before the end of the third week, most of the pupils showed signs of speaking out.

WORKING THROUGH TEST CORRECTIONS

In consultation with my triangulator we decided to reinforce what had been learned about properties of numbers by allowing the pupils to unravel their own mistakes that they had made in the test. We felt that by questioning and contesting

statements further in this way, as well as through the process of talking through problem areas, we could help the pupils to get a better understanding of the work. The suggestion by the triangulator for me to reconsolidate, by letting the pupils rework their test corrections, seemed to be wise. I soon realised pupils would also benefit by it in the process of finding their own mistakes.

I asked the pupils to work through their own mistakes. Those who got any mathematical problems wrong had to explain why they had done the mathematical problems in the way they had. Those who had got the mathematical problems right, on the other hand, had to explain how they had done the mathematical problems. My duty was to move to each group so that I could get an idea of where the pupils had gone wrong and to support them by asking questions so that they could focus and think through their work.

This exercise was thus a continuation of the previous exercise. We thought it important because the value of correcting work as part of the process of learning is often ignored at school. Yet, as the triangulator said, it should play a consolidating role in the process of education. The exercise was particularly interesting for us to observe.

From this the triangulator and I realised that the pupils had an opportunity to say, and also justify, why they had made the mistakes. The triangulator, in particular, felt that

this exercise should be encouraged in all subjects because it allows the pupils to learn, understand and speak about why they had made mistakes. The exercise also allowed for constructive argument at inter-group level. We felt that the pupils were free to express themselves at the chalkboard and to substantiate their arguments. Another good thing, I think, that happened was that not only were the shy pupils now prepared to work voluntarily at the board, but the weaker ones too. It was also interesting to note that the groups used their own methods to explain the mathematical problems which brought along different dimensions to the concept under discussion.

We found that the pupils were able to explain the work to each other in their own ways using their own home language as is often used on the Cape Flats. I realised that they were starting to focus. My task was to problematise the work. We learned that a better understanding of the work was emerging from the inter-group discussion.

INTERVIEWS

Interviews conducted by both the triangulator and myself indicated that the pupils liked what we did and that they understood the work better and, most of all, they felt more confident. Some of the pupils said that they were empowered to speak more freely and confidently because they grasped the work better.

MAKING NECESSARY CHANGES IN THE GROUPS TO EMPOWER PUPILS:

FOURTH CYCLE 02-03-92 TO 05-03-92

During the third cycle I detected that there was a serious behavioural problem that might impede the collaborative process and that needed to be addressed. The problem was that there was a group, mainly boys, who were disrupting the class and who often tended not to cooperate. There were two pupils in particular who were 16 years of age - much older than the rest of the class. They played a dominant role in the class and most pupils as well as some teachers were actually afraid of them.

Although it might seem as though this problem was divorced from our project, it was a very real problem experienced in many classrooms in our schools. I could ignore it but I chose not to. I spoke to my triangulator who felt that addressing the problem was an integral part of the learning process which would be worth trying to solve during the project.

Since I did not believe in oppressive methods of dealing with pupils, my plan of action to counteract such behaviour was to empower the rest of the pupils to stand up against such unwanted behaviour. For this reason I gave the rest of the class, who were willing to cooperate, an opportunity to make

their voices heard about the behaviour of these `bullies,' about whom they often complained.

Coupled with the behavioural problem there were some other problems that needed to be addressed. My triangulator and I observed:

- that the class took some time settling down on returning from another lesson;
- that pupils were not doing homework regularly;
- that in some groups we still had some pupils dominating interactive `conversations'; and
- that some pupils worked very untidily while others often did not do their work.

Taken together these problems presented considerable potential for disrupting the collaborative learning task, which meant that things that I had set out to do might be difficult to achieve eventually. So I felt I had to try to deal with these problems.

After discussing these problems with the triangulator, I had some idea of what the nature of the problems could be. We realised that besides other reasons such as laziness and the socio-political problem, it could also be that the process of interactive learning was not employed as a teaching strategy throughout the school. We also did not discard the feeling that we could also be perceiving signs of a lack of

motivation, cohesion and co-operation within the groups. My triangulator and I thought that we should try addressing these problems together seeing they shared some common elements. I suggested that we try regrouping the pupils as I had done in my previous project - rearranging them in such a way that they faced each other in their desks while talking.

I informed the pupils of my plan of action. I told them that I was reformulating the groups. I said that I thought that regrouping might help to break down some of the behavioural problems encountered. I thought that since I knew the pupils a little better, a regrouping could allow for a more balanced spread of pupils into better structured groups, which could help with the motivation of, and sharing of knowledge with, other pupils. I had a hunch too that as the traditional way of sitting in class - in rows behind each other, turning around to face one another when they had to discuss the work - was not really conducive to collaborative discussions, we would rearrange the desks as well.

All the groups were affected. Pupils who were giving us problems were also separated and put into groups where I thought there were pupils who were sufficiently confident in terms of voice to contain their behaviour. Based on my previous projects I also had reason to believe:

- that the change to facing each other in their desks could enhance the collaborative process;

- that there could be increased enrichment at the level of intragroup discussion when they looked at each other while talking; and
- that our plan of action could be a means of bringing about much more depth in that discussion.

We observed that although the pupils started off hesitantly after the changes had been made, they settled down much faster than they had before. It also seemed as though the unruly behaviour started to subside considerably. I thought that this was essentially because I had separated the unruly pupils from each other, but the triangulator argued that he had observed that it stemmed rather from a counter-active voice in the groups. I did not expect the pupils to make their voices heard against unruly behaviour as I thought they might fear intimidation. However, the pupils soon started to address problems, injustices and any abuse of power that existed amongst themselves in the class.

We observed during class activities:

- A definite improvement in their work and in their behaviour.
- That a better working relationship of co-operation and motivation amongst the pupils appeared to be taking effect.
- That the pupils who had caused problems, slowly but surely

started to cooperate.

- That I was called upon to deal with petty problems far less.
- That judging from the type of questions asked as well as answers given, it appeared that the intensity and the quality of group discussions improved. As Johnson and Johnson (1985:109) relate:

> ... cooperative learning situations provide the alternatives of auditory learning and the use of oral explanations provide the explanations that may be essential for deeper level understanding, higher level reasoning, and long term retention of the material being learned.

- I no longer needed to tell them to discuss, as it appeared that they knew when they had to do this.
- That they were eager to get stuck into the work as they sometimes asked me not to interrupt their discussion. The principal noted this and was quite elated.

Interviews with six pupils revealed that they were surprised at first, but that they actually felt more comfortable with the new seating arrangement. In interviews which I also conducted with six other pupils on different days, it was reported that they felt more at ease and were able to speak more freely in the groups because they were not being threatened any longer.

During an interviewing session with the triangulator I recorded that he was pleased at the improved group

functioning and ascribed it to the restructuring of the class. He also commented that it appeared as though they were starting to show more interest in their work as most of them now also did their homework. He was particularly impressed by the quality of the interaction taking place as he had taken a keen interest in what had transpired.

On reflection, I think, this restructuring was implemented at the right time as we were about to deal with the more difficult concepts of mathematical laws - associative, distributive and commutative laws. Although I do not have ample proof that group restructuring brought about improvement (in the quality of the intergroup as in intragroup discussions groups), I certainly think that this restructuring contributed to a less tense atmosphere in class. This restructuring at the intra-group level also provided for face-to-face interaction amongst pupils. This, to me, was as important as everything else that was happening at a mathematical conceptual level because I thought that the environment in which they learned could also help to enhance the learning process. I also found that I could access the groups more easily and that it was fun sometimes to sit with them while they were discussing the work.

The triangulator noted in his report that "their linear way of thinking, it seems, is taking on a more critical dimension." He also mentioned that he thought the

classroom atmosphere had changed with the rearrangement of the desks and that he found it conducive to the process of learning. Sitting in the groups he said: "I felt part of my pupils and of the learning process." He commented that the intensity of the noise had also died down considerably in comparison with when we had started. On another level it seems that the pupils were quite oblivious of teachers coming into the class. The triangulator also noted this in his report and so did the maths teacher while she was observing a lesson the following day. I want to believe that this was partly attributable to pupils' beginning to respect listening to the voice and words of others in the groups. I realised that the skill of listening, which was, at first, lacking in them, was as important as was getting them to speak their minds. In addition, after we had rearranged the desks, they also learned to look at one another while someone was talking, which I think might have helped the process.

Teachers who had come in as regular observers from before the regrouping had much the same to say as the triangulator. Some of them informed me that they were going to implement this in their classes. Some even asked me to come around to their classes to help them with the implementation of collaborative learning.

THE `OPEN BOOK' TEST

FIFTH CYCLE 09-03-92

In one of my last exercises before concluding the project I gave the pupils a test similar to an open book test as a form of evaluation. The whole exercise was geared towards seeing how well the groups had progressed in empowering each other and sharing knowledge as well as in helping each other to understand the work. Secondly, after the test had been written, I hoped to see the effect that our plan of action had had on inter-group interaction when the corrections had to be done working from the board.

I explained the rules and nature of this test:

1. The groups could scrutinise the actual test fifteen minutes ahead of time.
2. During this time they could refer to their classwork books to discuss the work only.
3. No writing could be done during this time as I wanted them to talk and think through the test.
4. During discussion they could call on me to clarify any uncertainties.
5. When the test had to be written each pupil had to work independently and no one could refer to their classwork books.

Observing the intensity of the fifteen-minute discussion, I noticed the following:

- the groups showed signs of intense concentration;
- the groups showed signs of sharing their knowledge with each other during the discussion; and
- that while one pupil was talking the others were listening.

When the triangulator and I compared notes we reached concensus on the following: all of the pupils were engaged in discussion, referring to their books, arguing and then reaching consensus. I was called upon to clarify some uncertainties that they had though I preferred to give them as few answers as possible as I wanted them to do the thinking. It was good to see full cooperation and that everyone was actively involved in discussion. What was good, too, was that questions were being asked all the time and answers were being challenged by more questions.

The inter-group level discussions during which corrections of the test had to be worked through were interesting to observe as the pupils and the groups challenged one another's statements. This, we thought, could also be an indication of the extent to which the pupils had been empowered to voice their opinions in class.

After the test I asked them to inform me in writing how they felt about writing tests like they had just written.

From diaries and notes they reported that they preferred writing tests in this way because the test was challenging and that they learned while discussing and writing the test. Some pupils wrote that discussing the work before the test had given them more insight into doing the mathematical problems. Five of them reported that they had understood the work better while discussing the work even though they had gone through it at home.

Those who I interviewed said that they understood the work far better working through a test of this nature. Most reported that they had not felt as nervous when they wrote this test and that they understood the work far better. Out of the ten that I had interviewed all said that the groups were functioning far better and that group discussions had helped them in working and thinking through the test.

This was the last test, written on the first Friday of March 1992, and I tried to include sections of all the work covered. The results proved to be as good as the weekly test results with an average percentage for the class of 84,7%. It was surprising to note that the weaker pupils - as was confirmed by teachers who had taught them previously - had again achieved good results.

EVIDENCE OF PUPIL EMPOWERMENT

On the penultimate day of the project I was asked to combine the standard 5c and 5b classes because of the absence of a teacher. The events that took place as a result of what happened out of this unplanned lesson gave me some indication of the extent to which the process of empowerment through interactive learning had impacted on the pupils. It appeared to me that they wanted to make their voices heard about the project.

I divided the standard 5b pupils up into the already existing groups with the std 5c pupils after they had asked me to teach them a section on the addition of fractions which they said they did not understand too well. They easily took to the programme as the standard 5c's took the initiative in guiding them through the process. I continued to act as teacher-facilitator.

An evaluation session at the end of the third period revealed that the standard 5b pupils had enjoyed working in groups and especially talking and working through the mathematical problems. They also said that they understood the work much better as a result of interactive discussion and group support. They commented that working in pupil groups was not as boring as just listening to a teacher all the time. This seemed to indicate that even though the pupils were also used

to the transmission mode, they were more susceptible to change than I had expected them to be.

In an evaluation session with both classes on the last day of the project, I decided to interview pupils of standard 5c and 5b separately. From the interviews it appeared that both classes were adamant that they wanted to be taught through the process of interactive learning. I was informed by the pupils that the two classes first collaborated before approaching the maths teacher and principal to request that they be taught through the interactive approach. The teacher who was responsible for the teaching of mathematics to all the standard five classes apparently became furious at the idea that the pupils should approach her to be taught through the process of collaborative learning. As a result they then decided to approach the principal, who gave them a hearing.

According to the pupils, the fact that the principal had participated in some of the lessons and that he was there to witness their progress was evidence enough, they thought, to ask him that they be allowed to be taught maths in this way. The pupils felt that they had learned to know Mr Patience, the principal, far better. To them he was a person to whom they could relate. They said: "Hy luister as ons praat en ons het geleer om vir hom te sê ons stem nie saam met hom nie".

The principal informed me that the pupils had valid reasons for wanting to be taught in this way. According to the principal, the pupils suggested speaking to the teacher about this issue in his presence. A teacher who had been a regular observer in the programme reported that she had never before witnessed "pupils so empowered as to refuse to be taught in the transmission mode." They had discovered, "Ons het ook regte." It appeared to me that they had realised that they had voice and that they wanted to make their voice heard regarding the issue.

CLOSING THE PROJECT

Before the end of the final meeting I asked some of the pupils if I could read through their diaries and through some of the notes that they had written up in order to compare them with my field notes, diaries and reports that teacher observers had given to me and to ascertain whether there were any significant similarities in our data. I thought that in comparing my field notes with their diaries and discussing this information with the triangulator might help to establish if the programme had indeed served its purpose.

Since we had built up a trusting and open relationship in which no question was too embarrassing to ask, the pupils in the class were very disappointed that I had to leave so soon. I informed them that our research was meant not only to

empower them in the learning process but also to help me understand myself and my teaching practice a little better.

In the discussion they said that they had also learned that there were other ways in which one could also learn effectively. I informed them that our research was hopefully also going to help other teachers realise that Action Research is a practicable and tangible mode of research and an on the job learning experience in which teacher and pupils learn to share in the learning process.

SOME CONSTRAINTS UNDER WHICH I HAD TO WORK

I had some problems on an inter-staff level in spite of the fact that the teachers had been told that I was to do the project. It seems there were a number of teachers who were concerned about my presence at the school and many a time I felt as though I was an intruder. I therefore felt that I had somehow to inform the teachers that my mission was purely to learn from what I was doing and in turn to share this with other teachers.

There were also difficulties at the classroom level. I had problems with respect to scheduled mathematics periods. Pupils would often come late from a preceding class and there were occasions when I would come late due to the periods being shortened by 10 or 15 minutes without my being

informed. Often afternoon maths lessons would be sacrificed at the expense of an impending sport programme such as athletics practice, and this sometimes left me with just over half the pupils in the class.

Various other problems that I had to contend with included behavioural problems from the pupils, and frequent interruptions by teachers speaking over the intercom system. However, I realised that I was at the mercy of the principal and the staff and that, as an outsider, there was little that I could do. I therefore had to fit in with their way of doing things. This sometimes made me feel despondent.

AN INTERVIEW WITH THE MATHS TEACHER.

In an interview that I conducted with the maths teacher, she said that she felt that the principal and myself had "empowered the pupils wrongly" and that "the pupils should not have had a say in this." She also believed that the principal had undermined her authority by giving the pupils a chance to say how they felt and what they wanted. Evidently quite upset, she referred to the process of collaborative learning as `restaurant education' because of the way in which we had arranged the desks.

This programme had a subsequent spin off. The principal liked what had happened in the project and decided to

introduce the process throughout the school. I suggested that, instead of just implementing the collaborative approach, he discuss it with the staff first. In a meeting that he held with the staff after I had left, they decided to implement collaborative learning. I subsequently learned from him that, even though all had agreed to cooperate, there were some who had preferred to revert to the traditional mode.

In conclusion, I wish to say that the last three chapters dealt specifically with the three projects that I had run at two different schools. The projects were not only an attempt to improve upon my teaching practice but also to see how I could help to empower my pupils to have a voice and at the same time also to have a better understanding of mathematics. In the chapter that follows I intend to reflect as a whole upon the three projects that I conducted at the two different schools. In doing so I also wish to reflect upon my personal experiences and the changes that I underwent in my attempt to improve upon my teaching practice while doing these projects through an Action Research approach.

CHAPTER SIX

REFLECTION

REFLECTING ON THREE ACTION RESEARCH PROJECTS

In this thesis I have attempted to describe and discuss three projects I launched in an attempt to democratise and improve upon my own teaching practice, and to promote a better understanding of mathematics through a collaborative problem solving approach, which, I thought, might also serve to encourage pupil voice. In this my final chapter, I will attempt to reflect on the work that I did in those projects as well as on the changes that I underwent while trying to improve and transform my classroom practice.

When I realised that I needed to enhance my teaching practice I was looking at a host of issues that were relevant to educational change. Most of these issues had their origin in apartheid education and were the cause of my disillusionment with my teaching practice. Knowing that I had to do something about this plight I stumbled headlong into a research course, Action Research, about which I initially knew little. However, I increasingly came to believe that it was the research methodology that could be the most user friendly for my purpose of classroom research. Besides, it appeared to be an accessible mode of research which I could employ together with my pupils and other participants in

the class while still continuing with school activities. Carr and Kemmis (1986:162) put Action Research into perspective by referring to it as: " ... a form of self reflective enquiry undertaken by participants ... " towards improving and understanding their own practices better, which was precisely what I was looking for in a research methodology. So, through the process of action and reflection as part of the Action Research cycle, I was set on changing my teaching practice from an oppressive to a more democratic mode.

My previous approach to teaching can be seen from a report written by an ex-pupil of mine, and now a teacher in the school where Project Three occurred, that

> ... Mr Abrahams was in fact himself stricter in transmission mode teaching than Mrs Williams ever was. He remembers an atmosphere of absolute totalitarianism to the point where he says, if Mr Abrahams cracked a joke to relieve the tension, he would often be the only one laughing - most pupils did not dare open their mouths to laugh for fear of retaliation later on.
> (Boltman 1992:3)

REFLECTING ON PROBLEMS ENCOUNTERED

Initially I thought that the processes I wished to promote were going to be relatively easy to achieve, but hands-on experience indicated that I was just not making much progress. So, while carrying out the projects, I encountered many difficulties and pitfalls. These had me pondering, on countless occasions, as to whether my research would be of

any significance towards improving my own teaching practice which I thought could contribute to an improved classroom situation.

Notwithstanding the fact that both Action Research and collaborative learning were new to me, I also discovered that my perceptions of Action Research as a mode of classroom research were relatively vague to me. In the case of Action Research as a mode of research, the only contact that I had had with it prior to my first project was through the literature. As such I had some difficulty in making meaning of its methodology and as a result, I, in this my first genuine attempt towards educational change, discovered, as did Fullan (1982:12), that " ... the process of planned educational change is much more complex than had been anticipated."

Having received a traditional teacher education and having been influenced by traditional research modes through my previous studies, it appeared to me that theory, as was the case in the traditional research mode, was going to have an overriding effect on informing practice. So, in the preparation of my first project, I again tried to get a theoretical understanding of this new research methodology - Action Research - its cycles, the modes of data collection as well as the processes of validating my findings.

However, during the projects I discovered that too many things were just too new for me to handle and to tolerate, casting doubt and confusion in my mind as to whether it would lead to improving my teacher practice. Such feelings were not uncommon when I thought that I was not making much progress and the reason for this became apparent to me through Joyce and Showers, cited by Fullan (1982:38), as they remind that there is the reality that:

> ... learning a new skill and entertaining new conceptions create doubt and feelings of awkwardness or incompetence especially when we first try something.

THE ROLE OF THEORY IN ACTION RESEARCH

Reflecting now on those early stages of the project, I realise that though I wanted to change I had a problem reconciling theory with practice. This, I think, stemmed from the fact that, still under the influence of a technicist mode of research, I tried to put into practice in class a theory that I had acquired, without trying to adapt it to my real classroom situation. In other words, in my case theory appeared to have had a deterministic relationship to practice. Perhaps in my fear of risking failure in class I was to blame for following the literature on Action Research by Carr and Kemmis, Elliot and Ebbutt to the letter, hence my difficulties. However, for this very reason both Hopkins (1985) as well as McNiff (1988) level criticism against some of the schemes of Elliott, Carr and Kemmis, and Ebbutt.

Hopkins (1985:39) warns of the danger of following the schemes in the way I did, for as he puts it, this " ... may lead teacher-researchers into possible confusion." McNiff (1988:36) says their schemes:

> ... require teachers only to apply systems to their pupils. In this sense they may be accused of prescriptivism ... they make statements on paper without showing in practice how those statements are realised.

Reflecting on my progress towards the end of the first project, I came to realise that another purpose of doing Action Research in class was to generate my own theory so as to be liberated from that which I had objected to - being prescribed to all the years. I realised that in as much as it is useful to be guided by theory, a theory should not be followed in a way that might inhibit creative action in class. With this in mind, I, together with other significant participants, set out to generate an educational theory in class guided by a classroom educational practice.

Notwithstanding the above, and knowing that I had to make changes, I was not too sure about how these changes were to be made and where these changes had to be made. The dilemma was that I also thought all the problems were overt - with my pupils and with other issues in education. I did not acknowledge, however, that part of the problem could well be within myself and in my teaching practice.

At the time that I started with project one, I was not aware of the dimension and quality of change that I needed to undergo, as I thought that I was already a `liberated' teacher. Said with hindsight, this meant that I thought that I was able to produce the results for the exams and that I allowed my pupils to speak in class and to question me in class. Nonetheless, I soon realised that I was far from being a liberated teacher. I had not realised the extent to which I was still entrenched in a transmission mode of teaching. I gradually became conscious of the fact that I needed to work at myself to become willing to change.

Having been thrown headlong into the first research project, I found one of first problems to manifest itself was the noise in the classroom, which increased in intensity from a tolerable to a sudden, sometimes uncontrollable, level. It became evident to me that I needed to handle this problem fast, as I was afraid that it would encourage behavioural problems. This appeared to be indicative of the fact that I was having difficulty in coming to terms with a changing classroom ethos. Besides, there were social realities in the school -`rules' set out by us, the principal and senior staff, that spelled out that " ... the classes must not make a noise." As a senior teacher I was obliged to carry out these rules, while at the same time my class was allowed to make a noise under the aegis of my research.

Another problem was perhaps that I was over-ambitious in wanting to tackle too many issues during the projects, and so I lost focus: there were just so many burning concerns that I felt needed to be addressed. At the same time I was unaware of the invaluable advice, offered by Hopkins (1985:47), that

> First, do not tackle issues that you cannot do anything about ... Second, only take on, at least initially, small scale and relatively limited topics ... Third, choose a topic that is important to you or to your students.

As a consequence, in an attempt towards change, I had to go through some unnerving, uncertain and threatening experiences, particularly while working through the first and second projects.

Without realising that both Action Research and collaborative learning are cooperative by nature, confusion set in as I mistook their methodologies to be one and the same. As a result, I somehow found it quite perplexing to keep a focus especially when other classroom realities such as behaviour and homework problems came into play. I therefore became afraid of risking that such problems can alter the course of events in the programme, and that one has to adapt one's plan in the light of developments.

Unsure of what to do, and instead of just focussing on one manageable feature, I attempted to solve several problems concurrently during the project and so became rather overwhelmed. I did not realise that these various dimensions

could cause me to lose focus. McNiff (1988:35) expresses it thus:

> The more I attempted to work towards solutions, the more it seemed I was forced to break off from the main focus of my enquiry, and deal with other equally significant aspects. I found at first that I was quite confused as to what constituted my main enquiry, how many of the subsidiary problem areas I should attend to and in what detail and what sort of research design I could adopt to give the whole scientific rigour to help me to cope.

These spontaneous problems, such as the behavioural and homework problems, were necessary for me to work through in class but it was not essentially what I had planned to work on as part of my original idea. However, they became important to me as part of my research as I thought them to be intrinsically related to classroom realities dealing with educational issues. The important issue in my mind was that change should lead to improvement in both my own practice and in the classroom situation.

At the same time I encountered feelings of ambivalence as I was trying to be democratic throughout my classroom practice without becoming prescriptive in imparting subject matter. I think that by the time that I was about to complete my second project, I began to have more clarity about the Action Research methodology and the collaborative process. Readings that helped to bring about a better understanding, I found, were those of Winter, Grundy, Davidoff and van den Berg, Carr and Kemmis, and McNiff; in other words, I tried to read widely while I proceeded with my Action Research. It was by

this process that I realised Action Research to be a distinct research methodology which should not be fused or confused with collaborative classroom work as a teaching strategy. I consequently attempted to formulate a theory to explain my way of dealing with these important issues that occurred during the course of events as I felt that it needed to inform and help my colleagues in their attempt at Action Research.

One other problem that I encountered at the onset of my first project was related to the fact that the triangulator, due to classroom obligations that demanded her attention, could not always be at our class sessions. The absence of this support, which was supposed to help me reflect on the process at the early stages, was a great setback.

However, I then had to rely on my field notes, audio-recordings that I had made, diaries that I kept in class as well as diaries and notes that I asked the pupils to make. The transcription of the audio recordings was relatively time consuming, but it was the source on which I relied most whenever my triangulator had difficulties coming into the class as a result of her work load. I was also fortunate in that I had no difficulty in arranging interviews with my pupil participants as well as with teachers who came in to observe.

In the case of the first project, our triangulator was not entirely familiar with the Action Research methodology either. This was a problem I realised as we were not able to identify and reflect on emerging issues during the programme.

As implementor of the project I tried to make it expressly clear to the triangulator and other participants what it was that I was attempting to do and what it was that I wanted them to focus on. For example, I asked a teacher to inform me whether I was in effect allowing the pupils to have a say in the generation of their own knowledge. This meant that I tried to make the lessons a mode of interactive enquiry. Knowing by then that Action Research emphasised the need for communication and the creation of a close interpersonal relationships with pupils and other participants I still had to find a way of using it effectively to achieve my purposes.

From the onset I observed that it was not going to be easy to create a democratic classroom atmosphere for my pupils. In the process I realised I needed to work on myself first, not losing sight of the fact that my pupils, too, had become accustomed to traditional classroom practices. I realised that unless this was the case I was not going to democratise my classroom practice nor was I going to bring about an emancipatory type of education through which the pupils could acquire voice. For me this had further implications as it meant that I was not only to become a researcher in the class

but also a facilitator of the actual classroom learning process. I realised that the whole process had to maintain its educational character so that all participants involved could learn from what we were doing in the class.

The process of change was, then, a learning process for me. Even though I did not realise that it was going to be so exhausting, the fact that I was committed to change through my search towards improving my own mode of educating and towards helping the pupils to have a better understanding of the classwork encouraged me to continue. To this end, the works of Davidoff and van den Berg (1990), Hopkins (1985) and Lawrence Stenhouse (1975) helped me to get some clarity on how I was to get going.

WORKING THROUGH THE PROCESS OF EDUCATIONAL CHANGE

Fullan (1982:56), in his discussion on implementation which he considers to be " ... the process of putting into practice an idea", identifies certain criteria which affect change in practice. One of these criteria pertaining to the nature of change - that there must be a need for change - had direct bearing on the problems that I experienced. On careful examination it became clear to me that although I had a need to change my teaching practice I had not prioritised my aims in terms of importance. Perhaps when I started off on my research project I had had a naive view of educational

problems.

Reflecting on how I first felt about changing my teaching practice, my view now is that I did not fully understand what the true implications of the meaning of educational change were. I believed that in identifying a problem to be researched I could easily work towards the solution. I also believed that the Action Research process had all the answers to the educational problems I was facing. Yet, working through my projects I was stunned to learn that things were not as simple as this. During my projects it was thus necessary for me to search for the meaning of educational change.

Reasons for this could have amounted to the fact that out of all the problems that I had envisaged for change I simply did not know where and how to start. To put it very mildly I did not have clarity about what it was that I wanted to change first, nor did I fully understand my means towards change, Action Research, well enough. Still, during the process I realised three things;

1) that I was not ready for change;
2) that if I wanted to reach an intended goal, which was to improve my teaching practice, I had to start with myself; and
3) that my perceptions of change were oversimplified in that there was more to the process of change than I had

realised.

Regarding problems arising out of lack of clarity, Fullan (1985:57) has found that " ... problems related to clarity have been found in virtually every study of significant change." He (ibid) goes on to say;

> ... lack of clarity - diffuse goals and unspecified means of implementation - represents a major problem ... and unspecified changes can cause great anxiety and frustration to those sincerely trying to implement them.

My projects were thus by no means plain sailing to me. I often encountered the unexpected and I also encountered many complexities. Thinking that you have arrived at a solution to the problem under focus, only to discover that another problem of equal intensity had raised its head, can be very disheartening, as I learned. The result was that it became difficult for me to keep my mind focused on my main enquiry. What to do next was a problem as I did not know whether it would be wise to give attention to these problems while at the same time continuing with my main focus.

Both Hopkins and McNiff have levelled criticism for lack of clarity at some model schemes of Action Research to which I too referred. Hopkins (1985:40) explains:

> My ... concern relates to the specification of process in the Action Research models ... It is useful to have a guide for action ... They delineate a sequence of stages, but say little about the `what' and the `how' within these stages ...

I tend to agree with them in that these models of Action

Research are deficient in so far as clarity is concerned - they fall short of explaining the actual process in action. However, it would be untrue to say that they did not give me some form of a guideline - prescriptive in a way - but it would have assisted had I had more clarity on the how and what of these stages during those very early stages. McNiff (1988:34), too, finds much wanting in the research of some people like Kemmis who are the advocates of Action Research, because she feels

> ... they do not make a claim to account for their own personal and professional development ... They do not, in fact, map their own imagined frameworks onto their practice ... they present abstract systems in which theory comes first and practice follows on.

In spite of the fact that I had difficulty in working through my first two projects due to a lack of guidance and understanding of the process, the experience of working through the projects through an Action Research mode was an invaluable one.

TRANSFORMATION IN THE MATHEMATICS CLASS

Realising that many educationists the world over are advocating a movement away from a top down approach and a more interactive mode to education, I believed that I had to pursue my search towards improving my teaching practice. I saw for mathematics education a need for pupils to talk through their work, to share in the generation of knowledge so that they could transcend the abstract and gain a better

understanding of mathematics for a change. I saw the need for enjoyment and humour which was lacking in mathematics classes and, in a way, I set out to achieve this through a process approach of collaborative learning. The advantage that I had was that I was intent on trying and working at myself as a mathematics teacher to move away from traditional modes of `filling and drilling', being constantly reminded of the words in Freire's (1972:45) emancipatory pedagogy which embodies the notion of educational change:

> Education is suffering from narration sickness ... Narration ... turns the children into containers ... to be filled by the teacher. The more completely he fills the receptacles, the better a teacher he is.

Digesting these words I realised this to be familiar terrain. I reminded myself that I was the one who was in pursuit of meaningful change which was the unfamiliar to me.

I realised that I had to pursue the emancipatory function of education so that the image of autocratic narrator or `expert mathematician' that I tried to portray could be changed. My intention by attempting to bring about these changes was so that my pupils could have more meaningful use for mathematics. I engaged them in talking through the process of doing mathematical problems in class, arguing a point, questioning them, encouraging them to question me so that they could have a better understanding and an appreciation for mathematics. This was all in pursuit of change and a better understanding of mathematics. I found Freire's

(1972:45) emancipatory pedagogy encouraging me to engage each pupil during mathematics lessons in such activities

> ... not simply as active rather than passive receivers of knowledge, but rather as an active creator of knowledge along with the teacher.

Because I was engrossed in the project I often became oblivious of problems which popped up spontaneously in isolation of my main focus, but in spite of problems of this nature I think that it was quite an exciting learning experience for both pupils and teacher.

By demystifying these spontaneous problems that we encountered I hoped to be lead towards unlocking the door to an educational improvement in class. Spontaneous multifaceted problems as they popped up in a class were what I had to be able to deal with to make education the dynamic process that it can be and, as for Action Research, I told myself it would be my means in search of an emancipatory pursuit.

However ambitious and complex my projects turned out to be from my perspective, I believe that they stimulated more change in me and in my pupils than if I, unlike Kemmis, Elliott and Ebbutt, had attempted to ignore the problems that arose beyond my main focus. To this end McNiff (1988:35) ponders:

> ... Kemmis, Elliott and Ebbutt simply do not accommodate spontaneous creative episodes ... I wondered how Kemmis dealt with the problem of unrest in class ... Did he return to it? solve it? abandon it?

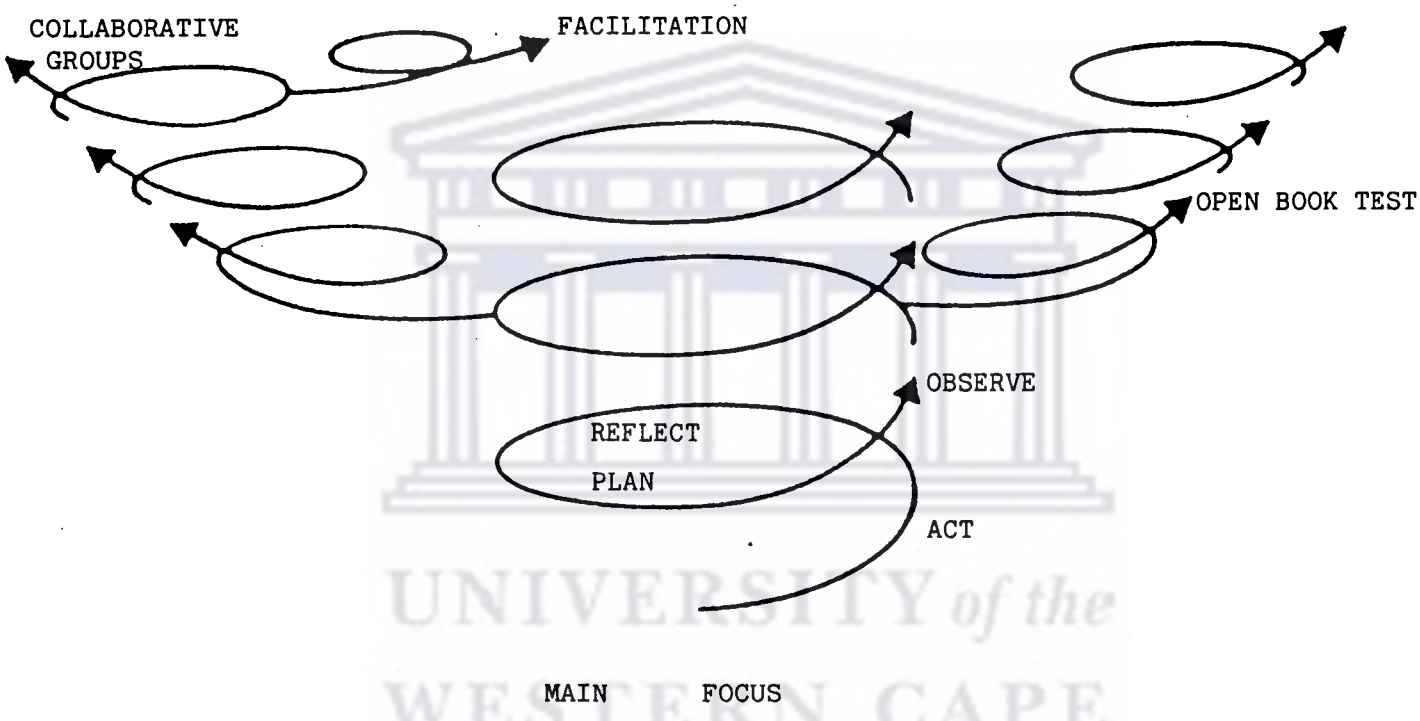
To me such issues were educational and, as much as I might have been researching a specific area of my classroom practice, I refused to see education as decompartmentalised facets for classroom research.

COLLABORATIVE ACTION RESEARCH AS A DYNAMIC PROCESS

By working through the projects I came to realise that Action Research is dynamic in that it allows one to have spin offs from your main focus. The problems that I encountered during the first project were related, I think, to my not being sure of how to accommodate these relevant spin offs into the projects. However, in my last project I felt more equipped to handle them together as I had a little more experience and, I think, a better understanding of the Action Research process. This allowed me to keep my main concern in focus and, with more confidence, I also tried to accommodate what I considered to be other valid educational problems that I dared not have ignored as they were part of the day-to-day classroom realities. My reading of McNiff's (1988) experiences at the time that I was doing my third project, reassured me that what I was experiencing was not unique. Besides, McNiff (1988:43) observes that

> The spirals of planning, acting, observing, reflecting, replanning, in the frameworks presented so far are able to deal with only one problem at a time. Action Research should offer the capacity to deal with a number of problems at the same time by allowing the spirals to develop spin-off spirals, just as in reality one problem will be symptomatic of many other underlying problems.

McNiff's (1988:45) FIG. 3.9 spiral diagramme is provided below.



The exercise of employing Action Research as a mode of classroom research in this thesis is thus is not to prove that it "works" as a mode of research as there are many projects to indicate that it does. It has to do with matters of education which should encourage teachers to account for their own professional and personal development in the process - and this is what I think educational change is about. I believe, and have experienced, that Action Research as a mode of research is a vehicle towards educational change. The process not only encourages teachers to advance explanations of how and why they have been stimulated to change their teaching practice but also encourages them to demonstrate publicly that this change has led to educational enhancement.

Through the process of action and reflection one will find that the Action Research mode of research is indeed one of learning and relearning. It becomes a process of educational change through its very nature of continually acting and reflecting upon issues, as I have discovered through my projects. However, working through the Action Research mode one will find the process of educational change to be a rather difficult, ambivalent interactive learning process through which there will be an unlearning of old practices and a learning of new ways of approaching teaching practice. So, working towards a process of change, through my projects, was not exactly simple, but at the same time it became a very

enriching and rewarding learning experience, as Fullan (1982:62) puts it:

> ... one must struggle through ambivalence before one is sure for ones self that the new version is workable and right (or unworkable and wrong and should be rejected). Good change is hard work; we may find comfort in the realization that engaging in bad change or avoiding needed change may even be harder on us.

REFLECTING ON THE COLLABORATIVE PROCESS APPROACH IN MATHEMATICS

The understanding of mathematics was a major concern to me in so far as the pupils were concerned. This debate is one which seems to centre around issues concerning a content via transmission mode of teaching versus a collaborative process orientation in mathematics teaching. The former is the one which I was intent of moving away from, for the sake of my pupils and myself. The latter was the approach which I think I was able to attempt with some success. Howson (1989) sees the former way of teaching mathematics as the acquisition of a body of knowledge through rules, theorems, skills and structures. Moodley (1992:4) argues that this view of teaching mathematics concerns the:

> ... manipulation of techniques, limiting children to solving routine problems - characterised by teacher showing and teacher telling with students following and repeating;

What I had attempted through the collaborative process approach was, I think, much broader than groupwork itself. Moodley (1992:4) explains, as he demonstrates the necessity

of involving teacher and pupil in mathematics enquiry:

> ... the learning of mathematics as a process (irrespective of the content material), emphasising meaningful development of concepts and ... increasing the prospects of real problem solving, open enquiry and investigation - characterised by teacher challenging, questioning and guiding with students (pupils) doing, discovering and applying.

At first I was afraid of taking the risk of venturing into this collaborative process approach simply because I was perhaps afraid of losing control and of not producing results. I was also afraid of attempting a different mode of teaching. Of my major problems that I had with the transmission approach was that mathematics teaching had become too mechanical and, as such many pupils did not understand what they were doing or why they were doing certain operations in mathematics. To this end I wish to support Moodley (1985) as he reminds teachers that, " ... a fair proportion of the learning problems in mathematics are actually taught to the children ...", as this is what I, too, discovered.

However, because many teachers (including myself) were educated in the traditional mode, many tend to find for themselves more conventional and `safe' ways of a drill-and-practice modes of teaching. Sadly, warns Andre Spier (1986) of the private sector in his address to educators, such an approach, " ... prepares people neither for life nor for work." Coming from a fairly traditional teaching background

myself, I had my doubts as to whether the process of collaborative Action Research in mathematics would contribute to a better understanding of mathematics. My belief then was that there had to be strict discipline in class to make the learning of mathematics possible. However, Action Research as a mode of classroom research being collaborative in nature, and thus engaging the pupils as part of the process, made it relatively easy for the pupils and myself to try what we had set out to do. Through the responses of the pupils I am convinced that there was sufficient evidence that we had made strides towards improvement. They liked what they were doing. Proof of this came through in all the projects but especially in project three. This was what some of the pupils said:

Project one;
- Sir, we understand the work better when we discuss it in groups.
- Meneer, kan meneer nie die ander onderwysers vra om die metode toe te pas nie?

Project two;
- Sir, ons geniet die werk nou. Wiskunde is nie meer so `boring' soos in vorige jare nie. As jy praat oor die werk dan kan jy nogal beter verstaan. Daar is altyd iemand om te `explain' as jy nie seker is nie.
- Sir, I am worried about next year, will the teachers allow us to discuss the work like this in maths? I am much more confident now and I understand the work much better.

Project three;-
- Hoekom kan ons onderwyser nie die metode toepas nie? Is duidelik dat ons die werk nou verstaan as ons dit `discuss'... die toets uitslae is skoons beter en die werk is moeiliker gewees.
- Kyk net die swak kinders het ook goed gedoen in die toetse. Ons gaan na die hoof om vir hom te vra of ons nie deur die metode kan leer wiskunde nie.

Much of what the pupils said above had been discussed by myself and the respective triangulators of the projects. We found that comments such as these made by pupils were indicative of the general feelings of the pupils. Teachers who came into the class to observe what was happening were also encouraged to attempt what they had witnessed as they said that they believed that the pupils were showing an improvement towards understanding the work. However, I had an intuitive sense that a collaborative approach might help the pupils to understand the work better. With this approach to teaching mathematics I was intent on leading my pupils to a way of thinking which would promote understanding.

Can I really claim to have changed? Earlier on in this chapter I quoted an ex-pupil of mine on the autocratic style of teaching that I had employed in the past. Now a teacher, he commented on observing me teaching, in project three that it was,

> surprising for him to find out that Mr. Abrahams pioneered collaborative maths teaching especially since such a lot of "freedom of expression" is allowed!
> (Boltman 1992:3)

This was confirmed in the report of the principal who served as an observer of my classes and as a triangulator during project three:

> When Mr Abrahams approached me ... to launch a project at the school I agreed readily. From the details provided I gathered that he was involved in a new approach to the teaching of mathematics. The actual reality of this `new approach' was vague to me until I stepped into the classroom one day where Mr Abrahams was

busy and I enquired what was transpiring.

Then I realised that Mr Abrahams combined the micro-group technique (with which I was familiar) with the collaborative learning experience (of which I had also a little background) in a controlled environment which was a highly stimulating experience for all the pupils concerned as well as for myself - I became involved as a triangulator. All of us loved the interactive approach, "sharing" rather than "being fed" knowledge.

Mr. Abrahams has definitely changed in his approach to education in the classroom. The formal rigidity of Mr. Abrahams' earlier years has been done away with. An informal atmosphere prevailed. Yet very definitely Mr. Abrahams still maintained discipline and very definitely "directed" the efforts of all concerned into positive "knowledge-generating" avenues (i.e. he facilitated the lessons). At all times he strove to maintain this creative atmosphere, where each participant was "allowed to participate, contribute, to be " ... Pupil empowerment - During the course of successive days I noticed that the pupils were empowered to voice their own opinions, challenge authority and assertively offering their own solutions.

(Boltman: 1992:4)

WORKING THROUGH PROBLEMS INHERENT TO MATHEMATICS EDUCATION

I gathered, during my years of teaching, that mathematics education, as Moodley (1992:2) also says, comes with its own problems. Amongst these problems are issues such as content, text books, language, teaching methodologies and research. Many of these issues might not have come through distinctly as things that I would work on specifically as part of the research cycles but they were very definitely pervasively diffused throughout the projects. For example, language usage common to pupils' ways of communicating in their environment was an integral part of the collaborative process in class. I had a hunch that this `pupil language', on

acceptable levels, would enhance the learning process more than formal mathematical language. I had no problem with them not sticking to formal school syntax. It was more important to me that they understand each other; this worked, I believe, because the pupils did come to understand each other more clearly.

I believe that my use of the less formal pupil language helped promote trust and understanding, which I thought were essential to promoting the learning process in my class. Because they could now understand what I was saying in their terms more clearly, they said, they were able to speak with each other collaboratively, without having to worry who was watching over them. I gained the impression that they appreciated the trust that I had vested in them. I thus preferred to break from a formal mathematical language. Besides, it was necessary for me to create this trusting relationship via a pupil language so as to reach them in some other way in order to explain mathematical terms and concepts, because as Ndidi too (1992:11) discovered, " ... they do not actually understand mathematical concepts and terms."

As with Ndidi I, too, have discovered that when pupils are taught through a language mode with which they are comfortable, " ... they can understand what is being taught more easily." The fact of the matter was that I allowed the

pupils to express themselves in the way that they felt most comfortable (in their collaborative groups) - for example, in their way of speaking a form of Afrikaans peculiar to the Cape Flats, as is evident in quotes from pupils in this thesis.

Since I wanted to facilitate mathematics as an investigative enquiry directed towards the understanding of their work I refrained from giving the pupils answers directly. At the same time they enjoyed the fun that was created in my questioning their answers. At first they had a problem getting used to me doing this. I captured in my diaries one statement that, I think, mathematical problems up this point:

> ... you make our minds go like elastic, its `nogal' nice you know ... why are you not satisfied with the answers that we give you ... we become tired of thinking.

After practically every lesson I would be confronted by pupils expressing their appreciation for being able to share knowledge, debate their points about an answer and in the end feeling proud that they had learned from each other. Ultimately, I heard them repeat that they understood the work better, and this was genuinely reflected in their classwork as well as in their class tests.

THE PROBLEM SOLVING APPROACH AND ACTION RESEARCH

I have noted Polya's (1957) approach to problem solving mathematics on aspects relating to mathematics in the Action

Research projects. I employed this mode effectively in word mathematical problems. His postulate of a collaborative approach as a means of solving mathematical problems was closely related to Action Research methodology.

Polya advocates a reconnaissance phase, scrutinising and trying to understand the problem through pupil discussion. As in Action Research, he then advocates devising a plan. Thereafter he advocates putting the plan into action. Pupils now carry out the set tasks, and then reflect, looking back to check the work and debating it.

The value of this model, I found while doing my projects, lies in its pedagogical implications. It suits the collaborative process mode of teaching for mathematics perfectly because it encourages an active enquiry. The pupils are able to discuss and talk through the work which helps the teacher avoid teaching by assertion, rather teaching by agreement and negotiation - in line with democratic teaching practices. Breen (1992:95), a scholar in mathematics education and a proponent of the collaborative approach towards mathematical problem solving, advises teachers of the value of Action Research as a collaborative process in the mathematics class:

> One of the most appropriate and accessible of research methodologies available for classroom research is that of Action Research. In this methodology an emphasis is placed on negotiation and collaboration. All participants in the research are involved in the planning and discussion stages.

From my experience I certainly agree with him.

THE PROCESS OF FACILITATION

One of the most meaningful learning experiences within my research into the collaborative approach was that of relearning how to work with a class. Noise, respect, tolerance of one another and behavioural problems were all issues that we had to deal with, within a collaborative group structure. In this I had to relearn to improve upon my role as a classroom facilitator through teaching in terms of a programme of classroom teacher facilitation. Considering, for instance, the problem of noise, it became necessary for me to re-examine my way of handling the problem from the perspective of a democratic mode as opposed to a traditional mode, because the course of events in terms of learning and educating depended upon the smooth running of the projects.

Given the fact that the pupils were not used to a collaborative group mode of learning, it was reasonable to have expected more noise in class. Contributing to the situation was the fact that I, too, had to find my way into a collaborative mode of educating in the initial stages. Besides, I was very apprehensive about coping with the Action Research methodology at the time. On the other hand, due to the fact that the pupils still had to come to terms with this apparently new teaching strategy, I found it necessary that

they go through these phases in order that they could see how important it was to have some form of discipline in their groups. As the facilitator I wanted them to work through and realise this themselves. This happened as the pupils spoke openly about cooperation, noise and behavioural problems in their groups, and this brought us to reorganize the groups in order to deal with the problem.

The process of facilitation in the collaborative process has proved to be a crucial one for me. This very process of classroom facilitation, I realised, separates the teacher as controller from the teacher as a transformative educator. Inherent in the process of facilitation are the realities of change for both pupil and teacher. I realised that I was not permitted to work in the class as an `expert' or controller of knowledge but rather I had to be prepared to share in the generation of knowledge and at the same time to be prepared to learn from the pupils and other participants in class.

On another level, as a classroom facilitator one has to be very sensitive to the execution of certain actions in class and in this respect the process of reflection has an important role to play. Sharpening one's mode of observation enables one to coordinate the whole process into an integrated whole. This implies that I had to move around from group to group to listen in or to problematise certain concepts. At the same time while listening in or questioning

the groups I had to be careful not to mislead the pupils as the constraint of time was ever present.

In the process I have also learned that the pupils were quite adept at manipulating you to get to an answer. For this reason I tried to problematise statements that they made instead of asking for direct answers. This, I feel, encouraged the groups to interact more rigorously. I also made it clear that although one could get to an answer on pure `gut feeling', or through intuition, I still wanted them to give well substantiated answers. It was not so much that I was dissatisfied with their answers, it was just that I wanted to bring out another relevant dimension of mathematics, which was for it to serve a purpose for life. As Breen (1992:87) puts it:

> The major challenge ... will stem from the challenge of using mathematics in real world situations ... into the world of using mathematics as a tool to help workers and students problematise their reality. This use of mathematics will empower the learner and enable her to become a subject in her world.

Perhaps one of the things one needs to be very careful about, especially when working with children, is their sensitivity to your attention to their groups. It might not seem significant but much of the motivation and encouragement has to come from a teacher if one wants to make the project work. As facilitator I also had to commend pupils or groups when I thought they came up with something really clever, which occurred quite often. Through doing this I was able to

encourage pupils to take note of what the quality of the mathematical thinking was that we encouraged. In this way I hopefully encouraged the promotion of a more critical approach to mathematics.

To me collaborative learning also took the form of inter-group discussions where the ideas of the groups are pooled and debated in order to get consensus and rigour into an argument. As a facilitator it was necessary for me to know when to engage this mode of inter-group discussion and at the same time to be sensitive to giving each group an equal chance of substantiating or criticizing a view point. I have thus learned through practice as a teacher researcher what an important role the facilitator plays in making a lesson or project a success.

One of the most invaluable lessons that I have learned was not to give answers too readily. The process of facilitation can thus encourage an emancipatory thrust when pupils are allowed and encouraged to find answers and problematise statements for themselves in inter- or intra-group discussions. It was necessary for me to engage the pupils in educating, providing answers for, each other.

One incentive for a group was when I tried momentarily to split one group by sending a member to other groups who were struggling to make meaning of a problem under discussion.

The problem was that I had to be very careful as this only had to be used as a last resort. The alternative would have been to stop the group discussion and make the pupils listen to one group but I found that the former way of doing it promoted an ongoing dynamic discussion out of which more or even better ideas could grow.

When it was necessary to problematise certain aspects I tried also to discuss them in terms of their relevance to life outside school. This, I think, made them aware of the fact that mathematics can be used for tangible things in the world outside of school, even in the political sphere.

One of the criticisms levelled at the collaborative approach is the time factor. The process can be time consuming but proper facilitation and some insight into the dynamics of what is happening in class can help one to overcome this problem, I have found. However, what appears to be time consuming, I believe, is a process which leads to a much deeper level of understanding, nurtured by pupil involvement and enjoyment and which in the long term is less time consuming.

My third project was perhaps the most revealing to me in terms of what I had originally set out to do. To some extent I believe that the process I set in motion was relatively successful in empowering the pupils, in encouraging a voice,

as well as in bringing into the class a democratic mode of working. This project enjoyed the advantage, too, of having a triangulator who had insight into the educational needs of pupils in the mathematics class. One other advantage, as I have suggested before, was that I had a better understanding of the Action Research methodology as well as of the process of collaborative learning.

It was in this project that the pupils, of their own accord, sought advice from the principal to ask their regular mathematics teacher to employ collaborative learning in the class. The fact that the pupils realised that they had the right to speak to the principal about what they had experienced through the collaborative learning process bears testimony to the fact that they knew what they wanted and had the confidence to attempt to get it. The fact that they acted and provided logical and well substantiated arguments as to why they needed to be taught via a collaborative process seems to prove to me that the pupils were somehow empowered. The principal, too, felt that the pupils had a democratic right to speak out against injustices.

I have learned that, although my first two projects can be criticised in terms of the requirements of Action Research, the fact that I was able to work in practically the same way on a similar project indicated that Action Research as a research methodology can be used as a mode of research from

one classroom to another or from one school to another. The process of reflection enables one to assess how to improve or modify the research findings from the one school to the other if needs be. I believe that in this way differences in the research projects can also be very revealing as well as a guide towards school improvement.

During the first project the pupils still sat in the traditional rows. I found this arrangement to be cumbersome as it was not conducive to the collaborative mode of learning, especially when six people were assigned to a group. My alternative arrangement was accepted well by the pupils in that the desks were rearranged so that the pupils could face one another. Besides that, I arranged the groups in such a way that each group could see the board clearly in the event of my wanting to discuss or teach something. The arrangement was convenient for the pupils, many of them informing me in surprise:

> ... It is better to sit this way. We don't have to turn around to speak or sit on the desks to see each other. ... As ons die way sit kan ons mekaar sien. Ons praat ook makliker en niemand kan weg steek nie.

However, during my last project the mathematics teacher, it seems, was not in favour of this arrangement. She said, "I cannot see myself teaching this way, there is too much talking going on in your `restaurant' education." What she forgot, it seems, was the fact that I had recorded her previously as saying:

> I like what you doing ... I never thought that the pupils would become so engrossed in learning. They don't even know we are around ... the results show they understand.

The fact that the pupils were allowed to talk through an idea and discuss the various steps in the mathematical problems helped them get a better understanding of the problems themselves and brought into play the relevance of mathematics in their daily lives. I encouraged them to make drawings or to make use of tangible examples that related to real life situations. I even encouraged them to try to attach some humour to their work. Some of them came up with some very novel and interesting ideas of working through the mathematical problems but it was mathematics experienced differently I thought that contributed to the classroom being a place where children could find a little happiness and enjoyment in what they were doing too.

The mathematics teacher, the triangulator, as well as other teacher observers who had taught this very class previously, attested to the fact that there was improvement in their results. They also mentioned that the programme brought about improvement in their attitudes generally, and this makes me satisfied that the process of repeated action and reflection in Action Research on the collaborative process helps to promote a better understanding of mathematical processes.

Some other encouraging results brought on by the projects

were also evident through the following observations:

- the pupils came to fetch me to get to the class (unlike before);
- they still wanted to go on talking about their work at the end of the lesson;
- I sensed that more and more pupils were starting to talk freely and with confidence;
- the frequency of pupils completing homework increased;
- the pupils showed more interest and said that they enjoyed mathematics; and
- test results improved as was evident in the report of both triangulators.

Bearing all these results in mind, I am inclined to believe that the collaborative mode of education is a workable solution to promote the enjoyment and most of all the understanding of mathematics. This was what Mrs Sadge, triangulator during projects one and two, said in one of her reports:

> ... there is no doubt that the pupils are gaining some insight into their work through this teaching approach to maths ... I listened to the arguments. They get into it.

Mr Patience (the school principal) said in a report:

> I sat in at most of the groups, I also participated in the discussions. It was captivating. The pupils have the ability to think logically and they certainly contest each other and this brings through meaning. What was exciting was that they were not afraid of questioning my statements. Through this type of questioning and through what I saw in their doing of the exercises that you prepared I am sure that they do have a better understanding of the commutative, associative, and distributive laws.

THE SPIN OFF: OPEN BOOK TEST

I would not consider the open book type of test that I administered in project Three as divorced from this project. Action Research is a dynamic mode of research, it somehow entices you to try this or that and because of this nature of the mode of research one easily falls into this `trap' which I somehow enjoyed. McNiff (1988:45) sees it as such:

> Generative Action Research enables a teacher-researcher to address many different problems at one time without losing sight of the main issue.

I convinced myself that there is no such thing as a next time to research things: the notion of an open book type of test was just another idea that emerged in the project and that I thought might enhance the process of mathematical thinking and understanding - as it did, in terms of the results that we monitored. Besides, I was in a process of change and to me classroom practice meant a whole process, not a decompartimentalised process. Thus I refused to change in some areas while others lagged behind. I did not want to have to come back to things that I could have included in the project.

So, as far as I am concerned, the open book type of test should be considered to be a spiral off from the main focus of my project. The reason I say this is that in view of the process of change that was taking place in class I could not simply hold onto traditional methods of testing any longer.

To me a test had to show insight and understanding. Perhaps again I was too ambitious in getting things that had bothered me all these years solved by `testing' them through an Action Research mode. The reason for my seeming to be ambitious was that I had convinced myself that " ... You either change your entire outlook on education or you don't change at all." Perhaps I was naive in becoming committed to change, so much so, that I wanted to change my whole teaching practice. However, how I had been schooled as a teacher prior to the M.ED Action Research course certainly had a bearing on my renewed perspective. I was actually shocked to find out what kind of teacher I had been.

INTUITION AS PART OF ACTION RESEARCH

Action Research as a research methodology encourages teachers in practice who are critical of the methodologies they have used in the past to try out their own intuitive answers to classroom practice. I want to argue that because of the nature of the Action Research methodology there is a place for intuition in Action Research too. Volmink (1992:18) believes that " ... intuition plays a vital role in the learning and teaching of mathematics ... as an instrument and a guide for action." Based on experience one often has the feeling that things can be changed in class or that things could be improved in one's teaching practice. Bruner, cited by Volmink (1992:21), says:

> Intuition implies the art of grasping the meaning, significance or structure of a problem or situation without explicit reliance on the analytic apparatus of one's craft ... once achieved they should if possible be checked ...

The reason for my claim is that committed teachers who want to break from the notion of being skilled technicians, teachers who are not prepared to be fed by an external or prescriptive methodology, can try out that which they feel can work in practice. Such a research approach enables them to be the creators of a theory based on actual accounts of classroom practice.

WHAT ACTION RESEARCH OFFERED

The collaborative structure inherent in the Action Research methodology created a supportive environment in class in which pupils could freely share in the generation of their knowledge. As a result I observed that Action Research also provided for an atmosphere of tolerance in class because of the diversity of approaches to solving mathematical problem in the groups.

Action Research promoted a cooperative interactive pattern in the class between teacher and pupil so that they too could work and generate knowledge together. I am inclined to believe that Action Research was instrumental in creating a culture of respect and acceptance of all those involved. Action Research helped me to develop a conscious awareness of

my pupils all the time through encouraging them to reflect on their statements and to substantiate their arguments. Through this the pupils were able to make meaning of the mathematics problems that led to a better understanding of the mathematics they encountered in class. The process, seen as a whole, can lead the pupils to experience mathematics as a form of empowerment.

Action Research as a form of practitioner research allows teachers to make an enquiry into their practice all the time - it is inherent in the process of reflection. As a process Action Research enables committed teachers to start with small projects in class in order to improve upon their practice and their ability to investigate that practice. It allows a teacher to polish the rough edges which may be bothering and confusing in order to get to the root causes of problem areas. As a research mode for mathematics, I found that Action Research, through the process of action and reflection, provided me with an ideal opportunity to look into the heart of problems that were bothering me as well as of problems that pertained to the subject and the pupils. For the pupils it provided an opportunity to give expression to their personal development in terms of understanding and in gaining self confidence and voice.

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APPENDIX A : LETTER TO PARENTS

PUPIL'S NAME _____ STD 5 _____

Dear Parents

I assume that our pupils have by now discussed with you the project which I would like to do with them in the class. The project, which is a research project, forms part of my university course work in Action Research. In doing the project I would like to see whether I could improve upon my own classroom practice as well as to see whether the pupils could get a better understanding of mathematics through applying an Action Research research methodology. It would assist me greatly if I could have your permission to carry out this research project with your child/children at our school.

You are at liberty to contact me at any time at school if you need to know anything further about the project.

Please indicate below whether I have your permission to proceed.

Thank You

A. Abrahams

PARENT_____ PERMISSION GRANTED...1) YES

2) NO