AN INVESTIGATION OF LEARNERS' PERCEPTIONS OF HOMEWORK IN RELATION TO THE LEARNING OF MATHEMATICS: CASE STUDIES IN THE NORTHERN TOWNSHIPS OF PORT ELIZABETH

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GABRIELE ERIKA WENDT

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ABSTRACT

Matriculation pass rates in South Africa, especially in Mathematics, have been poor. The literature and personal experience suggests that a problem with homework may be a factor in this. In order to discover how Port Elizabeth learners from ex-DET schools perceived and experienced Mathematics homework, and the nature of such homework, ten case studies of Grade 11 learners were done. While conducting and analyzing the case studies, a pattern emerged from the findings, which together with some new questions, needed to be explored on a larger sample population. In order to do this and to be able to generalize the findings, four follow-up studies in the form of surveys on Mathematics homework were conducted at nine schools. These studies involved a learner questionnaire, a teacher questionnaire, the timing of learners as they did set Mathematical problems and the analysis of common errors made by the learners while doing the problems.

The findings revealed that learners received too little homework too infrequently and did it inefficiently and ineffectively. The learners worked too slowly, did not complete the homework, left out the difficult problems and made numerous unnecessary mistakes. However, most of the learners claimed to have enough time available to do their homework and spent approximately one hour on Mathematics homework when it had been assigned. Many of the misconceptions and the resultant errors originated from work that should have been well covered in previous grades. However, parts of the syllabi were omitted in previous Grades and completion of the syllabus and homework was only seriously considered in Grade 12. Some implications of the findings for educational practice and further research are discussed.

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CHAPTER ONE

INTRODUCTION

1.1 The roots of the study

This research springs directly from personal experience.

As a Mathematics teacher with ten years experience at schools and a Teachers' Training College, I have always been very aware of the academic results of my own learners and students, as well as those writing the Matriculation Mathematics examinations. As Matriculation results are usually well publicized (and criticized), my awareness and concerns about the Mathematics results were constantly brought to the fore. Figures of the last years of the Department of Education and Training (DET - the department dealing with Black Education only) examination results illustrate the general problem and support the extent of my need to investigate one aspect of the phenomenon.

The poor state of the Matriculation results, and especially the Matriculation Mathematics results, can be judged from the official and unofficial figures presented below. The national pass rates for DET Matriculation candidates writing the National Senior Certificate (Std 10) examinations in 1992 and 1993 were 33,5% and 29,9% respectively. The Cape Province (East and West combined) fared little better at 37,5% and 30,5% respectively (Ms B de Wet, D.E.T. pers. comm. according to the official press statement by Dr B. Louw in January 1994). The National Senior Certificate pass rates for Mathematics were even lower at 17,9% (SG) and 18,5% (HG) in 1992, and 17,9% (SG)and 16,5% (HG) in 1993 (Mr J. van Rensburg, D.E.T. pers. comm. October 1994).

Detailed results after 1993 are not officially available. The 1995 ex-DET schools' results that I was able to obtain unofficially set the Mathematics pass rate for HG and SG together at 33%. The Mathematics results obtained (unofficially from the departmental computer, through personal contacts in the Department of Education) in 1996 for all East Cape (1996 boundaries) schools were 31,8% for HG and 39,1% for SG. It was suggested that these results were inflated and were not a true reflection of the situation, especially in view of the overall pass rates for ex-DET schools in the Eastern Cape being 41,70% in 1995 and 35,74% in 1996. The figures above thus suggest that more candidates passed Mathematics in 1996 than passed Matriculation. However, considering that not all Matriculants take Mathematics, that most learners consider it a difficult subject and that Matriculation can be passed even if Mathematics has been failed, the idea that more candidates passed Mathematics than passed Matriculation is improbable. The overall pass rates later released for all schools (not only ex-DET schools) were 47,8% for 1995, 49% for 1996 and 45,5% for 1997 (Strauss, van der Linde, Plekker and Strauss, 1997)

International literature shows a relationship between doing homework and Mathematics achievement (Goldstein, 1960; Keith, 1982; Keith and Page, 1985; Stevenson, 1998). Learners doing regular homework of appropriate quality and quantity were found to achieve higher marks than those who did not do regular homework. Educators also generally support the view that regularly assigned homework enhances learner achievement. Aspects identified in the literature, as affecting the relationship between homework and achievement, include whether the homework is marked, the type of homework assigned, the frequency of homework assigned and the time spent on homework by the learner.

The findings in the literature confirmed my own experience that learners who did regular homework and took it seriously outperformed learners who did homework randomly and treated it casually.

My experience with learners and students is varied. My first few years were spent teaching High School learners Mathematics and Functional Mathematics. The latter years at a Teachers Training College included the first year Mathematics course, which concentrated on school Mathematics. Although Mathematics was a prerequisite for all applicants for the Secondary Diploma at College, the Matriculation Mathematics symbols generally obtained by the candidates were E (HG) or D (SG). The first year course offered thus followed much the same methods and subject matter as at a school.

Throughout all my years of teaching, motivating learners and students to do Mathematics homework has always been a challenge. All learners and students maintained that they realized that Mathematics was a thinking subject which required much practice and logical thought. Teachers, students and learners agreed that Mathematics differed from 'learning subjects' such as History or Biology in that it demanded constant practice. That Mathematical theory needed to be learnt was accepted, but most felt that it could be learnt during practice, rather than employing the methods used in the 'learning subjects'. A formula used twenty times over, while working on related problems is a formula easily remembered. Why, then, do the learners and students demonstrate a resistance to doing homework?

The final realization for the need to investigate the problem emerged while I was teaching a Bridging Course for learners who needed Matriculation Mathematics. These learners had previously failed the subject or had not taken it since Grade 9. The course involved lectures, tutorials and computer-aided tuition on the Standard Grade level. Contact sessions consisted of three hours on two afternoons a week (Mathematics only) for a year. The outcome of the course was that, over the years that the course was offered, only 18% - 46% respectively improved their symbols, or passed without having done Mathematics before. The majority did not benefit.

The main complaint by lecturers and tutorial assistants was that the students did not do their homework. Some appeared not to do any homework and the majority did only some of it or only did it sporadically. In contrast, one particular learner did his homework regularly and obtained a B symbol for the final examination. Highlighting his achievement was the fact that he had last done Mathematics in Grade 9. He had thus done three years of Mathematics in one year and done it exceptionally well. He received no additional attention or lectures but did ask questions and regularly handed in his work. His other Matriculation symbols did not suggest that he was above average in intelligence.

It was my observation over the years that those learners and students who regularly did homework were also the better achievers. However, questions such as "did they

do homework because they were able to?" or "were they able to do Mathematics because they did homework" were not that easily answered.
Another factor influencing this study pertains to the attitude and support given to the subjects by their parents. Although the high illiteracy and innumeracy rate among African people in South Africa prevents many parents from helping their offspring directly with their schoolwork and homework, motivation and support too seemed to be lacking. When informally questioning eight of the learners who were doing the Bridging Course on the topic of parental support, all said that they received no direct or motivational support from their parents. None were actively encouraged to do nor discouraged from doing homework or studying. Only financial support (ie. board, lodging and course fees) was supplied by their parents.

1.2 The focus of the study

The study is based on the literature stating that homework and parental support do indeed affect achievement in Mathematics. Sufficient research has demonstrated that greater quantity, and especially better quality, homework and parental support increase learner achievement in Mathematics. The question that arises is whether increased homework quantity and/or quality could improve the Matriculation Mathematics results of the Black learners in the Port Elizabeth northern townships. In order to answer the question, it is necessary to understand the homework situation of the ex-DET learners. This would lead to an exploration of the possible causative relationships between homework and achievement in Black schooling. This study investigates and describes how homework is perceived and done by learners in the northern townships of Port Elizabeth.

This perspective of the broad topic of the effect of homework on achievement in Mathematics was chosen for three distinct reasons:

- Firstly, it was do-able and kept the study within feasible limits.
- Secondly, when compared with variables such as poverty, socialisation, resources and teacher up-grading, homework is probably something that can be changed and have an effect in the shorter term.

- And lastly, it offers the possibility of the individual learners being able to help themselves rather than waiting for someone else or the government to solve the problem. Homework, too, is easy and inexpensive to implement.

1.2.1 Feasible limits

Any study, to be effective, needs to be directed and goal orientated. As such, decisions need to be made at the beginning of the study, which will limit the study to certain conceivable aspects of the chosen topic. These decisions can be amended during the study, provided that the direction and goal are maintained. Care needs to be taken that the study does not become so broad as to `dilute' the resources available for the study. Such dilution would result in the various aspects of the study receiving less attention or emphasis than they warrant. The resultant lack of attention to detail could mean that important information is ignored or overlooked.

To prevent the dilution of information, a study needs to be kept within feasible limits. Smith (1978, as quoted by Merriam, 1991) used the expression `bounded system' to describe a study with set, obvious boundaries. The nature and direction of the research questions are known and the amount of control desired is set. In other words, set aspects of the chosen topic or issues have been identified as the focus of the investigation.

1.2.2 Short-term changes

According to the literature (see 3.2), possible reasons contributing to poor achievement and thus the low Mathematics pass rate include a myriad of factors from the past apartheid and political activities through parental economic status to the economic state of the country.

These factors are so intertwined and interrelated that trying to solve only one of them would be meaningless. The change would only meet up with the inertia of the other factors, resulting in almost no change. A large amount of money, time and commitment are needed to effect the changes necessary to benefit the education system.

Unlike the above factors, homework and study habits can be changed in the shorter term. If problems with homework can be identified, a teacher, his learners and their families stand a chance to effect a change and thereby improve the learners' academic achievement in the short term. They would not have to wait for some major organization to effect a change in the long term.

Furthermore, the implementation of change in the apartheid system took decades to bring about. Similarly, the alleviation of poverty, decrease of large-scale unemployment or the upgrading of teachers will take years. The learners at school at the present time cannot afford to wait years for changes to take place. They need to improve their Mathematics achievements before they leave school. The same can be said of the country's workforce, which needs qualified and competent Mathematics Matriculants and graduates in the short term.

1.2.3 Self help

One individual, or a few together, could not possibly hope to effect significant change in the above mentioned factors. Individual learners need to be able to help themselves rather than wait for someone else or the government to solve the problem. They need to be offered a solution at a level at which they have control, which they can implement independently and which is inexpensive.

Homework is an area in which the learner has individual control. The learner does homework independently, away from school. A learner may thus be able to help himself despite other circumstances. A learner and his family would stand a chance to effect a change and thereby improve his academic achievement in the short term. With enough motivation, determination to work hard and family support learners may be able to help themselves despite other circumstances. They would not have to wait for someone else to do it for them or spend a lot of money on effecting the change. Furthermore, change in homework and study habits is inexpensive.

1.3 Aim of the study

The aim of this study is to investigate and describe how homework is perceived and done by learners in the northern townships of Port Elizabeth. The approach was twofold:

To investigate:

(1) The perception and experience of homework by the learners.
(2) The nature (quantity and quality) of such homework.
(3) The awareness and involvement of parents in their children's homework.

The assumptions made at the onset of the study and supported by the literature (Chapter Three) are:

(1) Regular homework is beneficial to achievement in Mathematics.
(2) Parental support is beneficial to achievement for high school learners.

1.4 Organisation of the study

The Context

Chapter Two describes the political, social and educational environment, which formed the background to the lives of the learners involved in this study.

The literature reviewed

Chapter Three is a selective review of the literature concerning current research and beliefs regarding Mathematics homework and parental influence.

Methodology of Phase I

Chapter Four deals with the methodology used in Phase I of this study, as well as the justification of case studies and their interpretations.

Findings of Phase I: A pattern emerges

Chapter Five contains a synopsis of each of the case studies and a description of the emerging pattern as discerned by me.

Discussion of Phase I: The specific and the general

Chapter Six is a discussion of the emerging pattern with an attempt at justifying the pattern and setting further questions. The further questions are an attempt to confirm the emergent pattern and so to generalize more widely.

Methodology of Phase II

Chapter Seven describes the methodology for the second phase of the study. The methods and the justifications of each of the four follow-up studies are set out separately.

Findings of Phase II: Some questions answered

Chapter Eight deals with the attempt to answer the questions derived from the case studies. It is subdivided into four sections according to the four studies used and presents the findings of each follow-up study.

Discussion of Phase II: Confirmation and generalization

Chapter Nine is a discussion of these findings and a comparison with available literature.

Some concluding remarks

Chapter Ten offers concluding remarks, recommendations and suggestions for future research on the topic of this study. It also contains criticisms of the study and considers the limitations of the study.

A case study

Appendix A presents an individual case study in narrative form in its entirety, with as little interpretation of the data as possible.

Case study interview questions

Appendix B contains the set, structured interview questions, which were used to initiate information gathering for the case studies. Further semi-structured and unstructured questions were used before, between and after these 'formal' questions.

CHAPTER TWO

THE CONTEXT OF THIS STUDY

2.1 Introduction

The learners involved in this study, be it in the case studies or the surveys, have been affected by the political manoeuvring and the educational climate before and for the duration of their schooling. Unrest and protests have affected their school attendance and attitudes towards school and education. Their parents' education (or lack thereof) has affected the support the learners have received from their parents. As such, it is necessary to view the learners' perceptions of homework in context with the political and social changes that have occurred in South Africa in the recent past.

This chapter gives the reader some background to the education system of South Africa in the second half of this century. Much has taken place in the political arena concerning education over that period and many changes have taken place. The changes, the machinations behind them, as well as their effect on the education system and the children within it, are briefly described below.

The events described have been set out in an integrated chronological order so as to facilitate reading and understanding. This does not claim to be an exhaustive description, but rather an overview for the study at hand. Readers wishing to know more detail than described, are referred to Christie (1991) for easy reading and to Hartshorne (1992) for deeper analysis and insight.

2.2 General Education Policies: 1945 - 1999

2.2.1 Segregation and apartheid education

By the end of 1945, South African education was already differentiated along lines of colour and social class.

At the time, education for Blacks was entirely in the control of missionaries. There were continual shortages of money as Government expenditure for Black Schools was pegged at the 1922 levels. Any additional expenses for Black schooling came from a "Headtax" for Blacks only. Few Blacks achieved higher education while most received virtually no schooling at all (Christie, 1991).

Whites, however, enjoyed a system of free and compulsory education. Most White children thus attained secondary education and many completed technical or higher education. Private schools were available for the privileged.

The struggle to eliminate this disparity between Blacks and Whites had been on-going for many years. Black protest was not new to South Africa. The South African Native National Congress had been formed in 1913 to protest against the Land Act of 1913, which set up the bantustans or homelands. The South African Native National Congress later became the ANC (Christie, 1991).

In August 1946 there was a serious strike at Lovedale, a pioneer educational institute near Alice in the Eastern Cape. School premises were damaged and prefects and White teachers were attacked. It was suggested by the Commission of Inquiry that the students had been influenced by the current mine worker's strike, which alongside other strikes, stoppages and demonstrations, was taking place throughout most of the country (Christie, 1991).

As a result of continued strikes by learners and students, the Government of the time was aware that education needed to change. The Eiselen Commission was thus appointed to look into Black education in 1949. The commission reported that radical measures were needed to reform the system.

In 1952 the Cape African Teachers' Association (CATA) and the Transvaal African Teachers' Association (TATA) condemned the Eiselen Report as being too moderate and held meetings to find ways of resisting the prospective system of 'Bantu Education'. They called on teachers and parents to oppose the new system. As a result CATA lost government recognition and militant teachers were dismissed (Christie, 1991).

However, in 1953, the Bantu Education Act was passed. It stated that all schools for Blacks had to be registered with the Government. The former missionary schools and the so-called 'night schools' were then taken over by the Government. Those not taken over closed down, due to a number of measures that made it extremely difficult for them to remain open and independent. Only three types of schools were allowed: Bantu Community Schools, State-aided schools (including mission schools) and Government Schools. However, this did not mean that Black education was made compulsory. In fact, the Bantu Education Act was the beginning of the apartheid education system (Christie, 1991; Graham-Brown, 1991), which led to segregated (and inferior) education for Blacks.

2.2.2 Protests against the Bantu Education Act

In May 1954, the ANC launched the "Resist Apartheid Campaign". Protest against the Bantu Education Act was one of the issues of this campaign. The other issues were: pass laws, Group Areas Act, Native Resettlement Act, Suppression of Communism Act and the anti-trade union measures (Christie, 1991). The Women's League and the Congress Youth League (CYL) were given the task of confronting the Bantu Education Act as the ANC did not have sufficient resources to fight on all fronts.

On a directive of the ANC given in December 1954, an indefinite schools boycott was to be launched from 1 April 1955. This was later postponed due to ineffective planning. A committee was set up to plan alternative education for the children during the boycotts. This committee later became the African Education Movement. The boycott started on 12 April 1955 in the Eastern Cape and the East Rand.

Many of the boycotting children were expelled from school. The boycott was seen as unsuccessful due to lack of proper planning and the strong repressive actions by the government (Christie, 1991).

In 1954 and 1955 Black teachers and students protested against the 1953 Bantu Education Act. At this time the African Education Movement was formed by the ANC to provide alternative education during school boycotts. These 'Culture clubs' operated as informal schools.

In 1959, the Extension of University Education Act was passed. This Act established separate Universities for Black students. They could now no longer attend "White" Universities. This resulted in strong protests against the Act throughout the country.

Although not entirely unsuccessful, by 1960 all culture clubs had closed down due to dwindling numbers as most scholars returned to state schools after the 1955 boycotts.

Thereafter followed the total segregation of education according to colour. This was done over a number of years, and included the forming of separate Education Departments for the different race groups. Three separate departments were thus formed, in addition to the separation caused by the Bantu Education Act.

The Coloured Person's Education Act was passed in 1963. Coloured education fell under the Department of Coloured Affairs and all Coloured schools had to be registered with the Government. Education for Coloured children became compulsory.

The Indian Education Act was passed two years later in 1965. Indian Education fell under the Department of Indian Affairs. Education for Indian children became compulsory.

In 1967, the National Education Policy Act was passed. It set out the principles of Christian National Education for White schools (Christie, 1991; Graham-Brown, 1991).

The Black South African Students Organization (SASO) was formed in 1969. In June 1976 the Soweto uprisings took place.

2.2.3 June 1976 Soweto uprisings

Resistance to the education system and its changes continued with the protest against the 1959 Extension of University Education Act. Unrest continued at schools during the 1960's. In 1972 three organizations were formed by the Black Consciousness (BC) movement. These were the South African Students Movement (SASM), the Black People's Convention (BPC) and the Black Community Project (BCP). In 1973, a series of strikes in Durban opened a new chapter in the development of the struggle against exploitation and oppression. A mood of combativity and a willingness to struggle emerged and developed out of the strike wave (Ismail and Grossman, 1998). Strikes, rallies and a number of political trials dominated the next few years - the longest of which was the trial accusing SASO and BPC leaders of promoting anti-White feelings and encouraging racial hostility (Christie, 1991).

It was in this atmosphere that the Minister of Bantu Education declared in 1975 that half of the subjects in Std 5 and Form 1 (Std 6) would forthwith be taught in Afrikaans (Christie, 1991). Certain subjects, including Mathematics and Social Science were to be taught and examined in Afrikaans (Lemon, 1994). Protests against this new regulation spread from school to school. Some opposed it for educational reasons, saying that the children would suffer, others on political grounds.

On June 16, 1976 the South African Student Movement (SASM) held a mass demonstration. Twenty thousand students marched through Soweto in protest against the enforcement of Afrikaans in the schools (Christie, 1991). The police opened fire and the Soweto uprisings began, resulting in at least 176 lives lost within the first week. South African education was in total chaos (Hartshorne, 1992).

The uprising spread throughout Soweto, then to townships on the Reef and around Pretoria, Nelspruit, Klerksdorp, Bothaville, Kimberley, Cape Town and the homelands. Even the Coloured students in Cape Town joined the protests (Christie, 1991). The students set fire to schools, beerhalls, liquor stores, White-owned businesses and vehicles. They went on marches and stay-at-home campaigns. The police "used dogs, guns, teargas, armoured cars (hippos) and helicopters. They raided houses and searched people at roadblocks. They detained without trial. And they shot" (Christie, 1991 p 241).

Among the people detained without trial was Biko, the BC leader. His subsequent death in detention in 1977 shocked the world. It was only in 1978 that the uprisings finally settled (Christie, 1991).

In 1979 the Education and Training Act was passed. It replaced the Bantu Education Act of 1953 and Black Education was placed under the Department of Education and Training (DET). Education for Blacks stayed segregated and unequal, although more money was now spent on education and teacher upgrading than ever before. New schools were built.

2.2.4 The 1980 Boycotts

In 1979 the Congress of South African Students (COSAS) was formed. Its policies differed from those of the BC in that it supported the Freedom Charter of 1955. COSAS concentrated on organizing students nation-wide and linked education matters to the broader struggle (Christie, 1991).

The Freedom Charter affirmed that South Africa belonged to all its inhabitants, Black and White. It demanded a non-racial, democratic system of government and equal protection for all people by the law. It urged the nationalization of banks, mines and heavy industry, as well as land distribution. It called for equal work and education opportunities and the removal of restrictions on domestic and family life. The wording of the Charter struck a good balance with its omission of reference to any racial group and its stand on behalf of all South Africans (Davenport, 1992).

The 1980 student boycotts began in Cape Town and spread through the country with a vengeance. They had learnt, from the 1976 uprisings, that good organization and co-ordination were needed for success. Black students over the entire country boycotted schools to protest against poorly equipped schools, the poor state of repair of schools, the shortages of qualified teachers and the dismissal of political teachers. They also wanted corporal punishment banned, no security police at schools and the right to appoint independent Student Representative Councils (SRCs). Teachers came out in organized support of the boycotts and pledged their solidarity.

The students of 1980 linked their demands to those of the wider society, ie. the Black workers. They would not become trained and educated to become slaves in the apartheid-capitalist society. Thus the students were not only challenging the education system, but the political system as well.

As in the 1950s, the students organized alternative education during the boycotts. School buildings were used as venues for the alternative education. The education centred on talks, discussions and debates to raise children's awareness on many topics. These included the history of Black people in South Africa, the June 1976 uprisings, the education system, politics in South Africa and sports policy.

In some schools these programmes were well attended with active participation, the children in the classrooms the majority of the time. In other schools, little or nothing went on for long stretches during the boycott. Children would stand around chatting, play ball games or drift off home. Most left school around midday (Molteno, 1983 as quoted by Christie, 1991).

By the beginning of 1981, most of the children were back at school and the boycott was over. This was partially due to the sense of fun and excitement turning into boredom and depression. Unfortunately, orderliness and discipline had broken down in many quarters (Molteno, 1983 as quoted by Christie, 1991).

However, the boycott was not seen as a failure. Some of the immediate school-based problems were dealt with. Additional textbooks were made available and school buildings were repaired. But schools remained segregated and education unequal (Christie, 1991). Another major gain was the degree of unity achieved in the Black struggle. This was unprecedented in the country (Molteno, 1983 as quoted by Christie, 1991). In addition, partly as a response to growing opposition in the country, the

Congress Alliance and the ANC military wing *umKhonto weSizwe* embarked on sabotage tactics that were more visible than those previously, during and after 1981 (Ismail and Grossman, 1998).

The effect of the combined unrests of 1976 and 1980 led to the De Lange Commission being set up to investigate education and charged with making recommendations for an education policy for all in South Africa (Christie, 1991 and Hartshorne, 1992).

The Education and Training Act was followed by the De Lange Commission, which was appointed by the government and instituted by the HSRC, in 1980. The Commission was to conduct an in-depth investigation into education and to make recommendations for South African education. The report, published in 1981, recommended a single education department, equal education for all and a changed school structure.

2.2.5 The De Lange Report

The De Lange Commission was appointed by the government in 1980 to do an in-depth investigation into the education system of South Africa. This was in response to unrest in schools, the 1980 school boycotts and complaints from industry and business concerning the shortages of skilled workers. The last investigation into education had occurred thirty years previously with the Eiselen Commission in 1949-51. This represented 30 years without educational change; too long for any country (Hartshorne, 1992).

The De Lange commission was assigned to make recommendations for an education policy for all in South Africa. These recommendations were to centre on:

1. Guiding principles for a feasible education policy in South Africa in order to:
   (a) allow for the realisation of the inhabitants' potential,
   (b) promote economic growth in South Africa, and
   (c) improve the quality of life of all the inhabitants of the country.
2. The organization and control structure, and financing of education.
3. Machinery for consultation and decision-making in education.
4. An education infrastructure to provide for the manpower requirements of

South Africa and the self-realization of its inhabitants.

5. A programme for making available education of the same quality for all population groups (Hartshorne, 1992).

The investigation was to be conducted in the light of, among other things, the present educational situation, the population composition in South African society and the means that could be made available for education in the national economy. The investigation was to cover all levels of education, ie. pre-primary, primary, secondary and tertiary (Hartshorne, 1992).

The De Lange Report put forward 11 proposals. These were:

1. Equal opportunities for education, including equal standards in education, for every inhabitant, irrespective of race, colour, creed or sex, shall be the purposeful endeavour of the State.
2. Education shall afford positive recognition of what is common as well as what is diverse in the religious and cultural way of life and the languages of the inhabitants.
3. Education shall give positive recognition to the freedom of choice of the individual, parents and organizations in society.
4. The provision of education shall be directed in an educationally responsible manner to meet the needs of the individual as well as those of society and economic development, and shall, *inter alia*, take into consideration the manpower needs of the country.
5. Education shall endeavour to achieve a positive relationship between the formal, non-formal and informal aspects of education in the school, society and family.
6. The provision of formal education shall be the responsibility of the State, provided that the individual, parents and organized society shall have a shared responsibility, choice and voice in this matter.
7. The private sector and the State shall have a shared responsibility for the provision of non-formal education.
8. Provision shall be made for the establishment and state subsidization of private education within the system of education.

9. In the provision of education the processes of centralization and decentralization shall be reconciled organizationally and functionally.

10. The professional status of the teacher and the lecturer shall be reorganized.

11. Effective provision of education shall be based on continuing research. (From Hartshorne, 1992 pp 156-7).

The De Lange Report further proposed an educational system under one education department for all groups and a move away from the traditional, formal schooling patterns of twelve grades. The new schooling structure involved a formal or academic structure running parallel to a non-formal or vocational structure (Chisholm, 1984).

The formal structure would have three phases: pre-basic, basic and post-basic. In essence similar to pre-primary, primary and secondary education. Basic schooling would be six years of free and compulsory education for all children. The children would be assessed on academic achievement for three post-basic streams. These were academic schooling, commercial or technical schooling and non-formal education, eg. in-service training or the learning of a technical skill at a private institution (Christie, 1991).

The De Lange report also illustrated the poverty of teacher training in Black education. Whereas nearly all White teachers had had twelve years of schooling and over 30% had degrees, only 2,45% of Black teachers had degrees, 16,09% had passed Std 10 and 62,9% had only passed Std 8. Of all Black teachers 18,56% had only passed Std 6 (Davenport, 1992).

The De Lange Report's guiding principles were accepted by the government in a White Paper issued in 1983. However, the major recommendation of a single education department was rejected. The government began to place emphasis on technical education and recommended that industries set up programmes to train and upgrade workers. Trade Unions also started to play a greater role in education by providing education for workers.

2.2.6 The White Paper of 1983

Different groups reacted differently to the De Lange report. The conservatives saw the proposals as a threat to Afrikanerdom. A more moderate group than the conservatives agreed that it was a possible strategy for reform. Liberals and capitalists welcomed the report while the radicals argued that it was a modernization of apartheid (Christie, 1991). Black South Africans felt that it merely confirmed what they had been saying for two generations (Hartshorne, 1992).

The White paper rejected the De Lange proposal of a single education department for all South Africans. While it accepted other proposals, it stressed that Christian National Education (CNE) principles would remain the basis of education in the country. It made a clear statement that segregated, vertically segmented forms and systems of education were to remain. CNE, mother tongue education, separate schools, separate departments and separation according to the Group Areas Act would not change. Thus, for example, under-utilized facilities in White Areas could not be made available to other groups etc. (Hartshorne, 1992).

The liberals and capitalists viewed this as a setback for reform as they felt that all proposals should have been accepted. Radicals felt that the De Lange proposals that had been accepted supported a system of education, class, race and gender differences. Working class (poorer and predominantly Black) children would be most likely to be channelled into the technical and vocational streams. Middle class children would be more likely to afford an academic education than those from the working class, as their parents could pay for it (Christie, 1991).

The De Lange Report, although not fully accepted by the Government, did bring the eleven principles into open discussion, against which the government's actions could be measured and challenged. The new legislation of 1984 (the National Policy for General Education Affairs Act) resulted from the De Lange report and the White Paper. It brought material advancement in Black education, an emphasis on technical education, a "so-called" ten-year plan, new financial formulas that would increase spending on Black education, multiracial councils of various kinds and serious attempts to co-opt Black teachers. However, segregation continued, major issues were not addressed and progressive ideas were crushed. Renewed protest and resistance thus dominated education in 1984-86 (Hartshorne, 1992).

The year 1984 saw the installation of the National Policy for General Education Affairs Act, to bring the education system into line with the constitution of 1983. A "general affairs" education department now oversaw finance, teachers' salaries and registration, and the curriculum. "Own Affairs" Departments of Education and Culture were set up for Whites, Indians and Coloureds while Black education was deemed a "general affair" and remained under the DET, headed by Whites (Christie, 1991; Lemon, 1994). Education in the Homelands still fell under their own departments (Christie, 1991).

2.2.7 Education Charter Campaign

In 1984 another period of protests and boycotts began after an uneasy calm had lasted through the earlier 1980s. The protests began with school issues such as the poor marking of the 1983 matriculation examination papers, the need for democratically elected SRCs, upliftment of the age limit restrictions, banning of corporal punishment and sexual harassment of students by teachers. These boycotts had started in Cradock and Port Elizabeth and resulted in a number of schools in Cradock, Pretoria and the Rand being closed by the DET.

It was during these boycotts that COSAS, AZASO and NUSAS (three student organizations) together launched the Education Charter Campaign in February 1984. Their main objectives were to bring enhanced unity to the protests by streamlining student demands, to consult with all students, to develop the organizational network, establish additional branches of AZASO and COSAS and to develop a document of action in order to strive for a democratic and relevant system of education (Christie, 1991).

These boycotts soon became part of the broader campaign including issues on rent and service cost increases. Police reacted to the protest by sending the army into the townships with the police. This only increased the boycotts and over 200 000 students went out on boycott in the Vaal Triangle alone. The Eastern Cape and the Reef were just as active in these boycotts. The students became increasingly militant, barricaded streets and fought street battles with the police and army. They burnt property, attacked suspected collaborators and took part in "people's courts" and necklacing (placing a tyre around a person's neck and setting it alight) (Christie, 1991).

Students often had no education to believe in. With a militant atmosphere abounding and not much to keep them at home or school, they literally had nothing to lose (Ismail and Grossman, 1998). The slogan of the time was "Liberation Now, Education Later" (Unterhalter and Wolpe, 1991).

United action between students, workers and community groups reached a height in the November 1984 stay-aways. This did not last long. In Port Elizabeth (among others) youth groups and unions could not reach an agreement in organizing a stay-away in early 1985. There was antagonism between the two groups. Often the youth were more militant than the community, leading to tension and resentment. In some cases, they forced their views on others, enforced school boycotts by picketing at school gates and refusing to let other students enter, enforced consumer boycotts by searching and intimidating shoppers and attacked bus drivers to enforce stay-aways (Christie, 1991).

A breakdown in learning resulted, especially in urban and secondary schools. Schools became places of conflict with the police and army instead of places of learning. Schools also became places where students could be organized for student protest. Thus many students experienced violence and detention. Friends and family disappeared or were killed. Students were under great stress and their lives changed (Christie, 1991).

Activities such as placard demonstrations, marches, rallies, meetings, stay aways, funerals, stonings, petrol bomb attacks, burning barricades and court cases were the norm. The police and army retaliated by brutally whipping students, parents and teachers, teargassing them and spraying birdshot and later live ammunition into the crowds. Under the State of Emergency, students were detained for 14 days in detention or held in solitary confinement for 90 days. Many were tortured in jail and suffered physical and psychological abuse (Ismail and Grossman, 1998).

The last part of the 1985 school year was characterised by debates on whether to write the matriculation examinations. There had been hardly any schooling since July. The boycotts had been so widespread and comprehensive that examinations at the end of the year were generally dismissed as farcical. At the same time, there was an urgent call from many organisations to stop the boycott and to drop the slogan "Liberation now! Education later! (Ismail and Grossman, 1998).

In 1985 the government declared a State of Emergency and COSAS was banned. The Soweto Parents Crises Committee (SPCC) was formed to address the crises in education. The first National Consultative Conference was held in Johannesburg in December 1985 by those opposed to government policy. It set down a number of resolutions on People's Education, as the beginning of a policy for the education of the masses.

2.2.8 Private Schools

The next major policy change in education was the passing of the Private Schools Act in 1986, which enabled private schools to admit learners of all races. While this gave Black children the opportunity of equal education, it enhanced the segregation based on class as only the wealthy could afford to send their children to private schools (Hartshorne, 1992).

Hartshorne (1992) coined the term "alternative schooling" which described a wide range of schools established after the passing of the Private Schools Act. These included schools dependant on parental contributions, private funding and some with government subsidies.

Hartshorne (1992) divided the "alternative schools" into different categories:

(1) Traditional English-medium private schools with a limited number of Black learners. The ethos and character remained unchanged from a traditional White private school.

(2) Private schools with a changed ethos and character to suit learner enrolment and falling under the SA Association of Independent Schools.

(3) New schools set up on a non-racial basis. Heavily capitalized and expensive to run, they fell under the New Era Schools Trust (NEST) and the Leadership Education and Advancement Foundation (LEAF).

(4) Private schools set up in buildings that once belonged to the government. They became non-racial in character and served mixed communities.

These "alternative schools" provided a refuge for individual parents and their children during the chaos of Black education. They were peripheral to the general schooling crisis, had limited impact on the crisis and were only accessible to affluent parents (Hartshorne, 1992).

> At this time, the government is following policies which are confused and contradictory, brought about by more pressure than conviction, by attempts to defuse immediate crises, than a clear view of the future. In essence this is because at the centre of its thinking there is still a hard-core commitment to preserving separate Afrikaans schools..... It is proving more difficult for government to renegotiate the segregated education system than it was for them to release Nelson Mandela or repeal the Group Areas Act.
>
> (Hartshorne, 1992, pp 334-5)

However, the State of Emergency continued, the National Education Crisis Committee (NECC) was formed in response and the Education Movement grew. National Consultative Conferences were held and adopted a number of significant resolutions concerning national education policy.

2.2.9 National Consultative Conferences

A new slogan "People's Education for People's Power" replaced the previous one after a meeting with the ANC in Harare. This slogan became the theme of the first National Consultative Conference (NCC) which was attended by 160 organizations across the country. The NCC was held in December 1985, after nearly two years of disrupted schooling.

The Conference agreed that students should return to school, providing the DET met certain demands. These were:

- the unbanning of COSAS;
- the release of students and teachers in detention;
- the recognition of democratically elected SRCs;
- the end of the State of Emergency;
- the withdrawal of troops from the townships;
- the repair of school buildings;
- free supplies of books and stationery (Christie, 1991).

As a result of the Conference, two important developments in student resistance took place. People's Education, as the beginning of a policy for the education of the masses, was born and students were to return to schools and work for change from within.

Resolutions taken by the Soweto Parents Crises Committee for People's Education included:

- to struggle against the Bantustan education departments;
- that teachers work actively with students and parents in forming democratic SRCs;
- to call for unconditional release of all students, teachers and parents in detention;

- that parents refuse to pay school fees in 1986 and that learning materials be provided free;
- to call on all students to return to school on 28 January 1986 (Christie 1991).

Despite these resolutions, students were slow to return to school. The situation was confused and report-back meetings of the NCC were disrupted or banned in some cases. Student grievances remained and boycotts continued in many areas. The State of Emergency was partially lifted and the DET claimed that it had met the demands as far as it could. Students did not agree that they had.

As a result a second National Consultative Conference was held in March 1986. The Conference again endorsed the return to schools and the principles of People's Education for People's Power. The National Education Crisis Committee (NECC) was formed and mandated to appoint a People's Education Commission to develop the ideas of People's Education and to produce materials that would be taught in schools on two afternoons a week. The Conference passed a set of resolutions and demands that were put to the DET.

The resolutions were much broader than those of the first NCC and included the following:

- to expose, isolate and fight against Inkatha;
- to condemn all repressive actions against teachers, to urge all obstructive organizations and teachers to stop negative and repressive roles and to stop collaborating with the authorities;
- to declare June 16 the National Youth Day (the day on which the 1976 uprising started and the first child was killed in the struggle);
- that banning orders on all organizations be lifted, all political detainees be released and exiles allowed to return home, all treason trials to be stopped;
- to call on all countries, corporations and individuals with investments in South Africa to withdraw their investments;

- to make known to all the world that they considered the Reagan Administration as accomplices in the crimes of apartheid;
- to urge all communities and democratic organizations to launch appropriate mass action campaigns, by considering all forms of rent, consumer and other boycotts;
- to demand that the state provide crèches, nursery schools and after-school care for all children;
- that all children should return to school when the new term started to:
  - demand the right to education;
  - use the presence of students at schools to assist in building and regrouping of student organizations;
  - to implement alternate people's education programmes immediately. (Christie, 1991).

After the formation of the NECC, the ideas and strategies of People's Education became clearer (Graham-Brown, 1991). The NECC developed the concept of People's Education by designing a philosophy, a strategy of returning to school, organizational structures, a strategy for working with teachers and a strategy of negotiating with the DET.

Implementation of the strategies was not easy. Student structures were increasingly weakened by almost two years of boycotts and a general breakdown in discipline. Negotiations with the DET were hindered by the government ignoring the calls for talks. The NECC was subject to repression, its members in danger of arrest.

In April 1986, the government put forward its own proposals for educational change. These included the ten-year plan and new financial formulas that would increase spending on Black education but continued segregation. The NECC rejected the ten-year plan as it made no provision for community participation in education.

In June a second State of Emergency was declared. A number of NECC leaders were detained. Many additional schools were closed in a battle for the control of schools between the NECC and the government. By the end of the year 73 schools were closed, most in the Eastern Cape. Seventy percent of DET secondary schools were disrupted and approximately 250 000 students went out on boycott. NECC meetings were banned and People's Education material was prohibited at DET schools (Christie, 1991).

In 1987 material from People's Education was banned at all DET schools. Unrest, dissatisfaction, boycotts and violence continued, although to a lesser degree than previously, throughout the country from 1987 to 1989. Schools were severely disrupted and NECC activities were repressed (Graham-Brown, 1991).

Even when calls to return to school were accepted, learning did not always take place. Students came to school at different times, left when they wanted to, did not bring books, refused to do homework or tests and increasingly rejected authority. Failure to pass was attributed to ready-made excuses. Anything from apartheid, poor schooling, incompetent teachers and untrustworthy examinations were used. All excuses were useful as they did contain a large measure of truth (Hartshorne, 1992).

In 1989 both COSAS and NECC declared themselves unbanned and the third and fourth NCC's were held in September and in December respectively (Christie, 1991). At the third NCC, held in September 1989, the NECC decided that it would have to separate its political and educational activities. Educational or programme work would fall under the Education Development Trust (EDT).

The fourth NCC was held in December 1989 in Cape Town. The theme of the Conference was "Consolidate and advance to People's Education". The NECC changed its name to the National Education Co-ordinating Committee as it resolved that it should not be only a crisis committee.

The Conference resolved to:

- launch a back to school campaign for 1990 and to defy student exclusions from school (strongly supported by Nelson Mandela after his release (Lemon, 1994));

- demand an immediate halt to teacher retrenchments and to work with COSATU on a campaign for teacher unity;
- continue building parent-teacher-student associations and so bring parents more actively into the education struggle (Christie, 1991).

At the end of 1989, other important political changes were beginning to take place. Political leaders were released from prison. Although protests and demonstrations continued during 1990 there was less violence than before as real, meaningful changes began to take place in education. In 1990 the South African Democratic Teachers Union (SADTU) was formed, the ANC was unbanned and Nelson Mandela was released on 2 February. The ANC and the government met several times to prepare the ground for negotiations for the future of South Africa (Christie, 1991). The 'Clase Models', named after the Minister of Education and Culture at the time, Piet Clase, were put forward by the government. The Models set out the conditions under which White schools could admit other races (Christie, 1991).

2.2.10 The "Clase Models"

The "Clase Models", which the government produced in September 1990 (Christie, 1991), put forward admission policies under which formally White State schools could admit scholars of other races. The admission policy was put in the hands of the governing bodies of the schools.

According to the "Clase Models", three different types of school administration systems could be voted in by the parents. The models differed according to the financing structures adopted by the parents of the learners at the school. The three models were the following: Model A, in which the parents could choose to go private with a 45% state subsidy and decide on their own admission policy; Model B, in which the parents could vote to manage their own admissions policy, subject to provisions intended to preserve their cultural character, but remain fully state financed; and Model C, which would be state-aided, with the state paying staff salaries. Admissions were decided by the parents but had to follow the policy set down in the Government Gazette (no. R703, 1990).

In order to change status, an official poll of parents had to be taken. An 80% turnout was required with 72% of those entitled to vote supporting the change (South Africa, 1990). By August 1991, 23% of White schools voted to change (most to Model B) with many still in the process of voting.

As a result of the overwhelming request for change in status, August 1991 saw the announcement of Model D. This allowed White schools with decreasing enrolments to be transferred to the DET, or transformed into open schools under the control of the White Department of Education and Culture (DEC) (Lemon, 1994).

However, the hidden assumption in many minds that the changes, which began in 1990, would bring about a miraculous change in the schooling situation was not fulfilled. The moves towards political negotiation brought greater instability to both Black and White education (Hartshorne, 1992). Much of the 1990 school year was lost in further boycotts and a month-long teachers' "chalk down" strike against working conditions (Christie, 1991).

At this stage there was widespread concern that the "culture of learning" had been eroded in the Black urban areas (Mϕller, 1994a). A conservative DET estimate of school days lost in Black secondary schools in the first half of 1990 was an average of 21 days out of the possible 96 days. Schools with teachers who had participated in the "chalk down" strike would have lost 22 days to this strike alone (Peron, 1999). Such teacher protests compounded the disruptive effects of student stay-aways (Mϕller, 1994a).

The retrenchment of 11 000 teachers and the related 17% budget cut in early 1992 had a profound effect on the "choice" of status for many Department of Education and Culture (DEC) schools. Ostensibly to minimize retrenchment, it was proposed that all DEC schools adopt the Model C status, unless two-thirds of the parents voted against this. The ownership of the school grounds, buildings, furniture and equipment would automatically be transferred to the school. The school would then be responsible for maintenance and upkeep. Payment of school fees would become compulsory (with a probable increase of 33%).

The threat of reduced teaching and maintenance provision put pressure on parents to accept the proposal. The two-thirds requirement for rejection made opposition to the change difficult, especially with set time limits imposed. The DEC was thus able to announce in May that 95,8% of its schools had accepted Model C (Lemon, 1994).

This semi-privatization of White schools effectively took them out of the reach of all but the upper and middle classes. Thus creating greater discrimination along class lines than racial lines (Lemon, 1994).

The Population Registration Act, an Act that classified people by race, was repealed in 1991. However, although the government could now no longer group its population according to race, it retained an education system that was still dependent on race. By mid 1992, education accounted for most of the remaining laws on the statute book which still used race to discriminate among people (Lemon, 1994).

April, 27th 1994 saw the first democratic elections held in South Africa with the ANC taking over as the ruling party.

2.2.11 Towards a democracy

Between 1994 and 1998 the number of students graduating from high school declined with national pass rates dropping from 58% to 47%. The corresponding drop in the Eastern Cape was 12%, from 57% to 45%. Those achieving matriculation exemption (university entrance qualifications) dropped from 18% to 12% by 1997. In the Eastern Cape, the drop was from 14% to 9%. This happened despite an increased government spending on education of 22% (Peron, 1999).

By early 1995 there was abundant evidence in Gauteng that there were many schools where schooling appeared to have broken down. This phenomenon (the "collapse of a culture of learning and teaching") was most pronounced in secondary schools. The morale of all parties in the school community was low (Chisholm and Vally, 1996 p 1). Frustration with the lack of discipline and the negative attitudes of teachers were especially perceived by the older learners and Matriculants - those who had most at stake in their school careers (Møller, 1994a).

The South African Schools Act of 1996 (Department of National Education,1996) dealt with the organization, governance and funding of schools. It set out regulations for attendance, codes of conduct, the governing body, the learners' representative council and the funding of schools. It also repealed large portions of the Coloured Persons Education Act of 1963, the Indians Education Act of 1965, the Education and Training Act of 1979, the Private Schools Act of 1986 and the Education Affairs Act of 1988 (Government Gazette no. 17579, 1996).

2.2.12 The South African Schools Act of 1996

This Act set out the admission policy of public schools. This included laws prohibiting administration of admission tests or discrimination against learners due to the inability to pay school fees or non-subscription to the school mission statement. However, according to the Act, the payment of school fees may be enforced through the process of law (section 40) unless the parents had been exempted from payment.

The language policy of public schools is now determined by the governing body subject to the Constitution, the Act, the Minister of Education and any applicable provincial law. No form of racial discrimination may be practised in implementing the policy (Government Gazette no. 17579, 1996).

Freedom of conscience and religion is provided for in that religious observances may be conducted on an equitable basis but attendance at these is free and voluntary.

Codes of conduct for learners had to be adopted after consultation with learners, parents and educators. These must be aimed at establishing a disciplined and purposeful school environment. The code of conduct must contain provisions of due process safe guarding the interests of the learner and any other party involved in disciplinary proceedings.

The Act prohibited the use of corporal punishment at schools. Any person contravening this law is guilty of an offence and liable on conviction to a sentence, which could be imposed for assault (Government Gazette no. 17579, 1996).

The governance of a public school is vested in its governing body. The governing bodies would consist of the principal (in his/her official capacity), elected members and co-opted members. The elected members include:

- parents of learners of the school;
- educators of the school;
- non-educator members of staff;
- learners from the eighth Grade upwards (Government Gazette no. 17579, 1996);
- the owner of the property on which the school is situated;
- members of the community co-opted by the governing body to assist in fulfilling specified responsibilities (but without voting rights) (Eastern Cape Measures, 1997).

According to the Act, the functions of the governing body include:

- promoting the best interests of the school and striving to ensure its development through the provision of quality education for all learners at the school;
- adopting a constitution;
- developing a mission statement of the school;
- adopting a code of conduct for learners at the school;
- supporting the principal, educators and other staff of the school in the performance of their professional functions;
- determining times of the school day;
- administering and controlling the school's property, buildings and grounds;
- encouraging parents, learners, educators and other staff to render voluntary services to the school;
- recommending appointment of educators and non-educator staff to the Head of Department (Government Gazette no. 17579, 1996).

A representative council for learners (LRC) has to be established at schools, consisting of learners from the eighth Grade (Std 6) upwards (Government Gazette no. 17579, 1996). Each class in the school has the opportunity annually to elect one member to the LRC. The elections would be conducted by the class teacher after one week's notice is given in writing and prominently displayed in each classroom. Election, after nomination, is by secret ballot with each member in the class having only one vote (Eastern Cape Measures, 1997).

The Eastern Cape Schools Act of 1996 followed the South African Schools Act of 1996 and set out the provincial education policy for the Eastern Cape. From July 1996 the interim post provisioning scales were phased in. This set out educator:learner ratios for the different provinces. For secondary schools in the Eastern Cape this was set at 1:35 (Government Gazette no. 17334, 1996), resulting in the retrenchment of many teachers.

2.2.13 The Eastern Cape Provincial Education Policy

In the Eastern Cape, where this study takes place, the Eastern Cape Schools Education Act of 1996, states that the Member of the Executive Council determines school education policy in the province within a framework of principles. These include:

- every person shall have the right to basic education and equal access to schools and centres of learning;
- every learner shall have the right to instruction in the language of his/her choice where this is reasonably practical;
- no learner or educator shall be unfairly discriminated against;
- there shall be a duty on the Department to foster the advance of persons previously disadvantaged by unfair discrimination, in order to enable their full and equal enjoyment of education rights;
- there shall be a duty on the Department to combat sexual harassment at schools;
- every learner and educator shall have the right to freedom of conscience, religion, thought, belief, opinion, speech and expression and the education process shall promote a culture of tolerance;

- every learner and educator shall have the right to peaceful assembly and demonstration and shall have the right to freedom of association;
- the structures of democratic governance in school education should be constituted with due regard to the racial and gender demographics of the province;
- the education process shall be aimed at fostering independent and critical thought;
- every learner is entitled to 10 years of basic education and to equal access to educational institutions.

(from the Eastern Cape Education Bill, 1996 p 9)

Emanating from the principles of the White Paper on Training and Education (Department of National Education, 1995), which became the South African Schools Act of 1996, was Curriculum 2005. The *Lifelong Learning through a National Curriculum Framework* document emphasised the need for major changes in education and training in order to normalize and transform teaching and learning. The emphasis was changed to an outcomes-based education from the traditional aims-and-objectives approach (Department of Education, 1997).

2.2.14 Curriculum 2005

The *Lifelong Learning through a National Curriculum Framework* document states that a paradigm shift to outcomes-based education is a necessary prerequisite for the achievement of the country's vision. This vision is

> a prosperous, truly united, democratic and internationally competitive country with literate, creative and critical citizens leading productive, self-fulfilled lives in a country free of violence, discrimination and prejudice.

(Department of Education, 1997 p 1)

The policy document sets twelve critical outcomes. These are broad cross-curricular outcomes that underpin the Constitution. The outcomes should ensure that learners gain skills, knowledge and values that will allow them to contribute their success to their family, community and nation.

The critical outcomes are:

A learner will:

- identify and solve problems in which responses display that decisions using critical and creative thinking have been made;
- work effectively with others as members of a team, group, organisation, community;
- organize and manage himself and his activities responsibly and effectively;
- collect, analyse, organize and critically evaluate information;
- communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation;
- use science and technology effectively and critically, showing responsibility towards the environment and health of others;
- demonstrate an understanding of the world as a set of related systems by recognizing that problem-solving contexts do not exist in isolation;
- reflect on and explore a variety of strategies to learn more effectively;
- participate as a responsible citizen in the life of local, national and global communities;
- explore education and career opportunities;
- develop entrepreneurial opportunities.

(Department of Education, 1997 p 15)

However, as Curriculum 2005 was introduced to Grade 1 in 1998 and will be introduced in Grade 7 (Std 5) in 2000 (*pers. comm.* Albert Nemakula, Vivlia Publishers), it will only be implemented in Grades 10, 11 and 12 (Std's 8, 9 and 10) from 2003.

2.2.15 The new education system

In order to increase the Matriculation pass rate, the government introduced new scoring methods for the 1998 matriculation examination. An extra credit is given to individuals who speak an African language but write the examination in a different language (Peron 1999). Does this take us back to unequal racial discrimination by ignoring White students with a vernacular other than English or Afrikaans?

Peron (1999) quoted Thabo Mbeki as being concerned about the entire teaching profession. Mbeki, as deputy president, spoke of educators who:

> ...have not hesitated to steal from schoolchildren, to rob learners of their textbooks, and to deny us the capacity to employ teachers who are willing to serve, by collecting salaries of phantom teachers.
> ....drunkenness among some teachers, even if they are a few, is unacceptable. I would like us to agree that Sadtu should expel from its ranks any of its members who are found to be drunk during school hours.
> I am sure you will also agree that it is unacceptable that teachers should persistently come late to school, leave early and otherwise seek to do as little work as possible.
>
> (Peron, 1999 p 114)

However, Mbeki admits that there are some areas, with little funding, few textbooks and rundown buildings, where teachers regularly produce excellent results.

Many Black and White parents, who can afford the extra fees, are sending their children to private schools. Teachers in Black schools particularly seem to see little need to teach (while sending their children to private schools). Peron further quoted the Sunday Times newspaper whose reporters had "spoke[n] to many children who decided to board far from home because 'nothing was happening in the townships' or because teachers were 'sitting in the sun' or in the staff room all day" (Peron, 1999 p 115).

This is confirmed by one Gauteng Principal's comment describing poor class teaching, no marking, no tests being given and no teacher appraisal. Teacher absenteeism and indiscipline was seen as a major problem, followed by facilities and resources. Learners commented that teachers were undisciplined, arrived late, and at times did not even go to the classrooms (Chisholm and Vally, 1996).

2.3 The schools involved in this study

2.3.1 Introduction

The schools selected for this research were spread over the entire northern township area of Port Elizabeth (in the Eastern Cape) and are relatively large schools with more than 750 learners per school, as are most schools in this area. Various variables were accommodated. These are: new school, old school; government built, Vusisiwe Trust school; Black principal, White principal; White Mathematics teacher, Black Mathematics teacher; amongst brick houses, amongst shacks; buildings in good condition, buildings not in good condition, etc.

The following descriptions of the schools refer mainly to my opinions and observations. These are based on my frequent visits to the schools and conversations with principals, teachers, students and learners in my roles as College of Education lecturer and researcher. At the end of each school description, an anecdote of personal experience has been added to give flavour to the description. The anecdote, while from that particular school, does not necessarily refer to the unique character of that school, but gives a picture that reflects on all the schools. Most of the anecdotes refer to a period towards the end of the school year when Matriculants have finished writing examinations and examinations for Grades 8 to 11 should be approaching or be in progress.
As the project ran over three years, the description of the schools has been divided into the years in which the learner from the school was part of the project. Five learners and thus five schools were part of the study in 1995. Two took part in 1996 and another two in 1997.

2.3.2 The 1995 Case Study Schools

The first five schools are distributed throughout the Port Elizabeth northern townships. All are centrally situated in their areas and have an enrolment of more than 800. One school is a DET built school, large, three-storied and very modern. Maintenance of the grounds and buildings is well above the average. It is situated in a relatively new township. Two of the schools were built by a Non-Government Organization, called the Vusisiwe Trust, to alleviate the school shortage. These schools are new, modern, two-story buildings requiring minimal maintenance. The last two schools are old, one-story, prefabricated buildings with no maintenance to the grounds. The different schools differ remarkably in their appearance and thereby give an immediate impression of either care or neglect. This immediate impression comes across as the principal's attitude to his/her school (although this may not be the case) and probably affects the morale of the teachers and learners at the school.

2.3.2.1 MSPT High School

This school, in Motherwell, is situated approximately 30 km from the Central Business District of Port Elizabeth but is relatively close to the Markham industrial area. Motherwell is the northern-most township of Port Elizabeth. It draws teachers and learners from the surrounding populous. Although the school is surrounded by neat brick houses, the learners may live in houses or shacks and have varied socio-economic backgrounds.

The school buildings are relatively new and are well maintained. The three story buildings are built of face-brick and look neat. The grounds are well tended and planted with shrubs. The teachers and learners take pride in their school and their academic achievements.

The learners are mostly dressed neatly in school uniform and are in class on time. The atmosphere is one of work and learning. The principal takes great pride in his school.

This school has the highest matriculation pass rate of former DET schools in Port Elizabeth and the second highest in the "old" Eastern Cape (prior to the creation of the nine provinces). The matriculation pass rate for 1994 was 94,6% (*pers. comm.* principal).

The school closes at 13:00 on Fridays and Wednesdays. Wednesdays are considered sports days and most Port Elizabeth schools close early on Fridays. On these two days the last two periods just fall away.

Despite an atmosphere of work and learning during the year, a visit on 24 November 1994, concerning the teacher questionnaire, found only the principal and four or five teachers at the school. Two appeared to be working on a car in the parking lot. I was informed that the Grade 11A Mathematics teacher was ill.

2.3.2.2 PKM High School

This school is situated in Zwide. The area is dominated by small brick houses on the one side of the school and neat Site and Service shacks on the other side. Site and Service shacks differ from other shacks in that they are on a designated plot of land with water, sewerage and sometimes electricity. The school is a Vusisiwe Trust school with new and modern buildings. The grounds are relatively well tended but light fittings, switches and wall plugs have been vandalized in all the classrooms. Some classrooms also no longer have door handles.

The learners appear neat and most are in school uniform. Discipline is maintained and classes are orderly. The principal is a young man who will stand no nonsense. On numerous visits to this school the atmosphere was one of work. The 1994 matriculation pass rate was 60,6% or 11th out of the 30 Port Elizabeth DET high schools (*pers. comm.* principal).

During a visit to the school at the beginning of November 1997, I found all learners busy with examinations. I was told that all the classes were writing at the same time as the matriculants. The teachers felt that the Grade 8 to 11 learners wouldn't attend classes at this time anyway, even if the examinations were held closer to the end of the year. Once the matriculants started writing, all learners stopped attending classes.

2.3.2.3 GQB High School

This is also a Vusisiwe Trust School. It is situated in Missionvale amongst Site and Service shacks. On two sides it is bordered by large main roads. Across the Uitenhage Road are squatter shacks. Across the Bethelsdorp Road is the KwaDwesi Township consisting of elegant if small houses occupied by middle class Black families. Learners are thus drawn from a cross-section of population groups, ranging from the poor to the moderately well-off.

Although the school is older, the buildings are new, neat and modern. The school moved from Zwide to Missionvale in 1994. However, light fittings, light switches and wall plugs have all been vandalized in the classrooms and graffiti is chalked on the notice boards at the back of the classrooms. The grounds do not appear to be tended.

The principal is a man who takes his job seriously and dislikes disruptions. However, discipline and period/bell times are lax. Learners and staff take their time returning to classes after breaks. Learners are used by the teachers to fetch or buy items from the stalls outside the school during breaks.

The learners appear neatly dressed in school uniform and are well mannered. The matriculation pass rate in 1994 was 69,2% or 9th out of the 30 DET high schools in Port Elizabeth (*pers. comm.* principal).

On a visit concerning the teacher questionnaire on 24 November 1995, most of the teachers were present but there were no learners. Four days later, eight or nine teachers were just leaving the school as I arrived at 10:45. The school only closed officially in the first week of December.

In October 1997, I visited the school to have learner questionnaires completed. I found the two Grade 11 Mathematics classes busy in their lessons. The Science teacher, busy with the Grade 11A's, did not like being interrupted and said that he had only been informed about my visit early that morning. He did consent to the learners completing the questionnaires but wanted to have a days' notice in future.

On visiting the school again on October 30, the HOD informed me that the other Mathematics teachers were not in yet (at 9:00). Few learners were at the school. They felt that examinations should already have started, as in past years, and that they shouldn't only start on 10 November.

2.3.2.4 LWK Senior Secondary School

This school is situated in a poor area in New Brighton. It is next to blocks of men's single quarters and very close to an industrial area. The school is a single-story prefabricated building. It has no electricity and many broken windows. The grounds are neglected and become a series of mud puddles after rain.

The gate is locked during the school day but opened at break time. Many learners thus leave during break and do not return. Few wear complete school uniforms. For an entire week after holidays teachers do revision, as many learners have not yet returned to school. Many classes appear to be without a teacher for a large proportion of the day. Unrest continues at this school. This was demonstrated when the learners held a meeting in May 1995, and decided to suspend all classes until their needs had been met. The 'needs' were unknown to me.

The principal of the school is an HOD in the acting position of principal. She is a friendly women but not a disciplinarian. The overall atmosphere at the school is one of unrest. The school has a policy of only handing school reports to parents and not to learners. This results in many learners and parents not seeing reports or marks. The matriculation pass rate for 1994 was 43,87% or 23rd out of 30 in the Port Elizabeth ex-DET schools (*pers. comm.* principal).

On 24 November 1995, when I paid a visit concerning the teacher questionnaire, I found three teachers in the staffroom. I did not go any further but the school appeared deserted. The Grade 11 Mathematics teacher was not present and the teachers thought it was questionable whether he would be in that day, although he was expected. The principal arrived just as I was leaving at approximately 8:45.

On another visit on 11 September 1997, the learners were loitering outside the classrooms and the gate was locked. The staff was in a meeting and I was asked to wait in the classroom designated as the principal's office. There, three girls were cleaning the floor. On being told that the principal and Mathematics teacher were unavailable, I proceeded to leave.

The three girls then started making "talking motions" with their hands in my face, particularly one. This may have been due to my statement that I needed the principal's permission before I proceeded with the learner questionnaire. One or two other girls called out "Hello lovey" to me on the way to the gate. This was the only instance in which I encountered rudeness at any of the schools or learner homes.

On 16 September 1997 the school was in the process of electing a Governing Body. The learners had their turn to vote in the morning with the teachers voting after them. My impression, from various visits during this time, was that classes were few and far between during the process.

2.3.2.5 SPK High School

SPK is a high school in Kwazakhele, close to an old power station and the salt pans. It is surrounded by Site and Service shacks.

The school consists of old, single story, prefabricated buildings with minimal maintenance. The grounds are untended. However, the buildings are in better repair than those of LWK Senior-Secondary School, and had fewer broken windows. The school gate is locked during school hours but is opened during breaks.

Much English graffiti is chalked on the notice boards at the back of classrooms. The learners are neatly dressed and most are in school uniform. The principal, judging from a learner's reaction after being summoned to the principal's office, is a strict disciplinarian. The pass rate in 1994 at this school was 53,8% or 18th of the 30 ex-DET high schools in Port Elizabeth (*pers. comm.* principal).
I again visited the school in November 1997 to have the teacher questionnaire completed. During the visit the Mathematics teachers told me that the matriculants did attend classes during boycotts because they wrote external examinations. The other classes generally supported boycotts.

2.3.3 The 1996 Case Study Schools

Only two schools were selected in 1996. This was to keep the candidate numbers manageable so as to continue with one of the previous case study candidates and his study group. I knew the schools and was known by the principals and some of the teachers due to my participation in a neighbouring Teachers' Training College.

The selected schools were interspersed between the schools already used in the study. They contributed to the diversity of schools as one had a White principal and many White teachers and the other was in an affluent township.

2.3.3.1 KWL Comprehensive High School

This school was selected out of the list of schools as it contained the added variables of a White female principal and an approximately 44% White staff, which would contribute to the study.

The school is in Zwide, situated next to the freeway extension from Uitenhage. Opposite this road is Vista University. It is surrounded by other schools and oldish, small, brick houses.

It is a large, well-established school in three-story grey brick buildings. The buildings are in good order and the grounds are tended. The school gates are kept locked during school hours but opened at breaks.

The school offers different streams viz. technical, home economics, commercial and academic. The academic stream was being phased out at the school with only Grade 11 and Grade 12 left in 1996.

The learners were neatly dressed, mostly in school uniform, and polite. Discipline is enforced inside and outside the classroom and learners have access to a guidance teacher.

The principal is only in an acting position but is an energetic and determined woman. She is considered somewhat autocratic by the staff. The matriculation pass rate for 1994 was 78,3% (*pers. comm.* principal). Unfortunately, the position out of the 30 ex-DET schools in Port Elizabeth was not known.

However, in September 1997, when I dropped by to see the Grade 11 Mathematics teacher, the learners had left school by 11:40 as all staff had a meeting with the Education Development Officer (EDO). And on the last day of the third term, even the teacher had not brought books to school.

During my visit to the school at the end of October 1997, I found the learners still in attendance and classes in progress. They were apparently kept there by "threats" and cycle tests. The learners were becoming high spirited and boisterous as they were aware that other schools were not as strict about class attendance at this time of the year, when matriculants had already started examinations.

2.3.3.2 KMGX High School

This school is in KwaMagxaki, an affluent Black suburb on the road between Port Elizabeth and Uitenhage. The school moved from the centre of KwaMagxaki to its new venue at the beginning of 1994. It is now close to the busy intersection of the Uitenhage and the Uitenhage/Redhouse Roads. Whereas KwaMagxaki consists of affluent houses, across the Uitenhage/Redhouse Road the families live in squatter shacks. The learners are thus drawn from a mixture of socio-economic backgrounds, from the poor to the moderately well-to-do.

The school is a series of three-story face-brick buildings. The grounds are tended and the school generally gives the impression of being well maintained. The gate is mostly closed during school hours but not locked.

However, in July/August 1997 the learners went home at break (approximately 11:00) on four occasions as the teachers were not in class. They were apparently busy marking examinations - at the beginning of the third term?

On entering the school at the end of October 97 to have teacher questionnaires completed, I found the learners milling around. No staff was evident other than the young, smart looking principal. I was then also told that examinations for Grades 8 - 11 would start the next day, on the 30th of the month. This explained the lack of teaching at the time. By the time I left at 11:45, many learners were leaving and walking down the road. Approximately half the staff cars had also left.

On another occasion a Mathematics teacher had told me that, on being asked by matriculation learners to explain exponents, he had referred them to two Grade 10 learners who could do the work. However, he told me that he realized that matriculants felt awkward asking Grade 10's for help.

2.3.4 The 1997 Case Study Schools

At the beginning of 1997 the selection of schools was done according to area. Two schools were selected so that nine case study schools were fairly evenly spread thoughout the northern townships and representative of all areas and a large number of variables. The areas chosen were in Motherwell and Kwazakhele. The school in Motherwell is on the opposite side of the township to MSPT, roughly four kilometres away, with numerous schools in-between.

2.3.4.1 CSLL Senior Secondary School

This school is on the western side of Motherwell, in an area dominated by Site and Service shacks. The school was especially chosen for this reason. The aim was to get a candidate who lived in a shack, as no shack-dweller had as yet volunteered for the project. Most of the other schools had learners living in shacks and an effort had been made to assure the learners that the type of home they lived in did not matter to the project. However, the knowledge that I would visit them at their homes appeared to have made such 1995 and 1996 learners loath to participate.
The school buildings are of neat, clean yellow brick. A paved quadrangle is situated in the middle of the buildings with markings for netball courts. The grounds are not tended. Besides the gate at the entrance, two gates lead into the school buildings. While the entrance gate was generally open, the two smaller gates were kept locked most of the time.

According to the principal, the school was three years old in 1997. It was originally meant to be a primary school and thus had single-story buildings and no laboratories.

During a visit to the school in October 1997, the principal stated (without being asked or prompted) that the school was still chaotic as it was understaffed. The understaffing could also explain why neither of the classes I had visited that day had had teachers present. In one of the classes a learner was explaining Mathematics on the board.

2.3.4.2 KWZ High School

This is another Vusisiwe Trust School. The buildings are in the same two-story grey brick pattern as all Vusisiwe Trust Schools. The grounds are not maintained but the buildings have relatively few broken windows and light fittings and switches appear to be generally intact. It is situated in Kwazakhele, an old established township area, amid small brick houses.

KWZ High School has one White teacher. She is the HOD for Mathematics and was teaching the Grade 11s in 1997. The principal is a very conscientious man who was friendly and helpful in my initial visits to the school.

A teacher I was chatting to during the third term stated that the first week of the term was not "as normal". This was due to the LRC elections that had to take place. The inspector was coming at the end of the week to fetch the results. The teachers were excited and spent much time discussing the matter. Classes were left to the student teachers with teachers only giving brief instructions to the students. She pointed out that the level of noise emanating from the classrooms indicated that not much teaching was going on.

The teacher further confided that interviews for the post of principal would be held on the Friday. This contributed to, and may have been the main cause of, the teachers' excitement and discussions.

2.4 Summary

My own experience, while visiting the above schools, has shown me that the unrest and boycotts at schools still continues. A culture of learning and teaching has still not been fully re-established. Many teachers and learners arrive late and leave early, stay away from school at a whim and often classes do not take place in weather that is too hot or too cold. The entire school can be disrupted because the choir (70 learners out of approximately 700) has gone on a tour. Days designated as Xhosa day, American day, sports day or LRC election day are taken off entirely. Meetings with staff, EDO's and governing bodies take place during school hours while the learners mill around doing nothing.

The learners involved in this study started attending school from 1982 (Mongesi) or 1985 to 1987 for the 1995 to 1997 candidates respectively. They thus began school during the most educationally disruptive part of the political and educational struggle. Unrest, dissatisfaction, boycotts and violence were commonplace. Although these children were probably too young to participate, they would have observed some of the violence and experienced the disruption of schooling. By the time they were 8 to

10 years old (1989), however, the calls to return to school had been made and the time of "Liberation Now, Education Later" had passed.

During their secondary school years (1992 to 1998) they will have experienced, and participated in, the sit-ins and protest meetings of disillusioned and angry students who had expected election promises to be immediately fulfilled (Peron, 1999). These students continued to use the tactics used in pre-democratic days to have their various demands met. A culture of teaching and learning was not yet making much headway and the new educational dispensation initiated in 1996 had yet to counter the negative educational influences of the past.

CHAPTER THREE

THE LITERATURE REVIEWED

3.1 The problem

The facts and figures of the low Mathematics pass rates, as stated in the introductory chapter, are frequently quoted and lamented on in articles. The problem has a lengthy history and has not changed much in recent years. The trend of low pass rates is shown in articles such as "Educational realities in South Africa 1990" (Department of National Education, 1991a), "Preliminary education statistics for 1991" (Department of National Education, 1991b), "School Mathematics in South Africa in the 1990's: A small-scale survey of the Status Quo" (Marsh, 1991), "Demographic inequities in Mathematics education in South Africa: Some facts and figures" (Marsh, 1993), "Legacy of Apartheid" (Spira, 1990) and "Apartheid: Scapegoat for every wrong in South African education" (Steyn and van der Westhuisen, 1993).

Of every three hundred and twelve Black children who enter school, only one eventually emerged with matriculation exemption in Mathematics and Science (Spira, 1990 as corrected in FRD, 1993). Hofmeyr and Spence (1989) quoted 1987 figures for matriculation in Black education:

> "The standard ten pass rate in African education is low. In 1987, only 56 percent passed of those who wrote, and only 28 percent, some 25 000 students, obtained a matriculation exemption for university entrance. However, when the number of students who obtained matriculation exemption with higher grade mathematics and science is calculated, then the pool shrinks further to a mere 500 - 800 students year."
>
> (Hofmeyr and Spence, 1989 p 37)

(In South Africa, the final year of secondary school was known as Standard 10 or Matriculation and equivalent to Grade 12. At the end of the year, the learners write the final examinations conducted by each province, under the auspices of the Joint Matriculation Board. Successful candidates are awarded a Senior Certificate. Candidates achieving above a set requirement are awarded matriculation exemption and thereby University entrance).

Since 1994 the number of learners (all races) graduating from high school has declined with national pass rates dropping from 58% to 47%. The corresponding drop in the Eastern Cape is 12%, from 57% to 45%. Those achieving matriculation exemption (University entrance qualifications) dropped from 18% to 12% by 1997. In the Eastern Cape, the same trend was evident in the drop from 14% to 9%. This decline was despite an increased government spending on education of 22% (Peron, 1999).

The low pass rate in Black education in general and especially in Mathematics is thus well known and documented. The shame at such results is deep and has led to non-disclosure of detailed statistics of results by the East Cape government in recent years (see introductory chapter). Yet articles offering concrete solutions to this problem are hard to find.

3.2 Reasons for poor achievement

Reasons for the discrepancy in pass rates between Black and White South Africans need to be probed. The easy route has been to blame apartheid for the discrepancy, especially due to the country's unique political history of official race segregation (see Chapter 2 on Context). However, the problem runs deeper than the mere segregation of people along racial lines. The resulting division of the races into first and third class citizens brought with it a hegemony of law and economics that impacted heavily on the education of the 'third class' citizens.

3.2.1 Factors resulting from apartheid

Apartheid, with the laws and social divisions it brought, was the cause of many of the problems with Black Education. However, the mere division of peoples into separate Education Departments, residential areas and entrances to government buildings, along with the laws and social division, does not bring about an unequal system. It is the classification of peoples as first and third class that makes a system like apartheid unjust, unequal and cruel. The connotations that accompany such a system and its demise cause as many problems as the system itself. It can be said that apartheid was not the sole cause of the poor achievement rate among Black learners. Merely removing apartheid would not solve all the problems in Black education. It is thus necessary to identify major problems in Black education (Steyn and van der Westhuizen, 1993).

Such reasons have been identified by van der Walt and Kruger (1991, as quoted by Steyn and van der Westhuizen, 1993). According to these authors, the major reasons for poor results among Black learners are:

> Pupils' preoccupation with politics and the problem of intimidation; insubordination of pupils; unsatisfactory pupil-teacher ratio; condoning from Grade 1 through to Std 10; irresponsible actions by heads of school; lack of completion of relevant syllabi for the school leaving certificate; poor support for teachers; poor facilities, furniture and textbooks; questionable competence and qualification of some teachers; non punctuality and absenteeism of both pupils and teachers; and attitude and commitment of teachers.
>
> (Steyn and van der Westhuizen, 1993 p 36)

No one single reason should be seen as the major or sole reason for the lack of achievement by Black learners. Yet a combination of only a few of those mentioned above could have a definite effect on Matriculation pass rates, especially in subjects such as Mathematics and Science.

The first two reasons given above stem from the political upheaval experienced during the 70's and 80's, a time during which the Black youth were used as a tool in the fight to end apartheid. The youth were viewed as ideal activists by political parties and as such directed against authority in a bid to make the country ungovernable.

The ploy had its effects politically, but unfortunately to the detriment of education.

"Condonation from Grade 1 through to Std 10; irresponsible actions by heads of school; lack of completion of relevant syllabi; non punctuality and absenteeism of both learners and teachers and the attitude and lack of commitment of teachers", also stem from the political upheaval of the 70's and 80's. All are associated under the general term of the "lack of a culture of learning and teaching". This "lack of a culture of learning and teaching", a broadly termed problem, is being addressed by many education departments throughout South Africa (Chrisholm and Vally, 1996 p3).

"Poor support for teachers; poor facilities, furniture and textbooks and questionable competence and qualification of some teachers" could be attributed to the financial discrepancies between the different education departments during the apartheid era. While there was less *per capita* expenditure for Black education, this was due to various factors more related to salaries than to school subsidies (Steyn and van der Westhuizen, 1993). Such factors include lower salaries (as a result of lower qualifications), housing costs carried by other departments, the relatively young age of the teachers and therefore less medical and pension subsidies, the large number of learners in primary schools and fewer in high schools (due to many Black learners leaving school to work or for other reasons), which are more expensive to maintain.

Much of each school year is lost to student boycotts and teacher strikes against working conditions. In 1990, a conservative DET estimate of school days lost in secondary schools in the first half of the year was an average of 21 days out of the possible 96 days (22%). Schools with teachers who had participated in the "chalk down" strike of 1990 would have lost 22 days to this strike alone (Peron, 1999).

Thus, although many of the educational problems are directly due to apartheid, Steyn and van der Westhuizen (1993) showed that political motives and activities played a large role in the education of South African youth, especially the Black youth. These are problems that arose as a result of apartheid, although they were not, strictly speaking, part of apartheid. However, having differentiated between the two types of problems (apartheid and activities against apartheid), it must be said that one cannot expect a system of repression to exist without protest against it and the consequences thereof. If apartheid were the sole cause of the problems, the removal of apartheid should have resulted in the disappearance of the problems. This was not the case. The problems that arose as a result of the fight against apartheid remained after the abolishment of the legislated apartheid. Educational techniques thus need to be found to assist the Black youth in getting the education they need.

Peron (1999) quoted Thabo Mbeki as being concerned about the entire teaching profession. Mbeki recognises that there are educators who have stolen from school children, robbed learners of their textbooks, collected salaries of phantom teachers (thus denying willing teachers employment), appeared at school while under the influence of alcohol, arrived at school late, left school early and otherwise did as little work as possible.

3.2.2 School segregation

School segregation in South Africa was a major result of apartheid and forced the different races to attend different schools. However, the removal of apartheid still left segregated schooling as the norm for many Black learners. Although no longer enforced by law, economic, cultural and geographic factors, as well as population numbers, have ensured that many schools have only Black learners enrolled. The large number of Black people living in concentrated areas requires a large number of schools within those areas. These schools are attended only by the learners within that community, from the same race and culture.

Such segregation of learners according to economic and cultural differences has an effect on the achievement of the learners. Entwhisle and Alexander (1992) found that the most important sources of variation in Mathematics achievement, of US children in the first two years of schooling, were differences in parent economic status, followed by school segregation.

Similarly, in a study on high school graduates in Florida (USA), Gray and Taylor (1989) found that the percentage of Whites in the high schools from which students graduated was significant and positive on student Mathematics performance. Black learners graduating from high schools with a high percentage of Whites achieved significantly higher scores on CLAST (College-level Academic Skills Test) for

Mathematics than those coming from Black High schools. Thus, Black learners attending schools with a greater racial (and cultural) mix fared better academically than those attending more segregated schools. Such findings make the continued segregation, albeit no longer enforced by law, all the more tragic.
Although the above findings were based on US learners, the learners involved in the case studies were possibly affected in a similar way, as they originated from the historically disadvantaged sector of South African society. However, these learners were not compared to learners from other societies and economic status was determined to be only one factor affecting achievement (van der Walt and Kruger 1991 as quoted by Steyn and van der Westhuizen, 1993). The lack of achievement due to economic status was thus taken as accepted for this study.

School segregation, with Blacks and Whites in separate schools, has been the norm for the duration of the case study candidates' school careers. Until 1990 school segregation was law (Christie, 1991) and even now mixed schooling remains the privilege of the middle and upper class Blacks. Great change in this aspect is not foreseen for the immediate future. The majority of Black learners will, in all probability, remain in 'Blacks only' schools, largely due to the economic, cultural and geographic factors mentioned above.

3.2.3 The third world situation

In their study, Steyn and van der Westhuizen (1993) found that the difference in the pass rates of Blacks and Asians (also victims of the apartheid system) made it unreasonable to blame apartheid (ie. race and *per capita* expenditure on education) as the sole reason for the poor pass rate of Black learners. They quoted de Wet's 1988 study, which concluded that the disparity between the education systems correlated positively with that of education in western Europe and Africa. De Wet maintained that the difference should rather be attributed to a first world - third world situation than to apartheid.

This concurs with the findings of Gray and Taylor (1989), who outlined two concerns that had emerged in USA educational policy. These were the overall decline in Mathematics achievement and the disproportional representation of non-Asian minorities among those who fared poorly. African Americans' achievement rates were well below those of their Asian counterparts. Thus Mathematics achievement appeared to be dependant on cultural and economic differences between Africa and the Euro-Asian block.

However, it must be added that apartheid perpetuated the distinction between first world and third world (Euro-Asian and African) situations. Job reservation (different types of jobs for different races), wage differences and the Group Areas Act made it virtually impossible for a 'third world resident' to attain first world living and educational standards.

3.2.4 Socio-economic status

The learners involved in this study are all from townships in Port Elizabeth. Segregation of living areas due to the Group Areas Act and inequality of work and pay under the apartheid system resulted in the Black people living in poorer conditions in separate townships.

Research on socio-economic status (SES) does not present a clear picture of its effect on achievement. Many argued that SES has a direct effect on achievement (Balli, Wedman and Demo, 1997), resulting in less parental support for learners from homes with lower SES. Others see the relationship between SES and achievement as having a more complex effect on achievement (Sui-Chu and Willms, 1996; Salerno and Fink, 1992 and Clark, 1993).

The situation in South Africa may be even more complex than in Western Countries. With the high unemployment rate, families in the townships often have only one breadwinner. Whereas this may not seem unusual or problematic for a Western family, the concept of the African extended family makes it a serious problem. The sole breadwinner may be supporting, not only his own wife and children, but also parents, siblings and their children, aunts and uncles. One salary thus does not stretch very far. It is such a scenario that Maqsud and Khalique (1991) encountered among the Tswana people. They thus suggested that parents of higher SES perhaps did not have enough time to provide their children with qualitative parental attention and encouragement. Children from homes with lower SES did receive adequate parental attention and encouragement but might not have the material comforts to ensure academic achievement.

Families with lower SES in the townships include many families living below the breadline. In a report on Gauteng schools, Chisholm and Vally (1996) pointed to the:

> Stark privations faced by many pupils on a daily basis, problems which they bring with them to school. Basic necessities such as food, parental love, care, and in some cases shelter, are absent... A number of pupils ... are starving, or suffering from family disorders, while others are living alone in shacks.
>
> (Chisholm and Vally, 1996 p 41)

The socio-economic context within which the schools are located also greatly affects the schools and thereby the learners' ability to achieve. The high unemployment rate and rivalry over scarce resources in the surrounding communities contribute to social problems such as theft, vandalism of school property, gang warfare over drug trafficking and violence against women. The lack of a peaceful environment and adequate facilities in which to learn is thus absent. The physical location of schools next to busy intersections and shebeens also has an impact on learning in the schools (Chisholm and Vally, 1996).

3.2.5 Lack of facilities

The scars of apartheid and the struggle against it still remain etched in the environment (physical and social) of schools. Chisholm and Vally, (1996) gave extracts of team members' observations at Gauteng schools. The descriptions included:

- poorly furnished classrooms;
- overcrowded classrooms without teachers;
- a library with books covered in dust but not in use because there was no suitable furniture;
- a home economics lab with eight stoves of which only two worked;
- a science lab with only basic equipment (some materials still packed in

their boxes);
- classrooms with broken windows;
- classrooms with broken or non-existent doors;
- empty technical workshops because all equipment had been vandalized;
- toilets not functional;
- schools without electricity;
- no staffroom;
- unkempt school grounds.

Nxumalo (1993) named some additional "features" as perceived by students, teachers and parents of Kwamashu schools in KwaZulu-Natal.
These are:
- shortage of textbooks;
- no sports facilities;
- poor instruction and shortage of teachers;
- shortage of schools resulting in overcrowded classrooms of 120, 130 or more learners;
- shortage of schools for specialized education eg. Technical schools;
- shortage of qualified Science teachers.

While the situation in the northern townships of Port Elizabeth may not be as drastic, I have visited many schools in disrepair and suffering from a lack of adequate equipment. The schools which the case study candidates attended suffered from one or more of the following: broken doors, windows and ceilings, labs devoid of equipment, insufficient desks, all electrical fittings vandalized, unfurnished staffrooms and ill functioning sewage systems.

Such conditions impact on the morale of the teachers and learners. They also have a negative effect directly and indirectly (through low morale) on the ability to work and learn. It is difficult, and certainly uncomfortable, to learn in classrooms where the wind blows books and papers around, the rain forms puddles on the floor and the doors bang constantly. On overcast winter days the classrooms receive little light from outside and none is available from the inside as the light fittings have been stolen. Proper laboratory experiments are not even considered as the proper equipment is not available. The smell from the toilets permeates the classroom.

3.2.6 Culture of learning

The lack of a culture of learning and teaching in Black urban areas is seen as one of the impediments to the improvement of education in South African Black schools (Mφller, 1994a). Chisholm and Vally (1996) described the lack of 'the culture of learning and teaching' as entailing historically and structurally created conditions, attitudes and practices that prevent learning and teaching from occurring in schools.

> For many, restoring a culture of learning and teaching is simply about bringing the conditions and disciplines of compulsory schooling to bear on teachers and students: regular attendance, punctuality and acceptance of authority. The RDP's [Reconstruction and Development Programme] Culture of Learning Programme introduced a new dimension and initially focussed on rebuilding the material and social conditions necessary for schooling to take place: school buildings and renovations, and capacity building of school governing bodies.
>
> (Chisholm and Vally, 1996 p 3)

Steyn and van der Westhuizen (1993) and Chrisholm and Vally (1996) named a number of reasons for poor results among Black learners. These included the lack of completion of relevant syllabi for the school leaving certificate; condonation from Grade 1 through to Std 10; poor support for teachers; questionable competence and qualifications of some teachers; non punctuality and absenteeism of both pupils and teachers; attitude and commitment of teachers; unsatisfactory pupil-teacher ratio; insubordination of pupils and poor facilities, furniture and textbooks. Thabo Mbeki, as deputy president, stated that "...it is unacceptable that teachers should persistently come late to school, leave early and otherwise seek to do as little work as possible" (Peron, 1999 p 114).

Kwamashu learners and parents have cited additional factors such as substance abuse, lack of inspiration and direction, teachers being poor or even bad role models, teachers having open love affairs with learners, teachers more concerned with upgrading their own qualifications than with their responsibility to the learners, parents disinterested in school and school affairs (Nxumalo, 1993).

Some of these factors that result in the "lack of a culture of teaching and learning" stem from the political upheaval of the 70's and 80's. Others have to do with the morale of the teachers and learners, with poverty, with the high unemployment rate, with the loss of dignity or with a total disrespect for authority.

3.2.7 Homework?

The possible reasons contributing to poor achievement and thus the low Mathematics pass rate include past apartheid, past political activities, the lack of a learning and teaching culture, African culture or third world situation, parental economic status, school segregation and the economic state of the country.

Whatever their origin, they are so intertwined and interrelated that trying to solve only one of them would be meaningless. The change would only meet up with the inertia of the other factors, resulting in almost no change. In order to effect a meaningful change, the change would have to be affected on a great scale. The scale of the change would make it a project of such proportions that it would need to be dealt with by the entire community or even the entire country. A project of such proportions would be dependant on a large amount of money and would take a long time to effect the change. One individual, or a few together, could not hope to affect significant change.

What, then, does the individual learner do to help him or herself? On what level could that learner change something that would give him a chance to increase his Mathematics achievement? It would have to be something over which the individual learner has control, does relatively independently and is inexpensive.

Learners in Kwamasku, Kwazulu-Natal were asked to find practical ways in which they, as individuals, could try to learn under current school conditions (Nxumalo, 1993). They were encouraged to help themselves and endeavour to create positive outcomes out of disadvantaged circumstances.

They made the following suggestions:

- study seriously and aim high;
- join study groups;
- use study aids and read books;
- attend weekend or other extra classes;
- be active, join sport or youth groups to reduce boredom and idleness;
- watch less television;
- approach people for help and advice, eg. learned people, those in higher classes or higher institutions;
- stop comparing yourself to others, eg. those who come from very poor families and cannot afford certain things.

(Nxumalo, 1993 p 57)

Four of the above items refer directly to homework or home study. Attending extra classes also refers to study away from school although not at home. Watching less television could also have an effect on homework, as it allows more time for homework or other activities. The remaining two suggestions are concerned with the morale and self-concept of the learners.

Homework is work generally done by the individual learner and is done when away from the school. With enough family support, motivation and determination to work hard, a learner may be able to help himself despite other circumstances. Improved homework, on its own, will not eliminate the other problems with education nor even alleviate some of the hardships which come with the problems. It may, in fact, add to the hardships, as dedication to study under difficult circumstances is called for. However, a learner and his family would stand a chance to effect a change and thereby improve his academic achievement in the short term. They would not have to wait for some major organization to effect a change in the long term.

3.3 Homework

3.3.1 Definition of homework

> Homework is defined as tasks assigned to students by school teachers that are intended to be carried out during non-school hours.
>
> (Cooper, 1994 p 2)

Cooper used the word *intended* as learners may do the homework in different settings such as study periods, library time or other classes. He explicitly excluded in-school guided study, home study courses (distance education) and extra-curricular activities such as sports or clubs.

Homework has been classified in a number of ways. Lee and Pruitt (1979) have suggested the following taxonomy according to purpose: practice, preparation, extension or creativity. *Practice* helps learners master specific skills and should be limited to work dealt with in the classroom. *Preparation* helps learners to gain the maximum benefits from future lessons. *Extension* determines whether learners can transfer skills and concepts to new situations and requires abstract thinking. *Creativity* assignments ask learners to integrate many skills and concepts in order to produce their own responses. These are usually done over a number of days or weeks.

LaConte (1981) also classified homework according to purpose. His classifications are good discipline; easing the time constraints on the curriculum; fostering learner initiative, independence and responsibility; reinforcing school learning experiences; and bringing the home and school closer together.

Strother (1984) divided homework up according to the skill used: reading, writing, drill, memorization; whether it is assigned on a voluntary or compulsory basis; is individualized or requested of the entire class; takes a day to complete or longer.

Cooper (1994) combined the above suggestion and categorized homework according to amount, purpose, area of skill, degree of individualization, degree of choice for the student, completion deadline and social context. Table 3.1 is taken from Cooper (1994).

For the purpose of this study, homework is defined as a task assigned to the learners by the teacher that is intended to be carried out during non-school hours. The length of the task is such that it is expected to be completed in one sitting (overnight). The purpose is educational in nature with practice and extension as the main objectives. The task is seen as geared to the class in general but should be completed individually and is compulsory. The area of skill focuses on the application of Mathematical knowledge.

Table 3.1: Categories of homework

Classification	Within classification
Amount	Frequency; length.
Purpose	Instructional: Practice; preparation; extension; integration. Non-instructional: Parent-child communication; fulfilling directives; punishment; Community relations.
Area of skill used	Writing; reading; memory or retention.
Degree of individualization	Geared to individual student; geared to group of students.
Degree of student choice	Compulsory; with task options; voluntary.
Completion deadlines	Long-term; short-term.
Social context	Independent; assisted (parent, sibling, other); student group.

As presented in Cooper (1994 p 3)

3.3.2 History of homework

The history of homework stretches back further than can be specifically traced. Study was mentioned in the literature wherever formal education is described outside the home and family circle, implying that teaching methods of the past probably included some form of homework. A clear, albeit subtle, indication that homework was a fact of life was evident in Ancient Athens (800-480 BC) where the learners at the school of grammatistes memorized learning material through repetition. Further, Pestalozzi (1746-1827) requested learners to write down their opinions as to why some classroom methods did not succeed (Junor, 1989).

Literature referring to the history of homework generally refers to the controversies over the decades of whether homework should be assigned. If the trend was to assign homework, the questions always centred on how much homework to assign. Early in the 19th century, headmasters in Britain believed that difficult subjects required supplementary work. Later, as examinations began to have a greater influence on children's futures, increased pressure to pass the examinations brought more pressure to do more homework (Strother, 1984).

By the 1860's, teachers were "keeping in" children who needed extra help. During that period teachers were paid according to the children's examination results. Some children were thus kept in to study for most of the day. As a result, letters were written to newspaper editors, articles appeared condemning compulsory homework and the government held debates on the topic. Parents became concerned about the mental and physical strain on the children due to such long hours of study. Teachers complained that the children of the poor did not have a chance to study at home (Strother, 1984).

This ongoing controversy resulted in inspections by the British Board of Educators in the 1930's. A government pamphlet subsequently recommended no homework for children under 12, one hour of homework a day for learners between 12 and 14 and 1½ hours of homework a day for learners between 14 and 16. Homework should only be assigned for four days of the week. Study rooms with paid supervisors were introduced to give poor children an atmosphere similar to that of a quiet, well ordered home in which to work (Strother, 1984).

Views on homework in the U.S. followed a similar pattern. In the late 19th century, learning theories presented the mind as a muscle that would be developed through exercise. As a result, schools put emphasis on memorization. Parents and educators considered homework as an important factor in disciplining the mind, especially with difficult or disagreeable assignments (Strother, 1984).

This idea, that the mind was similar to a muscle, was carried through to the early 20th century. Memorization of multiplication tables, names, dates, etc. lead to the acquisition of knowledge as well as exercising the mind. As this kind of rote learning could easily be done at home, homework played an important part in schooling (Cooper, 1994).

Around 1910, the 'Ladies Home Journal' and 'School Review' opposed homework. It was considered that the unsupervised work allowed children to practise mistakes. It was also considered by some to be an unhealthy practice to make children carry their schoolbooks home (National Education Commission on Time and Learning (NECTL), 1993).

By the 1940's, a strategy of problem solving was developed which opposed the memorization theory. Problem solving thus became a central task of education. Homework as practice of memorization skills or as punishment was questioned. Greater emphasis was placed on the development of learners' initiative and interest in learning. Homework was viewed as an intrusion on the learner's time, which could be used for 'private, at-home' activities (Cooper, 1994).

In the late 1950's, the trend again moved towards assigning more homework. The launching of the Sputnik satellite by the Russians played a role in this reversal of trends. It was felt that the lack of rigour in the educational system was leaving learners unprepared to face a future in a world of complex technology. Homework became the tool to accelerate the pace of knowledge acquisition.

However, by the mid-1960's the trend was again reversed. The excessive pressure for learners to achieve was acted out in the amount of homework assigned. Learning theories of the time, that questioned the value of most approaches to homework, were quoted. The possible detrimental mental health consequences of too much homework were again stressed (as in the previous century). Emphasis was placed on the need for social experience, outdoor recreation, creative activities and enough sleep. Homework that interfered with these was not meeting the basic needs of learners (Cooper, 1994).

By 1983 the trend had again moved back to the view that homework was beneficial. Cooper (1994) stated that declining achievement scores and an increasing concern for traditional family values in the U.S. had changed the perception of the value of homework.

In summary then, parents and teachers questioned the effects of homework on learners' mental health, their leisure activities and the amount of sleep they had, during 1900-1910, 1930-1940 and 1965-1980. The amount of homework assigned was decreased. Yet each time the pressure to increase homework reasserted itself when academic results dropped. Homework seemed to be the first step taken when reformers attempted to improve academic outcomes. This reasoning possibly had to do with the philosophy that learners should work harder and also with the ease of implementation of more homework. Increased homework costs very little and needs no major curriculum development (Strother, 1984).

3.3.3 The purpose of homework

According to Bracey (1989), homework is "practice to increase the speed and mastery of work or the maintenance of skills". However, he also quoted Epstein (1989, from Bracey, 1989) in saying that homework is also given to increase the involvement of each student with learning, to foster personal development, to establish communication between parents and children, to carry out directives from administrators, to inform parents about what is happening in class and to punish wrongdoers. Small, Holtan and Davis (1967) felt that graded homework aided class control.

Although Bracey's (1989) and Epstein's (1989 as quoted in Bracey, 1989) articles referred mainly to elementary and middle school children, part of their reasoning could apply to high school learners. Homework in high school can be given as practice to increase mastery of the work, to maintain skills already learnt, to increase the involvement of learners with learning and to foster personal development and responsibility. Such reasoning would even apply to tertiary education.

Cooper (1994) stated that homework rarely serves only one purpose. Most homework assignments have elements of several purposes. Some of these are related to academic instruction and others meet the purposes of the teacher, the school administration or the school district.

However, the most common purpose of homework was considered to be practice or revision (Cooper, 1994 and Earle, 1992). Such homework is meant to reinforce the learning of the material dealt with in the classroom and to help learners master specific skills.

Another purpose of homework is to have learners prepare for the next lesson. This is done by introducing material that will be dealt with in subsequent lessons. The idea is to assist learners to obtain maximum benefit when the material is presented in class. The learners have the advantage of background information or experience when the work is covered in class.

The third purpose for homework is called extension. This involves the transfer of previously learnt skills to new knowledge or situations. It may require the application of abstract principles to new circumstances not dealt with in the classroom.

Fourthly, homework can serve the purpose of integration. This entails the application of many skills or concepts, learnt separately, to produce a single product.

To these purposes of homework, Cooper (1994) added the establishment of communication between parent and child, the fulfilment of directives from school administrators, the punishment of students and the public relations objective of informing parents about what is going on in the school.

La Conte (1981) similarly stressed five 'non academic' purposes of homework. These are good discipline; easing the time constraints on the curriculum; fostering learner initiative, independence and responsibility; reinforcing school learning experiences;

and bringing the home and school closer together. Etzioni (1983, as quoted by Strother, 1986) gave five additional 'non academic' purposes for homework: Homework enhances the ability to concentrate, to follow rules, to control impulses, to face and overcome stress and to resist distractions.

The U.S. Department of Education (1986) in a document entitled "What Works" stated that homework also teaches learners to be independent learners. It gives them experience in making judgements and comparisons, raising additional questions for study, developing responsibility and self-discipline.

Strother (1984) wrote that homework is necessary to guarantee that enough learning time is devoted to each learning area, particularly in high school where so many subjects are dealt with. She states that parents expect their children to receive a reasonable amount of homework. Parents see "reasonable" as enough to enhance learning and even, in some cases, to keep the children "out of mischief". However, parents also want their children to have time for formal extra-curricular activities, play and household chores.

According to the TIMSS study (Stevenson, 1998), German parents saw the purpose of homework as its ability to enable teachers to determine whether the learners had understood what was taught in the classroom.

Thus, the purpose of homework is viewed differently by different people, from the practice to increase mastery (Bracey, 1989 and Epstein as quoted by Bracey, 1989) through the formation of independent learners (US. Department of Education, 1986), determination of learners' understanding of the work (Stevenson, 1998) to the guarantee of sufficient learning time (Strother, 1984) and other non-academic purposes (LaConte, 1981 and Strother, 1984). However, each of the above requires the learner to practise skills and/or knowledge (through use and memorization) that were learnt in the classroom. As such homework falls within the constructs of behaviourist learning theories.

If learning is considered as the apparent modification of a person's behaviour through his activities and experiences (Curzon, 1990) and homework is the practice and reinforcement of such behaviour, then homework relies on behaviourist learning theories for the behaviour to be actualized. Homework thus becomes an activity intended to induce learning, through the deliberate creation of conditions in which learning occurs. According to behaviourists such as Pavlov, Watson and Thorndike, assigned homework would be the stimulus to which learners have been conditioned to respond by completing the homework (Curzon, 1990). During that process the habit of doing homework becomes a conditioned reflex. Similarly, the stimulus of the instruction to "solve for *x*" results in the response of applying a set method to find a solution for *x*. The learner experiences satisfaction in the ability to complete the problem and be able to mark it as correct during feedback in class the next day.

Tolman's neo-behaviourist learning theory also applies to homework. The 'particular sign' is the instruction to do set problems for homework, the 'particular behaviour' (response) is to do the homework and the 'particular consequence' to that response is the reward of having done the task correctly or the dissatisfaction (or punishment) of not having done the task correctly. In a similar manner, learning for Skinner involved a change in the form or probability of the learner's operand (voluntary) responses. The strength of the learned response, ie. the probability of its recurrence, is generally determined by the amount of reinforcement it receives (Curzon, 1990). Thus, a learner doing ten similar problems, solving for *x*, will be able to solve for *x* more quickly and easily in future problems than a learner who did only two or three problems. The probability of the desired response being given (solving for *x*) is determined by the amount of reinforcement it receives - the more problems, the better the ability to solve for x in similar situations. Such reinforcement is one of the main purposes for assigning homework, especially in Mathematics ((Cooper, 1994 and Earle, 1992).

However, such a behaviourist view of homework is criticized by social constructivists in educational theory today. This is rightly so if learners are to be capable of acting and thinking for themselves - as opposed to merely reacting according to behaviourist theory (Department of Education, 1997). When presented with the instruction to solve for x, a learner should be able to decide on the appropriate method to use and how best to apply it. He should not just 'follow a recipe' which has brought results in previous instances. To really be able to succeed in Mathematics the learner should also be able to reason why his chosen method is the most suitable method for him to use. Yet, the learner will only be able to make such decisions if he has knowledge of the various methods and has sufficient practice in them to recognize the options and choose the best option. Thus, as Mathematics learning involves practice, repetition and positive reinforcement, aspects of behaviourist theory are of value to learners of Mathematics. Such practice and repetition is necessary for the learners to understand and cement the essentials for later application. A subject such as English may well need a different approach.

Earle (1992) felt that although the purposes of homework mentioned above might be reasonable outcomes resulting in the use of homework, they failed to develop a sound theoretical framework for the use of homework. He questioned whether homework had a firm footing in instructional or learning theories and suggested that the lack of theory may be a contributing factor to the inconclusive research over the years.

Earle (1992) went on to suggest that instructional design theory, as outlined by Gagne (1975), was a valid theory upon which homework should be based. Homework, based on this theory, more easily assumed a proper role as a valid component of instruction. As such he explains the purpose of homework according to six of the nine instructional events of the instructional design theory. These are:

- stimulating recall of prerequisite learning (revision of material learnt in order to enhance the learning of new material);
- presenting the stimulus material (preparation for new material to be dealt with in the next lesson);
- eliciting the performance (practice of new material learnt);
- providing feedback about performance correctness (material is corrected as soon as possible);
- assessing the performance (assessment scheduled as homework);
- enhancing retention and transfer (retention of material learnt and the application of old learning to new learning).

Earle (1992) therefore argued that instructional design theory elevates homework to a position of value as a valid component of the learning process. Although homework doesn't usually teach, it does meet with the requirements for several instructional events. If homework is designed carefully to meet such instructional events, it is not just "busywork". Homework, in effect, becomes an instructional assignment and a meaningful event in the instruction and learning process.

Earle (1992) described Gagne's (1975) basic model of learning and memory and the processes associated with this theory. The stages involved in an act of learning explain the way in which a learner processes information internally.

According to the theory, sensory stimuli from the learner's environment are processed as patterns of neural impulses through a sensory register. Selective perception filters filter out unimportant stimuli, facilitating attention to the primary stimulus. After rehearsal, the primary stimulus is moved into short-term memory storage. Semantic encoding and organization then need to take place before the learning is stored in long-term memory.

The retrieval of learning is also triggered by environmental stimuli. These bring prior learnings into a short-term working memory. In the short-term working memory additional material learnt can be associated with and linked to existing material preparatory to long-term memory storage and performance. This entire storage and retrieval system is assisted by the learner's executive control processes, utilizing a variety of cognitive strategies to enhance learning. Table 3.2 sets out the process diagrammatically.

Table 3.2: A basic model of learning and memory

Storage	Retrieval
Stimuli (rehearsal and repetition) ↓ Short-term memory (semantic encoding and organization) (practice and reinforcing) ↓ Long-term memory	Stimuli ↓ Prior learnings into short-term working memory (rehearsal, practice, association, organization, semantic encoding) ↓ ↓ Long-term memory (response generator) ↓ Performance

(As described in Earle, 1992)

Earle (1992) described the following example of the process:

> ...in teaching the concept "triangle," the teacher presents the learner with a variety of triangular shapes highlighting their physical attributes. Worksheets provide practice in the recognition of triangles. The concept is stored along with the concepts of other geometrical shapes. As part of a new lesson on equilateral triangles, the teacher asks questions about triangles to stimulate retrieval of related learnings into working memory before adding the features of equilateral triangles to the learner's repertoire. A similar pattern of practice and feedback solidifies the new concept in the long-term memory.
>
> (Earle, 1992 p 38)

Teachers, although unable to have direct control of the process, are in control of events in the learning environment, which can be used to enhance the internal process (Earle, 1992). Gagne conceived instruction as "a deliberately arranged set of external events designed to support internal learning processes" (Gagne, Briggs and Wager, 1988 p 11).

The theory sets out nine specific events which can be applied by teachers to ensure that their instruction matches the internal learning process. The relationship between the instructional events and the internal learning processes is shown in Table 3.3 (as taken from Gagne *et al*, 1988 p 182). Six of these events (*) are used by Earle (1992) to describe the purpose of homework as based on a sound theoretical framework.

Table 3.3: Gagne's relationship between instructional events and internal learning processes

Instructional Event	Learning Process
1. Gaining attention.	Reception patterns of neural impulses.
2. Informing the learner of the objective.	Activating a process of executive control.
3.* Stimulating recall of prerequisite learning.	Retrieval of prior learning to working memory.
4.* Presenting stimulus material.	Emphasizing features for selective perception.
5. Providing learning guidance.	Semantic encoding; cues for retrieval.
6.* Eliciting the performance.	Activating response organisation.
7.* Providing feedback about performance correctness.	Establishing reinforcement.
8.* Assessing the performance.	Activating retrieval; making reinforcement possible.
9.* Enhancing retention and transfer.	Providing cues and strategies for retrieval.

(From Gagne *et al*, 1988 p 182)

3.3.4 Research on homework

Strother (1984) pointed out that relatively few research studies had dealt with the topic of homework by the early 1980's. Even when the topic did arise, it was discussed with much controversy. Views of childhood, leisure time, as well as changing attitudes towards the curriculum, teachers and teaching methods influenced attitudes towards homework (see 3.2.3). Epstein (1983 as quoted by Earle, 1992) stated that little was really known about how or why homework was associated with improved achievement, behaviour or attitude, or whether it had any positive effect at all. LaConte (1981) and Earle (1992) mentioned that many studies that had been conducted were inconclusive.

Leading researchers who have analysed the studies on homework agree that the quality of the research is poor and that the findings are contradictory (NECTL, 1993). The research design used most often to assess the possible effects of homework was to correlate the amount of time learners spend on homework with their achievement at school.

Again in 1994, Cooper's review stated that few researchers had investigated the topic of homework (Cooper, 1994). He felt that the role of research in forming attitudes towards homework had been minimal and put this down to the complex influences on homework. No simple, general finding proved or disproved the effective use of homework. However, by 1994 enough research could be found to support whatever position was desired. Advocates for or against homework often cited isolated studies to either support or refute the value of homework (Jongsma, 1985; Cooper, 1994).

Cooper (1994) collected the research done on homework, both positive and negative, in the last 50 years that examined the effects of homework or that compared variations in homework assignments, processes, and contexts. He rigorously integrated the results of the studies. He then used the integrated results to set homework policy guidelines for school districts, buildings and classrooms.

Homework consists of various aspects. Some have been the subject of research while others have not. There can be little doubt that issues such as teaching methods, teacher creditability or teacher qualifications have an effect on the homework assigned or homework completed. Aspects such as the amount of homework completed, the accuracy of the homework completed or the efficiency of homework affect homework's effect on achievement. Yet they have not been addressed in the literature to date. Time spent on homework has been the topic of many a study. However, the actual quality or amount of work done during that time has so far been overlooked.

The various aspects of homework, as presented in the literature, are set out below.

3.3.4.1 Effect of homework on achievement

Of the American researchers who have probed the topic of Mathematics homework, most claim that time spent on homework has a direct positive effect on Mathematics achievement (Goldstein, 1960; Keith, 1982; Keith and Page, 1985). That homework in high school is linked to better achievement is supported by Bracey (1989), Hagborg (1991), Keith (1982), Keith and Page (1985), and Marquis (1989). Most educators support the view that regularly assigned homework enhances learner achievement (Coulter, 1979). It is interesting to note that all the above research supporting homework as a tool for academic achievement was done during the periods in History when the trend was to assign more homework.

Although analysing the amount of homework done to determine the effect of homework on achievement is a simplistic approach, such approaches have been considered valuable and have been adopted. However, the findings from such studies have been inconclusive. Small *et al* (1967) stated that several reports on homework research have indicated that the results linking homework to achievement have been inconclusive. Goldstein (1960) suggested that the data of many studies, finding no link between homework and achievement, had been misinterpreted and that regularly assigned homework did favour higher academic achievement. Small *et al* (1967) further quoted Koch (1960) and Hines (1957). Koch's research on Mathematics homework for sixth graders, concluded that daily homework "of a reinforcing nature" was a significant factor in the achievement of arithmetic computations. Hines concluded that written homework increased achievement in plane geometry. After reviewing the literature of the time, Small *et al* (1967) assumed that homework did increase achievement.

Keith (1982) pointed out that homework also seemed to have compensatory effects, so that learners with lower ability could achieve grades commensurate with their peers of greater ability by doing more homework. Thus, "homework is clearly important and should be treated as such by all concerned" (Keith, 1982 p 252). Although the study was not conducted specifically on Mathematics but on homework in general, the conclusions could hold true for Mathematics.

However, LaConte (1981), Friesen (1979) and Barber (1986) stated that research had not shown a clear-cut advantage for assigning and doing homework. Even when achievement gains had been found, they were minimal when compared to the amount of work expended by teachers and learners (Barber, 1986). It must be borne in mind, though that Barber (1986) was critiquing a paper by Wahlborg, Pascal and Weinstein (1985) and was in turn said to have misinterpreted the paper.

In answering the question: Does homework increase academic achievement? Ziegler (1986) said that the best answer, at the time, was that large scale correlation studies at the secondary level suggested a strong positive relationship between the amount of homework and academic achievement. At both elementary and secondary levels, doing homework is associated with the learners' liking for the subject.

Hagborg's (1991) study concurred with that of Keith (1982) in that the time spent on homework was predictive of achievement, grades and even school dropouts. Page and Keith (1981) stated that homework was a fairly simple and inexpensive means of improving academic achievement.

The Japanese place great emphasis on homework as the basis for the excellent achievements of their adolescents in Mathematics and Science. Japanese learners are expected to spend several hours a night doing homework (often not assigned), reviewing the day's lessons and preparing for the next day's work (Stevenson, 1998). The Japanese even have three different words that they use for the three different types of homework assigned to their adolescents. 'Shikudai' refers to homework assigned by teachers. 'Fukushu' refers to continuous revision of work that has been covered in class to ensure that the learners are ready for tests. 'Yooshu' refers to the preparation of work that is going to be dealt with in class the following day or week (NECTL, 1993).

3.3.4.2 Effect of marking homework

Researchers such as Small *et al* (1967) did not comment on the direct effect of homework but suggested that checking homework has an effect only in as much as it brings greater classroom control with it. They concluded that the grading of homework was not really worthwhile unless the teacher had qualified assistance. While it was some help to the learners, it did not significantly contribute to achievement. However, this research was done during a period when less homework was advocated.

Austin (1979) indicated that the sooner feedback was given after the homework had been done, the more effective the feedback would be. Since learners could not benefit from practising incorrectly, correcting homework was crucial for the learning process (Lee and Pruitt, 1979). Jongsma (1985) found that the value of homework depended on whether the teacher checked the homework for correctness. When consequences were enforced for not doing homework, homework had the effect of improving academic performance.

Marquis (1989) felt that although a system of accountability for homework was necessary for the learners, collecting, checking and grading each learner's homework every day was not necessary. It must be said though that Marquis' article is a discussion article and is not based on research.

In his review of the literature on homework, Cooper (1994) didn't find any studies that showed that differences in marking or feedback had different effects on homework. Apparently it made no difference whether feedback was given or not, whether the learner was merely told that the answer was wrong or received a description of the error, whether all homework was discussed or only the problems requested by the learners, whether praise or critical remarks were given or whether and how the homework was graded.

3.3.4.3 Effect of the type of homework assigned

Schmalz (1990) stated that homework was only effective if it was given on recently reviewed topics or to explore a particular problem. He thereby supported Koch's (1960 from Small *et al,* 1967) opinion that homework should be of a reinforcing nature to be effective. Homework given for the sake of homework is merely a waste of time. The purpose of homework requires that it be effective and contribute to the learner's knowledge. It therefore follows that if homework is effective, it should have an effect on achievement.

The effect of the homework should be visible in some way. If the purpose of homework is instructional (Cooper, 1994), then a visible effect could be expected in the improved skills or knowledge of the learner. Improved skills or knowledge should be reflected in academic achievement. Thus, effective homework can be expected to reflect on achievement.

Keith's (1986) research supported the idea that Mathematics homework lends itself to practice assignments. Cooper's (1994) review also found that subjects and topics amenable to practice and preparation type homework showed the strongest relation between homework and achievement. He thus suggested that homework might be most effective for the learning of simple tasks. This, however, would not serve to generate interest in a topic. For interest, more challenging assignments using higher order thinking skills and integration of different domains of knowledge are needed.

According to Cooper (1994), homework should serve different purposes in the different Grades. For younger learners, homework should foster positive attitudes towards school and better academic-related behaviours and character traits. It should not be used primarily to improve subject matter achievement. As the learners grow older, the function of homework should gradually change towards facilitating the acquisition of knowledge in specific topics.

3.3.4.4 Effect of homework versus no homework

Austin and Austin (1974) reviewed the literature comparing homework to no homework in Mathematics. They concluded that the research tended to support the belief that regular homework played an important role in improving Mathematics achievement. Certainly, to date no research study has determined that doing 'no homework' is beneficial. Thus, if 'no homework' is not beneficial, then homework must be seen as either beneficial or not beneficial, but cannot be seen as detrimental to a learner's Mathematical achievement.

Austin (1979) summarized the research on the effects of homework in Mathematics up to 1977. He concluded that:

- required homework may be preferable to voluntary homework;
- having no homework assigned in one school year could adversely affect the

performance in subsequent years;

- assigning homework is preferable to no homework in Grades 4 - 10;
- homework consisting only of routine drillwork probably has limited value;
- homework appears to improve computational skills although not necessarily problem-solving shills;
- long homework assignments are not necessarily more effective than shorter ones;
- feedback on homework can improve achievement;
- early feedback is preferable to delayed feedback.

Jongsma (1985) pointed out that the review of 24 studies done between 1923 and 1976 by Friesen (1979) did not show strong support either for or against homework. This is not surprising when the time span over which the studies were done is compared to the changes in attitude towards homework over that time. The attitudes changed from favouring more homework (1910 - 1930) to less homework (1930 - 1940), back to more homework (1940 - 1965) and then to less homework again (1965 - 1980). However, Friesen (1979) did identify an important factor. In some cases, average and below average learners did significantly better if assigned homework.

Summarised from 17 research reports comparing homework to no-homework, appearing since 1962, Cooper (1994) found the following trends:

- Homework is better than no homework at all.
- Homework effects vary with Grade level. Older learners (high school) benefit most from doing homework.
- Gender or intelligence does not influence the effects of homework.
- Homework has a small effect on Mathematics achievement. The effect is greater for computational or conceptual skills than for problem-solving skills.
- Homework produces more positive effects when learners do more assignments per week.
- The effect of homework is negative in relation to the time needed for the homework. The longer a learner needs to complete his homework, the less effect the homework has on his achievement.

- Relative to other instructional techniques and the cost involved in the implementation of homework, it can produce a substantially positive effect on learners' performance in high school (Cooper, 1994 p 18).

3.3.4.5 Positive and negative effects of homework

In his review article Cooper (1994) listed positive and negative effects of homework as found in the literature. He found that the positive effects could be grouped into four categories. These are: immediate academic effects; long-term academic effects; non-academic effects and parental involvement effects. The immediate effects of homework on learning were the most frequently used rationales for assigning homework. Table 3.4 lists more detail of the positive effects.

Some negative effects were also attributed to homework by the literature (Cooper, 1994). These refer more to the physical and mental aspects of the learners than to academic matters. These include satiation, interference with leisure time and community activities, parental interference, cheating and increased differences in academic achievement in high and low achievers. Table 3.4 lists such negative effects.

Satiation refers to an attitude that learners develop towards their work and school. If the potential for any activity to remain rewarding is limited, then doing homework may have a negative effect. Homework causes the child to spend more time on school learning. Thus by doing homework, or too much homework, the learner may become overexposed to academic tasks and lose interest. Homework, therefore, may undermine good attitudes and strong achievement motivation.

Homework can also lead to physical and emotional fatigue. This impacts on the learner's access to leisure time and community activities. The importance of leisure time and community activities lies in the after-school learning that takes place during these activities. As important life skills are learnt during such activities, a balance needs to exist between homework and leisure activities.

Table 3.4: Effects of homework on learning

Positive effects	**1.Immediate achievement and learning.** Improved retention of factual knowledge; Increased understanding; Improved critical thinking, concept formation, information processing; Curriculum enrichment. **2.Long-term academic.** Encouraged learning during leisure time; Improved attitude towards school; Improved study habits and skills. **3.Non-academic.** Greater self-direction; Greater self-discipline; Better time organization; More inquisitiveness; More independent problem solving. **4.Parental involvement.** Greater parental appreciation of schooling; Greater parental involvement in schooling.
Negative effects	**1.Satiation.** Loss of interest in academic material; Physical fatigue; Emotional fatigue. **2.Interference with home life.** Denial of access to leisure time and community activities; Loss of learning from leisure time and community activities. **3.Parental interference.** Pressure to complete work well; Pressure to perform well; Confusion of instructional techniques. **4.Cheating.** Copying from other students; Help from others beyond tutoring; Overreliance on others for assistance. **5.Increased differences between high and low achievers.**

(Adapted from Cooper, 1994 p 6)

Parents may have a negative effect on homework when they pressure learners unduly to complete homework or to do the homework with unrealistic rigour. Parents may also create confusion when their methods differ from those taught at school or when they are unfamiliar with the material sent home as homework.

When parental assistance goes beyond that of simple tutoring or assistance, the learner may develop an over-reliance on assistance. When this is the case, homework may promote cheating, dependence on assistance and a lack of self-direction and self-discipline.

Some argue that homework has increased the differences in achievement between high and low achievers. This difference is emphasized when associated with economic differences (Cooper, 1994). The argument states that high achievers from well-to-do homes have greater parental support and more appropriate assistance than low achievers. Learners from well-to-do homes are also more likely to have quiet, well-lit places in which to do their homework, and better resources to help them to complete assignments successfully.

Cooper (1994) pointed out that the positive and negative effects of homework can occur together. Homework could improve study habits while also denying access to leisure activities. Different homework assignments could produce different effects, some positive while others are negative. With the various different types of homework and ways in which they can be carried out, a host of complex effects should be expected.

3.3.4.6 Effect of the frequency of homework

Marquis (1989) suggested that homework be given regularly at the end of each Mathematics period, ie. every day. He further suggested that homework not be a part of the problems practised in class but be separately assigned. These problems should be carefully chosen with a purpose in mind.

Homework was found to produce larger positive effects if more assignments were done per week. However, the effect of the homework was negatively correlated to the duration of the homework (Cooper, 1994). The longer the homework, the less the effect of doing the homework. Cooper (1994) suggested that the longer homework treatments may have involved less frequent assignments during any given week, thereby reducing the effect of the homework.

Moyana (1996) did a survey on Grade 10 South African learners and compared frequency of homework with Mathematics achievement. Although he found a difference in achievement between learners who had frequent homework and those who had less or no homework, it was not significant. However, he classified frequent homework as being homework assigned daily, four times a week or three times a week. Would he have found a significant difference in achievement if he had excluded three times a week from the frequent homework data set?

3.3.4.7 Time spent on homework

3.3.4.7.1 Effect of time spent on homework

In the last 30 years, over half a million learners have been asked to report the amount of time they spent on homework. During the first 15 years less homework had been recommended, while more homework was encouraged in the last 15 years. The learners' responses were then related to some measure of academic achievement. The results have shown that homework and achievement are related but cannot show which, if either, causes the other. That is, does homework improve academic achievement or do teachers assign more homework to the better achievers? Both positive and negative correlations have been found in past research, although positive correlations dominate the negative correlations (Cooper, 1994).

Research on the time taken for homework also did not distinguish between the amount of homework assigned by teachers and the time taken by the learners to complete the homework. Reports of time spent doing homework typically relied on learner self-reports. The accuracy of the reports may thus be questionable and possibly biased towards longer times (Cooper, 1994).

In his study on high school seniors' achievement, Keith (1982) found that time spent on homework contributed significantly to student grades, even after controlling for race, family background, ability and programmes of study. The direct effect of time spent was second only to intellectual ability. Keith (1982) also quoted Wagstaff and Mahmoudi (1976) for a sample of Engineering students (Mathematics related) where time spent on homework/study was found to be the third best predictor of examination grades, following ability test scores and assignment completion.

In a review of 17 studies, involving 112 714 students, Cooper (1994) found the following trends:

- The most dramatic positive influence on the relationship between the time spent on homework and achievement was for high school learners.
- The effect of more time spent on homework was most noticeable for Mathematics. The effects being greater when the homework involves rote learning, practice or rehearsal.
- Learners who spent more time on homework also scored higher on a measure of achievement or attitude.
- There was no relationship between the time spent on homework and individual differences (eg. gender or background).

3.3.4.7.2 Recommended time ranges for homework

Driscoll (1980) suggested that short daily [regular] assignments appear to be the optimal form of practice for elementary school Mathematics.
The Forum of Educational Organization Leaders (Washington, DC. as quoted by Strother, 1984) recommended one hour of homework a day for elementary school learners and two or more hours per day for high school learners. This being all homework and not only Mathematics.

In a booklet published by the International Honour Society in Education, Keith (1986) suggested that the following time ranges, geared towards the average learner, should be workable for all homework:

- ten to 45 minutes a day for Grades 1 to 3;
- 45 to 90 minutes per day for Grades 4 to 6;
- one to two hours per day for Grades 7 to 9;
- 90 minutes to 2½ hours per day for Grades 10 to 12.

Smith (1988) suggested that a primary school child spend thirty to sixty minutes on homework. By junior high school, a time of thirty minutes for Mathematics alone, as suggested by Kroeze (1989), thus cannot be considered excessive. Kroeze (1989) further suggested Mathematics homework of up to an hour for Grades 11 and 12.

Marquis' (1989) suggestion expanded on that of Kroeze (1989). He suggested that the number of problems assigned each day should require no more than thirty to forty-five minutes a day for Grade 9 students (equivalent to first year Algebra in his study). Thus, summarizing Smith (1988), Kroeze (1989) and Marquis (1989), Mathematics homework should entail part of one hour's homework for primary school, thirty to forty-five minutes for Grades 8 to 10 and approximately one hour for Grades 11 and 12.

In the Hagborg (1991) study of homework time of high school students, the group doing homework reported spending an average of 62,09 minutes on daily homework. This time referred to all homework and not only Mathematics homework. The times obtained were based on students' reports and were thus students' perceptions of times for homework done, with the possibility of the Hawthorne effect playing a role. The average age of the students was reported as 15,91 with no indication of Grades involved. It is thus assumed that a cross section of all students was taken and that the average time for the higher grades should be on the higher end of the scale, ie. above 62 minutes of general homework per day.

However, Hagborg (1991) warned that although the time a student spends on homework can provide a rich array of information, it may give less information than would be expected about academic performance. Although the time spent on homework has the advantage of simplicity and appears to provide useful information, it glosses over the complexity of the issue of homework. Two such complex issues associated with time spent on homework are the amount of work completed within that time-span and the accuracy with which the homework was completed. Yet no research has included these important issues. Thus, a learner may spend 2 hours a day on homework and yet complete only a few problems. Alternatively, a learner could spend the time on homework, complete all the problems, but get the majority wrong. Either way, the time spent on homework says nothing about the efficiency or effectiveness of the time spent.

Cooper (1994) found nine studies (13 independent samples) that reported levels of achievement for different amounts of time spent on homework. He made some considered assumptions in order to combine the independent samples and assess the possibility that there were optimum amounts of homework. For high school learners, he found that a positive relationship only appeared after at least one hour of homework a week was reported. It then continued to improve achievement to the highest measured interval of more than two hours per day (or 10 hours per week).

Based on his review of the literature, Cooper (1994) recommended that school districts prescribe general ranges for the frequency and duration of homework. He felt that these should reflect grade-level differences and should also be influenced by community factors. Cooper set the following ranges as guidelines for homework from all subjects combined:

- Grades 1 to 3: one to three mandatory assignments per week, each lasting no more than 15 minutes.
- Grades 4 to 6: two to four mandatory assignments per week, each lasting between 15 and 45 minutes.
- Grades 7 to 9: three to five mandatory assignments per week, each lasting (in total) between 45 and 75 minutes.
- Grades 10 to 12: four to five mandatory assignments per week, each lasting (in total) between 75 and 120 minutes.

Cooper further recommended that each school have a policy which further specifies the time ranges for the different Grades and subjects. This is especially important in schools where different teachers teach different subjects, as in high schools. Each teacher should know which days of the week are available for him or her to assign homework and how much of the learners' total daily time is allocated to that subject.

Chinese college-bound senior learners in Hebai, China are expected to attend a two hour homework session after school during which the learners did homework individually (Ma, 1996). Japanese learners are expected to spend several hours a night doing homework (often not assigned), reviewing the day's lessons and preparing for the next day's work. German learners at *Realschule* (schools for average learners) have homework nearly every day comprising of 15 to 30 minutes per subject - a total of one to two hours each day. Low achieving learners at *Hauptschule* spend half an hour to an hour on homework daily, mostly comprising German, Mathematics and English (Stevenson, 1998).

3.3.4.8 Effect of completion of homework

According to Marquis (1989), students needed to know that homework was important, that completion was expected and that they would be held accountable for the work. Wagstaff and Mahmoudi (1976 in Keith, 1982) placed assignment (or homework) completion as a good predictor of achievement, even above the amount of time spent on the homework.

Carefully assigned homework that is completed would have maximum effectiveness as all the needed practice and different variations of the problems would have been dealt with. A learner leaving homework incomplete would lack the well-rounded knowledge and practice for which the assignment was designed.

3.3.4.9 Effect of success on homework

Powers, Douglas, Cool and Gose (1985) discussed the effect success had on achievement. High school learners, who attributed success to their efforts, tended to increase their motivation to achieve because effort was seen as internal and under their own control. Therefore, those who attributed their success to effort tended to have greater motivation to achieve further. Achieving success as a result of completing regular homework should thus lead to greater motivation to do regular homework.

There was also a small tendency for those, who attributed their failure to lack of effort, to be less motivated to achieve. This basically implied that learners who were too lazy to do homework, and realized that this was the reason for their lack of achievement, might become even lazier.

3.3.4.10 Effect of socio-economic background of learners on homework

Parent education level, income and occupation are components of socio-economic status (SES). Various researchers have examined SES as a single variable and have suggested that families with a high SES are more involved with their children's education than families with low SES and that more involvement leads to improved academic performance (Astone and McLanahan, 1995; Coleman, 1966; Fehrmann, Keith and Reimers, 1987; Muller, 1993; Revicki, 1981; Stevenson and Baker, 1987 - all as quoted in Balli, Wedman and Demo, 1997).

However, Sui-Chu and Willms (1996) found that parents provided relatively similar levels of homework supervision, regardless of socio-economic status (SES). They found that achievement was more strongly linked with home discussions about school than with homework supervision alone. Home discussions about school were only moderately related to SES. Salerno and Fink (1992) and Clark (1993) similarly found that learners from low SES families could achieve academically if "pressed' for success. Low SES was thus not seen as necessarily being a barrier to family involvement and academic achievement. However, the Salerno and Fink (1992) and Clark (1993) studies showed that the association between academic achievement and a learner's family background was more complex than a simple linear function (Balli *et al.*, 1997).

That SES is not that relevant to academic achievement was also pointed out by Maqsud and Khalique (1991). They found that SES measured consistently negative when correlated to learner self-concept scores. They thus suggested that in Batswana culture (Bophuthatswana, South Africa), parents of higher SES perhaps did not have enough time to provide their children with qualitative parental attention and encouragement. Children from homes with lower SES might not have the material comforts but might receive adequate parental attention and encouragement.

Bracey (1989) pointed out that children who generally had difficulty completing homework were usually found to have less-educated parents, had parents who were not confident about their ability to help their children and had few books or educational items, eg. rulers or dictionaries, at home. More homework in such a case would at best be a simplistic solution and not a cure for educational problems (Epstein as quoted by Bracey, 1989). Dornbusch (1986) and Balli *et al.* (1997) found that higher parent education level was associated with higher learner achievement.

It would appear that a vicious circle of less educated parents → parents not confident to assist learners → fewer educational items → difficulty completing homework → low achievement → less educated parents, may have evolved in some communities. Two practical possibilities for breaking the cycle would be by introducing more educational items or by assisting in the completion of homework. However, the provision of educational items alone, without the motivation to make use of them, would probably be futile. The completion of homework is thus seen as the point having the most potential.

According to the literature above, improved academic performance and homework completion are dependent on the amount of family involvement and homework supervision. However, home discussions about school, rather than homework supervision alone, were more strongly linked to achievement. SES was only moderately related to home discussions about school.

Thus, if families improve on home discussions about school, homework completion should improve. 'Discussions about school' are taken to be a broad topic about any activities or thoughts related to the child's schooling. Parents do not need to be academically educated to encourage a child's tales of school or to respond to them. They only need to show an interest. The cycle of less educated parents → → → less educated parents can be broken at the point of 'parents not confident to assist learners'. Parents need to realize that interest and parent involvement are required to assist their children, rather than academic skills.

3.3.4.11 Effect of attitude

In their study on secondary school Mathematics learners in Bophuthatsawana, South Africa, Maqsud and Khalique (1991) investigated the impact of socio-economic background, school alienation, gender, self-concept and attitude toward Mathematics on the learners' performances in Mathematics. They found a significant positive relationship between Mathematics achievement and attitude towards Mathematics for both boys and girls. None of the other variables showed a significant correlation with achievement in Mathematics.

Maqsud and Khalique (1991) also quoted Cheung (1988) as reporting a positive correlation between secondary school learners' attitude towards Mathematics and their achievement in Mathematics.

Maqsud and Khalique (1991) used the definition of Romberg and Wilson to describe attitude:

> If an individual has a set of predispositions towards an object in the environment (eg. Mathematics, self, school teacher, etc.), it is reasonable to expect that such predispositions would interact with the perception of the object in such a way as to affect the individual's response to that object.
>
> (Romberg and Wilson as quoted in Maqsud and Khalique, 1991 p 386)

This definition suggested to them that favourable predispositions of learners towards Mathematics could be expected to favourably influence their Mathematics performance.

The Aiken's Scale of Attitudes towards Mathematics used by Maqsud and Khalique (1991) gave measures of enjoyment of Mathematics, motivation in Mathematics, importance of Mathematics, and freedom from fear of Mathematics. They thus argued that it would be common sense to accept that learners holding such characteristics would perform better in Mathematics than those who lack the characteristics.

In a similar vein, learners having the above characteristics could be expected to have a positive attitude towards Mathematics homework. If they enjoy Mathematics, are motivated to do the problems, think Mathematics is important and do not fear Mathematics, they should be prepared to do Mathematics homework. One could even expect them to do it to the best of their ability with maximum effort.

However, attitude has two dimensions. Is it attitude towards Mathematics that affects the learner's attitude to homework or is it the learner's feelings towards homework that affect his attitude towards Mathematics?

3.3.4.11.1 Effect of attitude on homework

Attitude is a variable that is not as easily measurable as achievement or aptitude. Schibeci (1984) suggested that more complex and subtle relations between attitudes and achievement might exist, which have been ignored in research reports. He suggested that much of the research lacks a theoretical framework concerning the nature of attitudes and the processes by which they relate to school learning and achievement. There is at best an explicit assumption that attitudes to school or school subjects should be related to achievement, if only on the grounds that positive attitudes lead to greater achievement.

In Mathematics, researchers tend to find a positive, although moderate, relationship between attitudes and achievement. However, the attitudes contribute little to the prediction of Mathematics performance (Assessment of Performance Unit, 1981 as quoted in Norwich and Jaeger, 1989). This study does not refer to homework, but to Mathematics in general.

In their article, Leone and Richards (1989) theorized that quality of the homework experience might affect the socialization process, and thereby the learner's adjustment to and role in everyday life.

> An angry, resentful student reluctantly doing homework alone in his or her bedroom is likely to be having a very different learning experience than a student in a more positive mood doing homework with a supportive parent.
>
> (Leone and Richards, 1989 p 532)

Their research then showed that the 401 young adolescents in their study generally found the experience of schoolwork to be negative rather than positive, regardless of the grades they were achieving. Homework was found to be a negative experience in terms of mood. The learners reported feeling more unhappy, lethargic and disinterested during homework than during other activities. Learners performing well academically gave similar negative reports. This suggested that they achieved despite their negative moods rather than because they enjoyed the activity more.

In their own study, Norwich and Jaeger (1989) found evidence that learners with more positive attitudes reported more intention to engage in future Mathematics learning behaviours. They also found a lack of evidence for an independent predictive relationship between learning behaviour intentions and future learning behaviours. Thus, a positive attitude leads to a greater intention to learn Mathematics. But learning behaviour intention cannot predict future learning behaviour. A positive attitude, therefore, may affect the intention to do homework (or do it well) but not necessarily the actual homework.

3.3.4.11.2 Effect of homework on attitude

Cooper (1994) found only three studies that compared the attitude of learners doing homework and not doing homework. The studies were conducted on Grade 3 to 6 and Grade 9 learners. The results of all three studies suggested that homework did not have a positive or negative effect on the learners' attitudes toward school, teachers or subject matter.

Yet, when comparing the time spent on homework to attitude, learners who spent more time on homework also scored higher on a measure of achievement and attitude (Cooper, 1994). Thus learners who were willing to spend more time on homework achieved better and had a more positive attitude towards schooling. Unless, of course, better achievement and attitude result in the learner being willing to spend more time on homework.

In his recommendations on homework policy Cooper (1994) suggested that homework should foster positive attitudes towards school and better academic-related behaviours and character traits for younger learners. It should not be used primarily to improve subject matter achievement. Only as the learners grow older, should the function of homework gradually change towards facilitating the acquisition of knowledge in specific topics.

3.3.4.12 Responsibility for homework

Reasons for the low achievement in Mathematics are complex. They are a combination of the behaviours of the learners, the teachers and the parents. Who, then, must take on the responsibility of ensuring that homework is assigned, is completed, is marked and is correct?

Homework is not the school's responsibility alone. The responsibility is also shared by the parents and learners (Keith, 1982). This responsibility can be acted out in the following ways:

- Administrators can review homework practices.
- Teachers can assign homework and lower grades to learners who neglect to do it.
- Parents and learners can ensure that the required work is completed.
- All should treat homework with the importance it warrants.

(Keith, 1982 p 252)

Marquis (1989) felt that the teachers must accept some of the responsibility.

> They must be willing to look at the areas over which they have control and be willing to try some new strategies to promote higher achievement by students. They must consider what aspects of teaching might need change. Among the areas to examine are the structure of the class time, handling of homework assignments, effective use of after-school help sessions, and testing.
>
> (Marquis, 1989 p 421)

At the same time, learners need to realize that homework is important and expected. They carry some of the responsibility and will be held accountable for their homework. However, they need to understand the need for the homework. For example, "They need to be told many times that they have little possibility of comprehending Thursday's concepts if they have yet to practice Tuesday's and Wednesday's" (Marquis, 1989 p 423). The responsibility of explaining the need for homework thus becomes the teacher's or parent's responsibility.

Further, depending on the age and maturity of the learner, strong willpower and follow-through are not common characteristics of learners, even though good intentions may be. It thus becomes the teacher's responsibility to establish a system of accountability. This could include collecting homework, checking it, correcting it, and even possibly grading it. A variety of accountability tactics would be more motivating and interesting (Marquis, 1989).

3.3.4.13 Future achievement

Gray and Taylor (1989) found that remedial courses in Mathematics at Colleges tended to have a negative influence on Mathematics achievement and that it indicated that the effects of inadequate high school preparation could not easily be overcome. The reason that remedial courses were not able to perform their task was that the students might have been too far behind to be brought up to the required standards in just two years. Lack of achievement due to regular non-completion of homework could impact on future achievement due to the inability to overcome missed work, ie. gaps in knowledge .

A learner, who begins a learning sequence by performing poorly on the initial steps, will perform even more poorly on subsequent steps as he lacks prerequisite knowledge. Unless attention is given to restudy of these prerequisites, more and more prerequisites will be missed at each successive step. Thus the academically poor will get poorer and poorer (NECTL, 1993).

3.4 Parental involvement

Broadly defined in education literature, "parent involvement' refers to parents participating in one or more school-related activities. Examples of such involvement would include helping with homework, encouraging learners' achievement, attending parents' evenings or volunteering for certain duties at the school (Balli *et al*, 1997). Hoover-Dempsey and Sandler (1995, as quoted in Balli *et al.*, 1997) suggested three reasons why parents do (or do not) become involved in school activities. These are:

- if the parents believe a parent's role includes involvement, and have observed such involvement modelled by their parents and other adults;
- the experience of personal efficacy for helping their children succeed at school;
- the perception of opportunities, invitations or demands to help from the school staff and from their children.

Efficacy can be enhanced through verbal encouragement by stressing the importance of involvement or through the emotional arousal that accompanies helping the children. However, efficacy can be reduced if the parents feel that they lack the skills and knowledge to help their children to succeed at school. The effect of illiteracy and lack of schooling on efficacy would thus be profound, especially when considering the help required by a Grade 9 learner.

Research demonstrates that although parents believe homework is valuable, they are frustrated about inadequate skills for helping their children, monitoring of homework completion, and the constraints on their time and energy (Hoover-Dempsey *et al.*, 1995 as quoted in Balli *et al.*, 1997). Parents of middle grade learners wanted to help with homework, but were seemingly unprepared to do so (Amato, 1994 as quoted in Balli *et al.*, 1997). Although middle grade learners spent more time on homework (than elementary learners) did, the parents felt less able to help (Dauber and Epstein, 1993 as quoted in Balli *et al.*, 1997).

Balli, *et al.* (1997) found that collectively, the research on homework shows that parents are interested in assisting their children. The patterns of family involvement may differ and some families feel that they lack the skills to assist their children with schoolwork.

3.4.1 Parental involvement and achievement

Research suggests that parent involvement with their children's homework is associated with improved academic performance. (Clark, 1993; Epstein, 1992, Keith, 1992; Leone and Richards, 1989). Current thinking is that parental input is not indispensable but does represent a positive influence on academic achievement. The supervision of homework would be a case in point (Møller, 1994a). Slaughter and Epps (1987) reviewed the literature on US Black education. They cite the role of the family as a primary force, which affects educational achievement over time.

Gray and Taylor (1989) felt that parental support was important as it is often the attitudes of parents toward achievement in Mathematics that strongly influence the learners' attitudes and motivation, particularly if the teachers' expectations of learner abilities were low. They suggested that parent involvement warranted further investigation.

Keith (1986) suggested that minimal involvement in actual homework should be the rule. Parents should provide a quiet place for their children to study (even if only a kitchen table). They should provide the structure and encouragement to assist the child to complete the assignment. They should also convey the importance of completing homework. These suggestions were supported by Cooper (1994).

Keith's thinking is further supported by Balli *et al.* (1997).They found that higher levels of family involvement were not associated with higher learner achievement in sixth grade learners. The involvement in this study referred to direct assistance with Mathematics homework. This surpassed the general involvement of parents with school such as motivating, monitoring homework or attending school functions.

In case studies involving three different cultures, Japanese parents stated that they felt motivation was a primary factor in achievement, regardless of ability (Stevenson, 1998). They thus saw themselves as playing a role in motivating their children to work hard. Germans claimed that home environment and parental support have a great influence on achievement while Americans cited family stability and support as being major factors in their children's achievements .

The values attached to education by parents and adolescents have twice the impact on Black and White learners' achievements than their socio-economic background (NECTL, 1993). Valuing education and having high expectations for achievement are considered powerful influences on achievement. When others around him believe in the learner's responsibility, the learner tends to make a greater effort and thus have a better chance of succeeding at school.

In a study of 7th and 9th Grade learners, academic achievement was positively related to educational encouragement by the parents, but not to the amount of time spent with the parents (NECTL, 1993). Another study found that in low-income Black homes, parents of high academic achievers set firm but not harsh rules, sought information about their children's academic progress, enhanced literacy skills through reading and word games and modelled an optimistic, assertive approach to life (NECTL, 1993).

3.4.2 Parents' attitude to homework

US parents expect homework as it extends the time spent on formal learning (Strother, 1984). It encourages learners to work on their own and allows for different learning styles. They expect their children to receive a reasonable amount of homework. "Reasonable" is seen as enough to enhance learning and even, in some cases, to keep the children "out of mischief". However, parents also want their children to have time for formal extra-curricular activities, play and household chores.

Many parents demand homework. They see it as an opportunity to give children the individualized assistance that is easily neglected in a crowded classroom. To them, homework also means higher grades which lead to admission to good tertiary institutions and so to good jobs (Strother, 1984).

A lower socio-economic and educational status results in fewer learning opportunities for young children in the home and less support for Mathematics related activities. These factors even overshadow equal opportunities at school, as the children are disadvantaged during after-school hours. Being below the poverty line thus hurts all children due to the lack of socialisation resources (clubs, activities and games during after-school hours) to support learners' out-of-school learning (Mosteller and Moynihan, 1972; Entwhistle and Alexander, 1992). This takes us back to the vicious cycle mentioned in 3.3.4.10 above.

Although the high illiteracy and innumeracy rate among African people in South Africa prevents many parents from helping their offspring directly with their schoolwork and homework, motivation and support too seem to be lacking. When I informally questioned eight learners who were doing a Bridging Course at a college to improve mathematics and science matriculation results, on the topic of parental support, all said that they received no direct or motivational support from their parents. None were actively encouraged to do, nor discouraged from doing, homework or studying. Their parents supplied only financial support (ie. board, lodging and course fees).

Research articles from which inferences can be drawn on the topic of parental help and support, appear to be divided into two distinct categories. The first group contains those taking indirect cognisance of parental influence and are concerned with the social effects of motivation to achieve, race, poverty and school composition on mathematics achievement (eg. Entwistle and Alexander, 1992 and Powers *et al.*, 1985). The second group contains those taking parental influence for granted and report on the influence of various aspects of parental support on achievement (eg. Campbell and Mandel, 1990; Hess *et al.,* 1984; Raymond and Benbow, 1989).

The importance of parental involvement is stressed by Campbell and Mandel (1990) and Raymond and Benbow (1989), be it academic help, monitoring or motivational support. Although both articles take parental support for granted and are dealing with gifted children, their ideas could well be relevant here.

Campbell and Mandel (1990) determined the influence of family practices as related to schooling from the perspective of primary school children. They found that parental variables accounted for 22% (possibly an underestimate of total contribution by parents) of the Mathematics achievement variance. According to the study, ethnicity was central to any understanding of parental influence. Ethnicity directly influenced parental influence, which in turn influenced Mathematics achievement: Moderate levels of pressure, help and monitoring (Asian American culture) enhanced achievement, as did less of the previous but increased psychological support (Caucasian American culture).

Such parental pressure, help, monitoring or increased psychological support would play a greater role during homework than during schoolwork as parents did not have contact with the learners during school hours. Homework, however, is designed to be done at home and as such can often be monitored or overseen by the parents. Long-term assignments or projects could also be discussed with parents if encouragement was forthcoming. No education on the part of the parent is needed for psychological support or encouragement.

A mixture of lower levels of pressure, help and monitoring together with higher levels of psychological support would be ideal (Campbell and Mandel, 1990). However, high levels of parental pressure, help and monitoring were found to be dysfunctional.

Although Campbell and Mandel's (1990) study was done on primary school children, the results could well apply to high school learners. Psychological support or encouragement would be more important than pressure or monitoring, given teenage personalities and the country's history (see Chapter Two). Learners with a tendency to rebelliousness against orders, disregard for authority, wanting to take responsibility for their own lives and the insecurity and need of support that goes with being a teenager would no doubt rebel against pressure and strict monitoring.

In the South African context, Møller (1994a) suggested that there were two areas in which parents can influence the academic achievement of their children. Parents can decide to which school to send their children and they can support the educational efforts of the children. Encouraging them to remain in school and to complete their homework and study for examinations would do the latter.

Another South African study (Steyn, 1990) done at six Afrikaans-medium primary schools, suggested that White parents were not significantly negative towards homework in general. A number of fathers indicated that the task of motivating the children and supervision of homework was strictly the mothers' domain. The parents felt that the subject matter was too difficult for them to help their children. Steyn recommended that guidelines for parents, concerning homework and their responsibilities, were essential.

3.5 Summary

Cooper (1994) stated that the role of research in forming attitudes towards homework had been minimal. He felt that this was due to the complex influences on homework. There are no simple, general findings which prove or disprove the effective use of homework. By 1994, enough research could be found to support whatever position was desired. Advocates for or against homework often cited isolated studies to either support or refute the value of homework (Jongsma, 1985; Cooper, 1994 preface). In the same vein, Earle (1992) cautioned that the effects of homework cannot merely be summarized, as many of the studies done were inconclusive by nature.

Aspects identified in the literature as having an effect on homework include whether the homework is marked, the type of homework assigned, the frequency of homework assigned, the time spent on homework and the family background of the learner. The effect of homework on achievement has been covered from various angles and at all levels, from pre-school to tertiary level.

Other aspects have been neglected. Issues such as the effect of teaching methods or teacher creditability on homework assigned or homework completed have not been addressed in the literature to date. The actual quality or amount of work done during the time spent on homework has so far been overlooked.

Marquis (1989) stated that in order to promote higher Algebra achievement by students, teachers must consider what aspects of their teaching might need change. Among the factors to be examined, he listed the structure of class time, the handling of homework assignments, effective use of after-school help and testing. That research is needed on these aspects and other aspects in South African Black education cannot be doubted.

CHAPTER FOUR

METHODOLOGY OF PHASE I

This study has been written up in two phases. The first phase consists of ten case studies of learners at nine different high schools in Port Elizabeth. This was done in an attempt to gain in-depth information concerning Mathematics homework. During the analysis of the case studies, an emergent pattern was sought in order to find explanations for regularities and behaviours found in the case studies. These explanations generally led to further questions or needed confirmation. The need to find answers to the questions and the desire to generalize and confirm or refute the pattern led to the development of phase II. The methodology of phase II is written up in Chapter Seven.

4.1 The conceptual framework

In a bid to discover how learners in the Port Elizabeth northern townships approach their Mathematics homework, three issues were considered. These issues entail the learners, the learners in their environments and the relationship of the learners with their homework. Of these issues, the learners' relationship with their homework forms the centre field of the enquiry. However, the importance of the learners themselves and their environments or *Umwelt* (Bogdan and Bilken, 1992) should not be overlooked.

Without the learners, homework and a relationship to it would not exist. The relationship between man and the world is not causal but dialectic. It follows a logical and reasoning path, even if only from the perspective of the individual. Thus, each learner's consciousness is entangled with the world, is active and allows the world to be what it is. In the context of this study, the learner's consciousness is thus actively engaged with his homework and allows the homework to be what it is. It is thus the learner's consciousness that gives homework meaning for the learner. That meaning may differ from the meaning given to homework, and the interaction with it, by other learners but it is nevertheless meaningful to the learner (May, 1995).

The learner's directedness of consciousness towards his awareness of homework can be seen as the intentionality of the consciousness. The learner is involved in that which he experiences and of which he is conscious. He is directed to and involved with the homework and other phenomena with an openness, yet with a uniqueness of his own perception and experiences.

In his directedness-towards-something, the learner makes that something, object. The perception of homework, although subjective and individualistic, thus becomes an object in its directedness towards the phenomena of homework.

Learners also cannot be isolated from their *Umwelt* as they act and react within that sphere and are acted upon by elements of that sphere. Their cognitive and affective actions and reactions are based on their exposure to their *Umwelt* and as such affect their relationship to homework (May, 1995).

A learner's home environment, his parents' attitude to schooling and homework, his friends and their attitudes, and his teachers all affect his perception of homework. Even things as basic as the amount of sleep and food may have an effect on his perception of homework. A learner receiving enough sleep and food may well experience homework differently to one who has too little of either.

The learner cannot be separated from his world. He establishes new relationships constantly and is involved in a continual dialogue with his environment. Education is concerned with the learner's relationship with his *Umwelt*, as an understanding of this relationship helps to provide an understanding of how the learner experiences his educational situation. His relationship to his *Umwelt* impacts on his consciousness of, actions and reactions to and perceptions of homework.

By its very nature a learner's perception of homework places this enquiry into the 'subjective realm' of educational research.

A person's own interpretation of his own perception cannot be other than subjective. When that interpretation is subjected to understanding, collation and analysis by a researcher, it is transported further into subjectivity, regardless of how objective the researcher wishes to be. Interested parties, reading the researcher's interpretation, add their own subjectivity on the topic to their interpretations of the report. As such, the research is a minefield of subjectivity, which needs to be consciously considered at every step along the way.

In this particular study, the researcher attempts to gain access into the conceptual world of the learners in order to understand how and what meaning they construct around homework in their daily lives. Through this attempt, the researcher moves into the subjective aspects of the learner's life. As it is the learner's consciousness that is actively engaged with his world and allows the world to be what it is, it is the learner's consciousness that gives meaning to homework in relation to how he engages with his world. The meaning he gives to homework is therefore subjective and dependent on his life world and perspectives on that life world.

If it is the meaning of our perceptions that constitute reality, then reality is 'socially constructed'. It exists only within a context of a mental framework or construct which has been created by our engagement with our life world (Guba, 1990). By believing this we are approaching the phenomenologist's paradigm which emphasises the subjective aspects of people's behaviour (Bogdan and Bilken, 1992). There are thus multiple ways of interpreting each learner's explanations of their perception of homework and each learner has multiple ways of perceiving homework. Each interpretation would be dependent on the interpreter's reality, which in turn is created by his own engagement with the life world.

Influenced by the philosophers Edmund Husserl and Albert Schutz, researchers in the phenomenological mode attempt to understand the meaning of events and interactions with people in a particular situation. This is also within the tradition of Weber, which emphasizes *verstehen*, the interpretive understanding of human interaction (Bogdan and Bilken, 1992). Phenomenologists do not assume that they know what things mean to the people that they are studying (Douglas, as quoted by

Bogdan and Bilken, 1992). In much the same way, this study interprets the learners' perceptions of homework but cannot assume to know exactly what these perceptions mean to the learners.

In this sense, the collection, analysis and interpretation of data for this study must be done with the awareness that understanding needs to be derived from the data. However, that understanding is not the only point of view possible. Other possibilities exist according to the understanding of others. The understanding of the individual learners themselves may differ from that of the collective understanding of the researcher.

Understanding the learners from their own points of view and communicating that understanding presents a problem on its own. Bogdan and Bilken (1992) pointed out the fundamental concern that 'their own point of view' is not an expression that the learners would use of themselves. As such it may not represent the way they think of themselves or their perception of homework. Bogdan and Bilken see 'their point of view' only as a research construct.

As such, the learner's perception of homework is forced into a mode that is foreign to the learner (Bogdan and Bilken, 1992). This would make the learner think of homework as he has never conceived it before. It would force him to relate it to issues that have not overly concerned him previously. However, Bogdan and Bilken (1992) suggested that while trying to understand learners from their point of view may not be perfect, it distorts the learner's perception the least.

The *verstehen* of others' points of view, and the communication thereof, must naturally be a construction of the researcher. It will be subjective at every point, from the learner's understanding and communication of his own point of view to the researcher's understanding and communication of the collective points of view of all the learners in the study. The readers, too, may construct their own understanding of the data as presented. This will, of course, also be subjective and depend on the readers' experiences and interactions with their *Umwelt*. Thus, no unequivocal explanation can be possible. There can be many constructions and there is no foundational way to choose among them (Guba, 1990).

The constructions of the different people wishing to understand the relation of learners and homework are dependent on each person's *Umwelt* and their interactions with it. The constructions cannot be separated from each person's values and as such are not value free (Guba, 1990). This minefield of subjectivity needs to be investigated and presented in such a way as to make it as clear and concise as possible. An appropriate methodology must be employed that best suits the data and its subjective nature. The methodology should allow the data to speak for itself and yet allow the researcher to make meaning of the collective data through collation and analysis. While the data and its analysis remains subjective, the outcome of the research should attempt an approach at objectivity.

The conceptual framework of the study on learners and their perceptions of homework thus lies within the research paradigm of interpretive phenomenology as defined by Goodman (1992), Guba (1990) and Popkewitz (1987). Although each of these authors categorizes the interpretive paradigm differently, either on its own as non-positivist or as post-positivist, all see it as a study of the meaning which actors make of a situation or an event (Janse van Rensburg, 1994).

According to Guba (1990), the following arguments support the interpretive mode of research:

1. Facts are theory laden and reality thus exists only within a context of a construct for thinking about it.
2. The underdetermination of theory implies that many constructs exist for each body of facts.
3. Facts are value laden and as such are interpreted according to the values of the interpreter of the facts.
4. Facts are dependent on the interactive nature of the inquirer and the inquired-into.

The method of interpretive research used as the starting point of this enquiry was the case study method. Case studies are frequently used for the thick data they generate and the detail of that data in the given environment (Yin, 1994). As such, the data can be presented in such a manner that it speaks for itself, with all its subjectivity and possible interpretations intact. However, it also gives the researcher the opportunity to collate and analyse the data according to his/her interpretation thereof, especially when a multiple case study method is applied. The presentation of the analysis gives the researcher the opportunity to explicate why certain ideas were formed and how subjectivity was applied. The presentation of the case studies also allows the reader to form his/her own interpretations to an extent independently of those of the researcher.

4.2 Case study methodology

4.2.1 What is a case study?

A case study can broadly be defined as a detailed analysis of an individual or group or an examination of a specific phenomenon. The analysis can refer to a medical case, a social case or a description of a person, institution or programme and need not refer only to a body of research that has been conducted. The type of phenomenon may range from a programme, an event, a person or an institution and even including a process (Merriam, 1991). Yin (1994) added to this by stating that a case study contributes *uniquely* to the researcher's knowledge of an individual or a complex phenomenon, whether social, organisational or political.

In research terms a case study is a study in which inquiry dominates. Stake (1994) described a qualitative case study as having strong naturalistic, holistic, cultural and phenomenological interests. In other words, it is a study that looks at the research questions in the context of their environments, retaining the characteristics of the real-life events, with little attempt at isolating aspects or ability to control variables or events. The aim is to optimize the understanding of the individual case before attempting to make generalizations beyond the case.

As a form of research, case study research is defined by an interest in individual cases, not by the methods of inquiry used. That is to say, case study is not a methodology but rather a choice of the object or phenomenon to be studied. The methodology used in case study literature varies greatly and may include qualitative as well as quantitative methods (Merriam, 1991).

The design of the case study depends on the nature and direction of the research questions and the amount of control desired. The questions asked tend to be predominantly "how?" and "why?" with little control over the environment or events. Ideally a 'bounded system' - an expression quoted from Smith (1978) by Merriam (1991) to describe a case study with set, obvious boundaries - should be identified as the focus of the investigation. In such a case the study would be selected because it is an instance of concern, an issue or a hypothesis.

4.2.2 Types of case studies

Case studies may be simple or complex, single studies or studies comprising of two or more cases, sites or clusters. Terminology differs in the description of case studies although the designs tend to comply with consistent classification.

Four types of case study designs are discussed by Yin (1994). These have been used here to "classify" the various case study designs encountered in the literature. They are the single-case (holistic) design, single-case (embedded) design, multiple-case (holistic) design and multiple-case (embedded) design.

Single-case designs:

Briefly stated a single-case holistic design entails a single case study viewed as an entire unit, without sub-units.

A single-case embedded design deals with a single case study that consists of various sub-units of analysis within the single case. This is comparable in design to McClintock, Brannon and Maynard-Moody's (1983) case cluster method, although their analysis was based more on quantitative than on qualitative methodology.

- Single-case designs are justifiable where the case represents a critical test of theory, where the case is rare or unique or where it serves a revelatory purpose (Yin, 1994).

Multiple-case designs:

A multiple-case holistic design refers to more than one case study but with each case viewed as a whole without sub-units. In design it is comparable to Miles's (1983) cross-site method.

The multiple-case embedded design entails more than one case study, where each case consists of various sub-units of analysis.

The evidence from multiple case studies is considered more compelling than that from single case studies due to replication, making the overall study more robust (Yin, 1994). However, a multiple case study can require extensive resources and time - as in the case of Miles (1983) - which may often be beyond the scope of available manpower and finances (Yin, 1994).

In a multiple-case design, according to Yin (1994), each case should serve a specific purpose within the study and so follow 'replication' logic. In this sense, each case is considered as a separate 'experiment' and not as a separate sample within an experiment. If similar results are obtained from the different cases, it can be said that replication has taken place.

> An important step in all of these replication procedures is the development of a rich, theoretical framework. The framework needs to state the conditions under which a particular phenomenon is likely to be found (a literal replication) as well as the conditions when it is not likely to be found (theoretical replication). The theoretical framework later becomes a vehicle for generalizing to new cases, again similar to the role played in cross-experiment designs.
>
> (Yin, 1994 p 46)

Whether a holistic or embedded design, a case study should also comprise of a bounded system, ie. have set, obvious boundaries

4.2.3 Why a case study?

The use of a wide scale survey for this study was rejected as being too superficial and unreliable (J. Malone pers. comm.). A short questionnaire completed by 25 learners and 5 teachers in 1994 gave contradictory responses to questions on the amount of time spent on homework as well as learners' and teachers' responses to average symbols obtained by the learners. Moreover, a survey tends to address a few variables across a large number of instances, answering questions of "what?" and "how many?", whereas a case study "concentrates on many (or all) variables present in a single unit without manipulation", answering questions of "how?" and "why?" (Merriam, 1991 p 7).

A 'multiple holistic case study' approach was selected as the research aimed to closely elicit learners' attitudes towards and perceptions of Mathematics homework. This was best done within their own environments and with uncontrolled circumstances so as to get a more accurate impression of the real-life situation.

A number of learners would form separate case studies, each with different variables to enable literal replication as suggested by Yin (1994). If similar results were obtained from all of the cases, literal replication would have been said to have taken place. A pattern running through all the cases could then be identified during analysis and used to develop the conceptual framework. Separate case studies of nine Std 9 (Grade 11) Mathematics learners and one study group, at nine different schools, would thus be conducted.

No initial attempt needed to be made to determine case studies suitable for theoretical replication (contrasting results for predictable reasons) due to the exploratory and explanatory nature of the initial studies intended. It was the use of multiple case studies, as a tool for generalization through established patterns or regularities, in the literature that strongly influenced the choice of case studies. Added advantages included the flexibility of methodology and the flexibility of analysis within case studies.

4.3 Case study design

4.3.1 Method

Achievement in Mathematics, and the problems encountered in Mathematics achievement among the Black youth in South Africa, is a very broad topic. Research has been done on a number of different aspects within this topic. Such aspects include socio-economic status, race, money spent on Black education, teacher qualifications, time spent at school, parental support and homework. However, in-depth studies require a specifically identified and focused topic in order to achieve a sufficient depth of inquiry. As a result the main focus of this study was to be limited to the learners' perspectives of Mathematics homework.

The data gathering techniques employed in the study were qualitative in nature and included learner diaries, interviews with learners, their parents, their teachers and the SSHA questionnaire.

Selected learners were asked to keep a daily diary, over an academic year, of Mathematics homework and their attitude towards the homework. Learners were asked to bear various aspects in mind when making diary entries. Typed questions concerning these aspects were pasted into the front of the diaries and included attitude to homework, degree of difficulty as perceived by the learner, time taken to complete homework, amount of homework received and done, type of Mathematics involved and where and with whom homework was done.

The use of the diary was an attempt at approximating the approach of the Experience Sampling Method (Csikszentmihalyi and Larson, 1987) as used by Leone and Richards (1989). The method was designed to assess activities during ongoing daily life and allowed for immediate assessment of moods during the activity.

Leone and Richards (1989) used the method to assess three major independent variables, viz. amount of time spent on schoolwork, the environment in which the homework was done, and the learners' attitudes while doing the work. Participants of their study carried a pager for one week and completed brief "self-reports" when signalled randomly every two hours between 7:30 and 21:30. The reports assessed what the participants were thinking, doing, where they were and who they were with when signalled. The affect (eg. happy - unhappy), arousal (eg. strong - weak), motivation and how well they were paying attention were also rated. Readers interested in further detail of the method should consult Csikszentmihalyi and Larson (1987) and Leone and Richards (1989).

In this study diaries were thus used also to determine learner affect while doing schoolwork and homework and to monitor the Hawthorne Effect. The diaries were collected twice during the year. Revealed behaviours and attitudes encountered were probed further during subsequent interviews.

Interviews, unless otherwise stated, consisted of a mixture of three interviewing techniques. Set, structured interview questions were asked of each candidate using the same or similar wording in the same order, as in "an oral form of a written survey" (Merriam, 1991 p 73). The main reason for the inclusion of set, structured questions was to ensure that the questions and the context in which they were asked had common meaning to all the candidates and elicited comparable answers which would later aid analysis of the data. Interviews with set, structured questions will be referred to as 'formal' interviews for the purposes of this study.

Structured interview questions remained the same for all candidates with additional questions for each learner based on diary entries and personal aspects. As in the HSRC Study Habits and Attitudes Test (see 4.3.2), the questions were deliberately set in random order. The reasoning for the random order of the questions was twofold:

- To avoid a build up of unrealistic answers based on previous answers. If a question is answered with a slight (albeit unconscious) bias, the next questions, if on the same topic, could continue and thereby emphasize that bias. If questions on the same topic do not follow each other, that bias may be lost and a more objective answer given than if the questions follow each other directly.

  Eg.: "Do your parents take an interest in your school work?"

"Yes."

"How often do your parents check your homework?"

"Every day."

If separated by other questions:

"How often do your parents check your homework?"

"Oh, most days."

- To confirm previous responses. Questions set on the same topic but separated by other questions would distract the learner from his first response. The response to the next question on that topic would therefore be a true response to that question, without the influence of the previous response. If the responses to the two questions are then similar, the answer of the one would confirm the answer of the other and *vice versa*.

  Eg.: "Do your parents know what mark you received for Mathematics last term?"

  "Yes."

  "If I asked them, what mark would they give me?"

  "50%"

  If separated by other questions:

  "If I asked your parents what mark you received for Mathematics last term, what mark would they give me?"

  "Um, I don't know. Maybe they have forgotten it."

Semi-structured interview questions of known topics were asked, in which neither the exact wording nor the order of the questions were determined beforehand. The questions were generally based on topics relating to homework or study habits, and were derived from the current interview, previous interview or diary entries. These questions usually followed directly after the formal interviews and were also recorded in writing or on tape. They resulted in more relaxed and longer answers than for the structured questions, as the formal interview was considered over. Similar questions were asked of most of the candidates.

Unstructured interview questions were asked to explore unrelated topics or to explain noticed behaviour or habits. These often ranged widely on various topics and helped to bring depth to the case study and 'thicken' descriptions (Cohen and Manion 1994). Unstructured questions differed from candidate to candidate and were generally asked before or after the formal interviews or during telephone conversations, lifts home and other casual contacts. These were recorded in writing at the conclusion of the phonecall, or after returning home from a visit.

Each candidate was interviewed on a formal and semi-formal yet in-depth basis on three different occasions, and had many informal telephone and/or personal contacts in between to build up rapport and confidence. Questions were also rephrased in different interviews to give an idea of consistency and to further confirm entries in the diaries and responses to previous interviews.

Further method triangulation (Cohen and Manion, 1994) or data triangulation (Yin, 1994) was done by interviewing the parents and teachers for their input of each candidates' attitudes and habits towards homework. The interviews followed the same combination of questioning techniques as described above. Each Mathematics teacher was initially informed of the project and the learner's involvement. This brought him/her in as an aid to give added detail to the questions during the subsequent interview. Parents or guardians were generally also met early on during the year of contact and were aware of the project and subsequent interview.

The Hawthorne effect (Cohen and Manion, 1994) had to be taken into consideration when viewing the case studies. It could be assumed that the volunteers came predominantly from the more studious; confident and the more fluent in English, set of learners. The project would also affect the selected learners by giving them increased awareness of homework and their relationship to it. This was due to the constant emphasis on Mathematics homework in diary entries and interviews. (This concern was later validated when in three cases, learners or their parents actually commented on the positive effect the project had on the learners' attitude to homework.)

However, it was anticipated that with the participation of the learners in the project for an entire year, the behaviour would probably approach the norm after some months when the novelty of being involved in the project wore off. The monitoring of changes in homework and behaviour patterns over the year were thus considered part of the study and carefully noted. Confirmation of normal behaviour and attitude was also sought in interviews with parents and teachers.

Due to the Hawthorne effect, all data was to be interpreted as being skewed towards increased homework and parent involvement. Phase II would be designed to test the patterns found in the case studies and it was hoped that they would contribute to eliminating some of the effects mentioned above.

All candidates were further asked to complete the HSRC "Survey of Study Habits and Attitudes" (SSHA). The survey is an

> ...easily administered measure for evaluating study methods, motivation for studying and attitudes towards scholastic activities which are important in the classroom. The purposes of the SSHA are:
>
> - to identify learners with ineffective study habits and attitudes;
> - to aid in understanding learners' experience in study problems;
> - to provide a basis for helping such learners improve their study habits and attitudes.
>
> (du Toit, 1995 p 1)

During the last two case studies, the case study design was modified to include homework observation sessions. The modification was due to discrepancies between the time the previous case study candidates spent on homework and the amount of work they accomplished in that time. The learners tended to spend much time doing homework, but didn't achieve the corresponding marks. The efficiency of the homework done was thus probably low. Additional information on how the learners did their homework and what they did while doing the work, was thus required. The modification applied therefore changed the emphasis from interviews and diary entries, as in the previous case studies, to a method that allowed observation of the manner in which the learners did their homework.

The last two case study candidates were thus asked to think aloud as they worked while I sat next to them, observed their methods and took notes. These sessions are referred to in the synopsis as 'homework observations'. The notes were discussed with the two learners after they had completed the homework, and Mathematical assistance was given if necessary and desired. The second and third interviews were thus changed to questionnaires and are referred to as interview questionnaires.

4.3.2 Candidate selection

The schools selected are spread over the entire northern township area of Port Elizabeth and are relatively large secondary schools for Black learners with more than 750 learners per school, as are most schools in the area. Various variables were accommodated. These are: new school, old school; government built, Vusisiwe Trust school (schools built by an NGO in order to alleviate the school shortage); Black principal, White principal; White Mathematics teacher, Black Mathematics teacher; amongst brick houses, amongst shacks; buildings in good condition, buildings not in good condition, etc. (For added detail on the selected schools see 2.3).

At each school appointments were made to see the principal and letters describing the project were handed to the principals while the project was explained to them. Permission was obtained to speak to the Grade 11 Mathematics learners. Dates and times to see the learners were arranged.

The learners were informed that the project, under the auspices of Rhodes University, was being conducted to determine learners' attitudes regarding Mathematics homework. This would mean that one learner in each selected school would keep a diary and be interviewed at intervals on information regarding Mathematics homework. Their Mathematics teacher and parents would also be interviewed towards the end of the year. It was emphasized that it was irrelevant whether they were good or weak at Mathematics, lived in a smart house or shack or were rich or poor. Everything they wrote or said would be considered confidential and they would be able to read the information appearing in the project report before it was printed.

They could then decide on anonymity if desired. Learners were encouraged to ask questions.

Questions asked by the learners usually revolved around "What is in this for us?" or "Is any money involved?" In reply to the first question, it was explained that help with Mathematics would be available to the selected candidates in the year following their participation. Help during their participation would influence the project and so was not possible. The reply to the money matter was always "Not for you and not for me".

Volunteers interested in the project were asked to complete a short questionnaire containing general questions on Mathematics, homework and themselves. This was done to ascertain whether a candidate would be suitable for the study. Dedicated participation and open, honest answers to questions were sought. Active participation over a year was deemed necessary to obtain the depth of information required and to build up a relationship with each learner conducive to confident answers and an honest exchange of thoughts and feelings. There was no shortage of volunteers.

The need for honest replies and true feelings and that there were no right or wrong answers was stressed to the volunteers. Candidates were then selected according to the perceived honesty and openness of their answers. An attempt was also made to obtain as many different variables as possible. These included male, female; A class, B class, etc.; large family, small family; siblings in Tertiary education, siblings still at school; one parent family, old parents, young parents; well-off, poor; interest in, dislike of Mathematics; Mathematics found easy, moderately difficult or difficult; positive or negative attitude to homework; help with homework received or not.

The learners at the selected schools are all Black teenagers with Xhosa as their home language. As such they are English second language speakers with an English language proficiency ranging from minimal to nearly fluent. However, the explanation of the project, replies to questions and questionnaires were all in English. This need to communicate in English led to possibly fewer volunteers than had it been in the vernacular. Only those considering themselves confident enough in the language initially volunteered to complete the questionnaire. However, once a learner volunteered, his/her friends would often follow suit, thus resulting in some questionnaires being completed in rudimentary English. These were not excluded from the selection process for a candidate from that school.

The narrowing down of candidates to those more fluent in English than their peers, due to conducting interviews, questionnaires and the diary in English, was seen as a limiting factor. However, it was assumed that enough information would be forthcoming from such candidates to formulate the phase II Xhosa questionnaire which would include those less confident in English than their peers.

The selection of only one learner per school was done primarily to prevent candidates influencing each other by discussing attitudes and homework habits. One learner per school also resulted in many schools being selected in order to complete ten case studies. Additional schools meant that a greater cross-section of geographical areas and socio-economic backgrounds among the candidates was available.

4.3.3 The Survey of Study Habits and Attitudes (SSHA)

In this study the SSHA was used merely to form a reference point, as attitude to homework is relative and the interpretation thereof subjective. Its main contribution was as a diagnostic tool to identify problems experienced by the candidates and to aid in pattern matching. As used in this study, the results of the SSHA should be viewed as an aid to the interpretation of pattern matching only as it measures general performance and is not specifically Mathematics homework orientated.

The candidates were asked to complete the survey at the end of the year after all interviews had been completed. Two of the learners did the survey together with Algoa College applicants and the rest did it at home at their leisure after having had the relevant directions explained to them. No time constraint in answering the questions is set for the survey.

The SSHA was developed by Brown and Holzman in the USA. It was adapted for South Africa and considered as a reliable measuring instrument for South African learners by du Toit (Vermeulen, 1980 as used by Van der Spuy, 1983).

Van der Spuy's (1983) summary of the research conducted in South Africa on study habits and attitudes and the SSHA are:

- the SSHA is a reliable measuring instrument;
- it measures personality traits, which are independent of intelligence;
- a positive attitude to study largely contributes to academic performance;
- although no consensus exists, good study habits also contribute to academic success.

Four aspects are addressed in the SSHA. Two combine to assess Study Habits and two to assess Study Attitudes. All scores are then used to determine the candidate's Study Orientation, thus resulting in seven fields.

A brief description of the SSHA scales are as follows:

- Delay Avoidance (DA) indicates to what extent the candidate promptly completes his/her assignments, avoids delay and is not inclined to unnecessary waste of time.
- Work Methods (WM) gives an indication of the candidate's use of effective study methods, his/her efficiency in doing assignments and the extent to which s/he sets about her/his school work in the most effective way.
- Study Habits (SH) combines the scores on the DA and WM scales to provide a measure for academic behaviour.

- Teacher Approval (TA) provides a measure of the candidate's attitude towards the teacher's classroom behaviour and methods.
- Education Acceptance (EA) determines the extent of the candidate's acceptance of educational ideals, objectives, practices and requirements.
- Study Attitudes (SA) combines the scores of TA and EA to provide a measure of the candidate's confidence in scholastic aims.

- Study Orientation (SO) is a combination of all the above mentioned aspects and provides an overall measure of the candidate's study habits and attitudes.

(du Toit, 1995 p 7)

Percentile ranks for the SSHA are given for boys and girls of each year group separately and combined. The scores obtained from the candidates were taken for Std 9 (Grade 11) boys and girls separately. A percentile rank below 50 indicates that the candidate experiences problems in that field. A high percentile rank is characteristic of learners whose performance at school coincides with their ability. A low percentile rank score indicates that learners are not performing according to their abilities (Vermeulen, 1980 as used by Van der Spuy, 1983).

4.4 Reporting

The reporting of the case studies is done under the various categories as sorted during the analysis of the data. Detail is as supplied by the candidates in the diaries, interviews and casual conversations over the year in which they were involved with the project. In many of the case studies the responses to questions and diary entries became increasingly explicit as the relationship developed.

Although the case studies took place during the era of Standards - to indicate class levels - and pupils, the reporting is done using the new educational phraseology that accompanies the change to Outcomes Based Education (OBE) in South Africa (Department of Education, 1997). The terms Grades for class levels and learners in place of pupils have thus been used throughout. However, Grade 6 to 11 learners worked through the Interim Eastern Cape School syllabi set up in 1995 and so any references to Mathematics done in the various Grades still refer to these syllabi.

The term teacher was retained for the report as High School teachers were at this stage still teaching or even lecturing. Teaching methods were still very much along the lines of filling empty (passive) vessels. Little groupwork or learner discussions took place in the classroom. It is thus strongly felt that the teachers cannot be described as facilitators, even by its broadest definition. OBE terminology has thus not been used here.

A description of the case studies is given in Chapter Five under the separate categories to highlight confirmations or contradictions between subsequent interviews, questionnaire answers or teacher and parent answers. The information in the categories is more freely interpreted than in the original reports, sentence structures are modified and suitable wording is used. This is defined as interpretation as the meaning of the original sentence structures and words are accepted as meaning the same as the reconstructed sentences.

The following serve as examples of such 'free interpretation':

> Original:
>
> > "Most of the teachers do not attend their classes because they have finished the syllabus. So the game is for us to play".
>
> Interpretation:
>
> > Classes did not continue once the syllabus had been completed and the learners were left to do their own revision (or other work).
>
> Original:
>
> > He was usually "on his own with his work".
>
> Interpretation:
>
> > Did his work without distractions (such as radio or television).

An additional purpose of the categorization was to begin the process of pattern matching between the different case studies. Further pattern matching was done in table form, using a table of categories, to facilitate the matching of certain aspects in each case study (see 4.5 below).

As the aim of the study was to take an in-depth look at Mathematics homework, without broadening the scope to unmanageable dimensions, other aspects which have come to the fore have received cursory mention only and no analysis.

As time at school affects the amount of possible homework, the amount of time during which "no class" or "no school" took place was viewed as part of the study. However, as it was not the intention of this study to analyse teaching methods, comments on diary entries or interview responses regarding this topic have been limited to their influence on the learner's attitude and perception of homework. All responses have been recorded so that the readers may consider the raw data themselves.

A detailed report of a case study can be found in Appendix A. The reporting of the case study takes on a narrative form, as is usual with case studies, written in clear sentences using plain words (Yin, 1994) without losing detail or misinterpreting information. All case studies were written out in the same way and the narrative form was then used as the basis for the analysis. As much of the data as possible was retained in the case study reports to preserve the atmosphere of the interviews, the tone of the diaries and the personality of the candidates. The reports were rich with personality descriptions and remarks made by the candidates, their parents and teachers. As much of this richness was lost when the data was transferred to categories during the analysis, the discussion of the data occasionally contains information and inferences from the data that are not directly mentioned in any category. This was seen as unavoidable if the data was to be presented in an organized and condensed fashion.

4.5 Analysis

4.5.1 Introduction

There is consensus in the literature that the analysis of a case study is the most difficult part of case study research. Analysis ranges from merely reporting the case and allowing readers to form their own conclusions, to in-depth interpretation of the data through categorisation of recurring regularities or patterns, using various techniques.

The goal of data analysis in a case study is to "consolidate, reduce and interpret the data" and so "to come up with reasonable conclusions and generalizations based on a preponderance of data" (Taylor and Bogdan, 1984 p 139). As a result, data analysis techniques are employed to reduce the large amounts of data gathered to a manageable size, thereby allowing a sense of meaning to emerge which can be conveyed to the reader (Merriam, 1991). Unless the analysis follows evident data patterns, lines of thought and mutually exclusive categories, the reader cannot use the data and its analysis to confirm (although not necessarily agree with) the interpretation of the researcher. In such a case the reader would be forced to form his own conclusions and the analysis would prove to be worthless (Merriam, 1991).

Sieber (quoted in Miles 1983) reviewed the analysis of qualitative data up to the early 1980's and found that little was written on the topic. "Methodologists obviously prefer to spend more time on such matters as gaining access, interviewing, choosing informants, handling reciprocities, and so on, rather than on the intellectual work of analysis" (Sieber in Miles, 1983 p 1). Since then various other authors have considered the aspect of case study analysis, including Miles (1983), Stake (1994), Merriam (1991) and Yin (1994).

Sieber's advice for good analysis is (1) intertwining of analysis and data collection, (2) formulating classes of phenomena, (3) identifying themes and (4) provisional testing of hypothesis (the search for concomitant variation while attempting to rule out spurious or confounding factors) (Miles, 1983).

Sieber's work led to the outline of a set of "rules of thumb" by Miles (1976) which, very briefly stated, includes the following:

- consider the validity of any particular generalization;
- given a generalization, make a prediction;
- test propositions - especially cause and effect;
- look at extreme bias situations .

Yet despite such "rules of thumb" and an initial conceptual framework, Miles found that the actual process of analysis was "essentially intuitive, primitive and unmanageable in any rational sense" in his research on the "Project on Social

Architecture in Education" (Miles 1983 p 127). They thus proceeded by concentrating on "primary tasks" taken from the conceptual framework and sought themes and generalizations that appeared plausible (Miles 1983).

Lincoln and Guba (1985 as quoted by Merriam, 1991) identified 'units of information' to serve as a basis for defining categories. Although the definition of a unit allowed for much variation, two criteria had to be met. A unit should be heuristic ie. reveal information relevant to the study and stimulate the reader to think beyond the point of the basic information. It should also be "the smallest piece of information about something that can stand by itself", ie. interpretable in the absence of any other information once a broad understanding of the context has been established (Merriam, 1991 p 132).

Merriam (1991) agreed that developing categories, typologies, themes or information units comes down to looking for recurring regularities or patterns. Various 'recipes' exist for such a task, including the use of index cards, file folders, marking text procedures, tabulation of data and computerized systems. All have similar guidelines for categorisation, comparison techniques and the efficiency of the categories.

Yin's approach (1994) for multiple case study analysis was to write up the individual case studies, draw cross-case conclusions, use these to modify the theory and then develop policy implications. This is similar to the methods extracted from literature by Sieber (Miles, 1983).

Yin (1994) further describes four dominant methods and three lesser modes of analysis. The dominant methods are pattern-matching, explanation building, time-series analysis and program logic models. Pattern matching and explanation building are described in some detail here.

4.5.2 Pattern-matching logic

Pattern matching compares an empirically based pattern to a predicted pattern. The major concern is with the overall pattern of results and the degree to which a discerned pattern matches the predicted one.

Co-inciding patterns lead to strengthened internal validity of the case studies. If initially predicted values are found, with alternative "patterns" of those predicted values not found, strong causal inferences can be made.

A built in lack of precision in pattern matching allows for some interpretive discretion on the part of the investigator. Thus care must be taken not to be overly restrictive in claiming a pattern to have been violated nor to be overly lenient in deciding that a pattern has been matched. Subtle patterns should be avoided and gross matches and mismatches sought (Yin, 1994).

Merriam (1991) in turn quoted Miles and Huberman (1984) to warn that

> ...the human mind finds patterns so quickly and easily that it needs no how-to advice. Patterns just 'happen', almost too quickly. The important thing is to notice genuine evidence of the same pattern and remain open to contradictory evidence.
>
> (Merriam, 1991 p 149)

4.5.3 Explanation building

Explanation building is a special type of pattern matching where the goal is to analyse the case study by building an explanation about the cases (Yin, 1982), with the intention of developing ideas for further investigation. The final explanation may not have been fully stipulated at the beginning of the study and so differs from the pattern matching approach. Alternatively, the objective may be to show that an explanation cannot be built from the set of case studies (Yin, 1994).

Yin (1994) set out the following steps for explanation building:

- making an initial statement about policy or social behaviour;
- comparing the findings of an initial case against such a statement;
- revising the statement;

- comparing other details of the case against the revision;
- again revising the statement;
- comparing the revision to the facts of further case studies;
- repeating the process as many times as needed.

He warns that the investigator needs to be aware of possibly drifting away from the original topic of the investigation.

The above steps closely resemble those of Katz's (1983) and Kidder's (1981) methods of analytical induction and negative case analysis as summarized by Taylor and Bogdan (1984).

The strategies of Miles, Katz, Kidder, Merriam and Yin all recommend that an investigator study groups (or cases) that will both maximize and minimize the differences as well as the similarities of the data.

Stake (1994) summarized the "major conceptual responsibilities of the qualitative case study researcher" as follows:

1. Bounding the case, conceptualising the object of study.
2. Selecting phenomena, themes, or issues - that is, the research questions - to emphasize.
3. Seeking patterns of data to develop the issues.
4. Triangulating key observations and bases for interpretation.
5. Selecting alternative interpretations to pursue.
6. Developing assertions or generalizations about the case.

(Stake, 1994 p 244)

All except the first two deal with the analysis of the data and the interpretation thereof and all are steps taken by the other qualitative researchers mentioned.

4.5.4 This study

The interpretation of the case studies in this study approximates the steps suggested by Stake (1994). Similar patterns of behaviour and attitude to homework were sought in each case and compared to the other cases, thereby also applying literal replication logic (Yin 1994). Thus as a starting point for analysis, the notes were sorted and then transformed into categories (Merriam, 1991) or units (Lincoln and Guba, 1985).

Two procedures were used to sort the data. Firstly, text referring to the same topic or issue was marked and placed into separate file folders (Merriam, 1991). The text was then transferred to the heading of that topic and sorted to form coherent paragraphs. The topics and issues mentioned above were partly predetermined from the structured interview questions, and partly retrospectively. Those identified retrospectively originated from the semi-structured and unstructured questions asked of the candidates, as well as from any casual comments they made.

Secondly, the data was transferred to a table of categories. This method consisted of working through the notes from the case studies consecutively and adding each new category to the table as it arose in the case studies. These categories were subsequently sorted according to the order in which the categories were presented in the case study synopses. Thereafter a search for regularities and patterns could be made.

The two sorting procedures were then used to identify and cross-check the data in order to establish the emergent pattern. In the search for regularities and patterns, the data in the case studies was interpreted and summarized from the synopsis of each case and the table of categories. This was done after extensive analysis by sorting the notes according to categories (Merriam, 1991).

Both types of analysis, as well as the emergent pattern, are presented in the following chapter. Having then attained a core of emerging theory, this was used as a guide for further data collection, which makes up Phase II of the study.

CHAPTER FIVE

FINDINGS OF PHASE I:
A PATTERN EMERGES

5.1 Synopsis of the Case Studies

5.1.1 Introduction

The reporting of the case studies is done under the various categories as sorted during the analysis of the data. Detail is as supplied by the candidates in the diaries, interviews and casual conversations over the year in which they were involved with the project. The names of the case study candidates, their parents and their teachers have been changed in order to ensure privacy.

The learners involved in the case studies are as follows:

1995 -	Nozuko Mx	1996 -	Loyiso Nt
	Pelisa Mq		Study Group
	Thembani My		Vuyiseka Pm
	Themba Mv	1997 -	Mongesi Sm
	Zoleka Mp		Nonthembeko Mw

Thembani spent his Grade 11 year and part of his Matriculation year as part of the project. The two years have occasionally been treated separately and are then referred to as 1995 (Grade 11) and 1996 (Matriculation) in the descriptions and table of categories.

The analysis of the case study data consisted of sorting the notes according to categories (Merriam, 1991) or units (Lincoln and Guba, 1985). Two procedures were used to sort the data. Firstly, text referring to the same topic was marked (Merriam, 1991). That text was transferred to the heading of that topic. The data was then sorted to form coherent paragraphs. Secondly, the data was transferred to a table of categories. The two sorting procedures were then used to identify and cross-check the data in order to establish the emergent pattern.

A short description of each case study is given below under the separate categories to highlight confirmations or contradictions between subsequent interviews, questionnaire answers or teacher and parent answers. The categories have been used in the descriptions to facilitate pattern matching. The categories were determined by the questions asked of the candidates and additional data provided during interviews and diary entries. Thus, some headings can be related directly to the structured interview questions (Appendix B) while others were derived from unstructured questions or diary entries.

The interpretation of the data for the description was kept to a minimum. The original data was used as it was given. No additional or hidden meaning was sought in the phrases or wording. Only where the wording was directly translated from the vernacular Xhosa by the interviewee, was interpretation of the meaning in Xhosa sought. An example of this is:

Original:

He was usually "on his own with his work".

Interpretation:

Did his work without distractions (such as radio or television).

Original:

"Most of the teachers do not attend their classes because they have finished the syllabus. So the game is for us to play".

Interpretation:

Classes did not continue once the syllabus had been completed and the learners were left to do their own revision.

Presenting the data in the form of descriptions, a table of categories, as well as the emergent pattern at the end, initially appeared cumbersome and unnecessarily lengthy. However, after consideration, it was deemed appropriate in order to gain an understanding of each learner's position. Presenting the data in this format will also allow the reader to confirm or reject the emergent pattern to his/her own satisfaction.

Such a presentation also highlights those areas in which the depth of data is lacking. Repeated attempts were made throughout the duration of the study to obtain in-depth information and to promote critical thinking and insight among the candidates, but without result. Unfortunately, little could be gained in this regard, as the learners appeared not to think deeply about homework and their understanding of it. They could not articulate any deeper thoughts or understanding on the topic. This may indicate a lack of critical thinking on the part of the learners, which is also borne out by my own experience of such learners. Such superficial thinking may be due to the teaching received at ex-DET schools, which predominantly consists of talk and chalk and expected regurgitation of work learnt (without understanding).

Thus, the lack of depth obtained in the case studies is due to three reasons. Firstly, that the candidates were unable to supply the depth of information required, due to lack of thought or understanding of the issues involved. The candidates did not appear to have considered homework and related issues with any depth, and were not prepared to do so at this stage. Thus, many questions were answered shallowly despite repeated rephrasing of the question or different approaches. Secondly, the learner's trust was essential to gather the required information. It was thus felt that intensive probing in issues that the learners couldn't or didn't want to answer would destroy the trust that had been built up. Such a lack of trust and its consequences were experienced in the case study involving Pelisa. Thirdly, certain issues were not explored as they only arose during the analysis of the case, a lengthy process which continued well after the interviews had been completed. At that stage, contact with the candidate had been broken off and the resumption thereof would have been inappropriate, as any follow-up questions would have been out of context for the candidate.

An example of a detailed case study can be found in Appendix A. This write up was done with all the subjects, but it was considered unnecessary to include these in the study presentation. However, this example is presented to give the reader a 'feel' for the kind of understanding that the case study offers for each learner. It takes on a narrative form as is usual with case studies, written in clear sentences using plain words (Yin, 1994) without losing detail or misinterpreting information. Additional information was included in the report to provide a background sketch and insight into the personality and life of the candidate.

The reporting of the case studies set out below is done under the various categories as sorted during the analysis of the data. Each category is named and the candidates' views or actions are given. Where appropriate the parents and teachers' responses to questions on the issue are included.

5.1.2 General

The case study candidates' personalities differed considerably from each other, as can be expected from any group of teenagers. Many (Nozuko, Thembani, Loyiso and Nonthembeko) were shy at first, but most were happy to communicate with me and expressed their thoughts in a relaxed fashion. Themba had no problem communicating in fluent English and was always outgoing and friendly. Vuyiseka spoke excellent English and used teenage slang with ease. She had an outgoing personality, a great sense of humour and was very self-confident and inquisitive. This allowed her to speak at great length on topics of interest and to express her thoughts freely. Zoleka appeared to be a serious, hard working and self-confident girl, who kept to herself. She often searched for the correct word to use (as did Nonthembeko) but had enough confidence to ask for clarification if she did not understand a question. Mongesi, at 24, was older than the other candidates. He always looked very mature and smart, and was easy going and self-confident.

Pelisa was very elusive. She seldom spoke to me on the phone and was seldom home during my visits. She would also disappear if she was at home and she saw me arrive. She used her poor English as an excuse for not being available although it was not that bad. I finally realized that her parent's suggestion that she spend a weekend with me, in order to learn English, contributed considerably to her reluctance to meet with me. She no doubt felt anxious about possibly being forced into a strange place, with a stranger of a different culture.

The candidates generally got to feel comfortable with me and communicated freely. Thembani would phone me at home during his second year with the project and visited me often during his years of further training. Nonthembeko was happy to call me by name and phone me once they had a phone. Nozuko ran into me and greeted me three years after her part in the project was over.

Diary entries varied as much as the candidates personalities. Thembani wrote lengthy and detailed entries. Loyiso, Nozuko, Zoleka, Vuyiseka and the study group 'diary keeper' made regular albeit short entries. Pelisa, Nonthembeko and Mongesi made very few to virtually no entries in their diaries. Nozulo's initial diary entries contained many apparent contradictions, which decreased as the project progressed. Mongesi and Nonthembeko's lack of diary entries was not considered a major problem as the case study's emphasis was changed to homework observations, which also allowed me to help Nonthembeko with Mathematics. The remaining interviews were therefore changed to interview questionnaires in which Nonthembeko wrote in her responses to the questions.

Two of the candidates did not relate to school well. Pelisa basically abhorred school and stayed away whenever possible. Her mother was aware of this and yet still had vague hopes that her daughter would continue with Tertiary education. Her father was only interested in her getting married. Vuyiseka did not enjoy school either and did not think that the present education system offered her what she needed.

As was expected, project participation had different effects on the different candidates. Thembani's participation in the project may well have motivated him to work harder than he would normally have done. His mother confirmed that Thembani was working harder as a result of the project and appeared to use the project as a way of encouraging his hard work. However, it did also appear as if all the learners in his class worked progressively harder during their Grade 11 year. During 1996, Thembani kept a diary but was not interviewed. He quickly got used to being in Grade 12, worked much harder than before and much preferred his Matriculation Mathematics teacher to the one he had had in Grade 11. He had a lot of confidence in this teacher, indicating his dependence on his teacher, although to a lesser degree than in the previous year.

During the third interview, Zoleka mentioned that her mother was worried about her Mathematics' marks because of her involvement with the project. This was interpreted as her mother becoming increasingly concerned about Zoleka's performance due to Zoleka's involvement in the project and not due to a parental desire for her child to achieve. Nonthembeko's motivation for taking part in the project was the promised help with Mathematics. According to her brother, Nonthembeko's participation in the project also made her work harder at Mathematics. Judging from Vuyiseka's diary entries and her interview answers, she did not appear to be influenced by her participation in the project and thus did not do more nor less homework than if she had not been part of the project.

It was more difficult to get to know the members of the study group than the individual candidates. Many learners formed study groups for the different subjects. A group leader was appointed by the members of the group for each subject. He/she then called the group together for that subject, possibly once a week, but not necessarily on a fixed day. Communication between subject groups appeared to be minimal. Communication between group members and the decision to meet was taken in the class but was not limited to learners from that class. The decision as to who would or could attend appeared to be rather complex. The composition of the group seemed to change constantly, including learners from other classes and schools.

The study group involved in the project consisted of eleven to thirteen Grade 12 learners, mostly boys, from two different schools. My contact person with the study group was Thembani whom I knew well by that time.

5.1.3 Attitude to Mathematics

According to the initial questionnaire handed out during candidate selection at the beginning of each year, the majority of the nine candidates claimed to find Mathematics interesting and to like the subject although they found it difficult or challenging. Candidates generally felt that they could cope with the subject.

Nozuko did not view Mathematics as an easy subject and knew that it required work and thought. She found Trigonometry especially difficult. Pelisa felt that Mathematics was too difficult for her and that she didn't understand her homework, although she wanted to understand it. As she was already aware of her inability to cope at the beginning of Grade 11, one wonders why she did not change her subject choice while it was still a feasible option. Others such as Thembani and Themba found the subject interesting although only manageable (Thembani) or difficult (Themba). Zoleka claimed to love Mathematics although it was difficult. Mongesi liked Mathematics, felt it was good for his future and that it was a challenging subject. Mongesi liked to do homework as it kept him busy. He felt that homework positively affected test and examination results. Nonthembeko felt "happy" about Mathematics but struggled with the problems.

Many of the candidates (Nozuko, Thembani and Zoleka) stated that they found class work, while being explained by the teacher or done with the teacher's guidance, easier than the homework. Did this imply that the degree of difficulty of homework was greater than that of classwork? Alternatively, did this suggest that there was a tendency towards passive learning in the classroom, with active learning only taking place during homework? That work was easy while it was being explained (passive learning) but difficult when the learners had to do it on their own (active learning)? Zoleka complained that she would understand the work while they were doing the homework (she worked with a group of friends) but then had lost the grasp of it by the time they dealt with the work again in class the next day. This was possibly as a result of passive learning in the group instead of actively doing the work herself, rendering her conscientiousness ineffective.

The learners viewed homework in different ways. Thembani did Mathematics homework only when it was not boring. His work ethic was to do what his heart told him to do, so that he always felt satisfied. Themba and Zoleka were prepared to work hard for success. When Zoleka's teacher left work to be done she practised on her own even if the class decided not to do the work. She would also worry if classes were missed as she felt that they were losing class time. She practised or studied on her own at home in the afternoons or on weekends. She also watched Mathematics on Teleschool once or twice a week. Vuyiseka spent as little time as possible doing homework, but still felt confident that she would pass. She much preferred to read fiction or watch television and often forgot about homework. Her lack of doing homework was confirmed in almost every diary entry. Her teacher confirmed that she did not do homework if it was difficult and often left half the work undone. Despite this he described her as average in Mathematics. She arrived at school too late for Mathematics on at least two occasions and sometimes fell asleep or failed to concentrate during the lesson. However, on one occasion, when she had missed class, she reported making an effort to catch up on the work. Nonthembeko classified herself as someone who thought about the things done in class and would try to recall what the teacher had said during the lesson. This later also became evident in the homework observations. She was happy to ask questions if she did not understand the work. She would repeat an explanation in her own words or carefully go over an explained problem again to make sure she had understood correctly. She also considered different possibilities to the problems and wanted to discuss these. This showed an ability to think laterally, which could assist in passing Mathematics.

The teachers' observations of the learners occasionally agreed with those of the learners but sometimes not. According to his Grade 12 teacher, Thembani did not do very well in Mathematics, thus concurring with Thembani's opinion of his own abilities at the beginning of Grade 11. Zoleka's teacher felt that she was not attaining her true potential in Mathematics and needed to practice more, despite her apparent hard work. Zoleka shouldn't just accept that she couldn't do Mathematics. Loyiso's teacher felt that Loyiso had a positive attitude to mathematics. He did very well in the subject, was one of the learners who liked to ask questions in class and did all his homework. According to his teacher, Mongesi did well in Mathematics, did all the homework assigned on his own, or with class friends. Nonthembeko's teacher felt that Nonthembeko should not have chosen Mathematics as a subject, as she was not coping at all and had many problems from previous years. Pelisa's teacher, contrary to Pelisa's dislike of the subject, felt that she was not that bad at Mathematics but did have some problems, especially in Geometry.

The candidates all had someone they consulted when they had a problem with Mathematics. Most preferred to ask a friend or sibling to assist them, rather than the teacher. On one occasion when Zoleka had prepared for a test, she had studied with her sisters' help and they had consulted three other textbooks. Her teacher confirmed that she consulted other learners who were better at Mathematics. She appeared to have been a hard and conscientious worker, who consulted peers rather than the teacher. Mongesi did his homework on his own with no help from anyone. If the work was difficult, he went to school for an explanation the following day, consulting his peers before deciding to consult his teacher.

Many of the learners in the project had a positive attitude towards their Mathematics teachers. Nozuko rated her teacher as perfect, as he taught slowly and had the patience to repeat explanations. Pelisa felt that her teacher was a good teacher but that he taught too fast for her. Themba thought his teacher was "terrific" and liked Mathematics as a result (although this had not been the case in Grade 10). Mongesi felt that his Mathematics teacher was perfect for the subject as he always explained things well. Nonthembeko felt that her Mathematics teacher was a good teacher. However, although Thembani initially felt that his teacher tried hard to help him understand Mathematics, the entire class later felt they had a problem with the teacher and blamed their failures on him. Thembani related his marks directly to the amount of homework, teaching and the teacher, ie. good teacher, much homework, and good marks, and vice versa. He considered his Grade 12 teacher a good Mathematics teacher, who gave a lot of work and pushed Thembani to work faster. Thembani's need to be pushed to work faster and his linkage of marks and teacher clearly show a dependence on the teacher for achievement.

Vuyiseka's comment on learners' thinking that they had passed a test and then finding that they had failed it was that the learners knew they had failed but thought it sounded better to say they had passed.

Nonthembeko did her homework in intervals of 30 minutes, after which she took a short break as her "mind was then tired". She always did her homework, as she wanted to improve her knowledge.

5.1.4 Amount of homework

The amount of homework done by the candidates appeared lacking in frequency and quantity. This was mainly evident from the diary entries, but also from learner and teacher comments. Nozuko's diary recorded either little homework or no homework. This contradicted the previous impression of her wishing to please me, interpreted from the first interview. Nozuko confirmed the sporadic homework in her interview, by saying that they did not get homework every day. Pelisa, Thembani, Themba and Zoleka claimed that homework was not given every day. The study group members from DMB claimed to receive homework twice a week while those from MSPT said they did not get homework every day. Initially, Zoleka was given homework regularly, however, later both homework and classwork became sporadic. Loyiso's class received homework more often than not and regularly did classwork. Vuyiseka, Nonthembeko and Mongesi received homework every day, although Vuyiseka did not receive homework on Fridays.

Very little Geometry homework appeared to have been given. After five days of Geometry, a little homework was given, which Nozuko described as "not easy". After another two days without homework, they were given a lot of homework which Nozuko, not surprisingly, found to be difficult. In Thembani's Matriculation year very little Geometry homework was given and little or no homework (or classwork) seemed to be given for the more difficult sections. As Geometry was done in the second semester, the decrease in the number of problems for homework during this time may be linked to a tendency to give less Geometry homework, which is considered a difficult aspect of Mathematics by most teachers and learners.

The amount of time spent on homework and number of problems done by the candidates also differed somewhat. Times ranged from 30 minutes for Pelisa and Vuyiseka to three hours for Loyiso. The number of problems ranged from one difficult problem (Thembani) to 15 problems (Mongesi's teacher).

It usually took Nozuko 1½ hours to do the three to five problems given as homework. However, by the third interview, she claimed to spend two hours doing homework, only half an hour of which was Mathematics homework.

Thembani's homework consisted of only one problem if the work was difficult and five problems if it was easy. Thembani usually spent 20 to 30 minutes on Mathematics homework although this could expand to approximately two hours in the second semester depending on the workload and possibly due to participation in the project. According to his mother, Thembani did an hour's homework a day, often between 16:00 and 17:00, in his room or in the lounge. She did not know how much time was spent on Mathematics. This agrees with Thembani's initial statement and does not include time spent working on homework at school and so can not be seen as a direct contradiction.

Thembani's teacher claimed that he gave five to seven problems for homework every day. This was slightly more than indicated in Thembani's diary. However, it agreed with the diary if Thembani elected to do a maximum of five problems only. The teacher had not related the amount of homework to its degree of difficulty. However, in Grade 12 homework was given more often than not and up to 14 problems were given, but with three to seven being the norm, even on weekends and holidays. During the second semester, one to four problems appeared to be more the norm.

Themba's diary entries and statements, supported by the teacher's statements, indicated that homework was not given every day and was at times not done, even by the top pupil. Half an hour for 20 marks is acceptable if 150 marks for a three-hour examination is taken as a guide and Themba's times are matched with the teacher's allocation of homework. However, if the homework:mark ratio did not change over the year, 1½ to three hours for 20 marks would be excessive. According to his teacher, Themba did homework on average three times a week. Mr Mtsh did not give homework every day. When assigned, the homework consisted of approximately 20 marks' worth of problems.

According to Themba, his class was usually assigned five problems which took him half an hour to complete if easy and 1½ hours if they were difficult. By the third interview, Themba stated that he spent two to three hours doing homework. Homework was only given after they had done classwork, although classwork did not necessarily imply homework. The homework would consist of five difficult problems or ten easier ones. The more difficult problems usually related to Grade 12 work.

The contradiction between Themba's claim of doing exactly the homework assigned and his claim of doing additional work on his own was highlighted by his claim of studying only when he felt so inclined and learning only the easier theory ie. formulae and theorems.

Vuyiseka generally did only part of the homework or did not do it at all. She felt that if she knew the work, she did not need to do the homework. Homework, if done, took her only about 30 minutes.

Pelisa only received two or three problems as homework once or twice a week and did not always do them. In contrast, her teacher claimed that he gave approximately five problems as homework every day. When she did get homework, she spent approximately half an hour on the two to three problems.

Zoleka's class were given five or six problems as homework. Zoleka claimed to do homework every day, although only that which was assigned. This took her roughly two hours (of groupwork). This was confirmed during her third interview when she added that it could take up to three hours if the work was difficult. Two to three hours for six problems would average out as 20 to 30 minutes per problem or six to nine problems in a three-hour examination, which certainly would not constitute effective work.

Loyiso's homework appeared to be plentiful, with anything from one to ten problems assigned. In his diary he reported homework as being "none" to "four exercises". On one occasion he reported that two "exercises" had taken him 2½ hours to complete. His teacher claimed to give three or four problems as homework every day, thus also confirming that Loyiso's "exercises" were in fact problems. Loyiso always did his homework and always tried to do all of it. However, if there were problems that were too difficult, he would leave them and carry on with others, showing a tendency to do only the easier work. It took him one to three hours to do the Mathematics homework, especially if it was difficult. During the third interview he again confirmed that it took him three hours to do his Mathematics homework and added that he did Mathematics homework every day. Up to three hours for four to ten problems could be considered excessive, especially if the difficult problems were not completed. Classwork and homework mostly appeared to be assigned regularly and to be of sufficient quantity to aid achievement. On one occasion additional homework was given, as the following day had been a public holiday. Homework quantity dropped considerably and was mostly non-existent during the first week of the fourth term. This was also the last full week of classes.

Study group learners from DMB received two to six problems for homework twice a week. Some of those problems were done in the group. With the learners from MSPT. In Geometry they usually received two problems and never more than three. In Trigonometry, four problems were generally assigned.

Homework was assigned four days a week for Vuyiseka. No homework was assigned on Fridays, with only a few exceptions. This was described in the diary, in the second interview and by the teacher. The teacher did, however, expect the learners to do revision of the week's work over the weekend. However, Vuyiseka never did this. Homework, as reported in the diary, generally consisted of one to eight problems. This was later confirmed as being five to ten problems during the third term. The teacher confirmed that he gave five or more problems as homework. In Trigonometry, they had received ten to twelve problems as homework. No homework had been received in Geometry initially.

Mongesi did not comment on the amount of homework assigned in the second questionnaire, but had had two problems for the first homework observation and four for the second homework observation. According to the teacher, the learners received ten to fifteen problems for homework each day.

Nonthembeko was usually given five or six problems to do for homework. This was confirmed by the teacher, who said that she gave four to six problems each day. Nonthembeko spent 1½ hours a day on homework, one hour of which was Mathematics. Her sister confirmed that she did 1½ to two hours of homework a day. One hour for six problems could be considered a moderate to long time to complete the work, depending on the degree of difficulty of the homework. The time period would be excessive if she tended to complete only the first part of each problem, as was observed on two occasions.

Mongesi's answer agreed with that of the teacher, that they were given homework every day. Initially he said that Mathematics was the only homework he did, although he later changed that to doing five to six hours of general homework a day (two hours according to his mother), of which one hour was Mathematics homework. He confirmed the latter in the third questionnaire.

Thus, only approximately half of the participants regularly received homework. This did not necessarily mean that they received homework every day. A learner may have received homework regularly, three times a week.

According to the teachers, the amount of homework assigned ranged from three to 15 problems each time homework was assigned. The majority of the teachers stated that they gave three to six problems for a day's homework. The learners' estimate of homework received ranged from one to six problems with very little homework received for Geometry. The number of problems appeared to depend on the grade of difficulty of the problems. Fewer problems were received if they were considered difficult!

As with the amount of homework, teachers' replies seemed to imply that they gave homework more often than the learners perceived to have received it. Of the two teachers who stated that they did not give homework regularly, one was a Matriculation teacher who taught Mathematics before school, after school, on weekends and during holidays, and generally expected much work from the learners. According to their SSHA's, the candidates generally claimed that "teachers expect [ed] too much homework".

Homework was mostly not completed although it was not considered "impossible to do all the homework" according to the SSHA. All felt they had enough time to do the work with the exception of Pelisa and Loyiso. This was despite Loyiso'a recurrent claim that he spent three hours a day on Mathematics homework. Vuyiseka felt that her parents did not ensure that she had sufficient time to complete her homework. However, this seemed unreasonable as both parents worked till 17:00 and thus did not determine how she spent her time in the afternoons. She furthermore claimed to do most of her homework at school, which she preferred. Thembani did not always do all the homework problems. According to the diary, he did not like to do more than five problems a day.

Although not doing regular homework and generally not completing it, many of the candidates thought that they did more homework than other learners. Nozuko felt that she did more homework than her friends did, but did not do the most in the class. The girl who did the most homework was classified as clever, but even she did not do homework every day. Zoleka claimed to do more homework than her friends did, although they always worked together. As a result of her reaction to the question I realized that the concept of some learners doing more work than others appeared strange to her. However, when asked about the learner who did the most homework, she gave the name of another, very bright learner, without hesitation. As he was part of the group with which Zoleka worked, her reaction to the initial question seemed contradictory. The teacher claimed that this learner had knowledge of Mathematics. Loyiso felt that he did more homework than his friends did but could not identify another learner who did more than he did. Nonthembeko also claimed to do more homework than her friends did. Mongesi said that he did sometimes do more homework than his friends did, but did not necessarily do the most in the class. Pelisa claimed to do less homework than her friends but said that even the girl who did the most homework, did not do homework every day, not only because it wasn't assigned but also because she wasn't always at school. Both Themba and his teacher claimed that Sipho Btj did the most homework in that class. But even he did not do homework every day. In Thembani's case, the learner who did the most homework was bright and did homework every day but did not always get it all correct. He did it because he always wanted to understand and be able to do the work. According to Vuyiseka, the most homework in her class was done by those learners who obtained the highest marks. This admission showed that Vuyiseka was aware of a connection between doing homework and achievement.

Although never told to learn theory, Thembani did learn it but often forgot some of it again. Themba also learnt only some of the formulae and the easier Geometry theorems, as there were too many to be able to learn them all. Zoleka's class was asked to learn theory and Zoleka tried to learn it, although it was sometimes difficult. Loyiso did not learn things off-by-heart as such, but would get to know the formulae and theorems by using them frequently. The study group members said that although they were told to learn theory off-by-heart, they only did it if it was "manageable" but mostly they didn't learn the theory. Only Nozuko, Pelisa, Vuyiseka and Nonthembeko claimed to learn all the necessary theory if instructed to do so. The candidates thus generally did learn the theory involved in Mathematics although most only learnt the easier work.

5.1.5 Extra work or extra lessons

Although the candidates seldom did extra work at home, they sometimes did work in class when the teacher was away. Extra lessons given by the teacher also sometimes took place.

In her diary, Nozuko claimed to practice Mathematics even when the teacher did not come to class. She confirmed her diligence in the first interview by stating that she did more homework than was given.

In the first interview Themba stated that he did exactly the homework assigned by the teacher. However, in one of the diary entries Themba wrote that he planned to practice Mathematics problems on his own. During the first interview he also claimed to do additional work on his own by revising work done in class. He stuck to this claim, even when challenged about it in a subsequent interview.

Loyiso initially claimed that he never did additional work. However, he partially contradicted this statement in the second interview when he said that he sometimes did a problem in addition to those given for homework.

Vuyiseka never did any extra work. However, her class had once had an extra lesson for revision. It had taken place the Saturday prior to the June Mathematics examination - possibly too late to be of much use.

In Grade 11 Thembani did not always do the homework problems, yet sometimes did more than was given and felt that the extra work was worth the effort it required. Extra lessons with much homework and even tests became very frequent for Thembani during his Matriculation year. They were given on most Saturdays, some Sundays and during the holidays, usually for more than two hours at a time. Even periods allocated to other subjects were used for Mathematics. During the second semester, extra classes were also held in the mornings from 7:00 to 9:00. No mention was made of what happened to the first period after school began at 8:00. Could that have been a Mathematics period? During one such extra lesson on a Sunday, only three examples were done on Geometric Sequences and four problems were given as homework. If a lesson was of at least two hour's duration, the amount of work appeared to be incongruent with the amount of time spent on it, even if the homework was done during the lesson. The teacher claimed to give three to four homework problems although not every day, which concurs with Thembani's diary entries for the second semester. He also confirmed that Thembani did his homework.

5.1.6 Reasons for doing homework

The learners generally had good reasons for doing homework. Only Nozuko didn't know why she did homework and only Nozuko and Vuyiseka did homework because the teacher told them to do so. There was no obvious awareness of the connection between homework and achievement evident in Nozuko's case. Even Pelisa did homework to understand the work although she did not like the subject. The reason Thembani and Loyiso did Mathematics homework was to prove to themselves that they understood the work.

Although Themba didn't know why the teacher gave homework, he did it to improve his confidence and to know what was going on. He did not always do what the teacher told him but felt that sometimes he had to do it on his own, for his own satisfaction. He preferred to do homework on his own at home as it gave him a chance to see whether he could do the work. This indicates that although Themba did not always do his homework he was well aware of the need to do homework in order to see whether he could cope with the work independently. The reason he gave for Sipho Btj's brilliance in Mathematics was that he did a lot of homework.

Zoleka did homework because she loved Mathematics, although it was sometimes difficult. She felt homework was good for her as it allowed her to practice Mathematics and so she benefited by doing it. It can thus be said that she was aware of a link between homework and achievement. This differs from the teacher's opinion of her, that she just accepted that she couldn't do Mathematics. However, it concurred with her results if she predominantly did passive learning.

In the study group one learner was identified as doing more homework than the rest did, although it was felt that no one learner did consistently more homework than the others. The group gave his love of Mathematics as the reason for the additional homework he did. However, he said that it was because he liked to prove to himself that he could do the work. He also wanted to go on to do

Mathematics at tertiary level. The other group members were not sure why they did homework.

Vuyiseka only did homework because she "had to". Although she was aware that high Mathematics marks and doing homework every day were related, one diary entry reported that she could not understand why she had received such low marks for a test. Did she apply her awareness of the relationship between homework and marks only to others or did she feel she had done enough homework?

Mongesi did homework because they were given the work and it gave him practice in the subject. The person he identified as doing the most homework did so because he had problems with the homework. His reasoning shows an awareness that doing homework improved Mathematical skills but does not necessarily indicate that he is aware of the relationship between doing homework and achievement in tests and examinations, although such awareness would be expected from an "A" candidate.

Nonthembeko did homework because she wanted to be able to do Mathematics, improve her knowledge and wanted to pass. She realised that doing homework and passing tests were related. Unless she knew the theory, she would not know what to do. She confirmed this in the second questionnaire.

5.1.7 Where and when homework was done

Nozuko, Loyiso, Vuyiseka, Mongesi, Nonthembeko and Thembani (if difficult) did their homework at home, in the afternoons or evenings. Themba, Pelisa and Thembani (if the work was easy) did theirs at school. Zoleka worked at another school or in the library with a group of friends.

In 1995, Thembani usually did his homework at school if it was easy but did it at home, where his sister helped him, if it was difficult. He confirmed this during the third interview. He preferred to do it at school with his friends, where he did it in the mornings during a free period. In July/August he became part of a study group of approximately ten learners - a large group for effective groupwork which would surely lead to many of the learners being involved in passive rather than active learning. In 1996, Thembani preferred to do his homework on his own and was proud when he could do it, but still consulted his sister and neighbour when he had problems. However, the group formed in August of 1995 still met, although mainly before tests and examinations.

Themba did as much homework as possible at school, rushing through it during class or free periods, especially if he knew he would be busy at home. He worked with a group of friends at school who helped each other but would work on his own if the homework were easy. At school the learners would work together without supervision. When he did the homework at home he did it in the afternoons, according to the first interview, and would try his best. According to his mother he did homework in his room at the back of the house in the afternoons and sometimes also at night. Although he professed to prefer doing his homework on his own on two occasions, in the HSRC test he circled that he preferred to study with others, which was how he did his homework at school.

Zoleka worked in a group with school friends, especially during examinations, but otherwise asked her brother or a friend for help when needed. She did her homework at about 15:00 in the afternoons, at a friend's house, a nearby school or the library where they worked in a group. She did not do homework at home on her own until later in the year, and then only occasionally. Her teacher stated that most of her homework was unfinished when she arrived at school. Whether this was because the group couldn't do the work or whether Zoleka left the group early, or didn't do as much work, is not clear.

While interviewing the study group members, they claimed to meet about four times a week and would study different subjects on different days. The group did not necessarily meet regularly once a week for Mathematics, but rather as was deemed necessary by various group members. When they did Mathematics, they worked together as one large group. This particular group appeared to meet mostly in the evenings and on weekends, while the group with which Zoleka Mp worked tended to meet in the afternoons. The late hours may account for Thembani's group consisting mostly of boys.

Vuyiseka did her homework either in her room at home or at school during a free period. She preferred a quiet, light, airy room and preferred to work on her own. She didn't see the value of working in groups. At home, she did the homework after everything else had been done and before going to bed at approximately 23:00. However, she mostly did the homework the next morning at school (at the last minute) where she had a classmate who helped her if necessary.

Loyiso and Mongesi did their homework in the evenings after supper or television. Mongesi would have preferred to do it at school, after classes.

Nonthembeko did her homework on her own in her room cum kitchen, before doing chores. However, she preferred to do it at school before class, thereby indicating that she may often have left her homework till the last minute. She did have a friend who was very good at Mathematics and who occasionally helped her. That she did her homework either at school or at home was confirmed in the final questionnaire and by her sister.

5.1.8 Attitude to groupwork

The study group members felt that it was worth working in a group and certain teachers actively encouraged it. Loyiso's teacher had encouraged such groupwork as a way in which to improve at Mathematics. However, Loyiso preferred to work on his own. Nonthembeko would have preferred to do groupwork at school although her teacher had not recommended it. She did not like doing her homework on her own and longed to join a group or to have someone to work with at home.

During a study session, the study group members would revise previous question papers or exercises from different textbooks. They seemed to choose the problems they felt they could manage. If they couldn't manage a problem, they would eventually consult a teacher.

The group members would work for approximately 2½ hours with individual learners taking breaks as they needed them. No group breaks were arranged. During one work session that I observed, the group took a long time getting settled and started, but then spent 1½ hours working.

5.1.9 Homework copied

All candidates, with the exception of Mongesi and Nonthembeko stated that they copied homework. Mongesi probably didn't need to copy and possibly had no one to copy from as he was the best Mathematics achiever in his class. Nonthembeko 'turned away' from this topic when it was raised but her teacher doubted that she copied.

Nozuko mostly did her own homework, although she would copy it if she did not understand the work. Pelisa admitted to copying her homework about once a week. She claimed that copying helped her, as a friend would then explain the work to her. Her teacher doubted that she copied. Thembani only copied the homework if it had been difficult and his sister had not had time to assist him. The learner he copied from would explain the work to him before he copied it. However, he would not elaborate on whether he understood the explanations. Themba copied homework from others fairly regularly - "once in two weeks" - when he had missed a day at school. He, like Thembani, would have it explained to him before he copied it, indicating an acceptance of passive learning, However, he said that he would also copy it if he did not understand it. Zoleka often copied homework, possibly due to the passive learning done during the groupwork. However, her teacher thought that she only copied if she hadn't done her work at all (possibly when she had not attended the group session). Loyiso copied the homework only when he found it too difficult to do, after having tried to do it on his own. His teacher was not aware that he occasionally copied his homework. Vuyiseka only copied if she knew she would have been able to do it anyway, given the chance. Others sometimes copied from her. According to her Mathematics teacher, even the top learner copied homework.

5.1.10 Days of "no school" or "no class" or "early closing"

All schools which were visited for case study candidate purposes experienced a loss of teaching time due to various reasons.
Many days in Nozuko's diary were reported as having no Mathematics teacher, no Mathematics during the period or no classes. During the 38 school days of the third term (July 31 to September 29), during which Nozuko made entries in her diary, there was 'no Mathematics' on nine days. These exclude the six school days on which Nozuko did not write in her diary during her father's death and funeral. The nine days give a ratio of almost 1:4 in comparison to the number of days in the term.

The reasons for `no Mathematics' were as follows:

5 days - teacher away
1 day - teacher at school but not in class
1 day - teacher late
2 days - teacher away

There were days when Pelisa's teacher could not be in class due to having to attend meetings. Pelisa could not clearly indicate how often this occurred. The teacher confirmed his absences but could also not say how often this happened. In the previous year his absences had been due to his attending a course. However, this was not so during Pelisa's Grade 11 year. Pelisa was also home and "on holiday" a week before the schools closed for the June holidays. This was seen as another indication that she missed school whenever possible. Another interpretation was that the learners were not expected to be at school after the June examination. However, this interpretation assumes that Pelisa would not stay away from school during examinations.

In 1995, Thembani stated that the teacher was not in class "many times, sometimes for a whole week". This sounded as though the teacher was absent from school for up to a week, on more than one occasion. Sometimes these absences were due to courses, meetings or the setting of examinations. The teacher confirmed that he had been away for a computer course but added that he left work for the learners and gave extra lessons to make up for such times, which Thembani attended. However, Thembani never mentioned these extra lessons in his diary nor during interviews. It is remarkable that he made such detailed diary entries but never mentioned lessons after school. The second term started very slowly at MSPT with not much happening, as the teachers were busy with reports. A day later the teacher was away for a week, on a course. Despite rushing towards the trial examinations, the teacher missed another class and left the learners to their own devices. The teacher was also not available after the trial examinations and apparently was not seen again until the end of the year.

During the 50 days of the third term (24/7 - 29/9/95), the learners had no Mathematics (or school) on 16 days. This excludes the period of 11 days during which Thembani had not attended classes due to his father's death, thus giving a ratio of 16 days out of 39 or approximately 1:2.

1 day - first day of term
5 days - Mathematics teacher on a course
1 day - problem at school
1 day - Arbor day
1 day - no reason given
1 day - teachers not in class
1 day - America day
1 day - Matriculation farewell
1 day - teachers marking and preparing for choir tour
2 days - teachers with choir tour
1 day - last day of term

Examinations took up 11 days (considered reasonable), leaving 23 days for teaching. Virtually no teaching seemed to have taken place during the fourth term.

In 1996, despite all the extra classes, things were little different. The teacher was absent for seven days in the first semester and many school days were missed for various reasons. The school also closed early on two occasions.

During the first two terms' diary entries of 1996 (commenced on 19/2), no school or no classes occurred on 16 occasions giving a ratio of 16:76 or 4:19 with reasons given as follows:

1 day - sports day
1 day - teacher preparing for athletics
3 days - teacher absent
2 days - strike at school
1 day - teacher at meeting
1 day - teacher not in class
1 day - no teachers (end of March test series)
1 day - America day
1 day - no Mathematics period (no reason given)
1 day - career day at P.E. Technikon
1 day - no Mathematics during period
1 day - teacher writing a test
1 day - no classes (day before June examination)

The Matriculants appeared to get many extra classes, especially in Thembani's case, but one must ask oneself what happens about the other standards missing 16 days of school in less than two terms. This does not even take into account the lack of learner attendance, and thus classes, on the first and last day of each term, nor the classes missed on the two days that school ended early.

Again, during the second semester, the teacher would come to class late or take leave to write a test. No work was given to cover this time away although the learners worked independently and even met on their own on a Saturday. The teacher confirmed that there were times when he could not be in class, and gave impromptu meetings and illness as the reason. It was school policy to leave work for the learners while the teacher was away. He did not mention any courses he was attending but had taken a year of study leave in 1995.

The learners of the study group from MSPT High School claimed that it rarely happened that the teacher could not be in class (in 1996). However, this was contradicted by the diary entries for the Matriculation year, of both the study group diary writer and Thembani. Reasons for the teacher's absences were given as his own studies or a meeting.

In Themba's case, there was not as much evidence of lack of schooling as in some of the other case studies. Only the early closing for the National Day of Mourning for the 100 miners killed at Diep Kloof mine on May 17 and the early end to examinations indicated a lack of schooling. However, according to his statement about copied homework, Themba was absent "once in two weeks". If this was extrapolated to a 32 week teaching year, he would have missed 16 days of schooling due to absenteeism.

Mathematics was done in every Mathematics period and no other topics were discussed although there were times, about once in two weeks, when the teacher could not be in class due to some or other problem. This was confirmed by the teacher. The teacher left work or a learner to teach them. If extrapolated again this would lead to another 16 periods without Mathematics, not to mention possible double periods.

The teacher's reasons for not being in class were given as courses or meetings attended after school or on weekends - a contradictory statement on its own. The reality of attending courses or meetings after school could well be questioned, as most courses and meetings take place during school hours to encourage teacher attendance at courses. His claim that he then left work for the class when he was away from school also indicates that these took place during school hours.

Zoleka's school was disrupted towards the end of the second term due to a misunderstanding between teachers and students. The length of this misunderstanding was not recorded. On the first day back at school in the following term they did no work.

The teacher would sometimes not be in class due to problems or because he was doing revision with the Matriculants. The teacher confirmed his absences, which he said, were due to his involvement in school sport and the examination committee.

On days when meetings were held for the teaching staff at the school Loyiso attended, there were no classes and no work was assigned. This happened approximately once in two months. Otherwise his teacher would come to class for Mathematics, even if late at times (periods were of 50-minute duration). No work was done for a few days before or after examinations. Learners went home early while the teachers set or marked examinations or wrote out reports. However, extra afternoon classes had been organised by the teacher, once before an examination and later for Trigonometry. The teacher also tended to teach despite having only a few learners in the class. She once also tried to arrange to see the class during a free period. Days when the teacher was sick or the first day of the term, were considered "party time". According to Loyiso, the school year ended on October 14. However, examinations for Grades 8 to 11 only started on October 28 according to the Mathematics teacher.

Ten days of "no class" or "no school" were recorded in Loyiso's diary during the first two terms. The first and last days of the terms were not included. As the diary was only started on 20/2, the time taken from the opening of the school in January to the start of actual teaching was thus also excluded. The reasons for the days of "no class" or "no school" were given as the follows:

1 day - teacher absent
1 day - teachers discussing problem of stabbing at the school
3 days - learner strike
2 days - last and first day of term (April holidays)
1 day - no reason given for no school

1 day - teachers preparing for show

1 day - no reason given for no class (separate to the day above).

The above days give a ratio of 10:75 for days without Mathematics. It does not take double periods into account.

Vuyiseka's teacher was only absent from school "very occasionally". This was as he had to stay home and look after his children when his wife was sick. This had only happened once or twice, according to the teacher. He would leave plenty of work for the class at such times. This was also the norm at the school. Vuyiseka generally felt that the teacher was very conscientious in his work. Learners at this school did not miss classes while the teachers were preparing or marking examinations. Although not much work had been done during the week prior to the June examinations, it had been described as a hectic week by Vuyiseka. Late comers were given a letter to take to their parents. However, if a learner came late again, he was sent home for the day.

The school occasionally closed early, such as for a memorial service for a deceased learner or for a SADTU meeting. This occurred on three days in the first semester, On one occasion the school closed early due to the principal's birthday. When not much learning had taken place on the first day of the third term, 'Opening Day', it was considered a "good day". Such a day was considered necessary for learners to adjust themselves to attending school again, according to Vuyiseka.

The syllabus had been completed by October 21, which coincided with Vuyiseka's penultimate diary entry. This gave the impression that she considered the school year to have come to an end, one week before the beginning of the examinations. No indication of revision was given in the diary. However, the teacher claimed that he always did revision a few days before they wrote each Mathematics examination.

The school had not taken part in the three-day strike against corporal punishment at the beginning of the year. However, despite the appearance of continuous schooling and hard work, closer scrutiny revealed many days on which no constructive work was done, such as the instances mentioned above.

At Mongesi's school, disruption of schooling occurred at the beginning of the year when learners objected to a cyclic timetabling system. This resulted in a week of no classes. Later, for two days in August, there had again been no classes, this time due to a teacher strike. Approximately once a week, the teacher could not attend the class due to staff meetings. The teacher confirmed these meetings but did not say how often they occurred.

At Nonthembeko's school, the teacher was too busy to be in class approximately once a week, but would leave the class work to do during these periods. The teacher confirmed her absences, which were due to meetings and other commitments such as "mindquiz" and "mindwalk" competitions. Work was given to the class during these periods. Latecomers missed the entire day of classes as they were locked out of the school premises.

Final Grade 11 examinations took place earlier than prescribed by provincial circular at all the schools at which case study candidates attended. The final examinations at Nozuko's school were written from October 16 to November 14. With the third term holidays being from September 30 to October 9, only 4 school days were left for the fourth term before the start of examinations. At Thembani's school examinations in 1995 had been written from October 16 to November 14, with Thembani's first examination being on October 23. Examinations for Themba ended on November 14, shortening teaching time by three weeks. Zoleka wrote final examinations from October 23 to November 9 after which the learners awaited their reports. Final examinations for Loyiso had ended and books had been handed in by November 14. Vuyiseka's final Grade 11 examinations started on November 1 and ended on November 22. Her final diary entry was made on the day of the last examination, expressing great relief that the year was over. Officially the examinations were to end on November 28. Final examinations at Mongesi's school were written from October 28 to November 17. Nonthembeko wrote her final Grade 11 examinations from October 27 to November 14.

After the examinations, learners stayed at home as the school year "had ended" and considered themselves on holiday. Many teachers confirmed that the learners did not attend school after the examinations and were not expected to do so. It was accepted as inevitable that they would not return to school.

5.1.11 Consequences of not doing homework

As the candidates occasionally didn't do their homework or copied it from another learner, they were asked about any consequences for leaving homework undone. Loyiso's and Nonthembeko's classes were verbally admonished. Themba's and Vuyiseka's class members might be given extra work to do. The 1996 Matriculation teacher sent the learners out of the classroom and informed the parents telephonically that the learner had not done the expected homework.

If homework had not been done, Loyiso's class was given a lecture on the consequences of not doing the work and told that they were only cheating themselves. Loyiso agreed with the teacher's point of view. If the learners in Nonthembeko's Mathematics class did not do their homework they would be warned that they would fail Mathematics. The teacher of the DMB study group members would get angry and shout if homework wasn't done as he expected it to be done. In Themba's Mathematics class, learners who had not done their homework were asked to meet the teacher in his office. There he gave them classwork to do and told them to do their homework. The teacher viewed this as punishment although Themba thought it helped him. Vuyiseka mentioned that there were generally no consequences to not doing homework in her Mathematics class, although the learners who had not done their homework might receive more homework than the rest of the class on the following day. In Thembani's Matriculation class, the teacher would send learners who hadn't done their homework out of the classroom or phone their parents.

5.1.12 Examination marks

The case study learners' examination marks and their end-of-year mark expectations showed distinct discrepancies. All expected to achieve higher marks during their end-of-year examinations than their performances thus far warranted. Even the teachers appeared to have the same tendency to expect higher marks than the candidates appeared capable of.

Nozuko had failed Mathematics in the June examinations with 30% but "swore" and "trusted in" passing in November. She expected to get 40% to 50% at the end of the year. Despite these hopes, she obtained only 21% for Mathematics at the end of the year. Her final mark was made up of a year mark of 22/100 and an examination mark of 61/300. Nozuko showed a greater inclination towards being extrinsically motivated in preparation for her final examinations than any of the other candidates did. She did homework only because her teacher told her to and she "trusted in" passing the examinations.

Pelisa had not received a report in June that year and did not know her marks. She expected to get 40% for Mathematics at the end of the year. Her June mark was the lowest in the class at 27% and yet the teacher felt that she was capable of obtaining a D symbol at the end of the year. Pelisa gave the final examination dates as November 23 to December 10, although I later found the school already closed on November 23. The actual examination dates were October 23 to November 11. Was this another indication of Pelisa's indifferent attitude to school or a genuine mistake (slip of the tongue) that can easily happen to all of us?

In Grade 11 (1995) Thembani had 34% as a June mark and 32% for the Grade 11 Trial examination. Only one person passed that examination. Contrary to the other candidates, Thembani hoped to pass at the end of the year, but did not expect to. He attributed this to the general impression that high marks seemed difficult to get and not to his lack of ability to achieve. However, after the final Grade 11 examinations, Thembani had been confident of passing. His result was, however, a fail in Mathematics which he wanted to query with his teacher. According to his teacher, Thembani had obtained 29% in June and 38% for the trial examination. This had compared poorly to the rest of the class. He had not wanted to venture a final mark for Thembani before the examinations. The only possible reason for Thembani's and the teacher's marks differing could be the inclusion of the year marks in Thembani's marks.

In 1996, the Matriculation teacher did not have any marks for Thembani but said that his marks were low when compared to those from the rest of the class. He expected Thembani to obtain an E symbol on Standard Grade in the final examinations. Thembani eventually got an F on Standard Grade for Matriculation Mathematics.

In the first interview Themba had said that he got 40% for Mathematics in the June examination and found Paper I easier than Paper II. In the second interview he said that he had achieved 50% in that examination and again confirmed this in the third interview. He felt that he was capable of getting up to 60% at the end of the year. His teacher felt that he was of average ability and should be able to attain a D symbol at the end of the year, thus concurring with Themba's estimation of his abilities. His actual mark for the June examination had been 30% (59/200). Themba's not knowing his Mathematics marks (or wilfully exaggerating them) possibly showed that he did not take cognisance of marks as an indication of his abilities or that he was not interested enough in the subject. However, the mark was written as 59/200 on the report. This method of presentation may account for Themba's impression that he had obtained 50% ie. $59 \approx 50$, with the percentage as a retrospective error. His given mark of 40% which he later reported as 50%, may, however, indicate that he really believed that he was better in Maths than in reality. As he knew that I communicated with his teacher, I do not believe that he was trying to mislead or impress me.

Zoleka said she had achieved a mark of 40% for the June examinations. However, after her final Grade 11 examination she felt that she had managed 70% for the examination, which she had found "not difficult". Her marks, as given by her teacher, were 35% in June and 26% at the end of the third term. He had expected her to get at least an E symbol at the end of the year. Her actual final Grade 11 Mathematics mark was 49/400 or 12%. Yet she was above the class average for Mathematics, had passed all her other subjects and was first in her class.

Loyiso, as in Thembani's case, seemed to have a misconception of his achievements. On February 23 Loyiso thought that most of the class would pass a test. However, most failed although Loyiso had passed. He put his success down to having "practised very much", thereby indicating that he was aware of a link between homework and achievement. He felt that learners became excited when seeing the problems in tests and examinations. As a result, they would rush to do the problems and consequently did not fair as well as they thought they had. (For the purposes of this study and due to the nature of Mathematics requiring practice, rather than learning, study was considered as equivalent to homework). Only when pushed during the second interview, did he eventually risk an estimate of 50% as a possible Mathematics mark for the end of the year. Again, during the third interview, he would not venture a guess on his final mark. He also could not say what his Mathematics mark had been in June. Loyiso obtained 49% for Mathematics in June (about average for his class). His teacher had expected him to get a C symbol at the end of the year, but the final Mathematics mark given to me by Loyiso, from his report, was 226/500 or 45%. However, in January, the marks supplied by the principal were a year mark of 67/100 and an examination mark of 163/400, resulting in a final mark of 230/500 or 46%. Loyiso had been third in his Mathematics class.

For the study group members, the June Mathematics marks ranged from a C to an F with the majority having an E symbol on Higher Grade. Symbols expected at the end of the year ranged from an A to a C with most hoping to achieve a B on Standard Grade. The group members felt that learners received lower symbols after writing tests or examinations than initially expected, as they became excited during the test or examination and thus made careless mistakes.

Vuyiseka knew that her June Mathematics mark was 55% This she claimed was a definite improvement on the previous year's marks. She expected 70% or 75% at the end of the year. The teacher felt that she should be able to achieve a C or even a B symbol at the end of the year if she applied herself. All her teachers felt that she could do very much better if she put some effort into her schoolwork. Her third term mark was 65% - an improvement as predicted by Vuyiseka. However, her final Mathematics mark was 226/500 (46%) according to the official mark sheet. She had the lowest mark of the five Higher Grade learners in the class. The highest mark had been 439/500 (88%). Judging from the trend shown during the year, the C expected at the end of the year by the teacher had been within reach.

Mongesi's Mathematics mark for June was 81%. He expected to get an A symbol at the end of the year. He remembered his exact mark in subsequent interviews and conversations. His teacher gave his June mark as 90% and his September mark as 85%. Mongesi was top of his class in Mathematics but his teacher still felt that he could do better if he continued practising. He expected Mongesi to get an A or B symbol in Mathematics at the end of the year, but only a C symbol at the end of Matriculation. He felt that such a drop in marks in the final Matriculation examination was normal. Mongesi's final symbol at the end of Grade 11 was a B.

Nonthembeko had obtained a June Mathematics mark of 20% but expected to get at least 75% at the end of the year. Her mark at the end of the third term was 38%. Her brother had not been sure of the mark during the parent interview but knew that it was between 30% and 40%. Nonthembeko's remark at the time, that it had been 30%, was also incorrect. Her brother's estimate had been closer to her actual mark for September, the last mark received before the interview. Nonthembeko's marks, as given by the teacher, were 13% for June and 11% for the final Mathematics mark. Nonthembeko's was the second lowest mark in the class although the class average for Standard Grade was only 16%.

Nozuko, Pelisa, Zoleka and Mongesi not did know the concept of a study timetable and thus did not use one. Themba, Thembani, Loyiso, the MSPT study group members, Nonthembeko and Vuyiseka all knew what a study timetable was. Thembani used one before examinations but did not stick to it as he got behind schedule when he encountered a problem. Loyiso would sometimes use one for the difficult subjects. The other subjects he learnt when he felt like studying them. The learners of the study group (for this interview, all from MSPT) tried to use a study timetable. However, its schedule was interrupted by the many extra Mathematics lessons given in the Matriculation year. Nonthembeko used one and was the only candidate who claimed to also adhered to it. Themba and Vuyiseka did not use a study timetable and studied when they felt so inclined.

5.1.13 Problems at school

The case study candidates were asked if they had any problems at school. Most had one or two general problems. Only Thembani and Zoleka mentioned more personal problems. Thembani initially stated that he did not have any specific problems with his schoolwork and claimed that he would discuss these with his teacher and not his parents, should they arise. However, although Thembani appeared to be happy with his teacher at the beginning of the year, he and the class became progressively dissatisfied with him as the year went on and blamed their failure in the trial and final Grade 11 examinations on him. Thembani also found concentration on schoolwork difficult after returning to school following his father's funeral. Zoleka was worried that she had sometimes learned very hard and yet had failed Mathematics. She would talk to her mother about this concern, but not to her teacher. Passive learning and not understanding the work could lead to such results. During times when there was no school, such as during the teacher-learner "misunderstanding", Zoleka stayed at home or went to the library to work.

Nozuko claimed not to have any problems at school and that she would mention any school-related problems to her mother. Her mother thus assumed that she didn't have any problems and that she was doing "alright".

Themba's only apparent 'problem' at school was when he had been absent from school and had to catch up on the work he had missed. He would then go to the teacher or anyone in the class to ask for assistance. His mention of absenteeism in this context again tends to confirm that he missed school quite often. Although Themba's mother occasionally asked him if he was happy, Themba did not mention any school problems to her and had said that nothing was worrying him at the time.

Loyiso had had a problem early in the year with afternoon classes in Trigonometry, due to confusion and a lack of communication with his teacher. He had not told his father or his teacher about this. He also found doing two topics at once, ie. Trigonometry in the afternoons and Algebra during school hours, confusing.

The study group members initially had problems getting a classroom to work in but had eventually obtained one. They had at first met at DMB but then changed to MSPT as DMB was too vandalised and no longer had electricity.

Vuyiseka had not had a problem during 1996 but had had a terrible teacher the previous year and consequently had achieved low marks. She had considered this quite a problem, showing definite teacher dependence for achievement. She had not discussed it with either her parents or her teachers.

Mongesi did not have any problems at school and did not discuss school problems with his parents.

Nonthembeko would have liked to work in a group at school and to have someone with whom to do her homework. She had mentioned this at home, but not to her teacher.

5.1.14 Parents' awareness of homework

The candidates' parents were generally aware that their children had homework and where they did it. According to Nozuko, her mother would see her doing homework in her room and knew that she spent approximately two hours a day on homework but did not know how much of the time was spent on Mathematics homework. Her mother did, however, see her books and tests and would comment on the test marks. Despite this, her mother did not know her June examination mark, as she had not seen a report. When Nozuko told her mother that she had done well at school and was second in class, her mother accepted the fact. The parent interview confirmed that Mrs Mx saw Nozuko's books and homework every day and was shown her tests. However, she did not know how much Mathematics' homework Nozuko had (understandable, as she herself knows little Mathematics), or what marks Nozuko got. She did however, claim that Nozuko's results were good.

Pelisa's mother claimed that she knew that Pelisa spent half an hour on Mathematics homework a day, although she did not know how much homework Pelisa had been given. She was also aware that Pelisa did her homework at home or at school after 14:00. Mrs Mq's reason for not seeing the actual work was that her eyes were weak. However, the above claim that she knew Pelisa did homework every day seems exaggerated as Pelisa herself said she only did homework once or twice a week. However, the half-hour of Mathematics homework done co-incided with the time given by Pelisa, possibly due to prior communication between mother and daughter. There was also a distinct impression that her mother was influenced by the project and wanted to impress me. Pelisa, however, did not show any signs of being affected directly by the project and reacted to her mother's attitude negatively by ensuring minimal contact with me. Her mother's wish that Pelisa spend a weekend with me, to improve her English, probably contributed the most to Pelisa's reluctance to see me.

Thembani's parents did not see his homework, books or tests but did see his report. His father would see him doing his homework in the evenings but did not know how much Mathematics homework he had. His father's weekend parties disrupted Thembani's studying. The situation was alleviated by building a room at the back of the house for Thembani, which became superfluous after his father's death. His mother did see his books and tests but did not understand them, as she was illiterate.

Themba's mother saw him doing his homework but only occasionally saw the actual work. She never asked to see it as she felt she did not understand most of it and so did not know how much work he had. She was shown the tests as soon as she came home from work. It was very obvious, from the answers given by both Themba and his mother that the two communicated well and often. Mrs Mv knew what was going on in her son's life.

According to Zoleka, her mother looked at her books every day and also saw her tests. She would see her doing her homework if she did it at home and would then take an interest in her work. Her family thought that she did Mathematics homework every day and knew exactly where she did her homework. Her mother also confirmed that she saw Zoleka's books and tests. Mrs Mp saw no need to remind Zoleka to do her homework, as she was always busy with it anyway.

Loyiso's father encouraged him to do his homework and discussed career options with him but never saw homework, books or tests. His father occasionally saw him doing homework in the lounge, if Loyiso was still busy with it when his father came home late at night. He did not know how much homework Loyiso had nor how much time he spent doing it. Mr Nt was aware that Loyiso worked hard but couldn't differentiate between time spent on Mathematics homework or other homework. He knew where Loyiso did his homework and that he got between seven to ten problems for homework. He claimed to check Loyiso's books and tests and tried to help him with Mathematics, as he knew what was going on in Mathematics. However, Mr Nt stated that this seldom occurred as it might result in an argument when their methods differed.

Vuyiseka's parents did not see her homework, books or tests and did not see her doing homework. This was confirmed by her father. They did not know how much time she spent on homework or how much homework she had. However, they did know when she had written a test and would ask for the results. They saw and commented on her reports and praised her achievements.

According to the third questionnaire, Mongesi said that his parents did not see his homework, books or tests but did see him doing his homework. They did not know how much of the homework was Mathematics. His mother confirmed that she couldn't say how much of his homework was Mathematics homework.

Nonthembeko's brother and sister, with whom she lived as the rest of the family were still in the Transkei, would see her doing homework but would not know when she was busy with Mathematics nor how much Mathematics homework she had. However, they did see her books and tests. They also knew her Mathematics marks. Her brother claimed that he knew when Nonthembeko was busy with Mathematics homework as her body language and books gave it away.

5.1.15 Parents' attitude to homework

The parents' attitude to homework, as perceived by the learners and their parents, was generally seen as supportive, even by Mongesi, whose mother would have preferred him to work and earn money. However, Vuyiseka felt that Black parents gave no support or help with homework, even if they were educated. She admitted that in some high society families, the parents might assist their children, but hers did not assist her. They did not tell her to do homework, check up on it or make sure she had time to do it. They confirmed this in the parent interview.

When questioned about her diary during the first interview, Nozuko had said that her parents did not tell her to do homework daily. However, in the third interview she stated that her parents encouraged her in her schoolwork by telling her to always do homework. This should not necessarily be viewed as a contradiction, as general encouragement differs from regular instructions to do homework. Her mother would ask why she hadn't studied if she had failed a test and would tell her to "keep it up" if she had done well.

To encourage Pelisa in her schoolwork, her mother would tell her not to miss school, arrive late nor leave early, indicating that she was aware of Pelisa's tendency to miss school if possible. Pelisa did not have to do any chores at home so that she had time to attend to her schoolwork. Her father's main concern appeared to be to get Pelisa married properly. This became evident in my discussion with him, when the main topic of our discussion became the book on marriage that he was trying to read before Pelisa got married.

Thembani's parents encouraged him in his homework (later confirmed in the third interview and by his mother) and gave him undisturbed time in which to do it but did not tell him to do his homework. In the final interview, Thembani said that his father had asked him if he had done his homework as he did not want him to fail. This should not be viewed as a direct contradiction to the above statement as there is a difference between telling him to do his homework and asking if it has been done. It is also an indication that his father was aware of the link between doing homework and achievement. After his father's funeral, Thembani had less time in which to do homework due to the additional chores he then had.

Themba's mother did not interrupt him when he was working or if he had said that he was busy. She often encouraged him to do his work and became impatient when he joked about it or played the fool. His mother often commented on his work but never said "well done" for fear that the praise would cause Themba to work less. Instead she would tell him to work hard and to pull up his socks. She felt that by Grade 11 he had passed the age of being told to do his homework. However, she had discussed a note received from his teacher with him.

She encouraged her children in their schoolwork and promised them a present if they did well. (She made sure that she kept her promise). She advised Themba to ask questions if he did not understand the work. She did not shout and perform when they did not do well but tried to encourage and persuade them to work hard.

Zoleka's parents told her to do her homework. They gave her fewer chores to do at home so that she had more time for homework. This was confirmed in the third interview. Her mother would tell her to "push" and to work hard and praise her if she did well. However, she would "shout" at her if she failed a test. The above shows parental support, albeit not direct academic support.

Loyiso's father never told him to do his homework, never checked if he had done it, nor made sure that Loyiso had the time in which to do it. This was because he was never home when his sons did their homework. He did want to see examination results and reports. However, Loyiso did not think that he knew his Mathematics mark. Mr Nt confirmed this during the interview. He thought that Loyiso had been very good at Mathematics in Primary School. Loyiso felt that his father should be a bit interested in their schoolwork but actually preferred him not to become too involved. It was obvious that his father had had a greater impact on Loyiso's schooling at a younger stage. Since then he had lost touch, as he was seldom home. Mr Nt felt that the hard work and late studying Loyiso did might be a bit strenuous for him but that it was fine as long as he could cope with it.

Of the thirteen study group learners asked, only one learner claimed that his parents told him to do his homework. None said that their parents checked that the homework had been done, and seven of the learners claimed to have time to do their homework. Only in five cases did the parents ask to see test results and reports although all showed their parents their results and reports.

Mongesi's parents did not tell him to do his homework but Mongesi claimed that they did check his homework and made sure that he had time to do it. This was later confirmed by his mother. They also asked for test results and reports. Mongesi felt that his parents should be interested in his schoolwork. As his mother did not know anything about schoolwork, she felt she had no need to see Mongesi's homework or books, but did see his report. She also did not know his Mathematics mark. (This was a pity as he did so well).

Nonthembeko's brother and sister would tell her to do her homework, give her time in which to do it and usually checked it. They also asked for her test results as they wanted to know whether she had done well. Nonthembeko felt that her siblings showed an interest in her schoolwork as they had studied themselves. They would comment on her work, tell her to study hard and to ask questions if she did not understand something.

5.1.16 Parents and school involvement

The parents appeared to have minimal contact with the schools or teachers. Many had never met their children's teachers and all only went to the school when specifically asked to, such as for a meeting.

Nozuko's parents had met her teachers but her mother was not aware that the class teacher was also the Mathematics teacher. Nozuko did not know that her mother was not aware of this. Mrs Mx was apparently not aware that it was school policy for the parents to fetch the reports at LWK SSS. Even after phoning the school about the report, she had not gone to collect it but was satisfied that Nozuko had been shown the report. She did know the dates for the final examinations.

Mrs Mq knew only the Mathematics teacher at the school, who had come to visit them at one stage. She had set aside some money for further studies, should Pelisa want to continue after Matriculating. She was concerned that Pelisa spent too much time away from home and with boyfriends. Although Mrs Mq did not know Pelisa's June Mathematics mark and had not seen her report, she appeared to be aware that parents were expected to fetch the reports at the school. She had, however, not done so. Real parental support for schoolwork and activities was virtually non-existent. The ample time allowed for homework or other school activities was due to the parents being financially secure and thus having servants to do all the chores.

Thembani's parents had not met any of his teachers before his father's death. His mother only met the class teacher as he came to pay his respects to the family. Neither parent had met his Mathematics teacher. This was confirmed by Mrs My in the parent interview. Thembani did not think his mother would remember his Mathematics mark, although she had seen it. She later confirmed that she did not know his trial examination mark as Thembani had not had a report. She had not phoned the school to ask about the report. Communication between Thembani and his father appears to have been much better than between Thembani and his mother.

According to Themba, his mother had not met any of the teachers and had been to school only when the school insisted that the parents fetch the reports. This occurred in June and at the end of the year. Mrs Mv had once met one of the teachers who also spoke on the radio. Mrs Mv said she had only been to the school at the beginning of Grade 8 to register Themba and did not know any of his teachers. She did see Themba's report in June and September but could not remember the Mathematics marks. Although Mrs Mv was aware that Themba had homework, needed time in which to do it and encouraged him to work hard, her knowledge of school, his teacher or his marks was scanty. She was not uneducated, had a good job and spoke the most fluent English of all the parents interviewed. Mrs Mv was also more aware of the amount of effort required to enter University than Themba and realised that he would have to work much harder than he was at the time if he wanted to attend University.

According to Zoleka, her mother knew her teachers, and her final Mathematics mark. However, her mother claimed not to have met them, with the exception of the class/Mathematics teacher. He had paid Zoleka a visit at the beginning of the year, but Mrs Mp could not remember his name. Mrs Mp did not know Zoleka's Mathematics marks but was aware that there was no report at the end of the third term. She knew that Zoleka had come first in class at the end of the year. She had not known anything about the "misunderstanding" at the school at the beginning of the year. This may have been due to Zoleka not being interested in "those things" as her sister claimed. Mrs Mp was also aware that Zoleka had attended a Mathematics course on Saturday mornings at the beginning of her Matriculation year, but had not known the details.

In Loyiso's family, each member appeared to live his own life. Loyiso's father had not met any of his teachers, did not know any of their names and felt that they were evasive. As the reason for not having met the Mathematics teacher, he cited a problem that Loyiso had had at school at the beginning of the year (although actually in Grade 10). Mr Nt adopted the attitude that such a meeting would probably end in a "long argument", resulting in Loyiso being victimized. Mr Nt appeared to be rather anti-school and its administration. He easily jumped to a negative conclusion without knowing all the facts. He was not willing to discuss problems with the teacher as he felt she did not have the right attitude. He had already discussed sending Loyiso to a neighbouring college for extra Mathematics lessons to improve his marks during Matriculation.

Vuyiseka felt that her parents were interested in her schoolwork (despite not assisting) but that it was up to her to do the work. She did not think it was that necessary that they should be interested in her work. She would tell them if something special had happened, but not otherwise. Her parents confirmed that she did not discuss schoolwork with them but did mention other school-related issues. Vuyiseka said her parents knew her June Mathematics marks and had commented on her improvement in the third term. Her father had not known the mark but had taken a guess at 50%, which was not far out. He felt that she was capable of achieving 70%. He was aware that she was not working as hard as she should. Vuyiseka could not remember whether her parents had met any of her teachers and did not really want to talk about that. They later confirmed that they had not met any of them.

Mongesi did not discuss schoolwork, problems, interests or activities with his parents. The only lessons they occasionally discussed were Xhosa lessons. Mrs Sm generally left Mongesi to get on with his work. She felt it was his concern and not hers. According to Mongesi, his parents had met some of his teachers, but not the Mathematics teacher. Again, Mrs Sm later confirmed this and said that she did not even know the Mathematics teacher's name. Mongesi's parents did not mind what he did after Matriculation but preferred him to find work. It would make little difference to them whether he passed Matriculation or not. No sign of any emotional or motivational support for Mongesi's schooling was evident.

According to Nonthembeko, her siblings had met some of her teachers, but not the Mathematics teacher. However, the siblings claimed that neither had met any of the teachers nor knew any of their names. Nonthembeko apparently discussed school activities and interests with her brother and sister and, although the example given was a bit weak, it became evident during the parent interview that they were confident that Nonthembeko would discuss any problems with them. They were also aware of Nonthembeko's unhappiness that they were not working in groups at school. Her brother, in particular, was aware of the work she did and the study methods she used. He would encourage her and tell her about study methods he had learnt at a foreman's course. These tips included taking short breaks to refresh the brain, immediate praise for work done well and motivational talks. Both siblings knew her Mathematics marks and were aware that she was not very happy with her achievement. They gave the type of encouragement and motivation needed by a Grade 11 learner.

5.1.17 Television

The amount of television that the candidates watched was seen as relevant as it could impact on the time they had available for Mathematics homework. The times and periods spent watching television differed considerably for the different candidates. The time reported by the learners also differed from those reported by their parents. Times spent watching television ranged from approximately one hour (Nonthembeko) to five hours (Vuyiseka) or possibly more (Themba).

Nonthembeko watched television for an hour a day. This was confirmed and classified as "not so much" by her brother and sister.

Nozuko watched television for approximately one hour each day. This was generally confirmed by her Mother's answer of 1½ hour's television per day.

Mongesi watched television in the evenings before doing his homework. According to his mother he watched for about an hour a day at home, although she did not know if or how much he watched at friends' homes.

According to her parents, Pelisa spent approximately two hours a day watching television and three hours on homework. The time spent on Mathematics homework was previously given as half an hour and is thus contradictory to Pelisa's own claims.

Loyiso watched television in the evenings after he had done his homework, from approximately 20:00 to 23:00.

Vuyiseka spent more than three hours a day watching television and practically lived in front of the television set. Her parents felt that she did not watch television excessively.

Thembani watched television every day, but the time spent watching depended on his free time. He would watch the news and then only again after 21:00, always appearing to put homework before television. According to his mother, Thembani watched approximately four hours of television a day - more than was indicated by Thembani although she did not indicate whether the four hours were before or after 21:00 or homework.

Zoleka said that she watched television every day for about five hours. This included watching Teleschool. However, according to her family, she did not watch that much, as she was not interested in it. She would only watch Teleschool and English or language programmes.

Themba watched quite a lot of television every day, starting with the "soapies" and going on to other programs of interest. He did not watch for the sake of watching but chose programs such as movies, sitcoms and soccer matches. According to his mother, he watched a lot of television and would watch till late at night, but would switch it off for an hour, if he had homework, before watching again. He also watched Teleschool. In Themba's case, television seemed to take precedence over homework. His rush to do his homework at school may have had something to do with what was on television that afternoon, eg. a soccer match.

5.1.18 Homework observations

Observations while the candidates did their homework were only done with Mongesi and Nonthembeko. I had decided to change the emphasis of the last two case studies. The change involved less emphasis on interviews and diary entries than in the previous case studies and greater emphasis on exactly how the learners did their homework. The discrepancies between the time the case study candidates spent on homework and the amount of work done, called for additional information on how the learners did their homework and what they did while doing their homework. Mongesi's and Nonthembeko's scarce diary entries contributed to this decision.

As learners tended to spend much time doing homework, but didn't have the corresponding marks, the efficiency of the homework done was probably very low. Mongesi and Nonthembeko were thus asked to think aloud as they worked while I sat next to them and took notes. These sessions are referred to in the synopsis as 'homework observations'. The notes were discussed with the two learners after they had completed the homework, and Mathematical assistance was given if necessary and desired. The second and third interviews were thus changed to questionnaires and are here referred to as interview questionnaires.

Mongesi was a bit shy to think out loud and preferred just to let me see what he was doing. He showed obvious understanding and insight in the work, but worked with much unnecessary writing and time taken. That he could easily have done more work mentally, without continuously rewriting the steps, was demonstrated by his ability to calculate the angles and sides of a triangle without using a sketch. He knew the theory of the homework observed but showed some uncertainty in his answers and did not estimate them beforehand. As an "A" student, Mongesi took very long to do each problem.

Nonthembeko felt quite at ease stating her thoughts. She always gave reasons for what she intended to do and could identify some of her own problems. She had problems going back to the theory dealt with in previous grades, eg. order of operations, like and unlike terms, multiplication of signs, angles and parallel lines, exterior angle of a triangle, etc. She also had a problem with analysing the problem before attempting to apply theory to it. She tended to approach each problem in the same way as she had done to the one prior to it. She worked very slowly and, with the exception of the first homework observation, always wrote down every step without mentally doing intermediate steps. She would refer back to work copied from the board and mention what the teacher had said in class, but did not consult examples or theory in the textbook.

5.1.19 HSRC 'test' results

Many of the candidates were asked to complete the HSRC Survey of Study Habits and Attitudes. The results were then used as a diagnostic tool in conjunction with the case study findings. Pelisa and the study group members did not write the 'test'. Pelisa made sure she was not available despite a special invitation to the Vista hall where the test was written in 1995. The study group members were not asked to write as the composition of the group changed constantly.

TABLE 5.1.1: SSHA scores for the individual case study candidates

CANDIDATE	DA	WM	SH	TA	EA	SA	SO
Nozuko	55	15	30	18	15	14	19
Thembani	25	60	42	55	30	45	41
Themba	55	75	65	55	60	60	63
Zoleka	83	70	80	12	45	21	60
Loyiso	45	60	52	70	65	68	63
Vuyiseka	22	87	47	75	50	68	60
Mongesi	67,5	65	67,5	47,5	65	57,5	65
Nonthembeko	45	85	67,5	40	50	45	57,5

Key: Delay Avoidance (DA); Work Methods (WM); Study Habits (SH); Teacher Approval (TA); Education Acceptance (EA); Study Attitudes (SA); Study Orientation (SO).

Nozuko scored very low on the SSHA, with the exception of a Delay Avoidance (DA) standard percentile rank for girls of 55. Her percentile rank score for Work

Methods (WM) was only 15, which combined with Study Habits (SH) gave her a total percentile rank of only 30 for SH. For Study Attitudes (SA) Nozuko scored a percentile rank of 14, made up of 18 for Teacher Approval (TA) and 15 for Education Acceptance (EA). Her combined percentile rank score for all values, ie. Study Orientation (SO), was only 19 - the lowest of all the candidates who did the test. These scores did not allow for great expectations for Nozuko's schooling and yet she passed Grade 11 and then Matriculation in 1996. Despite her assertion that she did additional work and usually did her homework, her extremely low WM score suggested that if she did that amount of work, it was not done constructively.

Thembani wrote the Survey of Study Habits and Attitudes in 1995 at the end of his Grade 11 year. Most of his percentile rank scores were below the 50th percentile with only WM and TA being above 50. Yet, despite such low scores, Thembani passed Grade 11 in 1995 and Matriculated at the end of 1996. All percentile rank scores combined gave him a percentile of only 41 for SO, the lowest of the candidates with the exception of Nozuko, who scored only 19. His low percentile rank score of 25 for DA does not concur with the amount of homework he did, neither with the extra work put in Grade 11, nor with the times given for when he did his homework.

Themba's percentile rank scores for study habits were all above the 50^{th} percentile. The scores (Table 5.1.1) co-incided with Themba's Matriculation pass in 1996, but not necessarily with his lack of a Matriculation exemption.

Zoleka scored well above the 50th percentile for SH. Yet according to her teacher, her homework was often incomplete and she worked mostly in a group. She had also failed Matriculation in 1996 although she had been first in class in Grade 11 (but had failed Mathematics hopelessly). In contrast to her SH, her attitude towards studying and education was well below the norm. All values combined gave her a score of 60 for Study Orientation - a score not in accordance with failing Matriculation, nor with being first in class.

Loyiso scored an overall 63 for SO on the standard percentile rank for Grade 11 boys. He scored higher on SA (with 68), than on SH (with 52). This was despite his father's negative attitude to schooling or possibly because of it, as he no longer liked his father to be involved with his schoolwork.

Vuyiseka's percentile rank scores showed a very low value of 22 for DA and a very high value of 87 for WM. Together these gave her a value below the 50th percentile for SH. The low score for DA concurred with her insistence of doing homework at the last minute. Despite her opinion of the current educational system and her dislike of school, her TA and EA scores combined to give a score of 68 for SA. Vuyiseka obtained a score well above the 50th percentile mark for Grade 11 girls, below which problems were expected.

Mongesi did not score as high in the SSHA as may have been expected in view of his high Mathematics marks. His age may have played a role in his score as he was compared to the norm for Grade 11 boys. With the exception of TA, all scores were above the 50th percentile. All scores together resulted in a SO score of 65, the highest among all the candidates. (When compared to Grade 12 boys, the scores related to SH increased and those related to SA decreased. The total score, SO, also decreased). The low TA score could be attributed to his age and the fact that he had a young teacher, who was only in his fourth year of teaching.

Nonthembeko scored very high on WM with a percentile rank of 85, the second highest among the candidates. This supported the study methods advocated by her brother and the encouragement of both siblings. She scored below the 50th percentile for DA with 45, again in accordance with her statement that she did her homework in class. This resulted in a score of 67,5 for SH. Her percentile rank scores for SA were just below the 50th percentile.

For each of the candidates who wrote the 'test', problems with the learners' Study Orientation could be identified. The problems identified as relevant to this study include the following (numbering is for this discussion only, and does not reflect the numbering in the SSHA test):

1 - If an assignment is dull and boring, I [do not] stick to it until it is completed.

2 - I believe that the easiest way to good marks is to agree with everything the teachers say.

3 - I get nervous and confused when taking a test and fail to answer the questions as well as I am capable of doing.

4 - When explaining a subject or answering questions, my teachers use words I do not understand.

5 - Interruptions disturb my studies when I am studying at home.

6 - I do poorly in tests because I find it hard to think clearly and plan my work within a short period of time. (Related to inability to work under pressure).

7 - I believe that having a good time and getting one's full share of fun out of life is more important than studying.

8 - I think that teachers tend to talk too much.

9 - I [do not] feel that my marks show more or less what I really can do.

10 - I believe that my studies are harmed because I waste too much time talking, listening to the radio, going to bioscopes, etc.

11 - I do my homework in an easy-going, unplanned manner.

12 - Some of my classes are so boring that I spend the period drawing pictures, writing notes or day-dreaming instead of listening to the teachers.

13 - I seem to get very little done for the amount of time I spend studying.

14 - I lose marks in tests because I change my first answer only to discover that I was right the first time.

15 - If there is time I [do not] take a few minutes to check my answers before handing in my test paper.

16 - When tests are returned I find that I have lost marks because of careless mistakes.

17 - I feel like skipping school whenever there is something else I'd rather do.

18 - If I have to be absent from class, I [do not] make up for missed lessons without being reminded by the teacher.

19 - When I have trouble with my schoolwork, I [do not] try to talk it over with the teacher.

20 - I hesitate to ask a teacher for further explanation of an assignment that is not clear to me.

21 - I think that teachers expect learners to do too much studying after school.

22 - My teachers fail to give adequate explanations of the things they are trying to teach.

23 - It takes a long time before I really start working.

24 - I put off doing written assignments until the last minute (ie. Mathematics homework).

25 - When in doubt about the proper form of a written task, I [do not] find a model or guide to follow.

26 - I believe that the most important task of the school is to teach learners things that will help them to earn a living.

27 - I [do not] copy the diagrams, drawings, tables and other illustrations that the teacher puts on the blackboard.

28 - I [do not] complete my homework on time.

29 - I think that students who ask questions and take part in class discussions are only trying to get into the teacher's good books.

30 - With me studying is a matter of hit-or-miss, depending on the mood I'm in.

31 - I [do not] study for an extra hour every day after doing my usual homework.

32 - I feel that it is almost impossible for the average learner to do all his assigned homework.

33 - I [do not] prefer to study and work alone rather than with others.

34 - I believe that learners who can memorise facts score higher marks than those who can "think" things out.

35 - I believe that the easiest way to get good marks was to always agree with the teacher.

36 - My place of study is not kept neat and orderly.

37 - Unless I really like a subject, I believe in doing only enough to pass.

38 - When I sit down to study, I find myself too tired, bored or sleepy to study well.

39 - I find it hard to pick out the important points of a reading assignment [when studying] - points that later appear in tests.

40 - I believe that having a winning team in sports is just as important as learning History or Mathematics.

41 - At the beginning of a study period I [do not] plan my work so that I will make the best use of my time.

42 - When I have an exceptional amount of homework or it is unusually difficult, I either give up or do only the easier ones.

43 - I memorise spelling rules, definitions of words, grammar rules, etc. without really understanding them.

44 - I neglect my schoolwork because I dislike certain teachers.

45 - I do not bother to correct errors on the papers my teachers have marked and returned to me.

46 - I get nervous and confused when taking a test and fail to answer the questions as well as I am capable of doing.

47 - During tests I forget names, dates, formulas and other details that I really do know.

48 - I get behind in my schoolwork because I have too many other things to do.

49 - I [do not] keep my assignments up to date by doing my work regularly from day to day.

50 - I lose interest in my studies after the first few school days.

51 - Problems outside the school - with other pupils or at home - cause me to neglect my homework.

52 - I [do not] copy the diagrams, drawings, tables and other illustrations that the teacher puts on the blackboard.

(The numbering of the points is for this discussion only, and does not reflect the numbering in the SSHA test.)

Using the SSHA as a diagnostic tool, Nozuko had 30 identified problems, the second highest number among the candidates. Nozuko's problems identified as relevant to this study are points one to 17.

Points 3, 6, 13, 14 and 16 indicate that Nozuko experienced problems when working under pressure and at speed. Point 4 suggests that Nozuko had a problem with the language of instruction. She was the only candidate taking the test who was identified as having a language problem. Points 1, 7, 10, 11, 12, 15 and 17 show that her attitude to her work was in need of attention and would not easily lead to a Matriculation pass. Point 9 would be an expected problem in view of her attitude of "trusting in" passing her examinations.

Thembani had the most problems with his Study Orientation, with 34 problems identified by the SSHA. Those relating to Mathematics or Mathematics homework were 5, 6, 7 and 18 to 34.

Some of his answers, eg. 17, 29, 30, 32, 33 and 34 may have been influenced by his moods and temporary negative attitude to life after his father's death. Point 18 may indicate that the Trigonometry that he caught up on may have been an exception. Alternatively, it may reflect that he only caught up on missed work in Mathematics and not in other subjects. Points 19, 20, 22 and possibly 25 and 27 again confirm that he turned to peers for assistance rather than to his teacher and failed to ask questions in class. Point 5 agrees with the disturbances experienced by the noise at home, particularly over weekends. Points 4, 23, 28 and 32 indicate that he probably worked too slowly to manage the set work within the expected time frame and thus found that he had "too much" work with which to cope. This would also lead to the need to be "pushed to work faster" by the Matriculation teacher. Point 28 may also refer to his preference to do a maximum of five problems, confirming that he did not always do all the homework assigned. The teacher stated that Thembani did his homework but did not specify whether he did all or only part of it. Point 31 indicates that although he did occasionally do additional work, this was not done on a regular basis.

Using the test as a diagnostic tool for Themba, his problems were *inter alia* the following: 3, 4, 5, 19, 28, 31, 33, 35 to 41. Other than Nonthembeko, Themba had the least number of identified problems with study habits and attitudes according to the diagnostic test.

However, the above points often contradict his interview answers. Point 19 disagrees with his statement that he asked for help when he had been absent or did not understand, although Themba may well have asked for assistance only from his peers. Point 5 indicates that he was often disturbed during his work at home. As his mother allowed him the time to study and did not disturb him, these disturbances may have been due to his siblings or television. Point 28 confirms that he did not always do his homework. However, point number 31 contradicts his statement of doing additional work. The difference could lie with Themba doing additional work every day for an hour, rather than only occasionally. Point 33 appears to contradict Themba's preferred method of doing homework. He preferred working alone as it gave him an indication of whether or not he could do the work, especially with easy homework. However, he would work with a group of friends at school on more difficult homework, even though he saw the benefit of active versus passive learning.

With the SSHA taken as a diagnostic tool, Zoleka had 28 identifiable problems in relation to her orientation to studying. Those relevant to this project were 2, 3, 8, 13, 20 to 22, 24, 26, 28, 29, 33, 38, 42 and 43.

Points 13, 28 and 42 concur with Zoleka not completing all her homework and with her teacher's opinion of her work. Point 43 again points towards passive learning and her problem of learning very hard but not understanding why she failed. Points 20, 22 and 28 indicate that she prefers to consult peers instead of the teacher. Points 3, 13, 21, 28 and 42 confirm her problem with working at the rate expected by examination standards. She thus needs to spend more time on the work than desired. Point 33 confirms her preference for groupwork and possibly passive learning.

Used as a diagnostic tool for Loyiso, the SSHA identified a total of 28 problem areas. Those relevant to this study were: 2, 16, 19 to 21, 23, 28, 31, 34, and 42 to 47.

Point 42 confirms his homework pattern of doing only the easier problems. Point 44 shows a possibility of teacher dependence, leading to a tendency of working for the teacher instead of for himself. Points 2, 34 and 43 partially contradict Loyiso's usage of formulae to get to know them, unless he used the theory without understanding it. Points 19 and 20 indicate that he preferred to consult peers rather than the teacher, as confirmed in an interview. Points 21, 23, 28 and 45 show a distinct lack of diligence. This was contrary to the one to three hours of Mathematics homework done each day, which did not include any additional work (point 46) other than the occasional additional problem. Points 16, 46 and 47 show a problem with working under pressure and within time constraints. This was emphasised by the amount of time needed to do his homework.

Vuyiseka'a problems identified by the SSHA and relevant to Mathematics and Mathematics homework were: 5, 11, 19, 20, 23 to 25, 28, 31, 33, 34, 38, 41, 48 and 49.

Points 19, 20 and 25 indicate that she tended to consult peers rather than a teacher or textbook when she had problems. This was also confirmed in her interviews. Points 23, 24, 38 and 28 were expected problems, as she tended to do her homework just before bedtime, usually having forgotten about it until then, or the next day at school. Points 11, 28, 31, 38, 41 48 and 49 were anticipated problems from the interviews and her diary.

A total of 23 problems were identified for Mongesi's orientation to his studies by the SSHA. Those related to Mathematics or its homework were points 6, 21 to 23, 26, 37 to 39, 42 and 45.

Point 42 indicates that he may have tended to do only the work he found easy, despite his claim that it was a challenging subject, and may explain his teacher's acceptance that final Matriculation marks are expected to be considerably lower than previous marks. Point 22 counter his original statement about his teacher, unless he was referring to his teachers in general and not only to his Mathematics teacher. Points 6, 21, 23, 39 and 45 show that he could use advice on how to study effectively and probably worked too slowly to be able to complete work at the expected rate. Point 38 shows that his choice of doing homework in the evenings after watching television interfered with its effectiveness.

The SSHA identified 21 problems with Nonthembeko's orientation to studying - the lowest among all the candidates. Those relating to Mathematics and its homework were points 6, 8, 9, 18, 21, 26, 28, 31, 33, 39 and 50 to 52.

Points 21 and 28 might indicate that she worked more slowly than expected or that she just did not expect to do very much work. Judging from her interviews and the homework observations, it is more likely to be the former. Points 6, 18, 31, 39 and 52 show a lack of understanding of good study habits conducive to good marks, possibly not within the advice given by her brother. Point 9 confirms her disappointment in and inaccuracy of the marks she gave. Her thoughts and type of questions asked during homework observations suggested that she should indeed be capable of attaining higher marks, although her expected 75% for the end of the year would be an enormous leap. Point 33 was expected from her interview responses.

5.2 Table of categories

The data derived from the individual case studies was analyzed using two methods. The first entailed sorting the notes into categories according to topics or issues that emerged from the case studies. The second method consisted of transferring the data to a table of categories. The notes from the case studies were worked through consecutively and each new category added to the table as it arose in the case studies. The categories were subsequently sorted according to the order in which the categories were presented in the case study synopses. Table 5.2.1 represents the table of categories.

Additional categories are named in the table of contents that were specifically named in the categories of the synopsis. The issues are mentioned in the synopsis but may fall within the broader categories, or at times even under more than one category. However, in the table of categories the issue would be named separately due to the compartmentalization of the table into smaller issues. Such an example is the dependence of the candidates on the teacher for their learning. Thembani indicated that his learning was dependent on his confidence in his teacher (mentioned under General). If he had confidence in his teacher he did well. If confidence was lacking, he achieved little. Vuyiseka's teacher dependence became evident when she mentioned that she had had a terrible Mathematics teacher during the previous year and consequently had achieved only low marks (mentioned under Problems at school). Loyiso's teacher dependence was apparent in his responses to the SSHA. Although the teacher dependence was evidenced in different contexts, all are mentioned merely as a "yes" in the table of categories.

TABLE OF CATEGORIES

TABLE 5.2.1 Table of categories of the ten case studies

	NOZUKA	PELISA	THEMBANI	THEMBA	ZOLEKA	LOYISO	STUDY GROUP	VUYISEKA	MONGESI	NONTHEMBEKO
LANGUAGE PROFICIENCY (1 - 10)	3 - 4	3 - 4	6	9	5	6 - 7	-	9	7	6
ATTITUDE TO MATHS	Not easy. Needs much practice and thought.	Too difficult	Interesting. Not good but can cope.	Interested, but can be difficult. Tries best. Likes Maths.	Loves it. Difficult but works hard.	Difficult - only does it because parents want him to.	-	Confident she would pass. Pays little attention.	Likes it - a challenging subject. Good for future.	Happy about it but never gets it right. Likes it.
AFFECTED BY PROJECT	Don't think so	No!	Yes	Don't think so	Yes	Don't think so	No	No	No	Yes
TEACHER DEPENDANT	No	No	Yes	No	No	No	?	Yes	No	Yes
ABILITY IN MATHS – ACCORDING TO TEACHER	-	Not bad	Not very good	Average	Potential not reached	Good	-	Average	Good	Very bad
FEELS HE/SHE CAN COPE	?	No	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes?
NO. OF PROBLEMS FOR HOMEWORK (TEACHER)	3 - 5	2 - 3 problems one/twice a week. (5 problems)	1 if difficult ['95] 5 if easy (5 - 7) 3 - 7 ['96] (3 - 4)	2 - 5 (20 marks) later 5 difficult or 10 easy	5 - 6	3 - 4 mostly 1 - 10 1 - 4	2 - 6 (D. Mbope) 2 - 4 (Masiph)	1 - 8 5 - 10 (Geomatry very little) (>5) 10 - 12 Trig	2 - 4 (HO) (10 - 15)	5 - 6 (4 - 6)
LEARNT THEORY?	Yes	Yes	Yes but often forgot it again	Only some of it	Yes	Only by using it often	Only if manageable - usually not	Yes	-	Yes
GEOMETRY HOMEWORK	Very little and then a lot - difficult	-	Little - none ['96]	-	-	-	-	Not initially then homework	-	-
ONLY DOES EASIER HOMEWORK PROBLEMS (SSHA AND OTHER)	-	-	-	-	-	Yes	-	-	(Yes)	-
REGULAR HOMEWORK GIVEN - EVERY DAY (TEACHER)	No. Little to no homework.	No, 1 or 2 a week. (Yes)	No ['95] (Yes) Yes ['96] (No)	No (No)	Initially yes, then no.	More often received than not. (Yes)	2 a week (D. Mbope) No (Masiph)	Yes, except Fridays. (Yes, ditto)	Yes (Yes)	Yes
TIME SPENT ON HOMEWORK	1½ Hours later ½ hour	½ Hour when done	20 - 30 minutes to 2 hours	½ - 1 Hour later 2 - 3 hours	2 - 3 Hours	1 - 3 Hours	2½ hour sessions	Very little 30 minutes maximum	Less to 1 hour	1 Hour
COMPLETE HOMEWORK	Not in test problems	-	No does not	No does not	No does not	No does not	-	No does not	Not in test problem	No does not

	NOZUKA	PELISA	THEMBANI	THEMBA	ZOLEKA	LOYISO	STUDY GROUP	VUYISEKA	MONGESI	NONTHEMBEKO
"IMPOSSIBLE TO DO ALL HOMEWORK" HSRC - SSHA	No	-	Yes		No	No	-	No	No	No
"TEACHERS EXPECT TOO MUCH HOMEWORK"	No	-	Yes	No	Yes	Yes		No	Yes	Yes
ENOUGH TIME GIVEN FOR HOMEWORK?	?	Yes - no chores at home	Yes ['95] Less time after father's funeral	Yes	Yes	Not really (Not home)	7 out of 13	Not ensured by parents.	Yes	Yes
REASON FOR DOING HOMEWORK (MOST HOMEWORK PUPIL)	Because teacher told her to	To understand the work	Prove himself and understand the work (-11-)	To improve confidence in work (To be good at Maths)	Loved Maths homework good - gives practice - gained (very bright)	To understand lesson.	(To prove he could do the work)	Because she had to (highest marks)	Because it was given and gave him practice Problems with Maths	To be able to do the work and pass
WHERE HOMEWORK WAS DONE PREFERED?	Mostly in bedroom (At school!)	At school! Sometimes at home	['95] school - easy home - difficult ['96] home	Home! (in room) As much as possible at school	Group at library/other school/friends at home	Home in bedroom	Group met at schools	Home School!	Home in bedroom (At school!)	At school or home
WHEN HOMEWORK WAS DONE (PARENTS)	After school	Probably during school hours (after 14:00)	(9 in SP)	Afternoons and continues at night	Afternoons 15:00	After 20h00 when quiet.	Group met evenings and weekends	Free period at school the next day.	Evenings after TV	Afternoons at school or home
WORKED IN GROUP/ALONE REFERED? (SSHA)	(Group!) Worked alone.	Group!	Group! ['95] (Group) Alone! ['96]	Alone! (Group)	Group! Alone if others didn't work.	Alone! and w.o. help. Gp work encourage & seen as good.	Group!	Alone! Can't see value of gp work. (Group)	Alone!	Alone Group!
WORK EASY WHEN EXPLAINED - DIFFICULT WHEN ON OWN e.g. HOMEWORK	Yes	-	Yes	-	Yes	-	-	-	-	-
HELPERS	Friend who lives nearby	Friends from class	Friends, sister, neighbours	Teacher, classmates	Friend, brother, sister	Friend from class	Teacher for problems they could not manage	Friends	None. If difficult, consults teacher	Brother, friend
TAKES LONG TIME TO START WORK	No	-	Yes	No	No	Yes	Yes - as observed	Yes	Yes	No
INTERUPTIONS WHEN DOING HOMEWORK AT HOME	Yes	-	Yes	Yes	No	No	-	Yes	No	No
HOMEWORK DEPENDANT ON MOOD	No	-	Yes	Yes	No	No	-	No	Not	No

	NOZUKA	PELISA	THEMBANI	THEMBA	ZOLEKA	LOYISO	STUDY GROUP	VUYISEKA	MONGESI	NONTHEMBEKO
CONSEQUENCES OF NOT DOING HOMEWORK	-	-	-	Given extra work	-	Lecture on effects of not doing homework	Sent but of class or letter to parents (Mass) Shout (D. Mbope) get answer	None May receive extra homework.	-	Teacher warns them that they will fail
HOMEWORK COPIED	When she didn't understand the work	Yes more than once a week	If difficult - explained first.	Fairly regularly - once in 2 weeks	Often	Only when too difficult and after trying.	-	Only if she knew she would have been able to do it anyway	Never	Probably not
EXTRA LESSONS	None mentioned	Not mentioned	No ['95] Yes!! ['96]	None mentioned	None mentioned	One at beginning and for Trig.	-	Only shortly before each exam.	No	No
TEACHER NOT IN CLASS (NO SCHOOL)	Often	Did happen but quantity not ascertained (PS took early holiday)	Often ['95] Often ['96] (Often)	Once in 2 weeks	Misunderstanding Sometimes: Exams comm. Sport Matrics	(1 semester - 10 days total) Once in 2 months - no work assigned. Home early while teachers set exams or marked reports.	Rarely (Masiph)	Only very occasionally. School occasionally closed early.	Once a week (2 days and 1 week)	Once a week - work given
EARLY EXAMS? SCHOOL AFTER EXAMS	Yes 16/10 - 14/11 No	Yes 23/10 - 11/11	Yes 16/10 - 14/11 No	Yes 14/11 No	Yes Ended 9/11 No	Yes Last school day 14/10 Exams 14/11 No	-	Yes 1/11 - 22/11(28/11) one week off before exam No	Yes 28/10 - 17/11 No	Yes 27/10 - 14/11 No
DID EXTRA WORK? (SSHA) DID ALL THE HOMEWORK? (SSHA)	Yes	No No (Teacher Yes)	Yes ['95] (No) No ['95]	Yes 3 times a week	Yes, worked on own did not do extra work (No) Yes	Sometimes - an additional problem. Usually	- -	No (No) No (No)	(No) Yes	No Teacher Yes (50%)
WORKED ON WEEKENDS? (HOLIDAYS?)	-	No	Yes ['95] ['96] (Yes ['96] less than 2 hours)	-	Yes	-	-	No	-	- Probably not
CATCHES UP ON MISSED WORK (SSHA)	-	Probably not	Yes ['95] (No)	-	-	-	-	On occasion	-	- (No)
KNOW: STUDY TIMETABLE USE: STICK TO IT:	No - -	No - -	Yes Yes No	Yes No No	No - -	Yes Sometimes for difficult subjects ?	(Majority) Yes Tried No	Yes No -	No - -	Yes Yes Yes

	NOZUKA	PELISA	THEMBANI	THEMBA	ZOLEKA	LOYISO	STUDY GROUP	VUYISEKA	MONGESI	NONTHEMBEKO
EXPECTED MARKS AT END OF YEAR (TEACHER)	Passing 40 - 50%	40%	A pass on HG ['95]	up to 60% (D)	70%	50% (C)	A - C Majority B (SG)	70 - 75% (C or B)	A (A or B)	75% (Shouldn't be doing Maths)
(TEACHER) JUNE: EXAM MARKS SEPTEMBER: FINAL:	30% - 21%	27% - -	['95] 34% (29%) ['95] 32% (38%) Failed ['96] F	40%/50% (30%) ?	40% (35%) (26%) 12%	(49%) - 45% (46%) 3rd in Maths	C - F Majority E (HG)	55% 65% 46%	81% (90%) 85% B	20% (13%) 38% (11%)
DISCUSS PROBLEMS WITH PARENTS/TEACHER? (SSHA)	Not parents	No	Teacher (No)	Not (Teacher)	Mother	Father	-	Neither (No)	Not parents	Parents
LEARNERS SAY THEY'VE PASSED (DONE WELL) BUT FAIL: REASON	-	-	-	-	-	Pupil become excited and rush to do them	Excitement led to careless mistakes	Better image than to say have failed	-	-
PARENTS SEE: REPORTS: HOMEWORK: (PARENTS) BOOKS: (PARENTS) TESTS: (RESULTS)	Yes (Yes) Yes (Yes)	(No) No No No	Yes (illiterate) No No (Yes) No (Yes)	No Occasionally - Yes	Yes (only final) Yes (if done at home) Yes Yes	Yes No No No	5/13 5/13	Yes No No No (Yes)	Yes No (No) No (No) No (Yes)	Yes Yes Yes Yes
PARENTS SEE PUPIL DOING HOMEWORK? (PARENTS)	Yes	No	Yes	Yes	Yes	Occasionally if still busy late	-	No	Yes	Yes
PARENTS KNOW HOW MUCH MATH HOMEWORK?	No (Mother) (No)	Mother knew time spent on Maths homework.	No	No	No	No	-	No	No Mother No	No Brother (Yes)
PARENTS ENCOURAGEMENT	Yes Telling her to always so homework. Questions and praise after tests.	To attend school all day every day	Yes Asked if done homework	Yes - told to keep working hard. Did not praise in case he became lazy. Should ask questions.	Yes Less chores "push" and work hard and practice	Yes Discussed career options and wanted to be tested.	-	Praise after reports or good test. No assistance.	None - wanted him to get a job.	Yes - motivational talks and good advice. Ask questions.
TOLD TO DO HOMEWORK?	Not really	No	No	No (old enough)	Yes	No	1 out of 13	No	No	Yes
(PARENTS) PARENTS MET TEACHER (MATHS TEACHER)	Yes (Yes) Not aware that class Maths teacher)	No (Yes)	No (No) only before funeral	No (No) (No)	Yes (No) Teacher came to visit once	No (No)	-	No (No)	Yes (Yes) (No)	Yes (No) (No)

	NOZUKA	PELISA	THEMBANI	THEMBA	ZOLEKA	LOYISO	STUDY GROUP	VUYISEKA	MONGESI	NONTHEMBEKO
PARENTS KNOW MATH'S MARKS (PARENTS)	No (No) Thought results were good	(No)	No	(No) couldn't remember	Yes (No) (Knew was first in class)	No (No)	-	Yes? Good question (Yes)	No (No)	Yes (Maybe yes)
PARENTS AWARE HOMEWORK - MARKS (PUPIL)	?	? (?)	Yes (Yes)	Yes (Yes)	?	Yes (Yes)	Yes for pupil doing homework	(Yes)	?	(Yes)
EFFORT MADE TO GET REPORT (IF APPLICABLE)	Phoned to ensure N3 saw results. Did not get report.	No	No	-	-	-	-	-	-	-
TELEVISION (PARENTS)	Maby 1 hour a day (1½ hours)	maybe 2 hours a day	4 hours Every day news and after 21:00. Dependent on free time.	Quite a lot Television (a lot)	5 hours every day Ind - teleschool (Not much television)	After homework maybe 3 hours	-	More than 3 hours every day (not excessive)	(maybe 1 hour at home)	1 hour 1 hour - (not so much)
HOMEWORK DONE IN LAST MINUTE (SSHA)	-	-	Yes	-	Yes	No	-	Yes	-	-
GET VERY LITTLE DONE FOR TIME SPENT ON WORK (SSHA)	Yes	-	-	-	-	-	-	-	-	-

5.3 The Pattern Emerges

The patterns as perceived from the separate candidate synopses and the table of categories, consist of recurring regularities evident in both the modes of analysis. Each perceived pattern has been described below and is based on the case studies. Each can most readily be verified from the table of categories. Each perceived pattern is discussed in the following chapter.

5.3.1 General

The language proficiency of each candidate has been rated on a scale of 1 - 10 to give an indication of my perception of each candidate's ability to communicate thoughts and feelings in English. Diary entries, questionnaire and interview responses were dependent on the candidate's competence in English, as their vernacular was not used for questions or responses. The accuracy of the candidates' responses to the questions was clearly dependent on the phrasing and understanding thereof and on the fluency with which the candidates could formulate the answers. The scale is a very subjective judgement and is clearly relative to my own and the other candidates' abilities to communicate.

The language proficiency was rated as five or above for seven of the nine single candidates, rating them as being capable of understanding the questions and giving adequate responses. Zoleka, rated as five, would occasionally not understand a question but would ask for clarification. She would also search for words when responding to questions but could make her meaning clear with a bit of patience. Nozuko and Pelisa, both rated 3 - 4, struggled to express themselves and sometimes misunderstood a question. The misunderstanding quickly became apparent in their replies and the question was rephrased.

5.3.2 Attitude to Mathematics

According to the initial questionnaire handed out during candidate selection at the beginning of each year, the majority of the nine candidates claimed to find Mathematics interesting and to like the subject although they found it difficult or challenging. Candidates generally felt that they could cope with the subject despite the difficult problems.

5.3.3 Amount of homework

According to the teachers, the amount of homework assigned ranged from three to 15 problems each time homework was assigned. The majority of the teachers stated that they gave three to six problems for a day's homework. Themba's teacher did not indicate the number of problems but judged the daily homework to be worth approximately 20 marks, ie. according to examination or test standards.

The learners' estimate of homework received ranged from one to six problems with very little homework received for Geometry. The number of problems appeared to depend on the grade of difficulty of the problems. Fewer problems were received if they were considered difficult!

Approximately half of the participants regularly received homework. This did not necessarily mean that they received homework every day. A learner may have received homework regularly, three times a week.

As with the amount of homework, teachers' replies seemed to imply that they gave homework more often than the learners perceived to have received it. Of the two teachers who stated that they did not give homework regularly, one was a Matriculation teacher who taught Mathematics before school, after school, on weekends and during holidays, and generally expected much work from the learners. According to their SSHA's, the candidates generally claimed that "teachers expect [ed] too much homework".

The time spent on homework was generally less than one hour, to an hour. Only two participants consistently said that they spent more than one hour on homework.

Homework was mostly not completed although it was not considered "impossible to do all the homework" according to the SSHA. All had enough time to do the work with the exception of Loyiso who felt that he did not really have enough time. This was despite his recurrent claim that he spent three hours a day on Mathematics homework. Vuyiseka felt that her parents did not ensure that she had sufficient time to complete her homework. However, this seemed unreasonable as both parents worked till 17:00 and thus did not determine how she spent her time in the afternoons. She furthermore claimed to do most of her homework at school, which she preferred. The candidates generally did learn the theory involved in Mathematics although some only learnt the easier work.

5.3.4 Extra work or extra lessons

Extra work was only done by a few of the candidates and then only occasionally. Only two worked on weekends. Responses, from the small sample asked, would indicate that the participants rarely caught up on missed work. Nor did they generally work on weekends or holidays. At Grade 11 level, they received very little extra work or lessons. This increased to the extreme for Thembani at Matriculation level when he had extra lessons before school, after school, on Saturdays, on some Sundays and during holidays - unfortunately to little effect as he failed Mathematics in Matriculation.

Although half the participants professed to know what a study timetable or roster was, only two used one for Mathematics. Loyiso did sometimes use a study timetable for other subjects and the study group claimed they tried to use one. However, even those who used one generally did not stick to it, with the possible exception of Nonthembeko.

5.3.5 Reasons for doing homework

The reasons given for doing homework showed that the learners understood why they were expected to do the work and how it would benefit them. Reasons were generally that Mathematics needed a lot of practice, that homework contributed to an understanding of the work and the ability to do the work with confidence. Only two of the candidates did homework solely because they were told to do so.

The classmates who did the most homework were usually considered clever and were those learners who achieved good marks. Only one hard working learner was thought to do so much homework because he experienced problems with Mathematics. The attitude was generally that the cleverer learners just did more work. Whether they were clever because they did so much homework was not considered.

5.3.6 Where and when homework was done

Homework was either done at home or already started (and completed) at school. A small majority of the candidates preferred to complete the homework at school rather than do it at home.

No pattern emerged as to the preference of when to do homework. If it was not completed at school, it was either done in the afternoons or late at night. Only one participant (other than the study group) did her homework in a group. No dominant pattern for either working in a group or alone emerged from the other candidates.

The majority of the candidates would have favoured working in groups although most actually worked on their own. Thembani initially preferred to work in a group but changed his mind in Grade 12 when he opted to work alone. Zoleka also chose to work alone if the others in the group were not working. Zoleka worked together with a group the most of all the candidates and Thembani occasionally worked in a group before tests or examinations. Both these candidates later elected to work more on their own.

Of the three candidates asked, all stated that the work was easy and understandable while explained in class. It was, however, a different matter when they tried to do their homework. It then suddenly seemed difficult and confusing.

All candidates had someone they turned to for assistance with Mathematics, usually a friend or a variety of friends. Only Mongesi did not have (or need) helpers but spoke to the teacher when assistance was needed. In fact, others turned to him for help.

Half of the participants (including the study group) took a long time to settle down before starting on their homework. The amount of time needed before work commenced in the study group was personally observed and deemed excessive. Although once started, they worked consistently and without group interruptions, much more work could have been accomplished had they started work immediately. Interruptions during homework were also reported by half of the candidates, and two reported both a long time to settle down and interruptions. Homework was not generally considered to be dependent on the mood the candidate was in when commencing work.

5.3.7 Attitude to groupwork

Many of the learners seemed to prefer groupwork and one teacher recommended it as a way of achieving good marks in Mathematics. Learners would spend long hours doing work in groups. However, other learners preferred to work on their own.

5.3.8 Homework copied

Most candidates copied homework. They tended to claim that the work was explained to them before they copied it or that they only copied when the work was too difficult or they didn't understand it. Easier work was generally done by all with the exception of Vuyiseka, who copied only when she knew she could have done it anyway.

5.3.9 Days of "no school", "no classes" or "early closing"

Days of "no school" or "no class" occurred often at most schools. Reasons for "no classes" or "early closure" included the choir being away, teachers being absent, the first or last day of term and the principal's birthday. Reasons for "no school" included boycotts, sports day or the Matriculation farewell being held that evening.

Incidences of teachers not being in class during Mathematics periods, ranged from rarely to often when the learners were asked the question directly, with no trend emerging. However, according to the summaries made from three of the diaries, teachers in those schools were often not at school or in class. Reasons given for teachers not in class included teacher late, absent, on a course, preparing for a show or teachers marking. On occasion no reason was given.

In all the schools involved, examinations for Grades 8 to 11 commenced at the same time as the Matriculation examinations or shortly thereafter. The dates for the beginning of examinations for Grades 8 - 11 ranged from 10 October to 1 November. Examinations ended on 9 November to 17 November, generally two to four weeks prior to the official close of the school year. This meant that the examination period started and ended earlier than formulated by the Department of Education, Sport and Culture. The examination period was also very prolonged, as the Matriculants write over a lengthy period due to the large number of subjects covered. Thus, the learners started examinations early, thereby having fewer days for classes, and ended examinations early, thereby having even fewer days of schooling. Learners did not return to class after their examinations, and only returned to school to return schoolbooks.

5.3.10 Consequences of not doing homework

There were generally few consequences for not doing homework. One of the consequences was a lecture or "shouting" that not doing homework would lead to failure in the subject. Alternatively, in two cases, they would be given extra work to do. Only Thembani's Matriculation teacher considered sending letters to the parents.

5.3.11 Examination marks

All participants expected to achieve more than 40% at the end of their Grade 11 year with the majority expecting 60% or above. Actual marks received at the end of their respective Grade 11 years were below 50% with only three above 40%. Mongesi was the exception with a realistic mark anticipation based on his achievements throughout the year and he achieved the expected mark. He had expected an A or B and had obtained a B symbol at the end of the year.

5.3.12 Problems at school

As perceived by the candidates, problems at school consisted of three elements - the school, the teacher and personal problems. One of the schools lost considerable class time due to boycotts, which the learner involved found frustrating. Three of the candidates experienced problems with the teacher. This ranged from confusion due to a lack of communication to dissatisfaction with the teaching skills of the teacher. The third aspect included frustration at working hard and yet failing, catching up with missed work when absent and the lack of groupwork at school.

Problems occurring at school or with schoolwork were not usually discussed with parents or teachers. Three candidates claimed to discuss problems with a parent while only one spoke to his teacher about problems (later contradicted in his SSHA responses).

5.3.13 Parents' awareness of homework

The learners felt that their parents were aware that they had homework and received marks. Parents generally confirmed this, yet only two of the parents could give an indication of actual marks when asked. The parents had no idea how much Mathematics homework was given although roughly 70% did see their children doing homework. In those cases, however, they could not tell in what subject homework was being done. Although the parents did not see the actual homework or books, they generally did see the candidates' reports and tests or results.

5.3.14 Parents' attitude to homework

Parents and learners unanimously felt that encouragement for schoolwork was given, generally as motivational talks to work hard or by allowing time to do homework by giving fewer daily chores. Parents generally did not tell their Grade 11 children to do their homework as they felt that at that age they should be responsible enough to do it on their own.

5.3.15 Parents and school involvement

The interviews with the parents showed that there was not much contact between parents and teachers. In the three schools where parents were required to fetch the reports, only one parent made an effort and then only to phone to ensure that her daughter (the learner involved) got to see her results. The mother did not request to see the report herself. The other two parents did not seem to be aware that they were required to fetch the reports.

It should be noted that as the school policy regarding the reports was only known to me long after the parent interviews had taken place, the parents were never asked about it directly. Only once the school policies were known, could certain remarks made by the learners and their parents be interpreted correctly.

However, the other parents also did not generally know, or could not remember, their children's Mathematics marks. This was despite learners' and parents' claims that the parents saw the candidates' reports and tests or results.

5.3.16 Television

Learners generally spent more time watching television than doing Mathematics homework. If Mongesi and Zoleka are taken out of the scenario, one could almost make the absurd statement that the more television they watched, the better their Mathematics marks. However, an alternative interpretation could be: the better their Mathematics, the more time they had available to watch television.

5.3.17 Homework observations

During homework observations, the two candidates involved took an unexpectedly long time to work through each problem. Part of the reason for this was that they each wrote down all intermediate steps and did little mental work, preferring to see it written out fully. Both candidates also tended to end the homework before they had completed all the work. Nonthembeko also experienced many Mathematical problems, often originating from previous Grades.

5.4 Summary

Lack of depth on homework issues and the learners' understanding thereof was unfortunate. This was due to the learners not being able to critically evaluate and articulate their thoughts on the matter, the need to retain their trust and the time needed to process and analyse the data obtained.

However, the analysis of the case study data, using two different methods, ensured that the data was rigorously examined. Interpretation was kept at a minimum throughout the analysis so that misinterpretations did not lead to distortions of the data. In this way it was also possible to ensure that the topic of the investigation remained the focus of the emergent pattern (Yin, 1994).

The use of the two separate methods also facilitated the pattern matching procedure. Comparison of the data in the synopses and the table of categories ensured that the pattern that appeared to emerge from the data was genuine evidence of the same pattern (Merriam, 1991). It also ensured that evidence contradictory to the pattern was found and noted, thus making it possible to build explanations around the patterns. The pattern is discussed in the next chapter.

CHAPTER SIX

DISCUSSION OF PHASE I: THE SPECIFIC AND THE GENERAL

6.1 The emergent pattern summarized

The emergent pattern can be summarized as follows:

- The candidates found Mathematics interesting and liked the subject, but found it difficult or challenging. Candidates generally felt that they could cope with the subject matter.
- According to the teachers, three to six problems were generally assigned as a day's homework.
- According to the learners, they received one to six problems for homework. Fewer problems were received if they were considered difficult!
- Teachers appeared to give homework more often than the learners received it and teachers appeared to give more homework than learners perceived.
- Very little homework was assigned and received for Geometry.
- Approximately half of the participants regularly received homework. However, regular homework does not imply receiving homework every day.
- The time spent on homework was generally less than one hour, to one hour.
- Homework was mostly not completed.
- All candidates claimed to have enough time to complete their homework.
- The candidates generally learnt only the easier theory.
- Learners claimed to understand why they were expected to do homework and how it would benefit them.

- There were generally few consequences for not doing homework.
- Most candidates copied homework, usually when it was difficult or when they didn't understand the work.
- The majority of the candidates would have favoured working in groups, although most actually worked on their own.
- All candidates had someone they turned to for assistance with Mathematics.
- Extra work was only done by the minority of the candidates and then only sometimes.
- The participants seemed to expect higher marks than their past achievements proved them capable of.
- Much teaching and therefore homework time was lost due to a large number of circumstances.
- Problems occurring at school or with schoolwork were not usually discussed with parents or teachers.
- Although learners and parents felt that parents were aware of homework and marks, the parents knew very little detail about either.
- Parents and learners felt that encouragement for schoolwork was given, generally by parents reminding the learners to work hard.
- There was not much contact between parents and teachers.

6.2 Discussion of the emergent pattern

The pattern discussed below became evident after the analyses of the data in the synopses of the individual case studies and data in the table of contents.

6.2.1 General

The language proficiency of the candidates, rated on an arbitrary scale of 1 - 10, was considered adequate for accurate communication of thoughts and feelings if rated as 5 or above. Candidates rated as 5 or 6 would take longer to express their thoughts and more thorough confirmation of answers was sought. Candidates rated 7 and above were considered capable of communicating well albeit a little hesitantly at times. The least information was obtained from candidates rated 3 - 4. This information should, however, not be considered false or unimportant as the candidates gave as much detail as they could. All candidates, with the exception of Pelisa, eagerly answered questions during the interviews.

The amount of detail given in diaries was dependent on the participants' ability to communicate in English, as well as their willingness to make lengthy entries. As can be expected, those with greater language competency in English provided more reliable detail than those who struggled with English. However, they did not necessarily write the most. Thembani, rated as 6, wrote the most detailed, varied and regular diary of all the candidates.

The problem with the language was one of the reasons for the later confirmation of certain conceived patterns. This was done using a learner questionnaire in the vernacular, Xhosa, during Phase II of the study.

6.2.2 Attitude to Mathematics

In the initial questionnaire handed out to volunteers, the majority stated that they liked Mathematics and found it to be interesting. I found this hard to believe. My own experience with learners and students had shown that learners do not enjoy a subject in which they do not achieve. Some volunteers had written that they found Mathematics challenging or difficult. Others, such as Themba, found it interesting yet difficult. Whether they had written this because they felt I expected such a response or because it was a true representation of their feelings is not known.

Mathe's (1991) questionnaire for 382 Soweto Matriculation learners determined that 13% claimed to love Mathematics very much, 48% chose the option "in-between" and 39% disliked the subject. This was a more realistic trend than the one found among the case study candidates, as many learners considered Mathematics a difficult subject (Mathe, 1991; Moyana, 1996). Mathe's findings add to the idea that the volunteers for the initial questionnaire wrote down what they thought was the expected response.

The attitude of the case study candidates that they could cope with Mathematics and yet generally received low marks was interesting. According to the candidates' Mathematics' marks, only Mongesi and Vuyiseka had reason to believe that they were coping adequately with the subject matter. Pelisa was the only one who admitted that she was not coping at all. Did the remaining six candidates feel that their marks were not a true reflection of their abilities? Did they suspect that they were not working hard enough to attain their true potential? Is coping seen as a relative term, in which achieving 40% is considered as coping with a difficult subject? Or do they perceive themselves as coping despite evidence to the contrary? Lastly, could they be saying they were coping so that they would make a better impression (as suggested by Vuyiseka when asked about test results)? The above questions might have little bearing on the focus of this study, but are in need of answers if this phenomenon is to be better understood.

Nozuko mentioned that she found class work, in the teacher's presence and with the teacher's guidance, easier than the homework. This could show a possible tendency towards passive learning in the classroom, with active learning only done during homework. Alternatively, it could imply that the degree of difficulty of homework was greater than that of classwork.

Were learners in general inclined to say that they enjoyed Mathematics or could cope and yet not achieve in the subject? In order to ascertain this, further questions were asked in a learner questionnaire and marks were requested during the second phase of this study. Another question which arises, although not considered a part of this study includes a learner tendency towards passive learning rather than actively taking part in the lessons. Did the learners expect to absorb Mathematics by merely listening to the teacher or others?

6.2.3 Amount of homework

6.2.3.1 Amount of homework done

According to the responses from learners and teachers, the teachers claimed to set more homework and more regularly than the learners reported. Such contradictory findings can be interpreted in two ways.

The simplest interpretation could be that the interviewees were all trying to give the responsibility for achievement to the other party. The teachers would claim to give more homework than they were in reality assigning. The impression created would be that they were doing their best to promote learning. The learners, in turn, would claim to receive less homework than was assigned so that it would seem as though they did all or most of their homework. Claiming to complete two or three problems on a regular basis may have seemed more believable than claiming to complete four or five problems regularly. The learners would thus appear to be working consistently.

A second possible interpretation is that the learners perceived the frequency and amount of homework assigned differently to that assigned by the teachers. Did they not listen properly when homework was assigned? Or did they conveniently forget the last problems or parts thereof when doing homework - as Mongesi and Nonthembeko had during the homework observation? The consistency of the discrepancy between teacher and learner responses suggested that both parties were giving sincere answers. The relatively small amounts of homework given and done also suggested that responses were not made with the intention to impress or mislead.

One to six (learners) or three to six (teachers) problems for daily homework could be deemed as little to adequate homework for Grade 11 learners by experienced teachers. The number of problems was especially inadequate when considering that fewer problems were given when the work was considered difficult. Very little homework appeared to be given for Geometry. From personal experience, I would have expected more homework when the work was difficult than when it was easy, assuming that more practice would be needed for the difficult work. I would also have expected more regular homework for Geometry than was received, as the majority of learners experienced difficulties with Geometry.

Approximately half of the candidates received regular homework. As already pointed out, this does not necessarily mean that they received homework every day. In four cases it was clearly stated that homework was not given every day. It was given either more often than not, four times a week or only twice a week. The remaining candidates did not receive regular homework.

In the frequency of homework, as with the amount of homework assigned, a discrepancy occasionally existed between the responses of the learners and the teachers. Teachers tended to assign homework more regularly than was perceived by the learners. Did learners copy down homework when given? Did they fail to listen properly when homework was assigned? Was homework assigned verbally or written down for all to see? Did they conveniently forget that they had received homework? Or were the teachers trying to impress with the amount of homework they assigned? Only in the case of Thembani's hard working Matriculation teacher, did the teacher's response differ from that of the learner to the "detriment" of the teacher. The teacher claimed to give less homework than was perceived by Thembani.

The need now existed to investigate whether Mathematics teachers in general assigned such infrequent homework and gave so few problems. Was this a general trend or was it restricted to the case study candidates?

6.2.3.2 Time spent on homework

Six lengthy problems (the maximum number received) of approximately seven marks each would be expected to take only 42 minutes if calculated according to examination standards. The examination standards referred to are the time and mark allocations used in the Grade 11 Mathematics examination papers. For the Standard Grade examination, two hours are allocated for 120 marks. This allows an average of one mark per minute. If calculated according to the Matriculation final examinations of 150 marks for three hours, six such problems should require 50,5 minutes. This is equivalent to an average of 1,2 minutes or 1 minute 12 seconds for each mark. If additional time is added to allow for homework, which is deemed a practice session rather than a test session, six lengthy problems should be completed in approximately an hour, depending on the competence of the learner.

Unfortunately, six problems were given as the maximum number assigned or received in most cases. The only two exceptions were a maximum of seven problems (Thembani) and 1 - 10 (Vuyiseka) or more than 5 (Vuyiseka's teacher). According to the above calculations, it was therefore assumed that the learners mostly had less than an hour's homework, when it was assigned.

Actual time spent on homework was generally reported to be one hour or less. As these were self reported times, the times are more likely to be over-estimates than under-estimates of the actual time spent (Cooper, 1994). Time spent struggling with work or doing odious tasks tends to drag. Five minutes can feel like an hour. Thus a learner spending half an hour on homework, could report spending an hour on the problems without being aware that he/she had exaggerated the time taken. The case study candidates may have been particularly unaware of the passage of time, as most of them did not wear watches.

According to Kroeze (1989), learners in Grades 8 - 9 should do half an hour's Mathematics homework a day. Learners in Grades 10 - 12 should receive up to one hour's homework a day. The learners thus mostly spent the correct amount of time on their Mathematics homework, although unfortunately not every day.

Comparing the amount of time spent on homework to the number of problems done caused concern. If a maximum of six problems was given (which would result in an hour's work) it can be assumed that less than six were often given. If the learners took the purported hour to complete less than six problems, they were either working very slowly or experiencing many problems with the work. In support of the former it needs to be pointed out that half the participants took a long time before settling down to work and that some experienced interruptions while working.

According to his teacher, Themba received problems worth 20 marks as homework, and spent ½ - 1 hour on his homework initially. Calculated according to examination standards, 20 to 24 minutes (20 x 1,2 minutes) would be necessary to complete the problems during an examination. Allowing additional time for a homework session, half an hour should be adequate to complete the work, unless serious problems were experienced. The question of whether Themba was using up to twice the calculated time to complete his work thus needs to be asked. Unfortunately, research on time and homework does not distinguish between the amount of homework teachers assign and the amount of time learners spend on the homework (Cooper, 1994).

Added to this was the probability that homework was seldom completed. During the homework observations, the homework (as described at the beginning of the observation session) was never completed. However, at the end of each observation session both Mongesi and Nonthembeko stated that they had completed the homework. They had each worked for over an hour and seemed not to be aware that they had left work undone.

Only Thembani claimed that it was impossible to do all the homework. All other candidates claimed they had enough time for their homework. It would therefore appear that, although relatively little homework was given, it was done in approximately an hour, but not completed. One must then wonder why the participants took so long to do so little. Nozuko acknowledged, in her SSHA, that she got "very little work done for the time spent on it". None of the other candidates appeared to have similar insight.

In summary then, it appeared that the candidates spent the recommended amount of time (according to Kroeze, 1989) on their homework. However, they did relatively little work during that time. They also often did not complete the homework assigned although only a maximum of six problems were assigned. The learners thus appeared to work very slowly or experienced problems with the work.

The efficiency of the homework (number of problems done in a set amount of time) was seen as an area for grave concern. Did the project affect the work of the candidates? Were they reporting times incorrectly due to their awareness of the need to do homework? What was the general trend in homework efficiency among Black P.E. learners? Did learners feel they could cope with Mathematics because they could cope with a few problems, done at a very leisurely pace, during homework? What was the quality of the homework done at that pace? While much information was available on the amount of time learners spent on homework, no literature addressed the issues of efficient and effective time use while doing homework. Information was needed on the amount of work done in a set time period, as well as the quality of that work, in order to determine the efficiency and effectiveness of the homework.

6.2.4 Extra work or extra lessons

The participants rarely received or did extra work in Grade 11. The idea of Vuyiseka's teacher, of not assigning homework on Fridays so that the learners would have time to revise the week's work, had little to no effect on Vuyiseka. The effect on other learners may have been better as Vuyiseka did little homework at the best of times.

The contrast to Grade 12 or Matriculation was astounding in Thembani's case. All of a sudden they had extra Mathematics lessons and homework before school, after school, on weekends - including some Sundays - and during the holidays. So much so that the learners complained that their lives were overrun with Mathematics.

Nonthembeko, too, received extra Mathematics lessons in Matriculation. She initially requested me to assist her, then went to Saturday morning classes at UPE and finally to Saturday morning classes at a nearby school.

As I had very little contact with the other candidates after Grade 11, it is not known whether this was the usual trend. Did the emphasis on Mathematics lessons and homework usually increase in Grade 12? If so, by how much did it increase? Was the increase generally due to the teacher, as in Thembani's case, or due to the learner, as with Nonthembeko? Answers to these questions would provide useful information for the understanding of Mathematics learning of Black high school learners.

6.2.5 Reasons for doing homework

The learners generally understood that they needed to do homework to increase their understanding, knowledge and ability to do Mathematics. This was clearly demonstrated in their responses to the questions on why they did homework and the time spent on homework. Mϕller's (1994a) case study candidates showed the same motivation for doing homework. They similarly believed that doing homework would produce positive results.

The parents, too, were aware of the necessity of doing homework, although not necessarily Mathematics homework. This was indicated by their willingness to give fewer chores to their high school children than to children in primary school or out of school. They also constantly reminded their children that hard work was necessary to achieve.

Although the candidates generally understood the benefits of doing homework and considered those who did the most homework as clever and as getting good marks, it would appear that no causative relationship was made between doing a lot of homework and achieving higher marks. When the study group was asked whether those doing the most homework did so because they were clever or whether they were clever because of doing more homework than the rest, they could not answer the question. Whether it was a problem with English, language or that they had never contemplated the issue could not be established. A language problem may have been created with the use of the work "clever" as it may have been interpreted to mean wise or crafty, rather than relating to the Mathematical ability. This interpretation is supported by Themba's understanding that a learner in his class was brilliant because he did so much homework.

Themba was well aware of the need to do homework in order to see whether he could cope with the work independently, although he did not always do his homework. Such awareness should result in active learning, as opposed to the passive learning done while watching the teacher or other pupils during group work. However, the habit of not regularly doing homework would negate any positive effects stemming from such awareness.

As a learner, I would not view any of the consequences named by the candidates for not doing homework as motivational. A lecture on the possibility of failure to an already failing learner would have little effect. A learner who is struggling with the work and finds Mathematics difficult will not normally be motivated to do more than he already does by being told what he already knows, ie. that he will fail.

Receiving extra work for not having done homework would seem reasonable and effective, provided the learner is capable of doing the work. If the learner neglected to do homework because he couldn't do the work, additional work without revision is fruitless. This would be even more fruitless if he was sent to the teacher's office to do the work on his own. Themba, however, thought that this method benefited him, although his mark of 37% in June did not suggest that he was capable of doing much correct work when unassisted. The benefit of additional work to Vuyiseka is questionable as she did little homework to begin with. Would she have done the additional work?

Thembani's Matriculation teacher considered contacting parents by letter when homework was not done. According to the study group learners from MSPT, this did have the desired effect. From interviews with parents and their interest in their children's schooling, I would surmise that it was more the learner's humiliation through a letter being sent home than the effect of the letter on the parents.

Such a letter leads to questions on the responsibility of learning. Does the responsibility of doing homework in Grade 11 lie with the learner or with the parent? Would a "lecture" from a parent have more effect than from the teacher? Marquis (1989) wrote that Grade 9 learners need to know the importance of homework, that it is expected and that they will be held accountable for it. However, he suggests that the teacher establish a system of accountability as Grade 9 learners may have good intentions but may lack follow-through and strong willpower. In a middle school teachers' manual, Epstein and her colleagues stated that homework is the responsibility of the learner (Aiex, 1996).

With corporal punishment no longer an alternative, further research on possible consequences for homework not being done are needed. Also of value, perhaps, would be research on the motivation to do homework.

6.2.6 Where and when homework was done

It appears that few studies have investigated the circumstances in which adolescents do homework or how these variables relate to the learners' academic performance. In one study, reading achievement was found unrelated to the presence of distractors such as music or television during study (Patton, Stinard and Routh, 1983). A second provided case study data that suggested that the quality of family interaction can both enhance or interfere with homework's effectiveness (McDermott, Goldman and Varenne, 1984). Both these studies called for additional research into the contexts in which homework is done.

The studies done in South Africa on the places where learners do their homework include those of Du Preez (1979) and Mϕller (1994a). Du Preez investigated the effect of television on homework habits shortly after the introduction of television in South

Africa. He found that television had had more effect on boys than on girls in terms of time spent on homework and ability to concentrate in the classroom. Boys spent less time on homework during the week than before the advent of television, but were able to concentrate better in class. The effect on girls was not significant for both variables.

In this study, as the study done by Mφller (1994a p 41), homework routines appeared to be well established in the lives of the case study candidates. They generally had set routines surrounding their approaches to homework. These involved doing as much homework as possible at school (Vuyiseka), doing the homework alone at home (most candidates) or working elsewhere with friends (Zoleka). Only Pelisa did her utmost to avoid homework, also an established routine.

Each of the candidates, serious about homework, had set places where they preferred to study. The awareness of a need for set times and places to study was evident from many of the interviews. Yet the need for peace and quiet did not come through as strongly as with Mφller's (1994a) candidates.

The participants' habits, regarding where and when they did their homework, I would consider normal. This decision I base on my experience with my own homework, that of my classmates, learners and students. The "normal" time and place to do homework was considered to be after school, in the afternoons or evenings, at home. The candidates' habits tended to fit into this description. This is contrary to the trend in American schools.

In American schools teachers provide class time in which learners can do homework, while learners also make use of study halls, lunch times and other free time to do their homework (Stevenson, 1998). Vuyiseka's tendency to do homework during free periods or breaks would be similar to this.

However, Marquis (1989) felt that class work and homework were two separate issues. Class work was a learner's solution to a few carefully selected problems so that the teacher was able to ascertain whether the work was understood. Homework was then assigned in addition to these problems.

Some of the participants preferred to work in groups when doing their homework. Zoleka usually met with a group to work at another school or at the library. Thembani worked with a group before tests and examinations in Grade 11 and 12. The study group met often although irregularly and consisted of learners from two different schools. Nonthembeko's only reported problem with school was that they didn't do groupwork.

Mϕller (1994b) suggested that the wish to study in groups may be due to a need to compensate for a poor quality home environment. Whether Zoleka, Nonthembeko or Thembani had poor home environments cannot be judged as such questions were not part of the interviews and diaries. However, from observations made during the visits, the candidates most likely to have irregular home environments were Nonthembeko and Loyiso. Nonthembeko wished to work in a group while Loyiso worked alone but felt that group work was a good practice.

6.2.7 Groupwork versus working alone

Whether groupwork (as homework) is more beneficial to learners than working alone was not a question included in this study and should possibly be considered by further research. However, based on the amount of time spent by the study group to commence work and their manner of work, I would be inclined to think that working alone would be more effective than working with a study group.

Davidson and Kroll (1991) reviewed the literature on co-operative learning (small groups working together to share ideas and complete certain academic tasks). They found that less than half the literature comparing small groups and traditional methods of Mathematics tuition has shown a significant difference in learners' achievement. But where significant differences were found, these were almost always in favour of small-group work. However, Mϕller's (1994b) research suggested that participation in study groups did not have a positive influence on educational achievement for Black high school learners in Soweto and Durban.

In a study on co-operative Mathematics homework of Chinese high school learners, Ma (1996) found that student-chosen groups of three members achieved better than four or five member groups. Teams of four or five members were thought to be too large to be effective. Three member groups with a majority of high achievers benefited the most from co-operative homework. Learners in five member groups with low ability scored significantly lower in Mathematics achievement than learners in other groups. Middle and low achieving learners benefited significantly from co-operative Mathematics homework, and made considerable progress, when they were in teams with a majority of high achievers. High achievers in mixed groups did not benefit, as they spent much time helping the other students, although they did maintain their top positions in Mathematics achievement.

From my observations of the study group, one or two candidates would explain the problem while the remainder contributed very little. No real discussion took place. The group also consisted of 10 - 12 learners, which resulted in few actively participating, few actively listening and many not paying any attention. Those only listening or not paying attention were in a similar situation to sitting in on a lecture and thus missed out on personal practice - the very reason for which homework is given.

Based on Ma's (1996) findings, the study group would not benefit from group work. The study group consisted of a majority of low achievers with only one or two average achievers. The group (10 -12 learners) was far too large to be effective. Co-operative learning was not actually taking place, as there was no real discussion of the work but mostly explanations by the average achievers.

With such a large group of low achievers one is also left with the question of what would happen if the active participants in the group were using incorrect methods? Such a thing could easily happen where all group members are average achievers at best, especially in Geometry where so many learners experience grave problems.

Of the candidates asked, all stated that work was easy and understandable when explained in class, but difficult and confusing when done on their own. While this may point to a lack of learner activities, participation, classwork and discussion in class (not the focus of this study), it is, however, an argument for groupwork while doing homework. The argument would, however, only apply if at least one learner in the group can adequately do and explain the work.

Candidates readily acknowledged that they experienced problems with homework and all were prepared to ask for help. The helpers tended to be friends or classmates or occasionally a sibling. Only Themba, Mongesi and the study group consulted the teacher when they had problems. As with groupwork, one has to wonder about the quality of the aid given by friends and siblings. They would have to have access to someone with Mongesi's skills and understanding to obtain effective assistance. Thus, taking Ma's and Møller's findings into consideration, the ability of the learners and the size of the study group, I feel that the learners probably benefited little from groupwork or peer assistance.

However, the contrasting view would suggest that doing homework alone when the work is not understood is as ineffective, if not more so than doing it in a group, as the work cannot be done or misconceptions are ingrained. Not being able to do the problems would result in a worse situation than being a passive listener in group work. Personal practice could not take place. No further learning would be possible until the learner returned to class the following day.

The worst scenario of a learner working on his own is that the learner does the homework but does it incorrectly and thereby reinforces misconceptions. When working alone no one is available to point out the error before it is ingrained. The learner is later left with the task of unlearning the misconception and learning the correct method.

However, one must also bear in mind that tests and examinations are written alone, when considering the benefits of doing homework in groups. Of what value is groupwork to the learners when they eventually have to be able to do similar problems entirely on their own?

It is also interesting to note that both Thembani and Zoleka later opted to work alone rather than work in groups. Further, the three candidates who achieved the highest Grade 11 marks - Mongesi, Vuyiseka and Loyiso - all claimed that they preferred to and did work alone. Did Thembani and Zoleka see the pitfalls of working in a (low achievement) group which led them to later work predominantly on their own?

It would be interesting to determine how learners generally worked in groups or alone. The question of time versus amount and quality of homework done when alone or with a group would also need to be answered. Were learners more efficient in doing homework alone than with a group? Were learners more effective when doing homework alone than with a group?

6.2.8 Homework copied

At times, candidates copied homework from their classmates. Although the exact frequency of copying could not be determined, it did not appear to be a regular occurrence. The reason for copying homework corresponded with that presumed for not completing homework, ie. when it was too difficult or was not understood. This belief was supported by the fact that Mongesi did not copy homework but helped his classmates by explaining work to them. Mongesi, as an A candidate, thus did not need to copy as he could do the problems. His classmates, however, could not do the problems, needed Mongesi's assistance and possibly copied his work after he had explained it to them.

Most candidates claimed that the work was explained to them before they copied it. This showed some responsibility towards understanding the work and tied in with their knowledge of the benefits of homework. It would appear that it was not just the need to show the teacher that they had done the work that motivated copying, but that copying contributed to the learning process.

Vuyiseka was the exception here. She claimed only to copy the homework when she knew she could have done it anyway. It needs to be remembered, however, that this was her own perception of her abilities and may have been misleading. Problems can appear to be easy until one attempts them. She also did not mention that the work was explained to her before copying. She would probably have considered that unnecessary as she felt she could do the work. Why then did she copy? To impress the teacher? To feel she had done the work?

6.2.9 Days of "no school" or "no class" or "early closing"

The amount of time lost per year due to days of "no school", "no class", boycotts or early examinations was remarkable. Learners would boycott school due to "misunderstanding" (Zoleka) or go on strikes (Mongesi). Teachers were absent from class or school to attend meetings or courses. Learners considered the school-year as over immediately after the final examinations and teachers didn't expect the learners back after the examinations. However, the examinations ended 2 (Vuyiseka), 3 (Themba, Nonthembeko, Mongesi) or even 4 (Zoleka) weeks before the official year-end.

All are a clear indication that "a culture of teaching and learning" had not yet penetrated into these schools. Losing two to four weeks at the end of the examinations so that teachers had enough time to mark examination papers without having to take work home - to the detriment of the learners - is a sad reflection on the teaching profession. Most of the reasons for not having class, eg. choir in Cape Town (during which most classes come to a standstill although only 80 learners and three teachers were involved) or principal's birthday, fall into the same category.

Nxumalo (1993) found similar trends in KwaMashu (Kwazulu-Natal) schools. Problems experienced frequently at those schools included teacher absenteeism, abscondence during school hours and irregular class attendance. Even when the teachers were at school, they did not give lessons but sat in the staffroom either chatting, busy with their own studies or marking papers. It was not uncommon for a teacher to abandon classes for a week or longer after being irritated by learners or after an argument had taken place.

The above examples support three of the reasons for poor results in Black education given by Steyn and van der Westhuizen (1993). They stated that irresponsible actions by heads of schools (eg. principal's birthday), non-punctuality and absenteeism of learners and teachers (choir to Cape Town) and the attitude and commitment of teachers (examination marking during class time) contributed to weak achievement.

Although the amount of schooling was not a focus of this study, its impact on homework was. When a Mathematics class did not take place, Mathematics homework was not given. Teachers rarely left work with or sent work to the classes while they were away. In those cases where they did send work (Vuyiseka), the work was often left undone.

Among the conditions given in association with excellence in Mathematics, Driscoll (1987) included the efficient and productive use of class time and considerable commitment to extra time for instruction by teachers. Both seem to have been neglected in the case study schools.

Stallings (1984 as quoted by Marquis, 1989) did research and calculations on time wasted during teaching time.

> Her research indicates that in many classes 38 percent of the time is spent on organization (returning papers, giving assignments) and off-task activities and another 50 percent on non-productive seatwork [learners waiting for attention?], perhaps done while the teacher grades papers, prepares for other classes, or chats with individual students.
>
> The first and last five minutes of the class period, often wasted on these organizational or off-task activities, could be better used ... This ten minutes a day, of a 50 minute class period, equals 1800 minutes wasted each school year for just one class and adds up to seven weeks of instructional time lost.
>
> (Marquis, 1989 p 422)

It can be assumed that the above scenario is typical of the case study schools as well. Add to that the time taken by learners to move between classes, which from personal observations is done at a very leisurely pace. Time left for actual teaching thus becomes minimal. Yet principals and teachers still use any excuse to take time off from teaching.

If so much teaching time was lost during a year, how did the teachers manage to cover the syllabus and prepare the learners adequately for the end of year examinations? Was the syllabus completed? If not, what sections of the work were omitted? Did the teachers have time to do revision with the learners? If the teachers assigned relatively little homework and had relatively little teaching time, how much homework were the learners really doing over the year?

6.2.10 Examination marks

When two learners and the study group were asked why learners would say that they had passed a test or examination, but then usually found that they had failed, two different responses were given. The popular response was that the learners became excited, rushed and made careless mistakes during the examination. The explanation given by Vuyiseka was that the learners were concerned about their image and just didn't want to admit that they had failed.

A phenomenon that occurred with all candidates was the expectation of higher marks than their past performances warranted. Was this another case of learners trying to maintain a better image as Vuyiseka had suggested or was this their actual perception of their abilities?

The consistency of the perceptions among the participants lends to the belief that they were expressing their true perceptions. Added to this, their perceptions that they were coping and that they spent much time doing homework, would suggest that they believed in their abilities to attain the suggested marks.

It thus appeared that the participants perceived their work and abilities in Mathematics to be better than in the real situation. When asked for Mathematics marks, these were also remembered as a little higher than in reality. This occurred in all cases where learner and teacher supplied marks for the same examination, with the exception of Mongesi. In his case it was reversed. Mongesi reported a lower mark than was actually attained. He was also the only candidate to give a realistic expected mark for the end of the year. Even the teachers tended to expect higher marks from the learners than they were able to attain.

Norwich and Jaeger (1989) found similar trends at a large comprehensive school in London. When learners, who showed high Mathematics achievements, reported on their learning behaviour, they reported less learning behaviour than when teachers reported on the same learners' learning behaviour. This was interpreted as teacher reports being influenced by the Mathematics achievement of the learners, ie. that the teachers assumed that these learners had 'good' learning behaviour and included this assumption in their reports. Learners, whose self reports of learning behaviour were well above that reported by the teachers, were generally in the lower ability sets (teachers had assumed that learning behaviour was 'not so good'?). Applied to this data, it would be expected that teachers expected higher marks from the higher achievers (Mongesi). This was not so. Mongesi's teacher felt he was only capable of a B or maybe an A, although he had achieved 90% and 85% in the previous terms. It would also be expected that the lower achievers rated themselves better than their results indicated. This was indeed so. However, contrary to the study by Norwich and Jaeger, even the teachers rated the lower achievers higher than their results warranted.

The discrepancy in achievement and perceived ability may have been due to a peculiar understanding of cause and effect on the part of the learners. What did the case study candidates perceive as the cause that resulted in high marks? Could the amount of time spent on the homework (regardless of its efficiency or effectiveness) be seen as a reason to achieve high marks? In support of this suggestion I present the following narrative from my own experience taken out of my personal professional journal:

> Bridging Course students had spent a year taking Mathematics for Matriculation. These particular students had last done Mathematics in Grade 9, after which they had dropped it in favour of other subjects. At the end of the year they wrote the Matriculation examination but failed it hopelessly.
>
> However, the following year they presented themselves at Algoa College (also the venue of the Bridging Course) to enrol for a Diploma in teacher training. They insisted that they qualified even though they had failed Mathematics, then a prerequisite for the Diploma. Their reasoning was that they had been present at most of the Mathematics lessons, tutorials and computer sessions. They had 'put in the time' and

thus should be given the credit for it. They seemed to rate their efforts in terms of time more highly than their achievements in terms of marks.

Another cause for achievement may relate purely to their beliefs in their abilities. Did they feel that merely believing in their own ability would result in higher marks? Or did they believe that luck and 'trust' (Nozuko) would allow them to pass?

Lastly, the demise of apartheid may have a bearing on the issue. After Mandela's release there was a hidden assumption in many minds that this would bring about a miraculous change in the schooling situation (Hartshorne, 1992). Although this did not come about, many learners may have felt that their marks would improve because apartheid was largely to blame for the so-called failure of Black people.

6.2.11 Study timetable

The use of a study timetable or roster did not appear to be entirely foreign. Half the candidates professed to know what it was although very few, if any, effectively used one. My own experience tells me that very few learners do use a study roster effectively, regardless of their background or environment.

6.2.12 Parental support

6.2.12.1 Parents and homework

By Grade 11, parents were not generally involved in the school or school work by the learners. Learners did not discuss school problems with their parents. The National Education Goals Panel (1995) in the USA reported that 65% of parents assisted their Grade 1 children with their homework. This percentage dropped throughout the Grades to 14% in Grade 8. If this trend continued, then very little assistance would be given in Grade 11. The trend reported by the candidates would thus not differ from that of the study done by Balli *et al.* (1997).

However, parents were aware of their children receiving homework and examination results. They generally understood the needs and benefits of homework and the meaning of results. Time was made available for most of the learners to do their homework, usually by giving them fewer chores to do in the home and by giving pep talks to work hard.

Other than such superficial motivation and assistance, parents showed little interest in the education of their children. Details of homework, tests, examinations or results were generally not known. Although a learner was seen to do homework, identification of the subject being done would be difficult from a distance or for a parent who had not been to high school. While academic knowledge of the work done during homework should not be judged as crucial for a learner's progress in the subject, knowledge of the learner's results and progress should be judged as crucial.

Campbell and Mandel (1990) found that a mixture of lower levels of pressure, help and monitoring together with higher levels of psychological support [and interest] should be ideal to encourage and motivate a learner (primary school) to achieve. High levels of parental pressure, help and monitoring were found to be dysfunctional. Psychological support, encouragement and interest in achievements should be seen as more important to high school learners than pressure or monitoring, especially when considering that teenage personalities and the country's history tend to generate rebellion against authority (see Chapter Two).

The lack of parental support found in the case study candidates is mirrored by the response to a questionnaire given by 382 Matriculation learners in Soweto (Mathe, 1991). When asked whether their "father/mother/guardian look at [their] school-work regularly", only 21% had responded with "always". The option "sometimes" was chosen by 25% and "never" was selected by 34%. The question: "does he/she encourage you to study at home" emphasized the lack of parental support. Only 14% of the Matriculants responded with "always", 29% responded with "sometimes" while 57% responded with "never".

The lack of support for schooling and homework from other family members points to the lack of a culture of learning within the family. However, if the parents are uneducated or only attended a few years of basic schooling, they cannot be expected to understand the need for support. Parents who have not experienced higher schooling will not be aware of the pressures put on the learners as they approach their Matriculation examinations. They will not understand the importance of or the reasons for homework. Further, uneducated parents feel that they cannot help their children, as they cannot understand the academic work.

Campbell and Mandel's (1990) study determined that lower levels of help, pressure and monitoring together with higher levels of psychological support were conducive to Mathematics achievement. Whereas the case study candidate's parents were generally not able to assist with the actual work, the other factors should be well within their abilities.

Møller suggested that there were two areas in which parents could influence the educational achievements of their children (Møller, 1994b). Firstly, parents could decide where to send their children to school. Secondly, parents could support the children's educational efforts, encouraging them to remain in school, ensure that they completed homework and other school assignments and studied for examinations. These areas, while not necessitating literacy, do necessitate knowledge of and interest in school activities.

When asked during the interviews, only two of the candidates' parents were able to give an approximation of the latest Mathematics marks. The remaining seven either did not know or couldn't remember the marks. Why would a candidate work hard if no-one, not even the parents, showed much interest in his achievements? Is a Grade 11 learner mature and independent enough to sustain interest in a difficult subject, in difficult circumstances, with so little parental interest?

In the TIMSS case study project, which included learners in the twelfth Grade (Stevenson, 1998), German and Japanese parents felt that parental support was a major contributory factor towards achievement. Thus, if the above comparison were valid, parental support in Grade 11 would still play a vital role in the learner's achievements. One would assume that parental support becomes less important as a "child" becomes more independent, with less independent learners requiring greater encouragement from their parents.

Mongesi's mother gave no support or encouragement and would have preferred her son to find work and bring home additional money. Nor did Mongesi involve her in his school life other than to show her his report (which she may not have understood due to her very limited schooling). Yet Mongesi was the best Mathematics student among the candidates and obtained a B symbol at the end of Grade 11. However, a further important difference between Mongesi and the other participants was his age. Mongesi was already 24 and had spent approximately 7 years out of school trying to earn money. He also showed greater maturity and independence than the other candidates. His age, and his experience in attempting to earn money without an education, may have given him the needed maturity and motivation to achieve at Mathematics.

Mongesi had made the decision to return to school himself while the other candidates had merely remained in school. Their parents had wanted them to have an education. Mongesi should thus rather be compared to students in tertiary education than to learners at school. Learners at school are thus considered as needing the support of their parents, even in Grades 11 and 12.

6.2.12.2 Parents and school

Parents also seldom had contact with the teachers or the school of their children. Although often aware of when tests or examinations were being written, parents unfortunately did not usually know which subject was being written - especially during examinations. Those parents required to fetch the reports from the schools had also not done so. Such disinterest could well be seen as demotivating to even the most ardent learner - not to mention learners not achieving well in most subjects.

Teachers, too, feel the lack of support given by the parents. According to Chisholm and Vally (1996), parents did not play any role in Gauteng school life and did not appear at school other than when they were summoned to be informed of a misdemeanour their child had committed (Chisholm and Vally, 1996).

Again, the lack of a culture of learning within the family is evident here. But the same argument applies as in 6.2.12.1. Parents, who had little or no schooling themselves, cannot be expected to understand the need for their involvement in the school and its activities. Some of these parents did not even seem to understand the need to fetch their child's report from the school (Nozuko, Pelisa).

6.2.13 Television

With the exception of Mongesi and Zoleka, candidates spent more time watching television than doing Mathematics homework. This should not be confused with the candidates spending more time on television than on homework generally. Although some candidates gave the impression of making Mathematics homework the priority (possibly because of this study), other homework was done.

If Mongesi and Zoleka were taken out of the scenario, a pattern of more television - higher Mathematics marks, seemed to appear. This certainly acts as a reminder that patterns may be simplistically interpreted but inaccurate as warned by Miles and Huberman (1984) in Merriam (1991). Or could the stimulation afforded by television aid concentration and thinking skills for these candidates, thereby enhancing learning? This interpretation would support Du Preez's (1979) findings when he investigated the effect of television on homework habits shortly after its introduction to South Africa. He found that television had a greater effect on boys than on girls in terms of their ability to concentrate in the classroom. Boys were able to concentrate better in class after the advent of television. Whether television viewing enhanced concentration or whether greater concentration enhanced viewing is a question left to others to research. [However, I personally learnt to concentrate by watching stimulating wildlife programmes on television at the age of 12.]

Time spent on television was found to be positively correlated to achievement among respondents with parents in lower-status occupations. The correlation was negative for learners with parents in higher-status occupations (NECTL, 1993). As the case study candidates were from homes with predominantly lower-status occupations, living in areas with lower socio-economic status, the time spent on television may have had a positive influence on their achievements.

6.2.14 Homework observations

During homework observations, the two candidates involved took unexpectedly long to work through each problem. The reasons for this were threefold. Firstly, they wrote out all intermediate steps in full and did little mental work. Secondly, both tended to work and think fairly slowly, often rechecking steps already completed, especially calculator work. And thirdly, Nonthembeko experienced many Mathematical problems. Writing out each intermediate step, doing little work mentally, working slowly and rechecking steps already done (repeatedly in Mongesi's case) point to a lack of confidence in their ability to do Mathematics correctly.

These observations support the discussion that learners spent the "correct" amount of time on Mathematics homework but did few problems in that time. The time spent on Mathematics homework was thus used inefficiently.

Nonthembeko's Mathematical problems tended to originate in previous Grades. Errors made with multiplication of signs, like and unlike terms or the order of operations indicate problems originating in Grades 7 and 8 (or even earlier). Although she no doubt made these errors throughout Grades 9, 10 and 11 - thereby continually reinforcing misconceptions - they were never rectified to the extent that permanent change could take place. Attempting to rectify such errors at this stage would require concentrated learning, if at all possible. Such concentrated learning would entail lengthy one-on-one tuition with special attention given to the areas where misconceptions were most evident. Did other Grade 11 learners make mistakes due to misconceptions carried along from previous years? Were these errors and misconceptions, which were constantly re-inforced during homework, one of the reasons why learners were not achieving in Mathematics?

Both learners also tended to stop doing homework before they had completed all the work. In one instance the individual problems were considered complete although the questions had not been fully answered. In the other observation sessions, not all problems assigned were completed. The total practice required would thus not have been accomplished and the homework could thus be considered to be partly ineffective.

Such incomplete homework could be due to various reasons. The learners may have felt that they had done over an hour's work, and so must have completed all the work. They would have 'put in the time' and thus expected to be able to do the problems although they had not done them all. This could be supported by Vuyiseka's thinking in that she didn't do her homework when she felt that she could do it anyway. She would assume that she could do the homework even though she had not tried it or even looked at it.

Alternatively, the learners may just have forgotten how much homework had been assigned. Neither Nonthembeko nor Mongesi appeared to have written down the homework assigned. After an hour, their memories may have subconsciously changed the remembered homework. Other factors may also have played a role, such as nervousness at my presence or the impression that they were using up my time. Did I subconsciously give out a message that I was getting tired/impatient/disinterested?

In the instances where the individual problems were considered complete although they had not been fully answered, the reason may have been due to the question posed in the problem not being understood. In one instance, each problem had given two sides and the included angle in a triangle. The learners were asked to solve the rest of the triangle. However, Nonthembeko only solved for the unknown side. This lack of understanding may have been due to Nonthembeko's problems with Mathematics, her low English language proficiency (rated as six out of ten for this study) or a combination of both.

To gain further insight into the effectiveness and efficiency of homework practices, "homework" problems will be timed and analysed for errors in Phase II of this study. This was viewed as an important process as the quality and quantity of homework versus the time spent on it had not been covered in any of the literature relating to time and homework.

6.3 Areas for further investigation

The case studies had provided much information on how the case study candidates perceived homework. It became clear that they felt that they did a lot of homework and spent enough time on it. They were confident that they could cope with the subject matter (although it was difficult) and expected to achieve despite evidence to the contrary. They appeared to know why they needed to do homework, ie. to understand the work, but may not have understood the exact relationship between effective homework and achievement.

However, many questions were left unanswered. These related to the quantity and quality of homework done in the time spent on the homework, the time devoted to Mathematics by the teachers and the reason for the many errors from previous Grades made by Nonthembeko during the homework observations. The quality of homework was accepted as including the non-completion of homework and the types of errors made during homework. A further concern was the lack of depth, on the issue of homework and the learners' understanding thereof, obtained from the case studies. For this reason, it was felt that more information than that provided in the case studies should be gathered using other techniques. This would also allow for generalization of the findings, rather than restricting them to the nine case studies.

In order to answer some of the above questions and to gather additional information, Phase II of this study was initiated.

CHAPTER SEVEN

METHODOLOGY OF PHASE II

7.1 Introduction

7.1.1 Rationale

In descriptive or interpretive research, researchers describe what has taken place (Cohen and Manion, 1994). They do not try to foresee what will happen in the future and do not readily generalize their findings. Such research typically leads to questions, which then require further research. The extended research may then allow generalization from the specific data obtained in the research to the general population.

Case studies in education tend to emphasize the interpretive, subjective dimensions of phenomena (Cohen and Manion, 1994) and as such can be considered descriptive research. The aim in case studies is to optimize the understanding of the individual case before attempting to make generalizations beyond the case (Yin, 1994). But extending data from one individual case to the population from which the case was drawn is not seen as realistic. There may be no evidence to indicate that the individual case was an exception or a case falling in the 95th percentile of the population.

The use of multiple case studies allows for some generalization as it uses many cases as a database. The chances of all cases falling within the 95th percentile of the population become remote as the number of cases increases. Generalisations can then be based on established pattern strands or regularities, which lead to a theoretical framework. A good theoretical framework then becomes a vehicle for generalization to further cases (Yin, 1994).

However, it was felt that to generalize from only 10 cases to the population of all Grade 11 learners in the northern townships of Port Elizabeth was not justifiable. Supportive data for such generalization was sought. Based on the pattern observed, and the interpretation of the multiple case study data, a second phase was thus initiated to confirm or negate preliminary pattern strands, to answer further questions and to make generalizations.

This quest for external validity, for the generalizability of results, is called "between method" triangulation of data. It is broadly defined as "the combination of methodologies in the study of the same phenomenon" by Denzin (as quoted by Jick, 1983 p 137). Triangulation plays a role in examining the same phenomenon from multiple perspectives, in enriching the understanding of the data by allowing for more and deeper dimensions to emerge and may reveal unexpected findings. Stake (1994) described triangulation as a process of using multiple perceptions to clarify meaning, thereby verifying the repeatability of an observation or interpretation.

Triangulation has various benefits. It allows researchers to be more confident of their results, it may uncover a deviant dimension of a phenomenon, lead to the synthesis or integration of theories, serve as a critical test for competing theories and illuminate 'behaviour in context'. The shortcomings are the difficulty of replication, especially if idiosyncratic techniques have been used (Jick, 1983). In this study a survey was used to go beyond the case study data.

7.1.2 Why a survey?

The sample survey has become one of the most widely used methods of data collection in social research since the development of sampling theory and techniques early in the twentieth century (Hakim, 1987). The primary descriptive methodology in educational research is also the survey (Fraenkel and Wallen, 1993; Cohen and Manion, 1994). Its main purpose is to describe the characteristics of a population. It involves a large group of people (the sample population) being asked questions about a specific topic or issue. The sample population, if large enough, allows certain general trends to be revealed and described. These trends can then be generalized to the entire population from which the sample was drawn (Fraenkel and Wallen, 1993).

Surveys are easily linked to (other) qualitative research and provide an excellent sampling frame for linked case studies, which examine particular situations, groups or processes in greater depths (Hakim, 1987).

The main purpose of a survey, regardless of the data collection technique employed, is to describe the characteristics of a population. They are typically used when a researcher wishes to find out how the members of a population distribute themselves on one or more variables (Fraenkel and Wallen, 1993).

Although a survey asks questions of a large group of people, the population as a whole is rarely studied. Rather a sample of the population is studied and generalizations made to the entire population from what is discovered about the sample (Fraenkel and Wallen, 1993).

Surveys answer the questions "who?", "what?", "where?", and their derivatives "how many?" and "how much?" of a large number of people at once. While the questions "how?" and "why?" (as used in the case studies) tend to be explanatory in nature, the questions "who?", "what?" and "where?" are more advantageous when the goal is to describe the prevalence of a phenomenon (Yin, 1994).

One of the reasons for the follow-up studies was to test the external validity of the data received from the case studies. Could the findings of the case studies apply to more than just the ten candidates? Were the pattern strands discerned in the case studies mere coincidence or researcher bias, or could they be validated? Yin (1994) and Merriam (1991 using Miles and Huberman, 1984) both warned that pattern strands can be found quickly and easily. They suggest that researchers should take care to notice genuine evidence of the same pattern and should remain open to contradictory evidence.

Another reason for the follow-up surveys was the need to confirm or negate the facts as established in the emergent pattern. The possibility existed that the Hawthorne effect (Cohen and Manion, 1994) had influenced the pattern considerably. As previously mentioned, the case study candidates were more aware of their homework due to the diary entries, interviews and phonecalls. Some of them definitely did more homework than before becoming candidates. The parents and the candidates themselves mentioned this. The extent of the Hawthorne effect was not known and could not be established using only case study methodology.

The case studies concentrated on the case study candidates and all information was from their perspectives. The candidates selected, however, could not be regarded as truly representative of all Grade 11 learners in the northern townships of Port Elizabeth. As mentioned in section 4.3.2, learners more proficient in English tended to volunteer for the initial questionnaires. Learners less fluent or possibly more shy thus were not likely to be chosen as candidates. Even if Mathematics and English proficiency were considered totally unrelated, the question remained whether such candidates held similar or different views of Mathematics homework. A study including candidates less fluent in English thus needed to be done and was the third reason for the follow-up studies.

The final reason for further studies concerned questions, which had emerged from the case studies. These questions had not been part of the original case studies but seemed to gain importance and relevance as the analysis of data progressed. Questions, such as the time taken to complete set problems, could best be answered by learners. Others, such as time spent with the different Grades, could only be answered by teachers.

The advantages of using surveys were:

- the different designs that could be adapted for the various types of follow-up surveys and information required;
- the repeatability of the surveys, in different locations at different times thus facilitating generalization;
- the transparency or accountability of the surveys. The methods and procedures used can easily be made visible to those interested;
- the evidence from which conclusions were drawn can be made visible in table form, thus allowing for less subjective interpretation of the data than in the case studies.

(adapted from Hakim, 1987 p 49)

The main weakness of surveys is the use of a structured questionnaire. This results in lesser depth and quality of information than in other types of data collection, eg. an in-depth interview (Hakim, 1987). However, as in-depth data was at hand from the case studies, this was not considered a limitation. The follow-up studies were to confirm or negate the emergent pattern for generalization purposes. Mass data was sought rather than in-depth information.

While the structured questionnaires led to a loss of sensitivity and quality of responses, they were counterbalanced by the opportunity to analyze the data on a reasonably comparative basis and draw conclusions about the entire study population sampled.

7.2 THE SURVEY METHOD

7.2.1 What is a survey?

Survey research is one of the most used forms of research employed by educational researchers. It involves asking a large number of people the same questions on a particular topic or issue. The main characteristics of surveys are:

- information is collected from a group of people so as to describe a particular aspect or characteristic of the population of which those people are a part;
- the information is mainly collected through asking questions;
- information is collected from a sample rather than from the entire population.

(Fraenkel and Wallen, 1993 p 343)

A survey collects information at a set point in time. Its purpose can be to:

- describe the nature of existing conditions;
- identify standards against which existing conditions can be compared or
- determine the relationships that exist between specific events.

(Cohen and Manion, 1994 p 83)

May (1995) described the relationship between survey questionnaires and causality and the use of theoretical ideas. If the results of the responses confirm the theory, then confidence in its explanatory potential is enhanced. The problem of a researcher's values entering the research can be checked through the means of replicability.

7.2.2 Types of surveys

Various types of surveys have been used in educational research and different authors classify surveys differently. Cohen and Manion (1994) differentiated surveys according to scope and complexity. Thus, a survey of all schools in the country is seen as having more scope and complexity than one dealing with all classes in a school or one dealing with learners within one class.

Fraenkel and Wallen (1993) classified surveys according to the time over which they are conducted. They thus identify cross-sectional and longitudinal surveys. A cross-sectional survey collects information from a sample at just one set point in time, over a day, a few weeks or months. A longitudinal survey collects data over different points in time in order to study changes over time.

Fraenkel and Wallen (1993) further divided longitudinal surveys into trend, cohort and panel studies. A trend study surveys different samples from the same population at different times (the members of the population may change), eg. high school principals in the province. In a cohort study a specific population is followed over time (the members of the sample population change), eg. first-year teachers. In a panel study the same sample is surveyed at different times (the same members of the sample population are repeatedly surveyed), eg. the same group of 1997 first-year teachers every three years.

May (1995) classified surveys according to the information gathered. He identified factual, attitudinal, social psychological and explanatory surveys. Factual surveys aim to collect information on the material situation of individuals. Attitudinal surveys concentrate on people's attitudes or opinions on various issues. Social psychological and explanatory surveys are more theoretically orientated. The first builds up a profile of personality types and tends towards a concern with small group behaviour. Explanatory surveys are specifically designed to test hypotheses, which are derived from theories.

Another way of classifying surveys could be according to the data gathering techniques employed. Although different techniques may be used in the same study, each technique has unique features. These techniques include face-to-face (personal) interviews with individuals, face-to-face interviews with groups, interviews by telephone, interviews by mail (Fraenkel and Wallen, 1993), standardized tests of attainment or performance, or attitude scales (Cohen and Manion, 1994).

The surveys used in this study can best be described as simple, cross-sectional, explanatory surveys using face-to-face interviews, group questionnaires and tests of performance. The data collection techniques for the four surveys used in the follow-up studies can be easily identified. Each has unique properties, which lend themselves best to the purpose of each study. The properties of each technique used are discussed in the sections describing each study.

7.3 Survey design

The design of the individual surveys is outlined later for each of the follow-up studies. Only the general design of surveys is detailed below.

7.3.1 The purpose of the enquiry

The objectives of a survey should be clearly defined. Each question asked in the survey should relate to one or more of the objectives. The questions need to be interesting and relevant to the respondents to motivate them to answer the questions (Fraenkel and Wallen, 1993).

Cohen and Manion (1994) stated that the objectives should be divided into a primary objective and subsidiary topics that relate to the central purpose. These need to be carefully identified and itemized. This is followed by an outline of the specific information requirements relating to each of the issues in the survey.

7.3.2 The target population and sample size

The target population is that group of people at which the survey is directed, eg. Grade 11 learners in the northern townships of Port Elizabeth.

In order to make accurate or trustworthy statements about the target population, it needs to be very well defined. The definition needs to be such that it is possible to state whether a person is a part of the target population or not (Fraenkel and Wallen, 1993). Fraenkel and Wallen (1993) used the example of faculty members in a particular school district to illustrate this point. Who is a faculty member? Does one include administrators who also teach, substitute teachers and part-time teachers?

The target population needs to be so well defined that it is unequivocally clear who is included and who is not. Otherwise, any statements made about such a population, based on a survey of a sample of it, may be misleading or incorrect (Fraenkel and Wallen, 1993).

Cohen and Manion (1994) cautioned that the criteria by which populations are defined could be difficult to operationalize. The definition of target populations such as the 'severely handicapped', 'underachievers' or 'highly anxious' depends on the person making the definition, and is not absolute. Target populations also need to be accessible. This would be relatively easy with learners at school or student teachers but more difficult for street children or heads of departments.

Financial costs also need to be considered when designing a survey and defining the target population. Sample surveys are labour intensive and require much fieldwork. Costs thus arise due to interviewing time, travel time and transport costs of the interviewers. Training and supervision of interviewers, questionnaire construction, piloting the survey, printing, postage, telephoning, coding, computer programming, etc., can all add to the costs (Cohen and Manion, 1994). For this study, the financial constraints were minimal as only one person was involved as interviewer and the target population was easily accessible in large collected groups.

The sample population is selected after the target population has been identified. Cohen and Manion (1980) described various methods of obtaining sample populations. These include random sampling, systematic sampling, stratified sampling, cluster sampling, convenience sampling, quota sampling, purportive sampling, dimensional sampling and snowball sampling.

For the follow-up studies all available Grade 11 learners in the nine case study schools were asked to complete the questionnaires and to do set homework problems. If these nine schools are taken as representative of the schools in the northern townships, and as randomly picked, then this would be considered cluster sampling. However, the schools were not randomly selected. The first five schools were selected as being conveniently situated for access and typical of northern township high schools. The others were selected to complement variables not yet included in the case studies from the first five schools. As such, the sampling technique could be described as a combination of purportive and dimensional sampling.

In purportive sampling, the sample population (schools) can be handpicked on the basis of the researcher's judgement of its typicality, the intensity with which the interesting features are presented in it or the criterion of convenience (Flick, 1998). A sample population that is satisfactory to the needs of the study is thus built up.

In dimensional sampling, various factors of interest are identified in a population. One respondent (school) is then chosen for every combination of those factors (Cohen and Manion, 1994).

These two types of sampling were considered appropriate for this study as they ensured a sample population drawn from typical northern township high schools (the first five schools) and covered a large number of different variables, as encountered in the northern township schools of Port Elizabeth. As such the schools were considered to be representative of all the schools in the northern townships and the data generalizable (Flick, 1998).

7.3.3 Data collection techniques

Data collection techniques in surveys include face-to-face (personal) interviews with individuals, face-to-face interviews with groups, interviews by telephone, interviews by mail (Fraenkel and Wallen, 1993), questionnaires (May, 1993), standardized tests of attainment or performance, or attitude scales (Cohen and Manion, 1994). Depending on factors such as available time, finances, sample population, response rate required, type of questions, manpower available and the need for follow-up questions, a technique is chosen.

- **Personal interviews** entail a face-to-face interview with each respondent. It is considered the most effective way to enlist the co-operation of the respondent and to get a high response rate. Rapport can be established, questions can be clarified, answers can be clarified or followed up and literacy of the respondents is irrelevant. However, it has the disadvantage that the respondent is known to the interviewer and lacks anonymity. Answers to personally sensitive questions may thus lack depth or validity. It is also a highly time-consuming process.

- **Face-to-face interviews with groups** are possible when the researcher has access to a large group of respondents at the same time and in the same place. The advantages are similar to those of personal interviews.

These are the high response rate and the possibility of clarifying questions or procedures. Low financial costs and time saved in interviewing large groups at a time are further advantages. The difficulty of following up answers is a disadvantage.

- **Interviews by telephone** are cheaper than personal interviews, save time and travel, allow questions and answers to be clarified, preserve anonymity and have a good response rate. The disadvantage is that only people with telephones can be interviewed, thus restricting the sample population.

- **Interviews by mail** (questionnaires) are inexpensive, save time and manpower and give the respondent enough time to give accurate or thoughtful answers. The disadvantages are a low response rate and the need for literate responders (Fraenkel and Wallen, 1993).

- **Questionnaires** can be administered to individuals or groups of respondents. Questions can be clearly and unambiguously presented and can be uniformly analysed. The advantages are that a high response rate is possible, rapport can be established and questions and answers can be clarified or followed up. In addition, respondents feel that they have privacy in answering the questions as questionnaires can be answered anonymously, especially when completed in large groups. Questionnaires also bear a low financial cost, save time and are easy to administer. The disadvantages are the need for literate responders and a possible simplification of the issues involved (May, 1995).

- **Standardized tests of attainment or performance, or attitude scales** are conducted in much the same manner as face-to-face interviews with groups. The researcher generally administers the tests to a large group of respondents at the same time and in the same place. The advantages are a high response rate, the possibility of clarifying questions or procedures, low financial costs and time saved (Cohen and Manion, 1994).

7.3.4 Processing of survey data

When processing the data collected from surveys, the researcher needs to reduce the large amount of data collected to a form suitable for analysis. Such data reduction generally consists of coding the data in preparation for analysis. This is done by hand for smaller surveys and by computer for larger surveys (Cohen and Manion, 1994).

Before data can be coded, however, it needs to be edited to identify and eliminate errors made by the interviewers or respondents. A time consuming yet essential task if valid data is required. Moser and Kalton (1977) listed three central tasks in editing:

- completeness checks ensure that there is an answer to each question;
- accuracy checks ensure that all questions have been answered as accurately as possible;
- uniformity checks ensure that all interviewers have interpreted instructions and questions in the same way.

Coding is the primary task in reducing data. This entails assigning a code number to each answer in all the questions. This is referred to as the coding frame. Setting up a coding frame needs to be done correctly before coding commences. All responses can then be entered into a computer for analysis.

Not all responses can be assigned a code number. Open-ended responses may not lend themselves to such reduction. Whereas a coding frame can be established before the interviews or questionnaires when using closed-ended questions (precoded), the coding frame of open-ended questions has to be developed after the interviews or questionnaires have been completed. This is done by taking a random sample of questions and generating a frequency tally of the range of responses. The coding frame set up from the frequency tally may then need a further check on validity. This can be done by using the coding frame to code another sample of questionnaires. The processing of the survey data for the individual follow-up studies is discussed in the methodology for each study.

7.4 The follow-up studies

The triangulation in Phase II consisted of four separate surveys (follow-up studies), following from the case studies. These involved (1) a questionnaire to 524 learners in the vernacular, (2) timing of learners as they completed a problem, (3) analysis of common errors made by learners and (4) a questionnaire to Mathematics teachers.

7.4.1 Questionnaire to learners

This study involved a questionnaire in Xhosa, completed by 524 learners, with Xhosa as their vernacular. It involved the nine schools used in the case studies, in an attempt to test the consistency of pattern strands observed in the case studies. The use of the vernacular extended the study to learners not as fluent in English as the initial candidates.

7.4.1.1 The purpose of the enquiry

The aim of this survey was to establish whether the emergent pattern determined from the case studies had external validity. Did the pattern reflect only the perspectives of the nine candidates and the study group or did other Grade 11 learners have similar perspectives?

The emergent pattern suggested that learners do not receive nor do much homework. This was reflected in the data showing that only approximately half of the participants received regular homework (yet not necessarily daily homework), that the time spent on homework was generally one hour or less than one hour and that homework was mostly not completed.

Additionally, as previously mentioned, the nine case study candidates were not truly representative of Grade 11 Mathematics learners in the northern townships of Port Elizabeth. The candidates were more than likely more proficient in English than many of their counterparts. Learners less fluent or possibly more shy than their peers probably did not volunteer for the initial questionnaires. Even if Mathematics and

English proficiency were considered totally unrelated, the question remained whether such candidates held similar or different views of Mathematics homework. It was thus necessary to gain information from more learners, including those less proficient in English. It was thought that a survey questionnaire in Xhosa could supply such verification.

7.4.1.2 The target population and sample size

The target population can be viewed in two ways. For the purpose of pattern verification, it consisted of all the Grade 11 learners taking Mathematics in the nine selected schools.

For the purpose of generalization, the target population consisted of all Grade 11 learners taking Mathematics in the northern townships of Port Elizabeth.

The sample population consisted of all available Mathematics learners in Grade 11 at the selected schools on the day the questionnaire was handed out: a total of 524 learners. Some learners were not present on the day and two classes at one school (the smaller out of four classes) were not surveyed due to time constraints.

In terms of the pattern verification, the sample population consisted of virtually the entire target population, *viz*. 524 learners out of an estimated 600. In terms of generalizations, the sample population consisted of a cluster sample (Cohen and Manion, 1994) of all the Grade 11 Mathematics learners in the high schools of the northern townships of Port Elizabeth.

7.4.1.3 Data collection technique

Questionnaires were handed out to groups of Mathematics learners in order to collect the data. The questionnaires, with two open-ended questions and 12 closed-ended questions, were handed to classes of learners at the same time in their classrooms. Different classes at one school were surveyed consecutively on the same day. Different schools were surveyed on different days within one month.

The learners in each class were informed of the project and told about the learner from that particular school, who had been involved in the case study. They were asked to be frank and honest in their responses to the questions in the questionnaire. The questionnaire centred on the last homework assigned to the learners (possibly on the previous day). All responses were to be given for those specific homework problems. As the population size and corresponding sample size was large, the previous day's homework was taken as typical for homework received by the learners. The details of the homework last received (textbook, page, exercise and problem numbers) were thus determined from the entire class and recorded on the questionnaire (as responses to the open-ended questions). The learners were then asked to complete the questionnaire for those specific homework problems. The number of problems completed and the time taken for completion were among the key issues of the questionnaire.

The group surveys made it possible to clarify questions or procedures and gave a high response rate. Financial costs were low and time was effectively used as large groups were surveyed at the same time. Following up incomplete answers posed a problem as the learners were requested not to write their names on the questionnaires.

7.4.1.4 The questionnaire

The questionnaire was translated from English into Xhosa by a group of three colloquial Xhosa speakers familiar with reading, writing and typing. It was then assessed by a first language Xhosa speaking lecturer at a teachers' training college and reassessed by a second language Xhosa speaking lecturer from the Xhosa Department at a university.

The questionnaire was kept short with a majority of closed-ended questions. The avoidance of trivial and uninteresting questions made responding relatively easy and encouraged completion of the questionnaire (Fraenkel and Wallen, 1994). In terms of analysis, closed-ended questions are easier to code and analyse (May, 1995).

The questions asked were:

LEARNER QUESTIONNAIRE

1. What Mathematics textbook do you use?

2. What homework were you given yesterday?

3. Did you do the homework?
   No, some of it, half of it, most of it, all of it.

4. If no, why did you not do it?
   No time, too difficult, not interested, too easy, waste of time, too lazy.

5. When did you do it?
   In class,
   After school, at school,
   After school, at home,
   In the evening,
   Before school this morning,
   Before class this morning.

6. Where did you do it?
   In class,
   In your room,
   In the lounge,
   At school (but not in class),
   Other.

7. How long did it take you to do the homework?
   Less than 15 minutes,
   15 - 30 minutes,
   30 - 45 minutes,
   45 minutes - 1 hour,
   1 - 1½ hours,
   1½ - 2 hours,
   more than 2 hours.

8. Did you do the homework .... on your own, with a friend, in a group?

9. Was the homework ..... easy, not easy, not difficult, difficult, partly easy, partly difficult?

10. Has the homework been corrected?
    Yes, no.

11. Did you get the homework correct?
    Don't know,
    No,
    Some of it,
    Half of it,
    Most of it,
    All of it.

12. Do you find Mathematics ..... easy, difficult, impossible?

13. How often do you get homework in a week?
    Once, twice, three times, four times, every day.

14. How often do you do your homework?
    Always, mostly, sometimes, never.

Questions 1 and 2 related to the homework for which the remainder of the questions were answered. The name of the textbook facilitated looking up the page, exercise and number of each problem, so that the exact problems done were known during analysis of the data.

Question 3 referred to the completion of homework, a concern originating from the homework observations done on two of the case study candidates.

Question 4 was only answered if the response to question 3 had been "no". The learners not having done the previous homework were then requested to answer the remaining questions for the last homework done by them. This was explained before the questionnaire was answered as well as on the questionnaire. As the case study candidates generally knew the reasons for doing homework, reasons for learners not doing homework were sought to gain insight into learners' homework habits.

Questions 5, 6 and 8 relate to the time and venue of the homework done and with whom it was done. These questions were included to verify the pattern emerging from the case study analysis. Question 8 could then also be correlated with question 7 to determine the time spent on homework when working alone or with a group. Case study learners working in groups had spent more time on their homework than workers working alone.

Question 7 was included to determine how efficiently the learners did the homework, as the case study candidates showed a trend of not being very efficient in doing homework. The question could be related to question 2 (quantity of homework), question 3 (completion of homework) and question 9 (difficulty of homework) to establish the efficiency (time versus quantity) of the homework. The use of time intervals was seen as appropriate as the learners would estimate the time taken for the homework retrospectively, and not actually time the homework.

Questions 10 and 11 referred to the effectiveness of the homework. This concern originated from the homework observations done on two of the case study candidates, as neither completed the homework assigned. The reasons for this trend could not be probed at the time, as such a probe would change the relationship with the candidates (from friend and equal to authoritative figure).

Questions 9 and 12 helped to understand the learners' perception of Mathematics and Mathematics homework. These questions were also with regard to the case study candidates' perception of coping with the subject and yet failing it. Many of the classes were also asked to supply their Mathematics' mark and to write it in the bottom right hand corner of the questionnaire. The bottom corner was then folded over to ensure confidentiality - no names were written on the questionnaire and the mark could not be seen as the questionnaires were collected. Question 9 was also related to question 3 to determine whether the established pattern of only doing easier work could be confirmed or rejected.

Questions 13 and 14 were included to obtain clarity on the frequency with which homework was received and the frequency with which it was done. The emergent pattern from the case study candidates suggested that homework was not received very frequently and then not always done.

The marks supplied by the learners in the bottom right hand corner of the questionnaire were either the June examination marks, June test marks or the latest test marks. No standardisation of the marks was attempted between different tests, examinations, teachers, classes or schools as the different academic standards of the tests and examinations were not known. All marks were converted to percentages and should be viewed as an indication of possible marks only and not as absolute values. The inability of the case study candidates to report or remember their marks accurately suggested that these marks should be treated as unreliable and only as an approximation of the true mark.

7.4.1.5 Processing of survey data

The questionnaire was coded and the responses checked for completeness and accuracy before being entered into a data processing programme (Question and Answer) on the computer. A check for uniformity was not needed as only one person had administered all the questionnaires. The data was analysed by using cross-tabulation reports and presented as raw data with percentages in brackets. This form of presentation was chosen instead of the use of statistical packages, as the intention of the study was to describe and interpret the data rather than to find statistically significant variations or differences between sets of data.

7.4.2 Questionnaire to mathematics teachers

This study involved obtaining information from Mathematics teachers that had not been available from the learners or case studies. This information dealt with the amount of teaching time spent with the different grades and the intensity of the tuition given.

7.4.2.1 The purpose of the enquiry

The explosive increase in Mathematics lessons and homework for Thembani's Matriculation class prompted this follow-up study. The aim was to determine the amount of time spent on the tuition of each Grade and the intensity thereof. By intensity of tuition, the urgency of the need to work and learn is implied. A greater urgency would mean less missed lessons, more extra lessons, higher attendance expected, and/or more effective use of lesson time.

7.4.2.2 The target population and sample size

The target population consisted of all high school Mathematics teachers in the northern townships of Port Elizabeth. A Mathematics teacher was defined as any teacher teaching Mathematics at a high school. Teachers also teaching other subjects, substitute teachers, and Heads of Departments were included. The exact qualifications of the teachers were not considered as long as the teacher had a professional qualification.

The sample taken from the target population consisted of at least one Mathematics teacher per Grade in the nine schools used in the case studies. In some instances more than one teacher per Grade was interviewed. In other instances, the same teacher taught more than one Grade in the same year. A sample of 51 teachers was interviewed.

The sampling method used can best be described as convenience sampling according to Cohen and Manion (1980). The teachers at the nine case study schools were convenient to use for the survey. Alternatively, the sampling method could be described as purportive sampling (Cohen and Manion, 1980). The Mathematics teachers at handpicked schools were selected to represent the Mathematics teachers at all the schools in the northern townships.

7.4.2.3 Data collection technique

Face-to-face structured personal interviews were used to collect the data. This was considered the most effective way to enlist the co-operation of the teachers and to get the best high response rate. A trial involving dropping off blank questionnaires and fetching the completed ones showed that completeness was lacking. The teachers tended to answer the questions half-heartedly.

Rapport was easily established as I was a fellow Mathematics teacher and was known to some of the teachers. The use of personal interviews allowed for the clarification of questions. The known identity of the teachers enabled answers to be clarified or followed up. However, the known identity may have resulted in sensitive questions lacking depth, although I never gained the impression that this was the case.

The interviews were conducted with the individual teachers by visiting them at their schools. A location was found which allowed enough privacy to ensure honest and open answers, such as the teacher's classroom or an empty staffroom. Each question on the interviewing schedule was read out to the teacher and the response marked down on the schedule. The teacher could see both the questions and the marking of the responses at all times.

7.4.2.4 The interview schedule

The principals and teachers were assured that the aim of the interview was not to judge the school, the teaching or the teachers but merely to collect more information for the project. The principal and at least one of the teachers were already aware of the project due to my constant re-appearances for information of the selected learner or the other issues mentioned above.

The interview schedule consisted of set structured questions. The teachers were interviewed rather than just asking them to complete the questionnaire so that the teachers could supply additional information without feeling that they would have to set it out in writing.

The teachers were shown the questions as they were interviewed and could thus hear and read them simultaneously. They would also be able to see all the options available and select the appropriate option(s). More than one answer per question was often accepted.

Ten questions were asked in a combination of open and closed-ended questions. The questions asked were:

TEACHER QUESTIONNAIRE

1. How often do the [Grade]'s receive homework?

   On average in a week: once, twice, three times, four times, five times.

2. On average, how many pupils in [Grade] do their homework when given?

   <20%, 20%-40%, 50%, 60%-80%, 80%-100%.

3. Is extra time spent on Mathematics (over and above normal assigned periods)? [for the Grade taught by the teacher].

   Yes, No.

4. How often are the extra lessons given? [for the Grade taught by the teacher].

   Never, once a week, twice a week, more than twice a week, whenever a period becomes available, whenever the work demands it, each weekend, other.

5. When are the extra lessons given? (Please indicate on more than one if necessary). [for the Grade taught by the teacher].

   Before school, after school, during free periods, during swopped periods, on Saturdays, on Sundays, other.

6. Do the respective teachers usually manage to finish the syllabus?

   Yes, No.

7. Why was the syllabus not completed? [for the Grade taught by the teacher].

   Syllabus too long,
   Time too short,
   Learners work too slowly,
   Learners don't understand that part anyway,
   Learners don't want to work,
   Teachers can't do the work,
   Teachers are not trained to do the work,
   Other.

8. Which sections were left out? [for the Grade taught by the teacher].

   Parts of: Geometry, Algebra.
9. Have you given extra lesson to your class this year? [for the Grade taught by the teacher].

10. If so, how many?

11. If it were suggested that more teaching time was spent on the Matriculants than on the lower Grades, would you agree or disagree?

Question 1 was used to confirm or reject the pattern as established from the case studies that the learners did not receive homework very often.

Question 2 was needed to determine whether learners generally did the homework assigned. The case study candidates had generally done homework when it had been assigned. However, it needed to be determined whether this was a true reflection of their study habits or due to the Hawthorne effect (Cohen and Manion, 1994).

The sudden increase in extra time spent on Mathematics during Thembani's matriculation year, prompted questions 3, 4, 5, 9, 10 and 11. Did Matriculation teachers at other schools also feel the need to spend so much time on the subject? Did any other teachers, teaching different Grades, feel that extra time was needed or was this urgency restricted to the Matriculation year? Question 4 (frequency of extra lessons) and question 5 (when the lessons were given) were only asked if the response to question 3 (extra time spent on Mathematics) was affirmative. Questions 9 and 10 were kept separate from questions 3, 4 and 5 so that the teacher would not be inclined to answer in general, but would give specific answers.

Questions 6, 7 and 8 were connected to the questions on extra time spent on Mathematics as extra lessons would assist in completing the syllabi. The questions on which sections of the syllabus had been left out were only asked if the response to question 6 (whether the syllabus had been completed) was negative. Completing the syllabi would ensure that the learners had covered all the work needed to continue with work in the next Grade. Not completing the syllabi would contribute to Nonthembeko's errors made during the homework observations.

7.4.2.5 Processing of survey data

The responses were coded and tabulated by hand. Checks for completeness had been done during the interviews. Uniformity was not relevant as only one person had interviewed all teachers. Accuracy checks were done before tabulating the data. This was possible due to cross-referencing questions and cross-referencing teachers who taught more than one Grade. The data was presented as raw data only, as descriptive trends were sought and interpreted. No statistical analysis was done as statistically significant variations or differences between data sets were not sought.

7.4.3 Time learners spent on problems

The time learners spend on problems has an effect on homework in that it impacts on the number of problems that can be completed during a set time period. Problems not done cannot contribute to the practice of Mathematical skills and thereby lower the overall skills available which can be used on later problems. The efficiency (time versus number of problems done) with which the problems can be done thus effects the time spent on homework or the number of problems done within a set time period. This study thus involved a test to determine more detail on the efficiency with which learners did their homework.

7.4.3.1 The purpose of the enquiry

The aim of this follow-up project was to establish the amount of time taken by the learners to solve homework problems. The time reportedly spent on homework, for the number of problems assigned for homework, indicated that the case study candidates took a relatively long time to complete problems in comparison to the time allocated to problems in examinations. It must be noted that homework is not done at the same pace at which examinations are written, as it is considered a practice session rather than a test of skills. Thus, examination time frames were seen as a guide only and time was added for the comparisons with homework. However, as homework should still be done efficiently, a method to establish the time taken to complete actual homework problems was needed (in contrast to self-reported estimates of unknown homework problems).

Further, during the observations while Nonthembeko and Mongesi did their homework, it became evident that they took unexpectedly long to work through each problem (again in comparison to examination standards with time adjusted for homework). The reasons for this were twofold. The two learners tended to write out all intermediate steps in full and do little mental work. Secondly, both worked and seemed to think fairly slowly, often rechecking steps already completed, especially calculator work.

As Cooper (1994) pointed out in his study of the literature on homework, the research on time and homework does not distinguish between the amount of homework assigned and the time taken to complete it. Cooper could find no studies that separated these variables. The research generally compared the time spent on homework to achievement (Keith, 1982; Hagborg, 1991) or the effects of homework versus no homework (Austin and Austin, 1974; Friesen, 1979; Moyana, 1996).

No study thus far has looked in detail at the actual homework assigned and the time taken to complete it. However, it was felt that the reasons why the case study candidates took so long to complete their homework could only be established if the actual homework assigned was looked at in detail.

The speed at which problems are solved can depend on a myriad of variables or combination thereof. These would include the type of Mathematics, the level of difficulty of the Mathematics, the level of difficulty of the problem, the number of problems, the ability of the learner, the natural speed at which the learner works and the method of calculation which the learner chooses or is capable of.

The timing and observation of a large number of learners doing homework was considered impractical. The time required to build up a relation of trust and establish a relaxed and natural environment in which the learner could naturally do homework would be prohibitive, especially if learners worked individually at their homes. A compromise of timing learners doing problems in class was therefore considered appropriate. Learners would be working in a familiar environment under familiar circumstances and the entire class could be timed at once.

Learners were thus timed while they did a problem in class, simulating homework. The expected speed at which a problem should be done was taken as the time allowed as indicated by mark allocation during an examination.

7.4.3.2 The target population and sample size

As with the group questionnaires, the target population can be viewed in two ways. For the purpose of pattern verification, it consisted of all the Grade 11 learners taking Mathematics in the nine selected schools. For the purpose of generalization, the target population consisted of all Grade 11 learners taking Mathematics in the northern townships of Port Elizabeth.

The sample population consisted of all available Mathematics learners in Grade 11 at five of the selected schools on the day the timing was done. A total of six classes and 155 learners were timed.

7.4.3.3 Data collection technique

Permission to time the learners was obtained from the principal and teachers involved. The teachers were asked to present their lessons as usual, but to allow one or two problems to be timed while the learners did classwork. The project and timing exercise were explained to the learners. No pressure was put on the learners to finish quickly or to rush the problems. No indication of an expected outcome was given.

All were asked to do the designated problems, on a sheet of paper handed to them, as if they were doing homework. If they did homework together with others, they could also do these problems with a partner or as a small group.

All started the problems simultaneously and were asked to raise their hands as soon as they had finished. The time taken would then be given to them and written on the sheet. All sheets were then collected for analyses of time and mistakes made.

At two schools, it was possible to obtain the learners' marks. All the learners present were thus asked if their marks could be obtained and used for comparative purposes. Names were then written on the papers and a mark list obtained from the teacher concerned to make the comparison possible. Marks were not made available at the other school as it was considered confidential information that belonged to the learners. I did not press the matter as I had already obtained data from two schools and had also obtained learners' versions of their marks during the learner questionnaire.

7.4.3.4 Processing of survey data

A memorandum was set for each assigned problem to establish a realistic time in which the problem should be completed. The realistic time was calculated according to the time allowed as indicated by mark allocation during an examination.

In finer detail this means that the problem assigned was marked according to the standard generally set for the end of year examination. The marks allocated were compared to the total number of marks allocated for such an examination (120 marks for two hours in Grade 11). The ratio of marks versus time was then calculated in order to determine the time available for the assigned problem during an examination. The mark allocation was done 'leniently', resulting in possibly more time being allocated than in an examination. The reasoning behind this was that this was, after all, homework and as such a practice session, rather than a test of skills.

The memoranda were set in consultation with Dr J. Clarke and D. Harper. Dr J. Clarke is the Mathematics HOD at a prestigious Port Elizabeth High School with 22 years experience in teaching, marking, setting and moderating examinations. D. Harper, also formerly a Mathematics teacher at the above school with 35 years experience, has been lecturing Mathematics and Mathematics Method at a College of Education. His duties include setting, moderating and marking papers. My own 9 years of experience are that of teaching and lecturing Mathematics and Mathematics Method at a High School and a College of Education.

In those two instances where previous marks were made available, times to complete the problem were compared to the marks in an attempt to throw more light on the use of time while doing Mathematics problems. That this attempt has no real internal validity is accepted as learners were told that they may discuss the problem and work together. The times are also dependant on which learners worked together. A weak learner may well have worked with a stronger learner and thus have had a faster time than usual or vice versa. Comparison with previous findings was thus used as a tentative guide only. The timing data was recorded and analysed by hand, without the use of a computer programme.

7.4.4 Analysis of common errors

During the homework observations of two case study candidates, the 'strategies' used in calculating answers to problems and the errors made during calculations caused concern. The strategies used included writing out everything in every step laboriously, without doing mental work or using shortcuts. The errors made, by one candidate in particular, were numerous. Errors made during homework would impact on the effectiveness of the homework done as incorrect work does not enhance learning. This study thus attempted to gain more information on strategies used and errors made while doing homework. Such a detailed study on homework has not been published before (Cooper, 1994).

7.4.4.1 The purpose of the enquiry

During the homework observations while Nonthembeko and Mongesi did their homework, Nonthembeko experienced many Mathematical problems. The Mathematical errors tended to originate in previous Grades. Errors made with the multiplication of signs, like and unlike terms or the order of operations indicated problems experienced in Grades 7 and 8. Others, such as including the variable in the coefficient of b in quadratic equations or problems with surds, originated in Grades 9 and 10.

Both learners also tended to stop working before all calculations had been completed. It was thus seen as relevant to investigate at what stage learners considered problems to be complete and why. Incomplete homework is ineffective as learning of the total concept cannot take place. It is also inefficient as the number of problems completed in a set time period is greatly reduced although the number of problems started may have increased.

At what stage did they perceive the homework to be complete and why? As these questions were not asked during the case studies, so as not to affect the relationship built up with the candidates, they needed to be established at this stage.

It was to gain more insight into the type of errors made by Grade 11 learners in the northern townships that this follow-up study was initiated. The question asked was whether many learners made mistakes originating in previous Grades or whether Nonthembeko was a unique case. As only one case study candidate had been observed making such mistakes, Nonthembeko could easily be an exception. No pattern had been established. However, as such (and other) mistakes would have considerable effect on the effectiveness of the homework, the types of errors made were worth investigating.

The main aim thus was to analyse a significant number of problems for the errors made. The type of errors and prevailing misconceptions influenced the ability of learners to do effective homework. Learners not doing effective homework would not be able to achieve in examinations as errors and misconceptions were being reinforced during homework.

A secondary aim was to gain insight into how the learners 'worked' the problems. To what extent was work that could have been done mentally or in one step on a calculator, written out laboriously? Were problems re-checked or re-worked? Were problems completed or left incomplete? If so, for what reasons were they incomplete?

7.4.4.2 The target population and sample size

As for 7.4.3.2.

7.4.4.3 Data collection technique

As for 7.4.3.3 as the data used was the same as that for the timing of the problems. The problems done during the timing survey were further analysed for mistakes made.

7.4.4.4 Processing of survey data

Each problem done by the learners during the timing of work was examined for the errors made by the learners. The errors were then categorized according to type of error and school grade during which the original misconception or error would have occurred. This was considered as the school grade in which the work was first dealt with.

As Grade 6 to 11 learners worked through the Interim Eastern Cape school syllabi set up in 1995, all references to Mathematics done in the various Grades refers to these syllabi.

As an example, the factorization of $2x^2 - 9x - 36$ will be used. Although factorizing of trinomials is first done in Grade 9, only problems without a coefficient of x^2 are part of that syllabus. Grade 10 deals with trinomials containing a coefficient of x^2. Thus if a learner incorrectly factorized a trinomial without a coefficient of x^2, it was categorized as a Grade 9 error. However, if the trinomial had a coefficient of x^2, it became a Grade 10 error.

Errors such as "long method used", "problem incorrectly copied", "variables left out" or "careless mistakes" were not assigned to a Grade as they deal with the use of time (T), Mathematical nonsense (N) or careless work (C).

The mistakes were coded and a tally sheet was made up (by hand) of the types of mistakes. The tally sheets were used to analyse the types and prevalence of mistakes. No statistical analysis was done as the types of errors commonly made were sought and not whether the frequency of their occurrence was significant or not. The general type of error, ie. its origin or the reason it was made, was considered important rather than whether a significant number of learners made the mistake or not. The errors found here were considered to be only a small 'sample' of errors made by the learners during a small "sample' of problems.

Coding categories of the mistakes depended on the problem that had been done and included:

- calculation left incomplete;
- long method used (correctly);
- incorrect substitution;
- problem incorrectly copied;
- incorrect subtraction during long division;
- used root other than x = 1 as first factor (but also correct);
- Mathematical nonsense;
- incorrect factorisation of trinomial;
- incorrect cubing;
- re-did portion of problem in identical manner;
- incorrect multiplication of exponents;
- careless mistakes.

7.5 Summary

In order to confirm or reject pattern strands established from the case studies and to find answers to additional questions that arose from the case studies, four follow-up studies were done. These were a questionnaire to 524 learners, a questionnaire to 51 teachers, the timing of certain problems while the learners did the problems and an analysis of those problems to determine errors commonly made by the learners.

The findings from the follow-up studies are presented separately in the following chapter.

CHAPTER EIGHT

FINDINGS OF PHASE II:
SOME QUESTIONS ANSWERED

Questions had arisen from the case study analysis that needed to be addressed if this study was to describe and interpret accurately how learners perceived and did their homework. These questions would confirm or reject the trends seen in the emergent pattern, as well as supply answers that had not been (or could not be) given by the case study candidates.

This chapter contains the findings of the four follow-up studies that asked the additional questions. The findings are tabled and described here and are then discussed thoroughly in the next chapter. The data supplied in the tables is presented as raw data with percentages usually given in brackets. This form of presentation was considered adequate for the purposes of description and interpretation, and as readily accessible to most readers. No deeper statistical analysis was done as the intention of the study was to describe and interpret the data rather than to find statistically significant variations or differences between sets of data.

Brief summaries of the findings of the individual follow-up studies are given on pages 285, 300 and 327 and a summary of all four survey findings is given on page 329.

8.1 Learner homework questionnaire

8.1.1 Introduction

The questionnaire was compiled in Xhosa to eliminate misunderstandings due to the language barrier. Answers appeared to be generally honest and sincere and were accepted as such. The findings obtained were thus treated as internally valid with the assumption that they matched the reality of the situation (Merriam, 1988).

Of the 524 learners who completed the questionnaire at the nine schools used in the case studies, 90 had been busy with algebra, 43 with Analytical Geometry, 302 with Geometry and 76 with Trigonometry. Only 13 learners had not stated what type of Mathematics they had been doing. The large number of learners busy with Geometry is attributed to the questionnaire being circulated towards the end of the year, a time at which many teachers elect to do Geometry. The implication of this is that the results may be skewed towards the homework trends for Geometry homework rather than those for general Mathematics homework.

The pattern from the case studies suggested that less homework is assigned and done for Geometry than for the other Mathematical topics. The reason appeared to be the difficulty experienced in doing Geometry. My own experience is borne out by the case studies that teachers tend to do as little Geometry as possible, as late as possible. They teach the theorems but shy away from the riders as they find them difficult to complete. As a result, they assign little homework that would require them to assist learners with riders or to supply solutions or corrections for riders. Learners, therefore, not having practice in solving riders, find Geometry homework difficult and leave most of it undone.

However, enough data is available on all Mathematical topics to be able to compare the homework trends in the various topics. The influence of the many learners busy with Geometry was thus not seen as an overly dominating factor in the data analysis. The case study pattern and the findings from the surveys were also accepted as comparable as the homework topics done by the case study candidates were often mentioned. It was thus possible to see the homework trends for Geometry and the other Mathematical topics in both the case studies and the surveys.

8.1.2 Findings

8.1.2.1 Frequency of homework received

At the end of the questionnaire the learners were asked how often they generally received homework in a week. Five categories were given: once, twice, three times, four times or every day. Of the 524 learners who completed the questionnaire, 509 answered the question.

TABLE 8.1.1: Frequency of homework received

Homework Received Frequency of homework done	Once a week	Twice a week	Three times	Four times	Every day
Always	2	15	51	18	149
Mostly	0	1	38	13	67
Sometimes	1	13	53	7	79
Never	2	0	0	0	0
Total: 509	5 (0,9%)	29 (5,7%)	142 (27,9%)	38 (7,5%)	295 (58%)

(Percentages in brackets)

As is evident in Table 8.1.1, less than 60% of the Grade 11 learners claimed to receive homework every day. Of those, only 149/295 (50,5%) claimed to always do their homework, resulting in only 29,3% of the 509 learners doing homework every day. Almost 30% said that they received homework on average only three times a week.

However, as learners in the same class gave different answers to the same question, this should be interpreted as the homework received, as seen from the learners' perspective. Table 8.1.2 clearly shows that the learners were aware of homework to differing degrees, even though they were taught by the same teacher, at the same time and in the same class. While some learners claimed to receive homework each day, others were only aware of receiving homework three or four times a week. In the case of the KWL 11d class, only one learner claimed to receive homework every day, while the rest claimed to receive homework only once, twice or three times a week. In twelve of the twenty classes asked to complete the questionnaire, the majority of the learners had said that they received homework every day. No trend emerged with regard to whether the class was denoted as an A, B, C, D or E class.

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TABLE 8.1.2: Homework received per school, per class

Homework received School, class	once a week	twice a week	three times	Four times	five times
KMGX, 11a	0	6	5	1	15
KMGX, 11b	0	1	15	3	7
KWZ, 11a	0	1	0	0	26
KWZ, 11e	0	0	1	0	10
PKM, 11a	1	2	10	1	29
PKM, 11b	0	0	4	1	12
GQB, 11a	0	0	13	1	8
GQB, 11b	1	0	4	1	14
LWK, 11a	0	1	3	3	22
LWK, 11b	0	6	14	1	13
LWK, 11c	0	0	10	0	15
KWL, 11a	0	2	2	7	21
KWL, 11d	2	5	4	0	1
MSPT, 11a	0	1	18	5	11
MSPT, 11b	0	2	6	1	31
MSPT, 11d	0	2	11	0	16
CSLL, 11a	1	0	0	0	8
CSLL, 11b	0	0	4	1	19
SPK, 11a	0	0	9	3	4
SPK, 11b	0	0	9	9	13
TOTALS	5	29	142	38	295

8.1.2.2 Frequency of homework done

When the learners were asked how often they did the homework received, four optional answers were provided, viz. "always", "mostly", "sometimes" or "never". The learners were left to interpret the relative terms according to their own perceptions. The line drawn between " mostly" and "sometimes" is thus vague.

No absolute terms such as three or four times a week were provided as the responses were also dependent on the number of times homework was assigned. Had such absolute terms been provided, findings of three times a week could have implied either "always" or "sometimes", ie. only three times out of homework received each day or three times out of homework received three times a week respectively. Table 8.1.3 illustrates this distinction.

TABLE 8.1.3: Frequency of homework done versus homework received

Homework received **Frequency Homework done**	**Once a week**	**twice a week**	**three times**	**four times**	**Every day**	**Total: 509**
Always	2	15	51	18	149	235 (46,1%)
Mostly	0	1	38	13	67	119 (23,4%)
Sometimes	1	13	53	7	79	153 (30,1%)
Never	2	0	0	0	0	2 (0,4%)

(Percentages of homework done in brackets)

Of the 509 learners who answered the question, only 46,1% perceived themselves as always doing their Mathematics homework, with another 23,4% perceiving themselves as mostly doing their homework. Of the 235 learners who had claimed that they always did their homework, only 149 claimed to have received homework every day. This resulted in only 29,3% of the learners having done homework every day. Another 30% claimed to only sometimes have done their homework. Of these only slightly more than half (51,6% or 15,5% of the total) had received homework every day.

8.1.2.3 Quantity of the previous day's homework done

The possible responses for the question of how much of the previous day's homework had been completed by each learner, consisted of five categories, from which the learner was asked to select one. The categories were: "homework not done at all", "some of it done", "half of it done", "most of it done" and "all of it done". The relativity of "some", "most" and "all" was left to the discretion of the learner. Thirteen learners had not given a response to the question.

TABLE 8.1.4: Amount of homework done.

Mathematics	Not done No.	%	Some done No.	%	Half done No.	%	Most done No.	%	All done No.	%	Total No.
Algebra	11	12,2	19	21,1	11	12,2	12	13,3	37	41,1	90
Anal.Geom.	4	9,3	3	7,0	4	9,3	12	27,9	20	46,5	43
Geometry	60	19,8	60	19,8	39	12,9	41	13,5	103	34,0	303
Trig.	8	10,5	12	15,8	9	11,8	28	36,9	19	25,0	76
TOTAL	83	16,2	94	18,3	63	12,3	93	18,2	179	35,0	512

Only 35% of all the learners had completed all the homework. In Algebra, Analytical Geometry and Geometry the greatest number of learners (although never more than half) claimed to have completed all the homework. In Geometry only just over a third had completed all the homework while in Trigonometry barely a quarter of the learners had completed all the work assigned (Table 8.1.4). When combining the figures of those who had done "most" or "all" of the homework, they rise above the

50% mark in Algebra (54,4%), Analytical Geometry (74,4%) and Trigonometry (61,8%). In Geometry, the figure remains below 50% at only 47,7%.

The percentage of learners having completed half or less of the homework are 45,5% for Algebra, 25,57% for Analytical Geometry, 52,5% for Geometry and 38,2% for Trigonometry. These figures do not take into account whether the homework completed was correct or not.

The percentage of learners not having done any homework ranged from 9,3% to 19,8% with an average of 16,2% (83/512). A trend of most homework completed in Analytical Geometry and least completed in Geometry appeared evident.

8.1.2.4 Reason for not doing homework

The case study candidates had claimed to understand the reasons why they were expected to do homework. If learners did not do the homework, the reasons for this were expected to throw light on possible problems experienced by learners. Only those learners who had not done the previous day's homework at all were asked to give a reason for this. Six excuses were available as responses, with a seventh being added if the learners requested it. The excuses were "no time", "homework too difficult", "not interested", "homework too easy", "homework a waste of time" and "learner too lazy".

TABLE 8.1.5: Reasons for not doing homework

Maths	No time (%)	Too Diff. (%)	Not inter-ested (%)	Too Easy (%)	Waste of time (%)	Too Lazy (%)	Ab-Sent (%)	TOTAL
Algebra	2	5	0	0	0	1	2	10
Anal.Geom	0	2	1	0	0	1	0	4
Geometry	16	40	2	1	0	1	0	60
Trig.	0	8	0	0	0	0	0	8
TOTALS	18 (21,9)	55 (67,1)	3 (3,7)	1 (1,2)	0	3 (3,7)	2 (2,4)	82

(Percentages for reasons in brackets)

Only on two occasions did learners ask to include "being absent" as the reason for not doing homework, as the learners were asked to complete the questionnaire for the last occasion on which they had received homework, if they had not received homework the previous day.

The predominant reason given for not having done homework was that the homework was "too difficult". This accounted for 50% or more of the responses to the question. Not having time to do the homework accounted for 21,9% of the reasons given (Table 8.1.5).

Not having a place to do homework was only covered by Question 6, where an option of "other" had been given for where homework was done. As none of the case study candidates had indicated a problem with a place in which to do homework, and various candidates even gave alternative venues for doing their homework (Zoleka even using three alternative venues), this aspect had not been included in the questionnaire. The questionnaire had been designed to confirm the observed pattern in the case studies and not as a general questionnaire collecting information (due to reasons already stated in the methodology). The problem of having no place to do homework was thus not considered part of this study.

Geometry showed the greatest variety of reasons for not doing homework, and had the highest percentage of learners who put forward "too difficult" as a reason for not doing homework (66,6%) and also the highest percentage of learners not doing any homework (19,8%) (Table 8.1.4).

8.1.2.5 When the previous day's homework had been done

This question asked the learner when he/she had done the previous day's homework. The six possible responses offered were: "in class"; "after school, at school"; "in the evening"; "after school, at home"; "before school that morning"; "before class that morning". No other options were given and no learners asked to give answers other than those supplied. That learners were not averse to asking for additional options was demonstrated in Question 4, where learners asked to have another option included, and Questions 5 and 12, where learners asked if more than one option could be selected. The answers received are as shown in Table 8.1.6.

TABLE 8.1.6: When homework was done

When homework was done	No. of learners (adjusted no.s)
In class	55 (54)
After school while at school	66 (61)
In the evening	115 (115)
After school when at home	250 (238)
Before school that morning	7 (11)
Before class that morning	30 (26)
TOTAL	525 (505)

Two learners did not answer the question and three learners chose two options, viz. "in class" and "after school at school" and "in class" and "after school at home". This suggested that they started the homework in class and completed it after school. The three above responses have been included in both options thus resulting in a total count of 525.

The figures in brackets are viewed as the more realistic figures, as they have been adjusted for probable accuracy by excluding learners who possibly misinterpreted the question. As can be seen from Table 8.1.8 when comparing where and when the homework was done, misinterpretation of the question possibly took place. An example of such a misinterpretation is homework, which was done "after school when at home" but "at school".

This misinterpretation could be due to the lack of definition in the options given or possibly due to the translation into Xhosa. The options "after school" were divided into locality, ie. "when at home" or "at school" rather than defining whether the time immediately after school or later in the afternoon was intended. It was also not made clear that "before class" implied before class at school, thus differentiating it from "before school".

The figures of the nine schools grouped together show that 299/505 (59,2%) of the learners had done their homework in the afternoon after school (either at school or at home), while 115/505 (22,8%) had done theirs in the evening. This resulted in almost 82% having done their homework during the "normally accepted" times for doing homework -during non-school hours according to Cooper's (1994) definition, in the afternoons or evenings. Only 7,3% and 10,7% did theirs in the mornings or during the period in which the homework was assigned, respectively.

8.1.2.6 Where the previous day's homework had been done

This question followed the question on when the homework had been done and gave five possible responses. A response of "other" was included, with space provided for further detail. The same two learners as above did not answer the question and the same three learners gave two responses. The three learners gave "in class" and "in your room" as their two responses, creating the impression that they had started the homework in class and had continued it at home. Two of these learners were from the same class while the third was in another school. The responses received are as shown in Table 8.1.7.

TABLE 8.1.7: Where homework was done

Where homework was done	No. of learners (adjusted no.s)
In class	117(116)
In your room	234 (228)
In the lounge	131 (130)
At school	33 (31)
Other	10 (10)
TOTAL	525 (515)

The figures in brackets were again viewed as the more realistic figures, as they had been adjusted for possible accuracy. In comparing where and when the homework was done, it became evident that the question had possibly been misinterpreted in some cases. This can be seen in Table 8.1.8. An example of such a misinterpretation would be homework that was done "at school" but "after school when at home". However, it is quite possible for a learner to do homework before class at home (but not before school) as most of the schools open their gates during break. Many of the learners go home during this time for lunch or books. Homework could thus be done at home during break.

The response of "other" was selected by only 10 learners. The detail supplied was: "at school" (1), "library" (2), "Kwitshomi" or "kulo tshomi wam" (a friend's) and "kulu Maba" (Maba's - possibly a friend) (3), "Egumbini lokutyela" (dining room) (1), "Newell High" by learners of Lwandlekazi (2), "ETamsanqa" (another school) (1), "assembly" (1), "kitchen" (1). Two of these, viz. "at school" and "egumbini lokutyela" were included in the options of "school" and "in your room" respectively, thus resulting in a total of 10 and not 12 for the category of "other".

TABLE 8.1.8: Comparison of where versus when homework was done

Where done When done	Class	Room	Lounge	School	Other	TOTAL
Class	54	1	1	1	0	57
After school, at school.	46	5	0	15	0	66
Evening	1	68	42	3	1	115
After school, at home	1	154	84	2	9	250
Before school.	1	3	3	0	0	7
Before class	14	3	1	12	0	30
TOTAL	117	234	131	33	10	525

The option of "no place to do the homework" was not given. It was assumed that learners who had reached Grade 11 would have found a suitable place to do their homework by then. Learners not being able to do homework due to lack of a suitable place were assumed to be unable to reach Grade 11. This assumption was supported by the responses of all but two learners, to the question concerning the place in which homework was done, and the lack of requests for an option of "no place to do the homework". As previous requests for additional options were made quietly and on a one-to-one basis, embarrassment at asking for such an option was considered negligible. None of the case study candidates had expressed a problem with a location in which to do homework.

From the figures of "where homework was done" it can be said that 358/515 (69,5%) had done their homework at home, with the majority having done it in their rooms. 147/515 (28,5%) had done theirs at school, either in the classroom or at another venue at the school. Less than 2% preferred another venue such as a library, a friend's home or another school.

8.1.2.7 Time taken to do the homework

For this question the learners were asked to estimate the time they had taken to do their homework the previous day. Possibilities of "less than fifteen minutes" to "more than two hours" were given in fifteen-minute or half-hour intervals (Table 8.1.9).

As the responses were estimates of time, the fact that the time intervals chosen overlapped was considered inconsequential in comparison to the clarity obtained by using easily recognisable time intervals. It was felt that no learner would have to decide between 29, 30 or 31 minutes as the time spent on homework. The period spent doing homework would either be perceived as more than half an hour or less than half an hour, etc. Learners were not approached the day before and asked to time their homework as this would have led to false responses in time taken, amount of homework completed and number of learners having done their homework, as the learners would have been more aware of doing the homework than normally.

It should also be taken into consideration that the responses were made from the learners' perspectives only. In estimating the time spent doing homework, five minutes may feel like half an hour to a reluctant learner while an hour may be perceived as 45 minutes to a learner enjoying the work.

Seven of the 524 learners did not complete the question on the time taken to do the homework and twelve learners left out the question on how much homework had been completed. The total number of responses taken into consideration was thus 515. Learners who had not done their homework on the previous day were asked to complete the questions for the last time they had done homework. These responses were included in the sample.

8.1.2.7(i) Type of Mathematics versus time taken for homework

TABLE 8.1.9: Time taken to do homework by all learners at the nine schools

Type of Maths Time taken to do homework	Algebra (%)	Analytical Geometry (%)	Geometry (%)	Trigonometry (%)	TOTAL (%)
< 15 mins	10	3	19	1	33
15 - 30 mins	27 (30,3)	14 (31,1)	69 (22,8)	12 (15,4)	122 (23,7)
30 - 45 mins	27 (30,3)	7 (15,6)	58 (19,1)	27 (34,6)	119 (23,1)
45 mins - 1 hr	21 (23,6)	12 (26,7)	99 (32,7)	13 (16,7)	145 (28,2)
1 - 1½ hrs	3	5	31 (10,2)	18 (23,1)	57 (11,1)
1½ - 2 hrs	1	3	11	5	20 (3,9)
> 2 hrs	0	1	16	2	19 (3,7)
TOTAL	89	45	303	78	515

(Percentages of time taken in brackets).

Over 70% of the learners perceived themselves as having done between 15 minutes and one hour's homework on the previous day, regardless of the type of Mathematics they had currently been doing (Table 8.1.9). In Algebra, Analytical Geometry and Geometry this figure rose to 84,3%, 73,3% and 74,6% respectively, while it was somewhat lower in Trigonometry at 66,7%. Only in Trigonometry did a relatively large number (23%) of the learners estimate the time taken to complete the homework as being between one and 1½ hours. Less than 30% spent the recommended amount of "up to one hour" for Grade 11 on their homework (Kroeze, 1989).

Table 8.1.10 shows the number of learners who perceived themselves as having done less than 30 minutes homework and those who saw themselves as having done approximately one hour's homework. A relatively large proportion of learners had done less than thirty minutes homework, especially in Algebra and Analytical Geometry.

TABLE 8.1.10: Number of learners who perceived themselves as having done less than 30 minutes homework or approximately one hour's homework

Type of Maths Time taken to do homework	Algebra (%)	Analytical Geometry (%)	Geometry (%)	Trigono-metry (%)	TOTAL (%)
≤ 30 mins	37 (41,6)	17 (37,8)	88 (29)	13 (16,7)	155 (30,1)
45 min - 1½ hr	24 (27)	17 (37,8)	130 (42,9)	31 (39,7)	202 (39,2)

Learners, busy with Geometry and Trigonometry, perceived themselves as spending more time on the homework, with approximately 40% having spent roughly one hour on the work.

Table 8.1.11, of the learners who had completed all or most of the assigned homework, shows similar trends to those in Table 8.1.9.

TABLE 8.1.11: Time taken to do homework by learners who completed all or most of the homework

Type of Maths Time taken to do homework	Algebra (%) All or most	Analytical Geometry (%) All or most	Geometr y (%) All or most	Trigono-metry (%) All or most	TOTAL (%) All or most
< 15 mins	6	3	8	0	17
15 - 30 mins	16 (32,7)	9 (28,1)	32 (22,7)	8 (17)	65 (24,2)
30 - 45 mins	15 (30,6)	5 (15,6)	29 (20,6)	18 (38,3)	67 (24,9)
45 mins - 1 hr	11 (22,4)	8 (25)	45 (31,9)	9 (19,1)	73 (27,1)
1 - 1½ hrs	1	4	15	6	26
1½ - 2 hrs	0	2	5	5	12
> 2 hrs	0	1	7	1	9
TOTAL	49	32	141	47	269

(Percentages of time taken in brackets).

8.1.2.7(ii) Homework categorized as easy or difficult versus time taken.

Four learners did not respond to the question on how easy or difficult the homework had been for them. Together with the seven learners who had not answered the question on the time taken to do the homework (two of which did not answer both questions), 515 responses were available for analysis.

The question required learners to rank the difficulty of the previous day's homework. The options ranged from "easy", "not easy", "not difficult", "difficult" to "partly easy and partly difficult". The terminology for this question was derived from the terminology used by the nine case study candidates during interviews and diary entries. All options are highly subjective with the difference between "not easy" and "not difficult" very vague and open to individual interpretation.

TABLE 8.1.12: Time taken to do homework by all learners at the nine schools in comparison to the perceived difficulty of the homework

Perceived difficulty Time taken to do homework	Easy (%)	Not easy (%)	Not diff-icult (%)	Diffi-cult (%)	Partly easy Partly diff-icult	TOTAL (%)
< 15 mins	6	5	7	5	10	33
15 - 30 mins	20 (45,5)	29 (23,6)	23 (28,4)	14 (13,3)	36 (22,2)	122 (23,7)
30 - 45 mins	4	29 (23,6)	20 (24,7)	22 (21,0)	45 (27,8)	120 (23,3)
45 mins - 1 hr	8	33 (26,8)	23 (28,4)	35 (33,3)	45 (27,8)	144 (28)
1 - 1½ hrs	3	19 (15,4)	6 (7,4)	14 (13,3)	15 (9,3)	57 (11,1)
1½ - 2 hrs	2	6	1	5	6	20
> 2 hrs	1	2	1	10	5	19
TOTAL	44	123	81	105	162	515

(Percentages in brackets)

As in the type of homework done, the majority of the learners (>70%) had completed their homework in 15 minutes to one hour (Table 8.1.12). This was expected as the same data was being viewed albeit in comparison to another variable. Interesting, though, was that the pattern changed little whether the homework was perceived as "not easy", "not difficult" or "partly easy and partly difficult". This could be interpreted as being due to the vague differences of the terms and their subjective natures. However, for homework that had been perceived as difficult, little change was seen in the pattern although 9,5% (10/105) took more than 2 hours to complete their homework, and 27,6% took longer than an hour. Only when the homework had been perceived as being easy had 45,5% done their homework in 15 - 30 minutes, with a total of 59% having completed it in less than half an hour.

8.1.2.7(iii) Achievement versus time taken

In many studies the time spent on homework was seen as an indicator of achievement (Goldstein, 1960; Keith, 1982; Keith and Page, 1985) and as having a direct positive effect on Mathematics. In comparing the marks supplied by 349 learners and the time spent on the previous day's homework, the following findings emerged:

TABLE 8.1.13: Time spent on homework as compared to marks supplied by learners

Time taken Marks	**< 30 mins**	**30-45 mins**	**45-60 mins**	**1 - 1½ hours**	**> 1½ hours**	**Total**	**%* of total**
0 - 10%	9 43%	5 24%	5 24%	0	2 9%	21	24%
11 - 20%	5 17%	12 40%	10 33%	2 7%	1 3%	30	40%
21 - 30%	17 42%	6 15%	12 29%	5 12%	1 2%	41	41%
31 - 40%	26 34%	11 14%	21 28%	9 12%	9 12%	76	39%
41 - 50%	19 29%	15 23%	16 25%	10 15%	5 8%	65	40%
51 - 60%	7 15%	13 29%	12 27%	8 18%	5 11%	45	45%
61 - 70%	14 47%	7 23%	8 27%	1 3%	0	30	30%
71 - 80%	10 40%	5 20%	4 16%	4 16%	2 8%	25	32%
81 - 90%	6 55%	2 18%	1 9%	2 18%	0	11	27%
91 - 100%	4 80%	0	1 20%	0	0	5	20%
Total	117	76	90	41	25	349	38%

(%*: Percentage of learners spending 45 minutes to 1½ hours on homework)

Only approximately 40% of the learners spent the recommended amount of time on Mathematics homework. Recommended time for Mathematics homework was taken as approximately one hour as summarized from Smith (1988), Kroeze (1989) and Marquis (1989) (See 2.3.4.7.2). However, the expected trend of more time spent on homework resulting in greater Mathematics achievement did not emerge from the data. In fact, the trend seemed to show the opposite. A greater percentage of learners who had spent the recommended time on homework received poor marks. Learners receiving high marks appeared to have spent less time on their Mathematics homework. However, it must be borne in mind that the data only covered one afternoon's homework.

8.1.2.7(iv) With whom the homework was done versus time taken

As some of the case study candidates had worked with a friend or as part of a group, a question asking whether learners had done their homework on their own, with a friend or in a group had been included in the questionnaire. This question also made it possible to compare the time spent on homework to whether it was done alone or as part of a group. Three learners had not completed this question, two of whom had also not responded to the question on the time taken to do their homework.

Learners who had done their homework on their own, generally appeared to have completed the homework in a shorter time period than those who had worked with a friend or in a group (Table 8.1.14). Those working in a group had tended to spend the most time on their homework, with only 15,5% spending 15 - 30 minutes and 36,1% spending 45 minutes to one hour on their homework.

TABLE 8.1.14: Time taken to do homework by all learners at the nine schools in comparison with whom they did their homework

With whom done Time taken to do homework	On their own (%)	With a friend (%)	In a group (%)	TOTAL (%)
< 15 mins	25	7	1	33
15 - 30 mins	86 (27,2)	21 (20,4)	15 (15,5)	122 (23,6)
30 - 45 mins	78 (24,7)	21 (20,4)	22 (22,7)	121 (23,4)
45 mins - 1 hr	79 (25,0)	31 (30,1)	35 (36,1)	145 (28,1)
1 - 1½ hrs	24 (7,6)	15 (14,6)	17 (17,5)	57 (11,0)
1½ - 2 hrs	14	3	3	20
> 2 hrs	10	5	4	19
TOTAL	316 (61,2)	103 (20,0)	97 (18,8)	516

(Percentages in brackets)

8.1.2.8 Quantity of homework done and with whom?

Case study learners working in groups had spent more time on their homework than workers working alone. The question thus arose of whether the learners working with a friend or in groups had spent more time doing homework because they did more homework or because they worked more slowly or less efficiently. To answer the question a comparison was made between the amount of homework done and with whom it had been done.

Table 8.1.15 shows that, of the learners who had worked alone, 40,5% had completed all their work while over 55% had done most or all of the homework. Those working with a friend or in a group tended not to complete their homework, with only 26% having completed all the work and less than 50% having completed all or most of the homework. It would thus seem that learners having done the homework on their own were more productive than those working with others, as more work was done and less time utilized, ie. the homework was done more efficiently.

TABLE 8.1.15: Comparison of the amount of homework done and with whom the homework was done

Homework done With whom done	None (%)	Some (%)	Half (%)	Most (%)	All (%)	TOTAL
on own	50	50	34 (11,0)	50 (16,2)	125 (40,5)	309
with a friend	18	22	15	21 (20,6)	26 (25,5)	102
in a group	14	22	14	22 (22,4)	26 (26,5)	98
TOTAL	82	94	63	93	177	509

(Percentages in brackets)

8.1.2.9 Quantity of homework done versus easy or difficult

The candidates that answered both the questions - how much homework was done and its perceived grade of difficulty - numbered 509. The responses to the questions are shown in Table 8.1.16.

Of the candidates who had found the homework easy, more than 50% had completed their homework. This pattern was found again for candidates who had found the homework "not difficult". For those that had found the homework "not easy" or " difficult", less than 30% had completed the work. For the category "partly easy and partly difficult" the majority of the learners had done all or most of the homework. It would thus appear that the more difficult homework was left undone or only partly done. This, too, would explain the lack of contrast in the time taken to do the homework, regardless of the degree of difficulty (Table 8.1.12), as less homework was completed when it was difficult (resulting in the same amount of time as taken for the easier homework).

TABLE 8.1.16: Degree of perceived difficulty of the homework in comparison to the amount of homework done

Perceived difficulty Amount of homework done	Easy (%)	Not easy (%)	Not diff-icult (%)	Diffi-cult (%)	Partly easy Partly diff-icult	TOTAL (%)
None	7 (15,9)	30 (25,0)	6	24 (23,5)	15	82
Some	4 (9,1)	23 (19,2)	12 (14,6)	27 (26,5)	28 (17,4)	94
Half	0	16	7	24 (23,5)	16	63
Most	9 (20,4)	17	15 (18,3)	9	43 (26,7)	93
All	24 (54,6)	34 (28,3)	42 (51,2)	18 (17,6)	59 (36,6)	177
TOTAL	44	120	82	102	161	509

(Percentages of degree of difficulty in brackets)

It would appear that homework termed "not difficult" had in fact been considered easier than that termed "not easy". This was supported by the high number of candidates who had done "none", "some" or only "half" of the homework in the "difficult" and "not easy" categories.

8.1.2.10 Correctness of homework

In a question on the correctness of homework, the candidates had been asked how much of the previous day's homework had been correct. The possible responses supplied were that they "didn't know", or had had "none", "some of it", "half of it", "most of it" or "all of it" correct. As in the previous questions, the learner was left to judge how much "some" or "most" of the homework was. This was done as some classes may have received many problems, others few, some only one problem, some long problems and some short problems. Thus, asking how many problems had been done would have led to misinterpretation of the data. Even asking for the number of problems completed out of the number received would have led to confusion as many learners could not remember what and how much homework they had received, without being reminded by fellow learners. Information of the previous day's homework was requested at the beginning of the questionnaire, eg. textbook, page number, exercise number and problems.

Eleven of the 524 candidates did not answer this question, leaving 513 responses. The number of responses for correctness of homework is presented in Table 8.1.17.

TABLE 8.1.17: Correctness of homework

Correctness of homework	Number of learners	Number of learners Who knew correctness of homework
Don't know	122 (23,8%)	
None of it	35 (6,8%)	35 (9.0%)
Some of it	118 (23,0%)	118 (30,2%)
Half of it	112 (21,9%)	112 (28,6%)
Most of it	97 (18,9%)	97 (24,8%)
All of it	29 (5,6%)	29 (7,4%)
TOTAL	513	391

From these responses one would assume that 122 learners' homework had not been corrected, as they did not yet know whether it was correct or not. Of the remainder (391 learners), a high percentage (58,5%) had only some or half of the homework correct with 9% having none correct. Less than a third (32,2%) had had most or all of the homework correct.

If these responses were examined together with those of the question on whether the homework had been corrected in class or not, the summary for the learners who had

had their homework corrected was little different from that of when all candidates were included (Table 8.1.18).

TABLE 8.1.18: Amount of homework correct compared to whether the homework had been corrected or not

Homework correct?	Homework corrected? Yes	No
Don't know	6 (1,8%)	116 (62,7%)
None of it	26 (8,0%)	9 (4,9%)
Some of it	103 (31,6%)	14 (7,5%)*
Half of it	88 (27,0%)	24 (13,0%)
Most of it	82 (25,2%)	14 (7,6%)*
All of it	21 (6,4%)	8 (4,3%)
TOTAL	326	185

As an additional 2 candidates (*) had not answered this question, the total number of candidates for the summary was 511, of which 63,8% (326/511) claimed that the homework had been corrected. The high percentage of learners saying that their homework had not been corrected could be due to two possibilities. Either the answers had not been discussed in the class or they had received the questionnaire before having had their Mathematics class for that day. The latter was possible, as I had been led from one class to the next in some of the schools, to have the learners complete the questionnaire, starting with the first class during their Mathematics period.

Despite not having had their homework corrected, 37,3% (69/185) of the learners had claimed to know how much of it had been correct. This could be attributed to the answers of problems being available in the back of most Grade 11 Mathematics textbooks. It must thus be assumed that those not having known whether their homework was correct, either had not looked in the back of the textbook, had not had a textbook, had not received homework out of their textbook or had not been sufficiently interested in their achievements to look up the answers. While doing the questionnaires with the classes, it had been evident that many learners had not had textbooks and that homework was often assigned from other textbooks, old examination papers or from worksheets.

When the amount of correct homework was compared to how much homework had been done, a few interesting figures arose. These included the number of candidates who had done no homework yet claimed to have some of it correct, the candidates who stated that they had not completed all the homework and yet had most or all of it correct or the learners who had had more homework correct than they had completed (Table 8.1.19).

The interpretation from the initial question would be that the candidates not having done the previous day's homework had responded to the question for the last homework done, as requested in the questionnaire. A possible interpretation for the other figures could be that the candidates had considered the amount of homework completed as the total amount of homework done, when considering the question on the correctness of the homework. The terms "half", "some" or "most" thus became relative to the amount of homework completed by the learner and not to the amount of homework assigned.

When considering only the candidates who had completed all their homework, the percentage for correctness of most or all the homework increased to 41,9%. Those who had had more than half the homework correct remained constant at 58,7%. This implied that a higher percentage of learners who had done all their homework, had had most or all their homework correct, than all the learners considered together (125/502 or 24,9%), regardless of how much homework they had completed.

When only the percentages of the candidates who had completed most of the homework and had most of it correct were examined, it became evident that they had the highest percentage of all homework correct, at 25,3%. The assumption was made that the candidates answered the question as having had most of most of the homework correct (ie. all the homework completed was correct). Still not an impressive figure, especially when considering that they had only completed the work that they had been able to do.

TABLE 8.1.19: Comparison of how much homework was considered correct to the amount of homework done by the learners

Homework correct / Homework done	Don't know (%)	None (%)	Some (%)	Half (%)	Most (%)	All (%)	TOTAL
None	16	17	15	16	12	2	78
Some	26	8	**27**	26	5	2	94
Half	15	3	22	**18**	4	0	62
Most	16 (17,6)	3 (3,3)	27 (29,7)	19 (20,9)	**23 (25,2)**	3 (3,3)	91
All	46 (26,0)	2 (1,1)	25 (14,1)	30 (16,9)	53 (30,0)	**21** (11,9)	177
TOTAL	119	**33**	116	109	97 (19,3)	**28** (5,6)	502

(Percentages of the amount of homework correct for candidates having done all or most of the homework in brackets)

A study of the highlighted figures in Table 8.1.19 shows that more learners had felt they had none of the homework correct (33) than had had all of it correct (28), regardless of how much they had attempted. A majority of 44,8% had had only "some" of "half" of the homework correct. Due to the relativity of the terms used, this information could be interpreted in two ways. Either a majority of learners had had half or less of the homework correct or at least 45 (27 + 18) of these learners had had all of the attempted homework correct. The latter interpretation assumes that the learners had responded with the double relativity explained above.

When the 119 learners who had not known whether their homework was correct or not were discounted, a majority of 58,7% (225/383) had had half or less of the homework correct. Those having had all the attempted homework correct (whether completed or not) remained a poor minority at 23,2% (89/383).

Comparing the type of Mathematics to the amount of correct homework, as in Table

8.1.20, suggests that the learners had had the least amount of homework correct in Geometry, where 33,9% had had either none or only some of the homework correct. This is followed by Trigonometry (29,3%), Analytical Geometry (26,6%) and Algebra (19,3%). The reverse order emerges when the percentages for all or most homework correct are examined. In Algebra, 31,8% of the learners had reported most or all the homework correct, in Analytical Geometry, 28,9%, in Trigonometry, 24,7% and in Geometry, only 21,9%.

TABLE 8.1.20: Amount of correct homework in the different types of Mathematics

Homework correct Homework done	Don't know	None	Some	Half	Most	All	TOTAL
Algebra	22 (25,0)	5 (5,7)	12 (13,6)	21 (23,9)	22 (25,0)	6 (6,8)	88
Anal. Geom.	11 (24,4)	2 (4,5)	10 (22,2)	9 (20,0)	8 (17,8)	5 (11,1)	45
Geometry	73 (24,3)	27 (9,0)	75 (24,9)	60 (19,9)	49 (16,3)	17 (5,6)	301
Trigonometry	15 (19,5)	0	21 (27,3)	22 (28,6)	18 (23,4)	1 (1,2)	77
TOTAL	121	34	118	112	97	29	511

(Percentages of correct homework in each type of Mathematics in brackets)

When comparing the perceived degree of difficulty in the types of Mathematics, a very similar pattern emerged (Table 8.1.21). 45 - 50% of the learners had found Geometry and Trigonometry "difficult" or "not easy", while only 25% had felt this way about Algebra and Analytical Geometry.

The learners thus appeared to have found Algebra homework the easiest to complete and get correct and Geometry the most difficult to complete and get correct.

TABLE 8.1.21: Percentage of learners that found the homework difficult or not easy

Type of Maths	Algebra	Anal Geom.	Geometry	Trigonometry
Homework difficult or not easy	25,7	25,3	48,2	45,5

8.1.2.11 Degree of difficulty of Mathematics

An additional question enquiring about the perceived degree of difficulty of Mathematics as a subject was inserted in the questionnaire. It was hoped that this would assist in explaining the contradictions obtained from the case study candidates as they had had a perception of coping with the subject and yet were failing it. The learners were asked whether they found Mathematics easy or difficult, with no further grading of options given. However, some learners asked to add an option of "in-between" and others marked both "easy" and "difficult" to indicate that Mathematics was sometimes easy and sometimes difficult for them. Only 14 of the 524 learners did not answer this question.

In the responses approximately two thirds of the candidates found Mathematics to be difficult (Table 8.1.22). This finding was as expected in keeping with past official Mathematics Matriculation pass rates of 17,9% (SG) and 18,5% (HG) in 1992 and 17,9% (SG) and 16,5% (HG) in 1993 (Mr J. van Rensburg, D.E.T. *pers. comm.* Oct 94). Statistics for 1994 and 1995 were not released although no official declaration of such was ever made.

In addition to the marks (as percentages) supplied by the learners, three codes were entered into the database. These were for classes not asked to supply marks (41), candidates not knowing their marks (101) and for candidates not having received their June reports (usually due to the parents not fetching the report personally) (21) and 1 candidate who was sick during the June examination. A total of 346 responses to both questions were available for analysis.

TABLE 8.1.22: Degree of difficulty of Mathematics as perceived by the learners

Mathematics - degree of difficulty	Number (%)
Easy	161 (31,6%)
Difficult	334 (65,5%)
In-between/both	15 (2,9%)
TOTAL	510

The candidates' marks have been grouped into ranges of 10 for the purpose of tabulation with a distinction made between 33% and 34% as 33,3% is the pass mark for standard grade.

An expected trend of a greater percentage of candidates with lower marks finding Mathematics a difficult subject emerges when comparing the learner' perception of the subject with his/her mark (Table 8.1.23). What is surprising though is the number of learners with marks of 33% or less whose response to the question was "easy". A percentage of 13,6 (14/103) candidates had failed the previous test or examination on standard grade level and yet stated that Mathematics was easy. If the figures for "in-between/both" are included in this calculation, the figure increases to 18,4% or 19/103. Thus 18,4% of the candidates found Mathematics "not difficult", yet had failed.

TABLE 8.1.23: Comparison of the learners' perception of the degree of difficulty of Mathematics to the marks given at the bottom of the questionnaire

Maths difficulty Marks (%)	Easy	Difficult	In-between/ Both	TOTAL
0 - 10	2 (9,5)	18 (85,7)	1 (4,8)	21
11 - 20	2 (6,9)	26 (89,7)	1 (3,4)	29
21 - 30	7 (17,1)	33 (80,5)	1 (2,4)	41
31 - 33*	3 (25,0)	7 (58,4)	2 (16,6)	12
34 - 40*	18 (27,7)	44 (67,7)	3 (4,6)	65
31 - 40*	21 (27,3)	51 (66,2)	5 (6,5)	77
41 - 50	21 (32,8)	42 (65,6)	1 (1,6)	64
51 - 60	19 (42,2)	24 (53,3)	2 (4,5)	45
61 - 70	16 (53,4)	13 (43,3)	1 (3,3)	30
71 - 80	12 (50,0)	11 (45,8)	1 (4,2)	24
81 - 90	7 (70,0)	2 (20,0)	1 (10,0)	10
91 - 100	5 (100,0)	0 (0)	0 (0)	5
TOTAL	112 (32,4)	220 (63,6)	14 (4,0)	346

(Percentages of the degree of difficulty per % range in brackets. *Data duplicated for purposes of clarity as 331/3 is the pass mark)

8.1.2.12 Mathematics marks

Perusing the Mathematics marks received, on their own (Table 8.1.24), it is possible to compare the "pass rate" of mid-year tests and examinations to the known previous Matriculation Mathematics pass rates of 17,9% (SG) and 18,5% (HG) in 1992 and 17,9% (SG) and 16,5% (HG) in 1993 (Mr J. van Rensburg, D.E.T. pers. comm. Oct 94).

TABLE 8.1.24: Number of learners obtaining mark ranges as indicated

Maths difficulty Marks (%)	TOTAL	
0 - 10	21 (6,1)	
11 - 20	29 (8,4)	
21 - 30	41 (11,8)	29,8%
31 - 33	12 (3,5)	
34 - 40	65 (18,8)	
41 - 50	64 (18,5)	
51 - 60	45 (13,0)	
61 - 70	30 (8,7)	
71 - 80	24 (6,9)	70,2%
81 - 90	10 (2,9)	
91 - 100	5 (1,4)	
TOTAL	346	

The responses given by the candidates suggest a 70,2% pass rate for mid-year Grade 11. Even though this should be considered on the high side as a proportion of the marks were only from tests and the remainder only on half a year's work, the contrast between these and the ±17% pass rate for Matriculation Mathematics suggests that there is a great difference in standards in the Grade 11 and Matriculation assessment.

8.1.3 Summary

A short synopsis of the responses to the learner questionnaires is as follows:

1. Less than 60% of the learners perceived themselves as receiving homework everyday. Of these only half actually claimed to always do

homework, ie. 30% do homework everyday. Almost 30% said they received homework on average only three times a week. The awareness of homework assigned appears to differ from that of homework received.

2. Less than 50% of the learners involved stated that they did homework each time they received it. Thirty percent only "sometimes" or "never" did homework.

3. Less than half the learners had done all the homework assigned on the previous day. In Trigonometry and Geometry, fewer learners had completed all the homework than in Algebra and Analytical Geometry. Up to half the learners had only completed half or less of the homework, with an average of 16% not having done any of the homework at all.

4. The predominant reason for not doing homework was that the work was "too difficult". The only other significant reason given was that of "no time".

5. Most homework was done in the afternoons after school, or in the evenings, during "normally accepted" times for doing homework according to school culture. The minority did homework in the mornings before school or during school hours.

6. A large majority of the learners asked did their homework at home, mostly in their rooms. A small minority of 2% preferred a venue other than home or school in which to do their homework.

7. (i) 70% of the learners perceived themselves as doing 15 minutes to 1 hour's homework. Learners tended to take a little longer for Trigonometry and Geometry homework than for Algebra and Analytical Geometry. A relatively large proportion of 30% had spent less than 30 minutes on the homework.

   (ii) The time taken to do homework changed little regardless of whether it was perceived as easy or difficult.

   (iii) Learners working on their own generally did the homework in a shorter time than those working with a friend or in a group did.

8. Learners working on their own generally completed more of their homework than those working with a friend or in a group did.

9. More of the homework was done if learners perceived it as "easy" or "not difficult". Less was done if the homework became "not easy" or "difficult".

10. Less than a third of the participants had most of the homework correct, with a high percentage (58,5%) having half or less of the homework done correct. Thus very few learners were getting more than half of the homework, considered easy enough to do, correct. Algebra homework appeared to be the easiest to do and get correct, whereas Geometry appeared to be the most difficult.

11. Approximately two-thirds of the participants found Mathematics to be a difficult subject. However, some learners had categorised Mathematics as "easy" and yet had failed the subject according to the marks they had supplied.

12. When comparing Grade 11 and Matriculation examination marks, there appears to be a great difference in standards of assessment between Grade 11 and the Matriculation examination.

8.2 TEACHER QUESTIONNAIRES

8.2.1 Introduction

Many questions arose from the case studies concerning the frequency, quantity and quality of homework. These are factors generally decided by the teacher and influenced by the length and number of periods that learners have in the subject. Thus, to obtain more information on the above factors, a survey of teachers was conducted.

The explosive increase in Mathematics lessons and homework for Thembani's Matriculation class further prompted the teacher questionnaire. The questionnaire was also used in an attempt to establish whether this was a 'normal trend' in all nine schools. Various Grade 8 - 12 Mathematics teachers were interviewed using the questionnaire as set structured questions for the interview. Not all Mathematics teachers were interviewed but at least one per Grade in each school made him/herself available. Occasionally one Grade was covered by two teachers, eg. one teaching Grades 8 and 10 and another teaching Grades 10 and 11. A total of 51 teachers were interviewed at nine different schools, some of whom taught more than one Grade.

Questions were asked with the intention of establishing the relative quantities of homework given to and done in each Grade, the amount (if any) of extra time spent on Mathematics in each Grade and whether enough time was available to complete the syllabus.

The last question was prompted by the amount of teaching time lost according to the case studies. Although not strictly within the focus of the study, the impact on homework was considered important enough to include the topic in the questionnaire. The amount of time taken by the Grade 11 candidates to do a few problems also suggested that they either worked very slowly or experienced grave difficulties in doing their work. If work in previous years had not been completed and had not been covered in the subsequent year, such difficulties could be expected.

8.2.2 Findings

A synopsis of teacher responses for each Grade can be seen in Tables 8.2.1 - 8.2.5. The number of teachers interviewed for each Grade is indicated above each table. The total of the number of teachers indicated does, however, not agree with the 51 teachers interviewed as some teachers taught more than one Grade and were interviewed for each Grade. The responses given by all interviewed are then indicated within the sections for the different questions asked of them.

However, the 'tallies' do not always co-incide with the number of teachers interviewed. As the questions referred to trends rather than concrete facts, some teachers gave more than one response in certain questions, which resulted in a greater number of tallies than the number of teachers interviewed. Fewer tallies than the number of teachers interviewed occurred when a teacher had given a response to a previous question that excluded subsequent questions. An example of this is question 3: If the teacher did not spend extra time on Mathematics with her class, questions 4 and 5 (how often and when extra lessons were given) became irrelevant.

TEACHER QUESTIONNAIRE - GRADE 8

TABLE 8.2.1: Responses to questionnaires of Grade 8 teachers (n = 10)

<table>
<tr><th>QUESTION</th><th colspan="5">RESPONSES</th></tr>
<tr><td>1. How often do the Grade 8's receive homework?</td><td>Once
0</td><td>Twice
1</td><td>Three times
3</td><td>four times
4</td><td>five times
4</td></tr>
<tr><td>2.On average, how many pupils in Grade 8 do their homework when given?</td><td>< 20%
0</td><td>20%-40%
1</td><td>50%
1</td><td>60%-80%
6</td><td>> 80%
1</td></tr>
<tr><td>3.Is extra time spent on Maths (over and above normal assigned periods)?</td><td colspan="2">Yes
2</td><td colspan="3">No
7</td></tr>
<tr><td>4.How often are the extra lessons given?</td><td>1

2

1</td><td colspan="4">never.
Once a week.
Twice a week.
More than twice a week.
Whenever a period becomes available.
Whenever the work demands it.
Each weekend.
Other: KMGX: Whenever teacher has time</td></tr>
<tr><td>5.When are the extra lessons given? (Please indicate on more than one if necessary).</td><td>
1
1

</td><td colspan="4">before school.
After school.
During free periods.
During swopped periods.
On Saturdays.
On Sundays.
Other:</td></tr>
<tr><td>6.Do the respective teachers usually manage to finish the syllabus?</td><td>Yes
2</td><td>No
8</td><td colspan="3"></td></tr>
<tr><td>7.Why was the syllabus not completed?</td><td>4
2

2
3

1

4</td><td colspan="4">Syllabus too long.
Time too short.
Too many boycotts and strikes.
Pupils work too slowly.
Pupils don't understand that part anyway.
Pupils don't want to work.
Teachers can't do the work.
Teachers not trained to do the work.
Other: KMGX: HOD told teacher to leave out unimportant sections.
CSLL: Used video tapes (Teleschool) - especially Geometry
SPK: Need to catch up on Grade7 work.
PKM: Need to explain little bits at a time - takes longer to complete a section, also redid some Grade 7 work.</td></tr>
</table>

8. Which sections were left out?	LWK: Ratio & proportion, parallelograms. KMGX: Ratio & proportion. MSPT: Geometry - only did triangles and parallel lines. CSLL: "Not sure as I don't have a copy of the syllabus" KWL: Ratio & proportion. SPK: Algebra, Geometry and linear equations not finished - too long. PKM: Mensuration. GQB: Parts of Geometry. KWZ: Triangles in Geometry, calculator work and Ratio & Proportion.
9. How many extra lessons have you given to each class this year?	LWK: 10; MSPT: 3 since August
10. Is more time spent on Matrics than on the lower Grades ?	LWK: Yes KMGX: Not asked MSPT: Yes CSLL: Not asked KWL: Yes SPK: Yes PKM: Definitely yes GQB: Yes KWZ: Yes

Further comments:

Two teachers taught Grade 8 at CSLL, while one teacher gave homework three or four times a week the other assigned homework five times a week.

In MSPT, additional lessons were given when the pupils demanded it (Question 4) and during the teacher's free periods (Question 5).

The reason calculator work was left out (Question 8) at KWZ was because the pupils did not have calculators.

None of the work left out (Question 8) was examined and the teacher at KWL said that it was not done in Grade 9.

For Question 10, the teacher at SPK claimed that more time was spent with the Matrics than with the other classes, as the Matric syllabus had to be completed due to external examinations. Matric pupils even attended classes during boycotts. The lower classes tended to concentrate only on work done at the moment and were not interested in previous work. They also preferred shorter tests (excluding previous work) out of 50 marks to tests out of 200 marks. The teacher would thus prefer the Standard 6's to write two examination papers instead of only the one they wrote at present, and so have a similar system to the Grades 10- 12.

For the same question, the teacher from PKM commented that he also taught Grade 12 Science and continually complained that the Matrics spent more time doing Mathematics exercises than Science. He had to force them to do their Science.

The teacher from GQB put the extra attention for Matric Mathematics down to them having only six subjects while Grade 8's had seven subjects. He was thus not actually answering the question but was also mistaken with the number of subjects for Grade 8 as the curriculum calls for nine subjects.

TEACHER QUESTIONNAIRE - GRADE 9

TABLE 8.2.2: Responses to questionnaires of Grade 9 teachers (n = 9)

<table>
<tr><th>QUESTION</th><th colspan="5">RESPONSES</th></tr>
<tr><td>1. How often do the Grade 9's receive homework?</td><td>Once
0</td><td>Twice
2</td><td>three times
0</td><td>four times
2</td><td>five times
5</td></tr>
<tr><td>2.On average, how many pupils in Grade 9 do their homework when given?</td><td>< 20%
0</td><td>20%-40%
3</td><td>50%
2</td><td>60%-80%
1</td><td>> 80%
3</td></tr>
<tr><td>3.Is extra time spent on Maths (over and above normal assigned periods)?</td><td colspan="2">Yes
5</td><td colspan="3">No
4</td></tr>
<tr><td>4.How often are the extra lessons given?</td><td>
1
1
1

3

2

</td><td colspan="4">never.
once a week.
twice a week.
more than twice a week.
whenever a period becomes available.
whenever the work demands it.
each weekend.
other: KMGX: Sometimes on a Sat.
MSPT: More time spent with 7's than 6's.</td></tr>
<tr><td>5.When are the extra lessons given? (Please indicate on more than one if necessary).</td><td>
3
2
1
1

</td><td colspan="4">before school.
after school.
during free periods.
during swopped periods.
on Saturdays.
on Sundays.
other:</td></tr>
<tr><td>6.Do the respective teachers usually manage to finish the syllabus?</td><td>Yes
2</td><td>No
7</td><td colspan="3"></td></tr>
<tr><td>7.Why was the syllabus not completed?</td><td>2
2
1
4

2

4

</td><td colspan="4">syllabus too long.
time too short.
too many boycotts and strikes.
pupils work too slowly.
pupils don't understand that part anyway.
pupils don't want to work.
teachers can't do the work.
teachers not trained to do the work.
other:KMGX: Pupils do not come to class
towards exam time.
KWL: Certain topics take very long.
PKM: Language - communication and
terminology not understood.
GQB: Teacher busy with exam committee so
often can't get to class.</td></tr>
</table>

8.Which sections were left out?	LWK: Graphs and triangles (Geometry). KMGX: Exponents and some ways of plotting graphs. MSPT: Most of Geometry. CSLL: None KWL: All statistics and ratio & proportion. SPK: A few things in Algebra. PKM: Mensuration and statistics. GQB: Geometry - only did parallel lines and triangles. Algebra - graphs on data handling. KWZ: None.
9. How many extra lessons have you given to each class this year?	LWK: Twice a week to once a month, depending on Chapter. KMGX: ± 5 after June. MSPT: 3 times a week since August. CSLL: ± 8. KWL: Less than 10. KWZ: 7 - 8.
10. Is more time spent on Matrics than on the lower Grades ?	LWK: Yes KMGX: More time spent with 8's than 7's. MSPT: More time spent with 7's than 6's. CSLL: Not asked. KWL: Can't really say. SPK: Not asked. PKM: Yes GQB: Yes, most time spent with Matrics. KWZ: No, claimed to spend a lot of time on Grade 9 but spent much time on sport.

<u>Further comments:</u>

When extra lessons were given (Question 5) some pupils did not attend. The comments given were:
KMGX: Most pupils don't attend.
SPK: Pupils don't attend.
KWL: Only a few pupils attend, those that tend to be making progress anyway.
LWK: 8 - 10 pupils request additional explanations.

Of the work left out in Grade 9 (Question 8), the teacher of LWK said he would try to do it in Grade 10. At KWL it was not done in Grade 10 and at PKM it would only partly be done in Grade 10.

At GQB, the teacher complained that the commercial class did not want to do homework and would sit in class and listen as though a lecture were being given. They were not active in class.

TEACHER QUESTIONNAIRE - GRADE 10

TABLE 8.2.3: Responses to questionnaires of Grade 10 teachers (n = 11)

QUESTION	RESPONSES				
1. How often do the Grade 10's receive homework?	Once 1	twice 0	three times 3	four times 0	Five times 7
2.On average, how many pupils in Grade 10 do their homework when given?	< 20% 1	20%-40% 2	50% 3	60%-80% 5	> 80% 0
3.Is extra time spent on Maths (over and above normal assigned periods)?	Yes 7		No 2		
4.How often are the extra lessons given?	 1 1 1 1 1 2	never. Once a week. Twice a week. More than twice a week. Whenever a period becomes available. Whenever the work demands it. Each weekend.(KMGX: pupils don't attend) other: SPK: Sometimes once a week. MSPT: Each weekend for first 3 months of year and first 3 months of second semester.			
5.When are the extra lessons given? (Please indicate on more than one if necessary).	 5 1 2 1	before school. After school. During free periods. During swopped periods. On Saturdays. On Sundays. Other:			
6.Do the respective teachers usually manage to finish the syllabus?	Yes 4	No 5			
7.Why was the syllabus not completed?	2 5 5 1 2 4	syllabus too long. Time too short. Too many boycotts and strikes. Pupils work too slowly. Pupils don't understand that part anyway. Pupils don't want to work. Teachers can't do the work. Teachers not trained to do the work. Other:KWL: Start late at beg. Of year. PKM: Pupils do not practice Maths. GQB: Start late at beg. Of year. CSLL: Pupils lack basics from lower Grades.			

8.Which sections were left out?	LWK: Subject of formulae and exponents. KMGX: Subject of formulae, inequalities, parts of functions, literal equations, applications of Geometry. MSPT: None. CSLL: Polygons. KWL: Parts of Geometry (only did two theorems). SPK: Parts of Geometry (only did theorems marked as * for examination purposes). PKM: Parts of Algebra and Trig - some of the graphs and calculations on triangles. GQB: Geometry - midpoint and intercept theorem, exponents. KWZ: None.
9. How many extra lessons have you given to each class this year?	LWK: ± 25. KMGX: ± 15, most after June. CSLL: ≤ 10, all after June. SPK: 3. MSPT: ± 15. GQB: Basically once a week. KWZ: ± 10.
10. Is more time spent on Matrics than on the lower Grades ?	LWK: Yes KMGX: Definitely yes. MSPT: No, all classes are called in on Saturdays - Compulsory. CSLL: Didn't want to comment as didn't teach Matrics. KWL: Yes. SPK: Not asked. PKM: Yes. GQB: Definitely yes. KWZ: Yes.

Further comments:

Three teachers taught Grade 10 at KMGX, while one teacher gave homework five times a week the other two assigned homework only three times a week (One of these being the HOD for Mathematics).

The reasons for not completing the syllabus (Question 7) at two schools were due to the late start at the beginning of the year. The teacher at KWL stated that classes started [maybe] in February as the timetable was not ready. However, they were trying to solve the problem. At GQB classes only started at the end of February as registration took so long.

Of the work left out in Grade 10 (Question 8), only the teacher of PKM said that the Grade 11 teacher might touch on those topics.

In Question 10, the teacher of MSPT disagreed with the statement and said that the same amount of time should be spent on all classes and that a school should not only concentrate on Matrics if they wanted good classes. At that school it is compulsory for all classes to attend on Saturdays and pupils were punished if they did not attend. Thus, the majority of pupils attended the classes.

The teacher at GQB felt that the Matrics got too much attention, to the detriment of the junior classes. He tended to neglect the Grade 8's in favour of the Matrics.

The teacher at KWZ also taught Grade 8 and 12 and agreed that he spent more time on Matrics.

TEACHER QUESTIONNAIRE - GRADE 11

TABLE 8.2.4: Responses to questionnaires of Grade 11 teachers (n = 9)

QUESTION	RESPONSES				
1. How often do the Grade 11's receive homework?	Once 0	twice 0	three times 2	four times 3	five times 5
2.On average, how many pupils in Grade 11 do their homework when given?	< 20% 0	20%-40% 3	50% 1	60%-80% 2	> 80% 3
3.Is extra time spent on Maths (over and above normal assigned periods)?	Yes 6		No 3		
4.How often are the extra lessons given?	 1 3 1 3 	never. Once a week. Twice a week. More than twice a week. Whenever a period becomes available. Whenever the work demands it. Each weekend. Other: KWL: Some weekends. LWK: June holidays - 2 weeks. SPK: Whenever there is a problem.			
5.When are the extra lessons given? (Please indicate on more than one if necessary).	 4 5 1	before school. After school. During free periods. During swopped periods. On Saturdays. On Sundays. Other: LWK: during holidays.			
6.Do the respective teachers usually manage to finish the syllabus?	Yes 3	No 6			
7.Why was the syllabus not completed?	3 1 2 4 2 2 3 	syllabus too long. Time too short. Too many boycotts and strikes. Pupils work too slowly. Pupils don't understand that part anyway. Pupils don't want to work. Teachers can't do the work. Teachers not trained to do the work. Other:KWL: many holidays. SPK: Explanations often take very long. PKM: A lot of activities during school hours, time spent teaching Matrics and large classes (54).			

8.Which sections were left out?	LWK: Linear programming, application of sin, cos and area rule (done beginning of Matric). KMGX: Linear programming, sin, cos and area rule. MSPT: Linear programming (done in Matric). CSLL: None. KWL: Word problems in linear programming. SPK: Geometry - concurrency, difficult problems in linear programming and Trig - tan graphs. PK: Trig - solving triangles. (ie. sin, cos and area rule. GQ: Linear programming (no HG pupils), Trig - formulae, Algebra - theory of quadratic equations, functions and symmetry. KWZ: Linear programming and generally HG work, half of surds and exponents and Trig - 45° & 60° triangles.
9. How many extra lessons have you given to each class this year?	LWK: ± 70. MSPT: ± 7 since June (new teacher). CSLL: ± 5. KWL: 3 times a week plus holidays. SPK: Twice a month ≈ 18. KMGX: ± 7.
10. Is more time spent on Matrics than on the lower Grades ?	LWK: Yes, no extra classes for Grades 8 - 10. KMGX: Yes, Grade 11 and 12 get more attention. MSPT: Yes. CSLL: Teacher gives more attention (extra lessons) to 11's than 8's. KWL: No, most time should be spent with lower classes. SPK: Yes. PKM: Yes, gives Matrics more time than 11's (same teacher. GQB: Yes. KWZ: Yes, because of external exams and still catching up on backlog from lower classes (incl. Grade 7) till end of Grade 11.

Further comments:

At PKM the teacher had no time to give extra lessons (Question 3) as he also taught Matrics.

At KMGX, the teacher gave extra lessons (Question 5) to both Grades 11 and 12 on Saturday mornings but always took the Grade 12 class first.

The teacher of KWL managed to complete the syllabus (Question 6) because of the extra time used for Mathematics.

For Question 7, the teacher of MSPT preferred the term stayaways rather than boycotts and strikes.

Of the seven schools asked whether the work not done in Grade 11 (Question 8) was done in Matric, only four schools said that it was.

In Question 10, the teacher of KWL gave a negative response to the question but worded his answer as though he was referring to the ideal situation and not to what was actually happening in his class.

TEACHER QUESTIONNAIRE - MATRICULATION (GRADE 12)

TABLE 8.2.5: Responses to questionnaires of Matric (Grade 12) teachers (n = 10)

QUESTION	RESPONSES				
1. How often do the Matrics receive homework?	once 0	twice 0	three times 3	Four times 2	five times 5
2.On average, how many pupils in Matric do their homework when given?	< 20% 1	20%-40% 0	50% 1	60%-80% 4	> 80% 4
3.Is extra time spent on Maths (over and above normal assigned periods)?	Yes 9		No 0		
4.How often are the extra lessons given?	 2 4 1 1 3 2	never. once a week. twice a week. more than twice a week. whenever a period becomes available. whenever the work demands it. each weekend. other: LWK: 2 weeks in June holidays. MSPT: 3 times a month on weekends.			
5.When are the extra lessons given? (Please indicate on more than one if necessary).	 8 2 1 4 1 1	before school. after school. during free periods. during swopped periods. on Saturdays. on Sundays. other: LWK: During holidays.			
6.Do the respective teachers usually manage to finish the syllabus?	Yes 9	No 1 (HG)			
7.Why was the syllabus not completed?	 1	syllabus too long. time too short. too many boycotts and strikes. pupils work too slowly. pupils don't understand that part anyway. pupils don't want to work. teachers can't do the work. teachers not trained to do the work. other:			

8.Which sections were left out?	LWK: None. KMGX: None. MSPT: None. CSLL: None. KWL: None. SPK: HG only - difficult questions in logs, parts of Trig graphs. PKM: None, also did Grade 11 work. GQB: None. KWZ: None.
9. How many extra lessons have you given to each class this year?	LWK: ± 70. KMGX: ± 16. MSPT: ± 15 since June. CSLL: ± 5. KWL: 1 hour per week and 4½ hours on Saturdays. SPK: ± 14 - 15. PKM: Regularly once a week, sometimes twice. GQB: ± 3. KWZ: Whole April and Sept. holidays, one week in June holidays (formal timetable) and ± 10 afternoons.
10. Is more time spent on Matrics than on the lower Grades ?	LWK: Yes, no extra lessons for Grade 8 - 10. KMGX: Not asked. MSPT: Yes, always took Matrics before Grade 11's although he taught both. CSLL: Yes. KWL: Definitely yes. SPK: Yes, tendency to ignore lower classes. Spent more time with Matrics than Grade 11's although he taught both. PKM: Yes, spent more time with Matrics than Grade 11's although taught both. GQB: Yes, spent more time with Matrics than Grade 9's although taught both. KWZ: Yes, because schools are judged by their Matric results.

<u>Further comments:</u>

Two teachers taught Matrics at KMGX, of which one gave homework four times a week and the other five times a week.

For Question 2, the teacher of SPK stated that about 50% of the Matrics did their homework, but said that it was usually more and that that year's class was "particularly dull".

At GQB the teacher gave extra lessons (Question 4) twice a week but only if time was available and said that most pupils did not attend.

LWK had extra lessons three times a week for Matrics and 75% of the pupils attended the extra lessons given in the June holidays.

At SPK, not all SG pupils attended the extra lessons and at CSLL not all attended on Saturdays at the beginning of the year.

The teacher of KWZ managed to complete the syllabus (Question 6) because of the extra time used for Mathematics.

8.2.3 Summary

A short synopsis of the findings from the teacher questionnaires is as follows:

How often did the learners receive homework?

Of the ten teachers questioned for Grade 8, one assigned homework four to five times a week and one assigned homework three to four times a week. In the analysis this resulted in two additional tally marks. For Grade 10, the three teachers questioned at KMGX caused the additional tally marks. For Grade 11, the teacher of LWK assigned homework three to four times a week and for the Matriculation year the two KMGX teachers brought the count up to ten.

Of all the Grades, the Grade where learners were assigned homework every day by the majority of the teachers was Grade 10. In all other Grades, at most five of the teachers assigned homework every day with teachers showing a tendency of assigning homework three to five times a week. In each of the Grades 8 - 10, at least one teacher assigned homework only once or twice a week.

As Table 8.2.6 shows, there is no clear pattern or policy regarding the frequency of Mathematics homework at the various schools, with the exception of KWZ. In all Grades at KWZ teachers claimed to assign homework five times a week. At PKM, homework was given five times a week with the exception of Grade 12, where homework was only assigned four times a week. At LWK, homework was assigned three times a week by three of the teachers, including the Matriculation teacher, otherwise homework was assigned four or five times a week. KMGX teachers assigned homework twice a week for Grades 8 and 9 and three times a week for Grade 10. Only for Grades 10 and 12 was it increased to four or five times a week. In general it would thus appear that only 50% of the teachers assigned homework every day, including Fridays.

It is also interesting to note that at MSPT, the school with the highest Matriculation pass rate of the ex-DET schools in Port Elizabeth, homework was assigned four times a week for Grades 8 and 9 and five times a week for Grades 11 and 12. Only the Grade 10 teacher assigned homework three times a week - this was the same teacher who had said that Saturday classes were compulsory for all.

TABLE 8.2.6: Frequency of homework assigned on average per week by teachers to the various Grades in the schools visited.

Grade	Once a week	Twice a week	Three times	Four times	Five times
8		KMGX	LWK, CSLL, SPK	MSPT, PKM, CSLL, GQB	CSLL, PKM KWL, KWZ
9		KMGX, GQB		LWK, MSPT	CSLL, PKM, KWL, KWZ, SPK
10	CSLL		MSPT, KMGX		LWK, PKM, GQB, KMGX, KWL, KWZ, SPK
11			LWK, KWL	LWK, KMGX, SPK	CSLL, MSPT, PKM, GQB, KWZ
12			LWK, SPK, GQB	KMGX, PKM	CSLL, MSPT, KMGX, KWL, KWZ

How many learners (on average) did homework when assigned?

Of the responses from 49 teachers, only 11 felt that more than 80% of the learners did their homework. Of these 11, seven teachers taught Grades 11 and 12. This left only four teachers (14%) in the lower Grades who claimed that more than 80% did their homework. In each Grade, including Matriculation, at least one teacher claimed that less than 40% of the learners did their homework.

At KMGX the Grade 9 teacher stated that less than 20% had their homework correct. The same teacher reported that 20 - 40% had done their homework before school and that 60 - 80% had done the work by classtime. At KWL the Grade 9 teacher claimed that of the 20 - 40% of the learners that did their homework, many copied. The same was said by the Grade 11 teacher at MSPT. In Grade 10 at GQB, 60 - 80% did their homework. This was attributed to the fact that the parents were called in if the work was not done.

Was extra time spent on Mathematics?

Where two or three teachers taught the same Grade, but gave the same response in Question 3, the response was only entered once. This gave a total of nine responses (tallies) per Grade as opposed to the nine to 11 encountered in the previous two questions.

The number of teachers giving additional lessons, over and above the normal allocated periods, tended to increase as the Grades reached the Matriculation year. The numbers ranged from two of the nine teachers in Grade 8 giving additional lessons, to all Matriculation teachers giving additional lessons.

How often and when were extra lessons given?

The extra lessons given increase in intensity as the learners move from Grade 8 to Grade 12. Initially extra lessons take place when the work demands it or the teacher has the time, but go on to become regular weekly lessons in Grades 10 and 11. By Matriculation they are also given over weekends, even including Sundays and holidays.

Did the teachers usually manage to complete the syllabus?

Most teachers did not manage to cover the entire syllabus. Only in Grade 12 did all teachers cover the syllabus, although one teacher was not able to cover all the additional work in the Higher Grade syllabus. In all other Grades less than half the teachers covered the whole syllabus. An effort appears to be made to do the required work as the Grades approach the Matriculation year.

If not, why was the syllabus not completed?

Reasons for not completing the syllabus frequently given by the Grade 8 - 11 teachers, were that the learners worked too slowly and that the work from the lower Grades had not been completed. The learners thus lacked the basic skills needed for the higher Grades. Only Grade 8 teachers gave the syllabus being too long as a reason for not completing the syllabus. Grade 10 teaches gave too many boycotts and strikes as the cause for not completing the syllabus.

Only two teachers chose the response of "teachers can't do the work", "lack of teacher ability" or "lack of teacher training" as the reason for the unfinished syllabi.

Which sections were left out if the syllabus could not be completed?

In Grades 8 - 10, 13 of the 30 teachers stated that they had left out parts of Geometry. Five teachers said that they had not done ratio and proportion - a section not used elsewhere in Algebra but vital to Matriculation Euclidean Geometry and Analytical Geometry. In Grade 11, linear programming and parts of Trigonometry were left out by six of the teachers. Linear programming is designated as Higher Grade work in the syllabus but Trigonometry is done by all and is elaborated on in the Matriculation year.

It was also surprising to see it stated that mensuration was left out of the Grade 8 syllabus and to see the midpoint and intercept theorems mentioned in Grade 10 as these are not part of the respective syllabi.

How many extra lessons were given to the respective classes in the year of the questionnaire?

The number of extra lessons given tended to increase as the classes went from Grade 8 to Matriculation. This supports the information given in questions 4 and 5. However, the trend set in questions 1 to 5 lost its significance when taken in conjunction with the number of learners who failed to attend the extra lessons. Only in Grade 12, and partially in Grade 11, did the learners appear to start taking these seriously, with the majority attending.

Is more time spent on Matriculants (Grade 12's) than on the lower Grades?

Of the 39 teachers asked whether more attention was given to the Matriculants than to the lower Grades, two refrained from commenting and only three disagreed with the statement. The KWL teacher in Grade 11 gave a negative response to the statement. However, he worded his answer as though he were referring to the ideal situation, and not to what was actually happening in his classroom. The Grade 10 MSPT teacher was the same teacher who taught Thembani in Grade 11. Yet no evidence of extra lessons, particularly on Saturdays was given in Thembani's Grade 11 diary or interviews. Did the Hod's study-leave during Thembani's Grade 11-year lead to the practice of additional lessons being dropped? (The questionnaire was done two years later, possibly with the practice being re-established). The Grade 9 KWZ teacher claimed that the lower classes did not get less attention. He stated that he spent a lot of time with his classes. However, he had also spent much time on sport that year and so had not called for extra lessons on more than 7 or 8 afternoons.

8.3 Time learners spent on problems and common errors

8.3.1 Introduction

During the study it became evident that learners needed more time to complete homework problems than was expected according to examination standards and the type of problems assigned. The case study candidates appeared to spend a disproportionate amount of time on only a few problems, in comparison to mark and time allocations as set for examinations (see section 6.2.3.2). This finding was confirmed by two additional factors. Both Mongesi and Nonthembeko took a long time to complete their homework during the homework observations; and the teachers' claims that learners worked too slowly The reasons why learners needed so much time thus needed to be investigated. If the reasons could be established and were easy to correct, learners would benefit more from Mathematics homework and thereby arguably achieve higher marks than previously.

As the 155 learners (six classes) involved in the timing of set problems were asked to hand in the papers on which they had done the timed problem, analysis of their errors could easily be made. It was hoped that such an analysis would reveal reasons for learners needing so much time to do the work.

Although not a focus of the study, it was suspected that learners needed a long time to complete their homework due to gaps in the their Mathematical knowledge as a result of teaching time missed and incompleted syllabi. The resultant errors could lead to the original problem changing and thereby becoming longer or even impossible to complete. The problem below is given as a simple example of such a change.

Grade 10 KMGX: Subject of formulae, inequalities, parts of functions, literal equations, applications of Geometry left out of syllabus.

Solve for x if $x + \sqrt{(5 - x)} + 1 = 0$.

$$x + \sqrt{(5 - x)} + 1 = 0$$

$$x^2 + 5 - x + 1^2 = 0$$

Incorrect squaring as 'subject of formula' not dealt with in Grade 10.

$$x^2 - x + 6 = 0$$

Problem cannot be factorized as originally intended. Formula must be used and length of time needed to complete problem increases.

8.3.2 Findings

8.3.2.1 KWZ High School

An appointment was made with the teacher for 10:30, at which time she would be teaching the Grade 11a class. The lesson was already in progress, and the learners had been informed about the project by the time I arrived. The explanation, handing out of the paper and assigning of classwork was thus quickly accomplished.

The learners were asked to do problem number 4. However, after 11 minutes and many attempts by the learners to find a factor, the teacher decided that there must be a misprint in the textbook. The teacher thus asked the learners to rule off that section and begin again with problem number 2. That problem proved to be easier and the first factor was quickly found.

One problem evident in at-least two groups of learners was the sharing of calculators, in some instances one calculator among four learners. This delayed the completion of the problem for some, as they had to wait for another learner to do the calculations before handing them the calculator.

Problem: Factorize:

$2x^3 - 3x^2 - 5x + 6$

$\checkmark$

$f(1) = 2 - 3 - 5 + 6 = 0$

Thus $(x - 1)$ is a factor $\checkmark$

$\underline{2x^2 \;-x\; -6}$

$\underline{x - 1} \;/\; 2x^3 - 3x^2 - 5x + 6$

$\underline{2x^2 - 2x^2}$ $\checkmark$

$-x^2 - 5x$

$\underline{-x^2 + x}$ $\checkmark$

$- 6x + 6$

$\underline{- 6x + 6}$ $\checkmark$

$- \quad -$

$2x^2 - x - 6$

$(2x + 3)(x - 2)$ $\checkmark$understanding of the concept

Therefore the factors of $2x^3 - 3x^2 - 5x + 6$ are $(2x + 3)(x - 2)(x - 1)$ $\checkmark$

(7) **7 minutes**

The time needed by the learners to complete the problem ranged from 5 min 25 sec to 27 min 0 sec, as shown in Table 8.3.1.

TABLE 8.3.1: Time needed to complete the problem - KWZ

5:25	5:45	6:00 IC	6:50 IC	7:00	7:00	7:00
7:30	7:30IC	8:15	8:40	9:20	9:40	10:05 IC
10:20	11:00	11:25	11:40	11:50	12:25	12:50
12:50	13:20 IC*	13:35	14:14	14:30 IC	22:00	27:00

(Chronological completion times of learners doing problems, n = 28. IC = Incomplete; * = Nonthembeko)

Seventeen of the 28 learners had the above problem correct, some after a second attempt, within the times noted above. Only 6 problems were left incomplete, three due to miscalculations in long division resulting in a trinomial which could not be factorized. Two of the learners, working together, obviously had no idea what was expected in the problem, while one learner had seemingly copied down the answer from a neighbour without understanding what he/she was doing. The answer was thus correct but the calculations incorrect and bearing no relation to the answer.

The learner taking 27 minutes had been assisted by the teacher towards the end and would not have been able to complete the problem without this help. His time has thus been disregarded when looking at the overall data.

According to the seven minutes allocated to this problem, only seven learners had worked within the recommended time limit. Of these, two had left the problem incomplete. If the learner who had completed the problem in 7 min 30 sec is included, only 30% (8/27) had worked within the time limit. The remaining 70% are considered to have worked too slowly. They would in all likelihood lose marks in an examination due to being unable to complete the paper.

At the end of the problem, two learners had continued on to test the first root and four continued on to solve for x (resulting in answers of x = 1; x = 2 or x = -3/2) before putting up their hands to say that they had completed the problem (Table 8.3.2), thereby using additional time.

TABLE 8.3.2: Common errors - KWZ

PROBLEM	NUMBER	SOME EXAMPLES
Calculation left incomplete	6	*factors could not be found as the problem was copied incorrectly *factors could not be found due to incorrect subtraction(Gr 8) *factors could not be found due to incorrect multiplication of signs (Gr 8) *no understanding of long division (Gr 9)
Long method used - correct	25	$*f(1) = 2(1)^3 - 3(1)^2 - 5(1) + 6 \rightarrow 2 - 3 - 5 + 6 = 0$ $*2 - 3 - 5 + 6 \rightarrow 8 - 8 = 0$ $*2(2)^3 - 3(2)^2 - 5(2) + 6 \rightarrow 16 - 12 - 10 + 6 \rightarrow 22 - 22 = 0$ $*2(3)^3 - 3(3)^2 - 5(3) + 6 \rightarrow 2(27) - 3(9) - 15 + 6 \rightarrow 54 - 27 - 15 + 6 \rightarrow 12 + 6 \rightarrow 18$ (T)
Incorrect substitution	1	*Stated that x = -1 but substituted (+1) (Gr 8)
Problem incorrectly copied	1	$*2x^3 - 5x^2 - 5x + 6$ (C)
Incorrect subtraction during long division	2	*-5x - (+1x) = -4x *subtraction of unlike terms (Gr 8)

Used root other than x = 1 as first factor (but also correct)	4	*used x = 2 *used x = -2; x = -1, then x = 1 *used x = 3 (Gr 11)
Mathematical nonsense	1	*x + 1 = 0 → x - 1 (N)
Incorrect factorisation of trinomial	3	*$2x^2$ - x - 6 → (2x - 3)(x + 1) *$2x^2$ - x + 6 → (2x - 3)(x - 2) *Guessed at factors: $2x^2$ - $2x^3$ - x^2 → (x - 1)(x - 1)(Gr 10)
Incorrect cubing	1	*$2(-1)^3$ = 2 (Gr 8)
Redid portion of problem in identical manner	3	*Substitution of f(2) done twice *Entire long division section done twice (T)
Incorrect use of signs	3	*$2x^2$ x (-1) → +$2x^2$ *x = -1 but divided by x - 1 (Gr 8)
Incorrect multiplication of exponents	1	*($2x^2$)(x) = $2x^2$ and ($2x^2$)(-1) = ($-2x^3$) (Gr 8)
Careless mistakes	4	*f(1) = 0, substituted f(-1) in first attempt *Negative sign left out *multiplication of signs initially incorrect but corrected(C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

Evidence of learners working very closely together could be seen in the 'careless mistakes' made by the learners. In two instances the mistakes were identical and in another instance the substitution of f(2) was 'repeated identically' in two problems. In the second instance, both learners had redone the problem and each had exactly the same mistake in the problem. Each of the above was treated separately, although the learners worked as a team, as both learners in each case probably felt they were using correct methods.

Twenty-five of the learners used the 'long method' to calculate the first factor (Table 8.3.2). Although the 'long method' is Mathematically correct, it takes up more time than a shorter method. Any Grade 11 learner should be capable of calculating $(1)^3$ and $(2)^3$ and adding a row of numbers mentally, thus making the 'long method' redundant in this problem. Three learners also re-did a portion of the problem, taking up additional time. Although re-doing a section to correct an error is to be commended, rewriting a section in the identical manner, as in these cases, serves no purpose.

Other than five careless mistakes, all errors were categorized as originating in Grade 8, Grade 9 or Grade 10, with the majority originating in the Grade 8 syllabus.

8.3.2.2 PKM High School

During the second lesson on the topic of completing the square, the class involved in the study was asked to complete one problem on a separate sheet of paper and raise their hands as soon as they had completed the problem.

Not much opportunity was given to explain the needed procedure for the timing of the problem in this class. The teacher, Mr Mtsh, went from lesson to classwork without a pause or mention of the project. As a result, at least two learners did the problem on another sheet of paper before rewriting it on the given sheet. Various other learners also did not raise their hands after completing the first problem and before continuing with the second problem. These papers were disregarded for the timing of the homework, but were included for the error analysis (for the first problem only). The second problem was not included in the error analysis as not all learners had attempted the second problem.

Problem: Complete the square:

$$y^2 - 5y + 1 = 0$$

$$y^2 - 5y = -1 \checkmark$$

$$y^2 - 5y + \overset{\checkmark}{(5/2)^2} = -1 + \overset{\checkmark}{(5/2)^2}$$

$$(y \overset{\checkmark}{-} 5/2)^2 = -1 + (5/2)^2$$

$$(y - 5/2)^2 = \frac{-2 + 25}{4}$$

$$y = \overset{\checkmark}{5/2} \pm \frac{\overset{\checkmark}{\sqrt{(-2 + 25)}}}{2}$$

$$y = \frac{5 \pm \sqrt{23}}{2}$$

Therefore:

$y = 4{,}898$ ✓ or $y = 0{,}102$ ✓ (7) **7 minutes**

The time needed to complete the above problem ranged from 8 min 50 sec to 27 min

30 sec. All the learners had completed the problem. The times are as shown in Table 8.3.3.

TABLE 8.3.3: Times needed to complete the problem - PKM

8:50 IC	11:00	11:00	11:20	11:30 IC	12:10 IC	14:00
14:10	16:40 IC	17:00	17:00	18:00	18:30	19:00
19:00	21:30 IC	21:40 IC	22:08	22:20	22:50 IC	23:00
23:30	24:00	26:00 IC	27:30	27:30		

(Chronological completion times of learners doing problems, n = 26. IC = Incomplete)

None of the above problems had the correct answer. Eight learners had left the problem incomplete, although four of these were obviously due to the lack of a calculator. In the latter cases, the problem had been left without calculating the square root in the latter cases.

Of the nine papers not included in the timing, four had been left incomplete. However, the incomplete problems were due to the lack of knowledge and not because the learners didn't have a calculator.

Seven marks, and thereby seven minutes, were allocated to the problem - "completing the square" without a coefficient for y^2. As the method basically follows a recipe, the seven marks and seven minutes were considered very lenient. However, despite the leniency allowed in the time allocation, none of the 26 learners completed the problem within the time limit. Seventy-seven percent (20/26) of the learners needed more than twice the recommended time to complete the problem.

The errors made by the learners (as summarized in Table 8.3.4) ranged from Grade 6, for incorrect working with fractions without variables, to Grade 11, for not understanding the concept of completing the square. Other than errors categorized as Grade 11, careless mistakes (C) or nonsense (N), the errors predominantly originate in Grades 6, 7 and 8. This may be due to the nature of the Mathematics involved. However, it will be argued that such errors should not be so prevalent in

Grade 11.

TABLE 8.3.4: Common errors - PKM

PROBLEM	NUMBER	SOME EXAMPLES
Calculation left incomplete (ie. do not understand concept)	8	*Answer: $y - 25/4 = \pm 1$ *Answer: $(y - 5/2)^2 = -1 + 25/4$ *Answer: $y = 7 - 1/8$ or $y = -2 - 1/8$ *RHS left incomplete (Gr 11)
Long method used - correct	12	*$\frac{1}{2} \times -5/1$ instead of $-5/2$ (T)
Long method used - incorrect	6	*$5 \times \frac{1}{2} = 2\frac{1}{2} \times \frac{1}{2} = 1/8$ *$\frac{1}{2} \times 5/1 = 2/5$ *$3/2 \times \frac{1}{2} = 3/2$ *$\frac{1}{2} \times -5/1 = -5$ (Gr 6/7)
LCM not multiplied into numerator	2	*$-25/4 + \sqrt{(21/2)} = \frac{-25 + \sqrt{21}}{8}$ *$-1 + (2/5)^2 = -1 + 4/25 = 4/25 + 4/25$ (Gr 7)
Problem incorrectly copied	2	*Incorrect problem done (C)
Square root calculated incorrectly	6	*$\frac{\sqrt{(4 - 25)}}{\sqrt{4}} = \pm \frac{21}{2}$ *$(-7/8)^2 = \sqrt{-7/2}$ *$\sqrt{11} = \pm 11$ *$\sqrt{(-1 + 25/4)} = -1 + 5/2$ *$\sqrt{9999} = \pm 99{,}99$ (Gr 8)
Square root forgotten	9	*$(y - 2)^2 = 3$ therefore $y - 2 = \pm 3$ *$-1 - (\frac{1}{2} \times 5/1)^2 = -1 + 5/2$ (C)
Incorrect factorisation	9	*$y^2 - 5y + 25/4 = (y + 25/4)^2$ *$y^2 - 5y + (\frac{1}{2} \times 25/4) \rightarrow y^2(25/4)^2$ *$y^2 - 5y + 25/4 = y - 25/4$ *$y^2 - 5y(-5)^2 = (y^2 -5)^2 = y - 5$ (Gr 9)
Incorrect method	5	*$y^2 - 3y(3/1 \times \frac{1}{2})^2$ - multiplied instead of added *$y^2 - 5y(5 \times \frac{1}{2})$ - not squared *$y^2 - 5y + (\frac{1}{2} - 5/1)^2$ - subtracted instead of multiplied(G
y used in completing the square	2	*$y^2 - 5y + (\frac{1}{2} \times 5y/1)^2$ (Gr 11)
Incorrect squaring	2	*$(-5)^2 = -10$ *$(-1\ 5/2)^2 = 2/10 + \frac{1}{2}$ (Gr 8)

Incorrect working with fractions	11	*$-1 + (-5/2)^2 \rightarrow 24/4$ *$2\frac{1}{2} \times \frac{1}{2} = 1/8$ *$-1 + (1/8)^2 = (-7/8)^2$ *$\frac{1}{2} \times -5/1 = -5$ *$2/10 + \frac{1}{2} = (4 + 1)/20$ *$\frac{1}{2} \times 5 = 2$ *$(-\frac{1}{2} - 5/1)^2 = (- 5/2)^2$ (Gr 6)
Incorrect use of signs	4	* $+ (-5/2)^2 = +25/4$ *$3 - 6y - 2y^2 = 0 \rightarrow 2y^2 - 6y + 3 = 0$ * $-1 + (-5/2)^2 = 25/4 + 1$ (Gr 8)
Number, operation sign or variable left out (and later reinserted)	13	*$(2\frac{1}{2} \times \frac{1}{2}) = (1/8)^2$ *$-1(\frac{1}{2} \times 5/1)^2 = -1 + 5/2$ *$-1(5/1 \times \frac{1}{2})^2 = -1 + (-5/2)^2 = (-1\ 5/2)^2$ *$(-5/2)^2$ disappears on RHS (N)
Mathematical nonsense	7	*$(-5/2)^2 = 4$ *$1,5 = \pm 2,25$ *$y = 0,4 = y = -1,5$ *$5 = 1/5$ (N)
Careless mistakes	3	*multiplication instead of addition *subtracted $(2/5)^2$ twice *addition sign left out (C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

8.3.2.3 GQB High School

At GQB the class involved in the study was busy with exponents and the teacher suggested they do problem number 17 for this study. Problem number 17 was denoted with an asterisk in the textbook to indicate a higher grade question, presumably due to the exponent taking the form of a fraction. After the explanation of the purpose of the exercise and a description of what was expected of them, the learners commenced with the problem.

Of the 22 learners of Grade 11a (the mark list showed a total of 28 learners) who had completed the learner questionnaire earlier in the year, 13 (59,1%) had indicated that they took Higher Grade Mathematics. Although no indication of chosen grade was requested during the timing of the "homework" problem by the 16 learners present, it can be assumed that at most 13 learners were Higher Grade candidates. Problems with the completion of problem number 17 on the basis of Standard Grade learners doing a Higher Grade problem could thus be expected.

There were no exponential problems on the chalkboard - only work dealing with decimal fractions, presumably from a previous lesson with another class. It was thus assumed that examples had not been done on the chalkboard before the learners were assigned the problem. However, they may have been done orally. This issue was not clarified as questioning the teacher on her teaching methods was not considered part of the project and could possibly lead to undesired antagonism.

Problem: Solve for x:

$$x^{1/2} - 3x^{1/4} + 2 = 0 \quad \checkmark^{\text{trinomial}}$$

$$\checkmark \qquad \checkmark$$

$$(x^{1/4} - 1)(x^{1/4} - 2) = 0$$

$$\text{Therefore} \quad x^{1/4} = 1 \quad \text{or} \quad x^{1/4} = 2$$

$$\sqrt[4]{x} = 1 \quad \text{or} \quad \sqrt[4]{x} = 4 \quad \checkmark$$

$$\checkmark$$

$$x = 1^4 \quad \text{or} \quad x = 2^4$$

$$\checkmark \qquad \checkmark$$

$$\text{Therefore} \quad x = 1 \quad \text{or} \quad x = 16$$

(7) **7 minutes**

Seven marks were allocated to the problem, one of which was for the recognition that it was a trinomial. The seven marks allowed seven minutes as a reasonable time in which to complete the problem.

The time needed by the learners to complete the problem ranged from 4 min 00 sec to 16 min 20 sec, as shown in Table 8.3.5.

TABLE 8.3.5: Times needed to complete the problem -GQB

4:00	4:15	4:15	4:15	4:15	4:16	5:00
11:15	11:50	12:40	13:00	13:00	15:00 #	15:00 IC#
16:20 IC	16:20 IC					

(Chronological completion times of learners doing problems, n = 16. IC = Incomplete; # = incorrect)

Only the last three learners had not completed the problem and are thus denoted as IC in the table. All learners had the answer correct, with the exception of two of the last four learners to hand in their papers. This was also seen as an indication that questioning the teacher about her teaching method using oral examples would have been a mistake.

Seven of the 16 learners had kept within the seven minute time limit with ease. The remaining 56% had used up to more than twice the allocated time. The last four learners to hand in their papers were also the learners who had either not completed the problem and/or had the answer incorrect.

TABLE 8.3.6: Common errors - GQB

PROBLEM	NUMBER	SOME EXAMPLES
Not recognised as quadratic equation	2	$*x - 3x^{1/2} + 4 \rightarrow x = 3x + 4 \rightarrow x = 7$ $*x^{1/2} - 3x^{1/4} = -2 \rightarrow x^{1/2} = -2 + 3x$ (Grade 11)
Incorrect factorisation	4	$*(x^{1/2} - 3x)(x^{1/2} + x) = 0 \rightarrow x^{1/2} = 3$ or $x^{1/2} = 1$ $*(x - 2)(x - 1) = 0$ $*(x^{1/2} - 1)(x^{1/2} -2) =0$ (Grade 9)
Long method used - correct	12	$*(x^{1/2})^{1/4} = 1^{4/1}$ or $(x^{1/2})^{1/4} = 2^{4/1}$ $*x^{1/2x2/2} - 3x^{1/4} = -2 \rightarrow x^{2/4} - 3x^{1/4} = -2$ (T)
Numbers or variables left out and/reinserted without reason	6	$*(x^{1/4} - 1)(x^{1/4} -2) =$? Zero forgotten. Later equal sign brought back into use. (N)
Exponents used incorrectly	2	$*x^{1/2} = 3 \rightarrow (x^{1/2})^2 = (3)^1$ $*x^{1/2} - 3x^{1/4} + 2 = 0 \rightarrow (x^{1/2})^{2/1} - (3x^{1/4})^{4/1} + 2 = 0 \rightarrow$ $x - 3x + 2 = 0$ (Grade 10)
Mathematical nonsense	2	$*x - 3x^{1/2} + 4 \rightarrow x = \underline{3x} + 4 \rightarrow x = 3 + 4$ $*x^{1/2} = -2 + 3x \rightarrow x^{1/2x4/1} = x = 1$ (N)
Careless mistakes	1	$*x^{1/4} - 2 = 0 \rightarrow (x^{1/4}) = 2^{4/1}$ (C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

Relatively few errors were categorized for this problem. Other than the use of a 'long method', the greatest error was that of leaving out numbers or variables (Table 8.3.6). This resulted in mathematical nonsense (N) and would lead to a loss of marks in a test or examination. The errors experienced with factorization and exponents stem from Grades 9 and 10 respectively.

Only 16 of the 28 learners on the mark list were present on the day the problem was done. All those present were asked if their marks could be obtained and used for comparative purposes. Names were then written on the papers to make the comparison possible. Only one learner did not put his/her name on the paper.

If times and correctness are compared to the June results made available (Table 8.3.7), the comparison shows that the faster working learners for this problem, tended to have the higher marks. As learners were allowed to discuss the problem and work together, these times are also dependant on which learners worked together. A weak learner may well have worked with a stronger learner and thus had a faster time than usual or vice versa.

TABLE 8.3.7: Comparison of June results and times to complete the given problem - GQB

Time	Mark (/200)	Problem completed	Problem correct
4:00	116	Yes	yes
4:15	124	Yes	yes
4:15	120	Yes	yes
4:15	118	Yes	yes
4:15	92	yes	yes
4:15	61	yes	yes
5:00	100	yes	yes
11:15	105	yes	yes
11:50	128	yes	yes
13:00	83	yes	yes
13:00	71	yes	yes
15:00	64	no	no
15:00	46	yes	no
16:20	99	no	no
16:20	62	no	no

8.3.2.4 KWGX High School

This class had been doing problems on the Remainder Theorem at the time this project was done with them. They had had problems to complete for homework and additional work, with expressions containing an additional variable, had been done in the classroom. Thus, the learners were asked to solve for the additional variable while the remainder was given.

After the learners had been working for 15 minutes 8 seconds the bell rang. Learners not yet finished with the problem were asked to write down the time and hand in their papers.

Problem: Solve for p:

$8x^3 + 6x^2 + px + 7$ divided by $2x + 1$ with remainder 6

$$2x + 1 = 0$$
$$x = -\tfrac{1}{2} \quad \checkmark$$

$$f(-\tfrac{1}{2}) = 8(-\tfrac{1}{2})^3 + 6(-\tfrac{1}{2})^2 + p(-\tfrac{1}{2}) + 7 \quad \checkmark$$
$$= -1 + 6/4 - \tfrac{1}{2}p + 7$$
$$= 7\tfrac{1}{2} - \tfrac{1}{2}p \quad \checkmark\checkmark \qquad \text{(Remainder)}$$

Remainder = 6

$$7\tfrac{1}{2} - \tfrac{1}{2}p = 6 \quad \checkmark$$
$$-\tfrac{1}{2}p = -1\tfrac{1}{2}$$
$$p = 3 \quad \checkmark \qquad (6)$$

6 minutes

The time needed by the learners to do the problem ranged from 6 min 30 sec to 15 min 8 sec with some learners not having completed the problem after 15 min 8 sec. The times are as indicated in Table 8.3.8.

TABLE 8.3.8: Times needed to complete the problem - KWGX

6:30	10:50	10:50	11:10	11:40	11:40	11:40
11:40	11:40	11:40	13:15	13:15	13:40	13:40 C
14:30	14:30	15:08 IC	15:08 C	15:08 IC	15:08 IC	15:08 C
15:08 C	15:08 IC	15:08 C	15:08 IC	15:08 C	15:08 C	15:08 C
15:08 IC	15:08 C	15:08 C	15:08 C	15:08 C	15:08 C	15:08 IC
15:08 C						

(Chronological completion times of learners doing problems, n = 36. IC = Incomplete; C = Complete)

None of the above problems had the correct answer!

The large number of completed problems at 15 min 8 sec may suggest that the learners had completed the problem when the bell rang, and were sitting with it until told to hand in the papers. However, lack of activity was not observed and the learners appeared to work until they were stopped by the bell. Two learners were observed, with their permission, while doing the problem. They had completed the problem after approximately 12 minutes. However, when asked if they were finished they did not hand it in as they purported to still be discussing the problem. Both these learners used very lengthy methods in doing some of the calculations, especially those dealing with exponents.

The problem was allocated six marks and therefore allowed six minutes as a reasonable time frame in which to complete it. Only one learner (2,8%) managed to complete the problem close to the recommended time. All others used in excess of 10 minutes with 22/36 (61%) needing more than twice the recommended time to complete the problem.

As can be seen from Table 8.3.9, most of the errors made in the timed problem originated in Grade 8. Those errors concerning fractions without variables are considered to have originated in Grade 6, as this is when most of the complex work with fractions is done. The large number of learners using up time (T) by writing out long methods which could have been done mentally, or rewriting steps, is particularly noticeable. So, too, is the proportionately large number of careless mistakes (C) and errors leading to mathematical nonsense (N).

TABLE 8.3.9: Common errors - KWGX

PROBLEM	NUMBER	SOME EXAMPLES
Calculation left incomplete	2	*2x + 1 therefore x = -1 *2x + 1 = 0 therefore 2x = 1 (Gr 8)
Short method used ie. mental calculation. But calculation incorrect	5	*2x + 1 = 0 therefore x = ½ *2x + 1 = 0 therefore -x = -2 *$6(3/2)^2 = 18$ (Gr 8)
Long method used - correct	19	*$\frac{2x}{2} = -\frac{1}{2}$ therefore x = -½ *$\frac{-p}{-1} = \frac{-1/p}{-1}$ (Gr 8)(T)
Long method used - incorrect	3	*2p/2 + 87/2 therefore p = 7/40 *2p/2 - 73/2 therefore p = 75 *1/2 = 2x/2 therefore = -½x (Gr 8)
Incorrect substitution	8	*x = -1, subst: (-2) *0 - 1 = -2x, subst: (-2) *2x = 1, subst: (2) (Gr 8)
Problem incorrectly copied from own paper	5	*2x - 1 = 0 became 2x + 1 = 0 *left out coefficient of x^3 & x^2 (C)
Problem incorrectly copied from board	2	*Remainder = 7 (C)
Numbers or variables left out and/reinserted without reason	11	*-8 + 4 + 7 = 19 + p *24 + 54 + p(-3) + 7 = 78 + ½p + 7 *-192 + 72 + p(-2) + 7 = -115 + p *2x/2 = -1/2 therefore x = -1 (N)
Answer left incomplete	7	*19 + p = 6 therefore p = 6 - 19 therefore = p - 13 *-p/2 = 17(Gr 8)
Mathematical nonsense	14	*$\frac{2x}{2} - \frac{1}{2}$ therefore x = -½ *2x + 1 = 0 therefore let -3 = 0 *$\frac{2x}{x} + \frac{1}{x} = -2$ *2x + 1 = 0 therefore $\frac{2x}{2} + 1 = \frac{-1}{2}$ *Divided by 3/2 twice ie. 47/(3/2) divided by 3/2(N)
Incorrect subtraction of fractions	1	*-15/2 + 6 = -9/2 ie. -15/2 + 6/2 (Gr 6)
Incorrect addition of fractions	1	*-15/2 + 6/1 = [-15/2 + 6/2] = -9/2 (Gr 6)

Incorrect division of fractions	1	*-9/2 div by -½ = -1/9 (Gr 6)
Steps rewritten twice unnecessarily	6	*Let 2x + 1 = 0 therefore 2x + 1 = 0 *Entire problem written out twice - next to each other *Redid first four steps identically, including rewriting the problem in words (T)
Incorrect solving of linear equation	7	*25 + ½p = 6 therefore ½p = 25 - 6 *2x + 1 = 0 therefore 2x = 1 *6 = 81 + p therefore p = 6 + 81 (Gr 8/9)
Incorrect calculation of exponents (not even consistency within one problem)	23	*$(-½)^3$ = -1½ and $(-½)^2$ = -1 *$(1)^2$ = 2 *$8(-2)^3$ [=(8 x -8)3] = -192 and $6(-2)^2$ [=(6 x 6)2] = 72 *$8(-1)^3$ = [$(-8)^3$] = -512 and $6(-1)^2$ = [6(-2)] = -12 *$8(-2)^3$ = -62 and $6(-2)^2$ = -24 *$(½)^3$ = 1/6 and $(½)^2$ = 1/4 *$6(3/2)^2$ = 18 although $8(3/2)^3$ correct *$8(-1/2)^3$ = 8(-3/2) although $6(-1/2)^2$ correct (Gr 8)
Incorrect use of signs	12	*6 - 35 = 29 *2p + -72 = 6 therefore 2p = 72 - 6 *6 = 81 + p therefore p = 6 + 81 (Gr 8)
Careless mistakes	16	*25 - 6 = 31 *Incorrect multiplication of -3 *Left out negative sign *Left out addition sign *Incorrect calculation *Adds instead of multiplying *6(-1/4) = -6 *7 becomes a 9 *Adds instead of dividing *Subtracts instead of dividing *17/2 = 8 (C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

8.3.2.5 KWL High School (1)

At KWL, it had taken 10 - 15 minutes to get in at the school gate. This was the norm at KWL. Latecomers standing outside the gates were not allowed to enter with me at 8:30. (They had been let in by the time I left at 9:20). As a result of the delay at the gate, the teacher had already explained the classwork and the purpose of the project to the learners. The learners were then given two problems from the board to do on the separate sheet of paper handed out for that purpose. All started at the same time. Although they had been asked to do the problems as though they were doing homework, some learners asked the teacher questions concerning the problem. This may have been due to being informed that they could discuss the problems with others as they would if they were doing their homework.

Many put up their hands simultaneously at 9:30 to indicate that they had completed the problem. These were asked to write down the time given themselves instead of having it written down for them. Although the bell rang, the learners continued to work until those still working were asked to stop after 11 minutes, as they needed to go to the next lesson.

Problem: Solve for x:

(1) $\cos 3x = 0{,}88$ $\checkmark^{\text{angle}}$

$3x = 28{,}36^\circ$ $\checkmark$

$x = 9{,}45^\circ$ for Quadrant I $\checkmark$

Therefore $3x = 360^\circ - 28{,}36^\circ$ $\checkmark$

$= 331{,}64^\circ$

$x = 110{,}54^\circ$ for Quadrant IV $\checkmark$ (5) **5 minutes**

(2) $\sin(2x - 30^\circ) = 0{,}87$ $\checkmark^{\text{angle}}$

$2x - 30^\circ = 60{,}46^\circ$ $\checkmark$

$2x = 45{,}22^\circ$ for Quadrant I $\checkmark$

$2x - 30^\circ = 180^\circ - 60{,}46^\circ$ $\checkmark$

$2x = 149{,}54^\circ$

$x = 74{,}77^\circ$ for Quadrant II $\checkmark$

(5) **5 minutes**

Five marks and therefore five minutes were allocated to each problem, resulting in a total of a lenient 10 minutes recommended for the completion of both problems. In each problem, one mark was allocated to finding the angle only (ie. knowing that the angle needed to be found before calculations for x can commence).

The time needed to complete the problem ranged from 5 min 46 sec to 11 min 0 sec, when those not yet finished were asked to stop. The times are as shown in Table 8.3.10.

TABLE 8.3.10: Times needed to complete the problem – KWL (1)

5:46 IC	8:20 C	8:43 C	9:15 IC	9:30 IC	9:30 C	9:30 IC
9:30 C	9:30 C	9:30 C	9:30 C	9:30 C	9:30 IC	9:30 IC
9:50 IC	11:00 C	11:00 IC	11:00 IC	11:00 IC	11:00 IC	11:00 IC

(Chronological completion times of learners doing problems, n = 21. IC = Incomplete, C = complete)

None of the above learners had correct answers for both problems. Most had the first part of the first problem correct but many had not solved for x in the fourth and second quadrants respectively.

Seventy six percent (16/21) of the learners handed in the problems within an acceptable time frame. This number included the learner who had completed the problem after 11 minutes. Of the 76%, only nine learners (43% of the total) had completed both problems by solving for the angle in the second quadrant. However, of those nine, none had the problems correct!

TABLE 8.3.11: common errors – KWL (1)

PROBLEM	NUMBER	SOME EXAMPLES
Calculation left incomplete	4	*Sin x = 30,2° - 30° *2x - 30° = 0,87 (Gr 11)
Long method used - correct	15	*$\frac{2x}{2} = \frac{30,87°}{2} = 15,44$ *$\frac{3x}{3} = \frac{61,6°}{3} \rightarrow x = 20,5□$ (T)
Long method used - incorrect	1	*$\frac{\text{Cos } 3x}{3} = \frac{0,88}{3}$ (Gr 11)
X subtracted for second angle instead of (1) 3x or (2) 2x - 30□	18	*x = 360° - 9,45° *x = 180° - 45,22° (Gr 11)

Second angle solved incorrectly	6	*$3x = 61,1° \rightarrow x = 20,5° \rightarrow x = 360° - 62°$ (Quad II) *$90° + 0,685$ (Quad II) (Gr 11)
Second angle left out (Quad IV or Quad II)	9	(Gr 11)
Trigonometrical angle not calculated	4	*$\sin(2x - 30°) = 0,87 \rightarrow 2x - 30° = 0,87$ *$\sin(2x - 30°) \rightarrow 2x = 30° + 0,87 \rightarrow x = 15,43°$(Gr 11)
Solving for x before calculating Sin or Cos	6	*$\cos \frac{3x}{3} = \frac{0,88}{3}$ *$\sin(2x - 30°) = 0,87 \rightarrow 2x = 0,87 + 0,5 \rightarrow$ $x = 0,685$ (Gr 11)
Solving for x incorrectly	3	*$x - 15° = 30,23° \rightarrow \frac{x - 15°}{-15} = \frac{30,23°}{-15}$ *$2x - 30° = 60,4° \rightarrow \frac{2x - 30°}{2} = \frac{60,4°}{2}$ (Gr 8) *$\sin 2x - 30° = 0,87 \rightarrow \sin 2x = 0,87 + 30°$ (Gr 11)
Incorrect quadrant used	1	*Quadrant IV used instead of Quadrant II in (2) (Gr 11)
Mathematical nonsense	7	*$x = \frac{30,87}{2} = 15,44 \rightarrow x = 0,3$ *$3x = 61,6° \rightarrow x = 20,5° \rightarrow x = 62° - 21°$ *$\cos 3x = 0,88 \rightarrow \frac{3x}{3} = \frac{0,88}{3} \rightarrow x = 9,45°$ *$\sin \frac{2x}{1} = ½ = 0,87$ *$\sin 2x - 30° = 0,87 \rightarrow x = 3$ *$\frac{\sin 2x - 0,5}{2x} = \frac{0,87}{2x} \rightarrow \sin -0,5 =$ Blank (N)
Numbers or variables left out and/reinserted without reason	2	*$\sin 2x = 0,87 + 30° \rightarrow \sin x = 30,87°$ *$\sin(2x - 30°) = 0,87 \rightarrow \sin \frac{2x}{1} = ½ = 0,87$ (N)
Answers rounded off too soon	9	*$x = 9,45 \rightarrow x = 10$ *$x = 9,45 \rightarrow x = 9$ (Gr 6) *$3x = 61,6° \rightarrow x = 20,5° \rightarrow x = 360° - 62°$ (Gr 10)
Careless mistakes	1	$2x - 30° = 60,5° \rightarrow 2x = 60,5° - 30°$ (C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

As the problem was on Trigonometry, most of the errors (as shown in Table 8.3.11) originated in Grade 11. This was expected, as learners begin with basic Trigonometry in Grade 10 and continue with it in Grades 11 and 12.

While analyzing the errors made, it became clear that the learners did not understand the concept of the second solutions to each problem. The angles in quadrants II and IV were either incorrectly calculated or not calculated at all. Another common error was the calculation of x before finding the angle (ie. before calculating sin or cos).

Errors originating in previous Grades dealt with solving for x and rounding off too soon. Answers rounded off incorrectly were categorised as Grade 6 errors as the syllabus deals with rounding off decimal numbers in this Grade. Answers rounded off too soon were deemed Grade 10 errors as it is at this stage that obtained answers are used in further calculations, especially in Trigonometry and Mensuration.

The June results were made available with the permission of the learners (see also Case Study: Vuyiseka). The comparison of these results with the times needed to complete the problem can be seen in Table 8.3.12.

If the problem was incomplete but the learner had the work correct to that stage (usually having calculated only the first angles), the problem was considered correct. However, if the learner had attempted the second angle in any one of the problems and it was incorrect, the problem was considered incomplete and incorrect even if the first angles had been correctly calculated.

From Table 8.3.12, a slight tendency for faster workers on the Trigonometry problem to have higher marks can be seen. This tendency is strengthened when looking at the learners who managed to complete the problem.

TABLE 8.3.12: Comparison of June marks and times to complete the given problem – KWL (1)

Time	Mark (/400)	Problem completed	Problem correct
5:46	224	No	no
8:20	238	Yes	no
8:43	212	Yes	no
9:15	139	No	no
9:30	158	No	no
9:30	159	Yes	no
9:30	152	No	yes
9:30	117	Yes	no
9:30	221	Yes	no
9:30	144	Yes	no
9:30	114	Yes	no
9:30	184	Yes	no
9:30	157	Yes	no
9:30	169	No	yes
9:50	196	No	no
11:00	167	No	no
11:00	86	No	no
11:00	160	No	no
11:00	131	No	No
11:00	no name	No	no
11:00	142	Yes	no

8.3.2.6 KWL High School (2)

The work done by this class entailed the simplification of trigonometric co-functions. The lesson was followed by classwork. As the teacher had not yet taught the class to use the calculator for Trigonometric functions and co-functions (although often Grade 10 work), he told the learners only to convert each expression into its co-function and not to simplify the expression. The learners were then asked to do two problems on the separate sheet of paper.

Problem: Convert to co-functions :

(1) $\sin 70^\circ \tan 80^\circ \sec 12^\circ$

$\quad ✓ \quad ✓ \quad ✓$

$= \cos 20^\circ \cot 10^\circ \text{cosec } 78^\circ$

(2) $\dfrac{\tan 18{,}4^\circ}{\sec 83{,}5^\circ}$

$= \dfrac{\cot 71{,}6^\circ}{\text{cosec } 6{,}5^\circ}$ ✓ ✓ **-1 for each mistake**

(3) **3 minutes**

The problems were allocated one mark for each conversion but with negative marking with (-1) for each error, due to the low standard of the work. The total marks, and therefore time, allocated was three marks and three minutes - allowing an ample 30 seconds for each conversion.

The time needed by the learners to complete their work ranged from 6 min 30 sec to 15 min 8 sec with some learners not having completed the problem after 15 min 8 sec. The times are indicated in Table 8.3.13.

Only one learner did not complete the problems and thirteen learners had correct conversions for both problems. However of those thirteen, only five had the problems 100% correct, as shown in the problem above. Eight learners had the conversions correct but had not written the answer in the form of the problem given. They had written each trigonometrical function and its co-function separately in the first problem, eg. Sin 70° = Cos 20°; Tan 80° = Cot 10°; Sec 12° = Cosec 78°. However, in each case the second problem was done as expected.

TABLE 8.3.13: Times needed to complete the problem – KWL (2)

1:42*	1:55	2:15*	2:15*	2:15*	2:30*	2:30
2:38	2:38*	2:44*	2:44*	2:50*	2:50*	3:11
3:15	3:25	3:35	3:35	3:35	3:35	3:35
3:35	4:10*	4:10 IC	4:30	4:50	6:12* (4:08)	6:40
7:00*						

(Chronological completion times of learners doing problems, n = 29. IC = incomplete; * = both problems correct)

The learner completing the problems in 6:12 had also completed a third problem and started a fourth. A close estimation of time needed to complete the first two was thus taken as 4:08, which represents 2/3 of the time taken.

Thirteen of the 29 (45%) learners did the conversions within the set time limit and a total of 45% also had the problems correct (although not all within the expected time frame). Only 34% had completed the problems correctly and within the time frame. Fifty five percent of the learners had exceeded the time limit, with two learners needing more than twice the time to complete the work.

As the problems dealt with Trigonometry, the majority of errors originated in Grade 10 and 11 (Table 8.3.14). The amount of Grade 11 errors and the proportionately large number of learners writing mathematical nonsense (N), indicated that the concept of co-functions had not been understood (and could lead to problems in the Matriculation examination).

Two learners had not understood the basic concepts of Trigonometry, as explained in Grade 10, and had left out the Trigonometric functions. Five learners experienced a problem with the subtraction of decimals or with negative numbers, errors originating in Grades 6 and 7 respectively. Three learners wasted time by writing out the Trigonometric functions in full.

TABLE 8.3.14: Common errors – KWL (2)

PROBLEM	NUMBER	SOME EXAMPLES
Conversions not done	1	*Tan 80° = Tan 10° (Gr 11)
Subtraction not done	1	*Sin 70° = Cos 70° (Gr 11)
Trigonometric function left out	2	*Sec 12° = 78° *Cos 90° - 70° = 20° (Gr 10)
Conversion incorrect	4	*Sec 12° = Sin 78° *Sec 83,5° = Cos 6,5° (Gr 11)
Mathematical nonsense	11	*Sin 70° → Cos = 20° *Tan 18,4° = 17,6° Cot *Cot(90° - 80°) = 10° (N)
Functions written out fully	3	*Cotangent; Cosine (T)
Conversions done but not as in given problem	8	*Sin 70° = Cos 20°; Tan 80° = Cot 10°; Sec 12° = Cosec 78° Mathematically correct but did not aid in solving the problem. Marks awarded.
Incorrect subtraction	5	*Sin 70° = Cos 0,94° *Tan 18,4° = Cot 62,6° (Gr 6) *Cos 70° - 90° = 20° (Gr 7)
Careless mistakes	1	*Sin 70° = Cos 30° (all others correct) (C)

(If the same mistake was made more than once by the same learner it was only counted once in the table above).

8.3.3 Summary

8.3.3.1 Timing of homework

In all six classes involved in the timing exercise, all had learners who handed in their work with incomplete problems. The number of learners doing this in Trigonometry ranged from 3,4% (1/29) for simple conversions to 57,1% (12/21) for learners not aware of a second angle in other quadrants. The ratios of incomplete problems in Algebra were 3/16, 7/36, 6/28, and 6/26, ie. 18,8% - 23,1%. Reasons for not completing the problems were the lack of a calculator and inability to do the

Mathematics - either because of previous errors made in the problem or due to lack of knowledge. These obstacles would also have contributed to the need for more time in which to do the problems.

The number of learners able to hand in the Algebra problems within the allocated time frames ranged from 0% through 2,8%, 30% to 44%. In each case 77%, 61%, 17% and 25% respectively used more than twice the recommended time. With the exception of the GQB problem, involving a trinomial with exponential fractions, all the problems were routine Standard Grade problems.

The percentages for problem completion are better for Trigonometry than for Algebra. Forty five and 76% of the learners respectively managed to hand in the work within the recommended time, although not all had the problems correct. Only 6,7% (2/29) of the learners needed more than twice the time. Both sets of problems were at Standard Grade level.

Reasons for not being able to complete the work within the recommended time limits revealed themselves during the analysis of common errors made by the learners.

8.3.3.2 Common errors

In each of the problems, learners wasted time by writing out long methods of calculations, which they should have been capable of doing mentally. In the problem involving Trigonometric conversions, this resulted in three learners writing out the functions and co-functions in full instead of using conventional abbreviations. Learners also wasted time by re-doing portions of problems in an identical manner and with identical mistakes as in the first version.

In Algebra, the majority of the common errors seem to have originated in Grades 6 to 10 with a predominance of Grade 8 errors. In the problem involving exponents, the errors probably originated in Grades 9, 10 and 11 as it is in these Grades that exponents are dealt with.

In Trigonometry, common errors appear to have their origin in Grades 10 and 11. This is to be expected as Trigonometry is only introduced in Grade 10. However, where Algebraic calculations were used in these problems, Grade 6, 7, 8 and 10 errors occurred.

In the two classes where June examination results were made available, a comparison between time taken to do the problem and results was made. In each case a slight tendency for the faster working learners to have the higher marks can be seen. However, no supportable tendency of high marks and fast work can be made from this example due to learners working together, the two instances being compared, and the fragile nature of the trend. Such a conclusion would require further in-depth study.

8.4 Brief overall summary with respect to Mathematics homework

- Homework is not completed.
- Less homework is completed if it is considered difficult.
- Lack of time is generally not a reason for not completing homework.
- Learners not only do too little homework, but also receive too little homework.
- Learners did not receive homework every day.
- Learners perceived to receive less homework than the teachers claimed to assign.
- Only a small portion of the homework assigned is done correctly.
- Geometry is considered more difficult and thus less homework is done in this topic.
- Homework is generally done in the afternoons or evenings, at home.
- Most learners do their homework on their own.
- The majority of learners spend 15 minutes to one hour doing homework.
- Learners working on their own generally did more efficient homework than those working with others did.
- Learners generally had half or less of the work attempted, correct. Learners were thus not very effective in doing homework.
- A large number of candidates who had failed Mathematics claimed to find it easy.

- The majority of teachers assigned homework only three or four times a week.
- No general tendency of an increase in the frequency of homework was found as learners moved up in Grades.
- Extra lessons increased in frequency as learners progressed up the Grades, with the greatest increase in Matriculation.
- The tendency to complete the syllabus also increased in the higher Grades.
- Reasons given for incompleted syllabi included "time too short", "syllabus too long" and learners "work[ing] too slowly".
- Work left out caused knowledge gaps and left learners unable to do later work.

- Learners work very slowly and leave problems incomplete, thus doing inefficient and ineffective homework.
- Common errors leading to inefficient homework included unnecessary work, problems copied incorrectly, careless mistakes and mathematical nonsense.
- Mathematical errors made by learners predominantly originated in previous Grades.

CHAPTER NINE

DISCUSSION OF PHASE II: CONFIRMATION AND GENERALIZATION

9.1 Introduction

The findings of the four follow-up studies are discussed below. Each study is discussed separately under a number of subheadings. This was done to facilitate cross-referencing between the different follow-up studies, as well as with the emergent pattern from the case studies. However, as new questions were added in the follow-up studies and different questions were asked in the different studies the subheadings differ slightly from study to study. The four follow-up studies are:

- The learner questionnaires
- The teacher questionnaires
- The time learners spent on problems
- Analysis of common errors

9.2 Learner and teacher questionnaires

The aim of the learner questionnaire was twofold. Firstly, it aimed at confirming or rejecting the observed pattern. Secondly, as the nine case study candidates were not truly representative of Grade 11 Mathematics learners in the northern townships of Port Elizabeth, additional data was needed if the findings were to be generalized. The case study candidates were probably more proficient in English than many of their counterparts. It was thus necessary to gain information from more than nine learners, including those less proficient in English than the case study candidates were. A survey questionnaire in Xhosa could supply such verification.

One of the problems with the case studies done on the nine Grade 11 learners and the study group was that all interviews, diary entries and casual communications were done in English - the second language for all the participants, parents and all but one of the teachers. In an attempt to eliminate these limitations in communication the follow-up study, to confirm various observed patterns in the case studies, included a questionnaire for a large number of Grade 11 learners in their vernacular Xhosa. It was thereby hoped that questions would be fully understood and that responses could thus be considered internally valid.

As the questionnaire consisted of set structured questions, categories or options were given from which participants chose the appropriate response. This was deemed appropriate as mainly confirmation or rejection of observed patterns was sought and not new data. The options given were often in relative forms such as "some", "most", "easy", "difficult" or "not easy". In each case, the learners decided which relative term was appropriate to their situation. They had no way of indicating exactly what was meant by their choice. Although "some" or "easy" reflect different quantities or degrees of difficulty to different learners, it was each learner's perspective which was sought and not absolute comparative values. As such the term "not easy" was seen by the learners to denote homework which was more difficult than that termed "not difficult". (Please note that all references referring to homework refer to Mathematics homework only). When designing the questionnaire, the opposite had been envisaged, ie. the scale of difficulty runs from "easy" to "not [that] easy", "not [that] difficult" and lastly to "difficult". The square brackets have been inserted for clarification of the initial perceived meaning only. However, the learners perceived the grades of difficulty to be "easy", "not difficult", "not easy", "difficult".

The relativity of the options caused a particular "doubling of relativity" when two questions with relative options were later compared. Such a comparison occurred when the relative amount of homework done was compared to the relative amount of homework that was considered correct. A learner who had done "some" of the homework may well have had "most" of it correct. This would be interpreted as having most of that homework that the learner had attempted, correct. A second possible interpretation would be that he had given a misleading answer in either one of the questions. As no sound reasons for learners deliberately giving misleading responses were apparent, and the learners all appeared to take the questionnaire seriously, the assumption was made that the first interpretation was the correct one.

As many questions arose from the case studies about the frequency and quantity of homework, a survey of teachers was considered a suitable method to find some of the answers.

Mathematics is a subject that requires number skill and an understanding of number values, their manipulation and innate patterns. As such, logical thought and intimate knowledge of the rules of manipulation is needed; both of which require constant and repetitive practice. Such practice is obtained largely through homework, and to some extent through classwork.

My visits to classrooms, in the line of work, have shown that a large portion of the time in the classroom is devoted to explanations of new work, leaving relatively little time for classwork. Classwork thus generally consists of one or two problems done by the learners in the teacher's presence or unfortunately, in many observed cases, consisting of one or two learners doing a problem on the board while the rest watch passively. Such a scenario leaves homework as the main opportunity for practice of vital Mathematical skills.

The type, quality and quantity of homework assigned is decided by the teacher. It is, however, also dependant on the amount of class time available and the number of periods the learners have in the subject. The amount of work covered during a period generally depends on the length of the periods. If that is the case, and the amount of homework assigned covers the amount of work done during the period, then the amount of homework may be dependant on the length of the period. However, this is by no means always the case. A small amount of work may be covered during a long period, or even over a number of periods, depending on the complexity of the work. But, from the general assumption of longer periods → a greater amount of work covered → a greater amount of homework, it would follow that additional constructive time in the class implies additional homework. Thus, teachers and learners being in class on time (and not arriving late) would result in additional quantities of homework, which in turn implies additional time to practice Mathematical skills.

A similar argument applies to the number of periods. If homework is assigned at the end of a period, then the frequency of homework increases with the frequency of periods. Thus, periods missed due to teacher absence or other reasons impact on the quantity of homework. This in turn impacts on the amount of work covered during the year and therefore on the completion of the syllabus.

In addition to the above, the explosive increase in Mathematics lessons and homework for Thembani's Matriculation class needed further investigation. The amount of time spent on the tuition of each Grade and the intensity thereof would give information on the quantities of homework assigned as the learners progressed through the Grades.

9.2.1 Frequency of homework

In the nine schools involved in the case studies of Phase I, 51 teachers answered a question on the frequency of homework assigned in a typical week. Of the 51 teachers, only 26 (51%) claimed to assign homework every day, including Fridays. Such daily homework would follow Driscoll's (1980) suggestion of short daily [regular] assignments for optimal practice. However, the remainder assigned homework three or four times a week (41%), or only once or twice a week. This may mean that too little homework was assigned for the amount of practice required in this subject.

However, the case studies and learner questionnaire indicated that learners perceived to receive homework less often than it was assigned. The possibility exists that they therefore did homework less often than it was assigned. The amount of homework done could thus be only three times a week or less in 49% of the responses received. One thus needs to ask oneself whether learners were getting enough reinforcement in correct Mathematical methods and enough practice in logical and disciplined thought.

No general tendency of an increase in the frequency of homework was found as learners moved up in Grades. Only at KMGX, and possibly MSPT, was such a trend approached in the year of the questionnaire. However, it would appear likely that the teachers decided individually how much homework they assigned per week. The quantity of homework would thus have more to do with a teacher's teaching methods and diligence than with subject, departmental or school policy.

The number of learners doing homework (as perceived by their teachers) supported the emergent pattern from the case studies that learners did less homework than was assigned, but did not necessarily "receive" less than assigned. Only 50% - 80% of the learners generally appeared to do their homework, with a slight tendency of more learners doing homework in the higher Grades than in the lower Grades. A marked change occurred in Grade 12 where 80% of the learners were perceived by the teachers as doing 60% - 100% of their homework.

This trend is supported by Mathe's (1991) study on Soweto Matriculants. 81% of the teachers stated that 60% to 80% of the Matriculants completed their assigned work (homework, classwork, etc.). Only 19% of the teachers felt that the learners were completing 81+% of the assigned work.

If less than the ideal quantity of homework was given and learners did not do homework every time it was assigned, very little homework was done and thus very little practice and reinforcement, ie. Mathematical learning, was taking place.

If learners only started viewing homework seriously in Grade 12, it is probably too late to be of any real use. Lack of Mathematical learning in the previous Grades would inhibit further Mathematical learning in Grade 12, as the ground rules and basics would not be sufficiently embedded on which to build new knowledge. This would apply in all spheres of Mathematics and especially in Geometry.

The lack of homework and thereby practice in the Grades other than Grade 12, would have a major effect on achievement. This, especially as Mathematics lends itself to practice assignments (Marquis, 1986) which show a strong relationship between homework and achievement (Cooper, 1994). Further, if having no homework assigned in one school year adversely affects the Mathematics performance in subsequent years (Austin, 1979), little homework for a number of years would probably have a similar effect on the Matriculation year.

9.2.2 Quantity of homework done

A pattern emerging from the case studies was that the learners did not receive nor do much homework. This pattern was confirmed through the learner questionnaire. Less than half the learners who completed the questionnaire claimed to have done all the previous day's homework. A large proportion had done only half or less of the homework and 16% had not done any.

Only 58% of the learners claimed to receive homework every day. Of these only half claimed to always do their homework. Thus only 30% of the learners apparently did homework every day. The same percentage did homework approximately three times a week. Yet one of the conditions predicated to be associated with achievement in high school Mathematics is "an emphasis on frequent homework with extensive feedback" (Driscoll, 1987).

The US National Assessment of Educational Progress (NECTL, 1993) reported that 22% of the learners (aged 17) did no homework and 13% did not do assigned homework. Due to the phraseology used, it was assumed that the 22% that did not do homework were not assigned homework. The figure for the Port Elizabeth learners not having done any homework (16%) is thus comparable to the figure in the US of those not doing assigned homework. The comparison to assigned homework was made as the Port Elizabeth learners only considered the homework assigned, when completing the questionnaire.

According to the teacher questionnaire, the number of teachers assigning homework every day agreed with that of the learners' perceptions. However, many of the teachers claimed to give homework four times a week (Table 8.2.6) while many of the learners perceived to receive it only three times a week (Table 8.1.1 and 8.1.2). Coupling this with the data that only 46% of learners always did their homework (Table 8.1.3) revealed that even fewer learners always did their homework than was expected from Tables 8.1.1 and 8.1.2. If some of the learners who did homework three times a week actually received it four times a week, they were doing less homework than they assumed they were.

However, homework may have been assigned so haphazardly that the learners found it difficult to give an approximate average. If the teacher assigned homework once during one week, twice during another, then four times in one week and then not at all for two weeks, it would be understandable that the learners gave different averages. They would then have to decide whether to give a running average, an average over two weeks, three weeks, the entire term or the entire year. Something they would not have given much thought to while completing the questionnaire. Alternatively, the inconsistency of learner responses from the same class showed that the learners were aware to differing degrees, of the homework they received. While some learners in the same class felt they generally received homework five times a week, others felt they only received it two or three times a week. Interpreting the data in this manner suggested that the learners had little idea as to how much homework was actually assigned.

A similar discrepancy between homework assigned and homework received was found by the U.S. Department of Education (1986). Whereas teachers said they assigned about 10 hours of homework a week (two hours per school day), high school seniors reported that they spent only four to five hours a week on homework. Ten percent stated that they did no homework at all or had none assigned.

How can learners actively participate in a class and not know when they have received homework? Is the difference between class attendance and class participation so great that many do not participate or even pay attention? Does the lack of homework done originate in the lack of participation in class? Is the lack of participation due to the teaching methods currently employed? Unfortunately these questions cannot be answered here.

However, the study by Mathe (1991) showed that in the 10 high schools studied, only 14% of those questioned 'sometimes' participated actively in the Mathematics lesson. 86% considered themselves 'passive' participants. The options of 'very active' or 'active' were not selected by the learners.

Leone and Richards (1989) found that learners rarely paid close attention or concentrated hard on schoolwork. Their data showed that learners spent relatively little time on schoolwork and also appeared to exert little effort when they did.

In summary then, less than half the learners had completed the 'previous day's' homework. As learners were asked to complete the questionnaire for the last homework received (if none was received on the previous day) the day is assumed to have been an average day at the school, which differed little from any other day. Forty two percent of the learners claimed they did not receive homework everyday. Learners are not always aware how often they receive homework. Learners thus appear to do very little homework.

9.2.3 Reasons for not doing homework

The learners seemed to be aware that they only did the easier homework. When asked why the homework was not done, the predominant response (67%) was that it was too difficult. Unfortunately, the learners were not asked to state whether they had attempted the homework before deciding it was too difficult. However, a response of "some done" would have been given in the question inquiring about the amount of homework done, had the homework been attempted. The assumption can thus be made that they had not even attempted the work.

Possible reasons for learners not attempting the difficult work are varied. It could stem from laziness or indifference, which may be inborn or acquired from the attitude of family members (role models). It could be due to an attitude that may have arisen during the apartheid era, that Blacks were incapable of coping with complex academic tasks. It could be related to the issue of inner and outer locus of control, that the learners believe that their lives are predominantly determined by outside factors and that they are therefore not capable of determining their own progress in the world. Such reasoning would bring in a former belief of people just accepting their lot in life without too much struggle. Then again, the learners acceptance of their ancestors' influence on their lives may contribute towards their attitude towards difficult work. Alternatively, it could be that the learners have not been made aware of the rigour expected of them in order to achieve in Mathematics. Lastly, the possibility that teachers leave out difficult examples, as they do not have the confidence to do them in front of the class, thereby giving the impression that difficult work need not be done. However, the actual reason may be a complex combination of the above and would require research on its own.

With regard to the attitude towards easy or difficult homework, Smith's (1988/89) research showed definite differences. First year algebra high school students [equivalent to Grade 9] rated low complexity lessons significantly higher than high complexity lessons in terms of understanding, development of confidence, enjoyment of the lesson and proper pacing of the work. The study thus showed a similar preference for easy work as that experienced by the learners in this study.

The only other reason given by more than 4% of the learners, for not doing homework, was that they had "no time". This did not correspond with the emergent pattern from the case studies. Loyiso and Vuyiseka felt that they didn't really have enough time and that time was not ensured by the parents, respectively. However, their responses did not agree with their statements or confirmations of their times and places for doing homework, or the amount of time each spent on the work (see case study emergent pattern for further details). All the case study candidates were thus considered as having enough time for homework - six by their own responses.

It may have been that the 18 learners claiming not to have had the time, did not have time for homework on the previous day only and that they usually did have time. On the other hand, it may be that the case study candidates made time for Mathematics homework due to the Hawthorne effect. They were probably more aware of the need to do homework than other learners, because of their participation in the study. Vuyiseka's and Loyiso's claims would thus have been the more realistic responses.

However, only 18 of the 511 (3,5%) learners completing the questionnaire, or only 18 of those not having done any homework (22%), had claimed "no time" as the reason for not doing homework. As the percentages are so low, it can be assumed that the number of learners not doing homework due to lack of time is negligible.

In contrast to the study done on homework in general by Hagborg (1991), no learners in this study claimed that it was a "waste of time" to do homework. In fact, this was the only category not chosen by any learners. All other categories had been chosen by at least one learner (Table 8.1.5.). Those declaring homework a waste of time in Hagborg's study were found to be less engaged in the challenges of schoolwork and presented more behaviour problems than those finding homework worthwhile do. They also viewed their own efforts as less related to academic outcomes than to other factors. In the context of this study, one would assume that the learners remaining in high school up to Grade 11 were generally committed to completing school and hoping to pass Matriculation. With the system allowing learners to leave school at the age of 16, learners without commitment would have left school by Grade 11. However, even for this situation, Pelisa is evidence that this does not always happen. Some uncommitted learners also remain in school as a result of parental wishes.

Reasons given for learners not completing homework, in a study of 3000 teachers in 92 high schools in Illinois, US, were that the learners forgot (40%), did not have enough time (19%), did not understand the assignment (11%), had to work elsewhere (9%), chose not to do it (7%) and had too many other assignments (6%) (NECTL, 1993). These reasons were for homework in general, not only Mathematics homework, reported by teachers and not learners.

If the reasons of 'too many other assignments' and 'having to work' are included in 'not enough time', as they would have been by the learners of this study, then these learners had been considerably more diligent in doing their homework than the learners of the above study were. Similarly, if 'did not understand the assignment' is equated with 'homework too difficult', then these learners experienced much more difficulty with their homework than the US counterparts. However, the difference between general homework and Mathematics homework could account for the large discrepancy here.

9.2.4 Completion of homework

As disturbing as is the little amount of homework received, is the probability that most learners never completed their homework. From the homework observations done with Nonthembeko and Mongesi it was evident that they never completed their homework. This was confirmed by the learner questionnaire. Only 35% of all the learners answering the questionnaire had completed all the homework. Forty seven percent had done only half or less of the previous day's homework (Table 8.1.3). If homework is preferable to no homework (Austin, 1979; Cooper, 1994), then surely completing the homework assigned is preferable to not completing it. If only a portion of the homework was done when the learner was aware that homework had been assigned, only minimal homework was being done by the majority of learners in general.

Although not directly comparable to this study, as the source of the figures differs and the figures are reported differently, the Illinois study of 3000 teachers investigated homework completion (NECTL, 1993). The study asked teachers how much homework learners did and reported the findings according to the number of teachers giving similar responses. In the study, half the teachers reported that learners completed between 81% and 100% of their homework. One third claimed that between 61% and 80% completed their homework. Teachers also noted that there was a group of about one-fifth of the learners who completed less than 60% of their homework.

However, if half the teachers reporting that the learners completed 81% - 100% of their homework is taken as equivalent to half the learners completing 81% - 100% of their homework, then this figure would be comparable to the 53,2% of learners from this study who completed most or all of their homework. But the number of learners in this study completing only half or less of the homework (46,9%) is much larger than for the learners from Illinois. The overall picture would then show that the learners from this study completed less homework than their counterparts from Illinois. This comparison is made worse than it at first appears, by a study of 10 countries (Canada, Britain, Israel, France, New Zealand, South Korea, Germany, Taiwan, Japan and the United States). The above study showed that the time spent on homework in the US was considerably less than in the other countries (NECTL, 1993).

It can also be seen (Table 8.1.16) that only the easier work was done. Thus, the difficult work, which requires additional practice, and usually appears in examinations, was neglected. This supports the pattern that emerged from the case studies. The case study candidates claimed to receive fewer problems if they were difficult. Whether fewer difficult problems were given, or the candidates only perceived it as such, cannot be ascertained from the data.

However, the lack of Geometry homework (usually considered difficult) assigned to

Vuyiseka and Thembani, as indicated in their diaries, suggests that little difficult homework was also assigned. Driscoll (1980) suggested that short daily [regular] assignments are the optimal form of practice. If this were accepted for high school as well as elementary school Mathematics, then the little homework assigned for Geometry would be far from optimal.

It would appear that the learners tended to do more homework in Algebra than in Trigonometry and Geometry as they found Algebra easier. The reason for the higher percentage for all homework done in Analytical Geometry may be due to it being a newly introduced topic and therefore still relatively easy. This is supported by the data for the amount of homework completed. If the homework was considered to be easy, more than 50% of the learners completed all the homework. If it was considered difficult, less than 30% did all the work. The opposite scenario shows the same trend. More learners neglected to do any homework if it was considered difficult than when they thought it would be easy. Thus less work is completed if it is difficult than if it were easy.

In the study on 382 Matriculants, Mathe (1991) determined that 89% of the learners liked Algebra most, 68% preferred Algebra + Trigonometry, only 7% preferred Analytical Geometry, only 3% liked Euclidean Geometry most and 8% preferred calculus. The section disliked most by 97% of the learners was Euclidean Geometry. If it were assumed that liking goes hand in hand with ease of work, then this data would support the above assumptions that more homework was done in Algebra than in Geometry because the learners found it easier. (When the teachers were asked a similar question, 72% gave Euclidean Geometry as the section they disliked most).

According to Marquis (1989), learners needed to realise that homework was important and that completion was necessary. Carefully assigned homework that is completed would have maximum effectiveness as all the needed practice and different variations of the problems would have been dealt with. A learner leaving homework incomplete would lack the well-rounded knowledge and practice for which the assignment was designed.

In speculating why homework was not completed, a number of reasons come to mind. The first reasons are the same as those for not doing homework. The learners did not do the difficult work. Thus, as soon as the homework became difficult they stopped doing it. They would complete the easier problems but leave the difficult ones undone. Alternatively, laziness or indifference may have determined the amount of homework completed. A further reason is that they stopped working after a certain amount of time, having 'put in the time needed to achieve'. If the learners perceived 'time put in' as the cause for high marks (as discussed in 6.2.10), then stopping after a certain time, regardless of whether the homework is complete or not, makes perfect sense. In this case the learners were probably not aware of the diligence and rigour expected of them in order to achieve in Mathematics. Lastly, it may be that the learners lacked the self-discipline or responsibility to complete the homework. As a crucial aspect of self-discipline is that of task-completion, this needs to be considered when discussing the completion of homework problems. In the same way responsibility for homework completion needs to be considered. The internal motivation of the learners (self-discipline and responsibility) may not be developed enough to ensure completed homework. (Also see section 9.2.5 on responsibility).

9.2.5 Responsibility for homework

At GQB, a Grade 10 teacher attributed the fact that 60 - 80% of his learners did their homework, to his informing the parents if homework was not done. Thembani's Matriculation teacher used the same disciplinary approach. According to the GQB teacher, the approach had its merits. I would, however, argue that such a method carries the risk of transferring the responsibility for doing homework to the parents and thereby removing it from the learner. At what stage should the learner take full responsibility for his learning, and thereby homework?

Surely, it would be more constructive and advantageous for the learner to take full responsibility for his homework, than for him to consider it someone else's responsibility? Should the education system encourage such maturity in its learners, that they would be capable of taking on the responsibility of homework? Mongesi's case would be an example in the argument for such a scenario. He accepted the responsibility of his own learning - his parents would have preferred him to work and earn money. He received no encouragement to do homework from his parents and bore the responsibility himself. Yet he was the highest achiever of all the case study candidates and of all the learners in his Grade.

Marquis (1989) wrote that Grade 9 learners needed to know the importance of homework, that it is expected and that they would be held accountable for it. However, he also suggested that it was up to the teacher to establish a system of accountability. Grade 9 learners may have good intentions but may lack the maturity and the strong willpower needed for follow-through. However, in a middle school teachers' manual, Epstein and her colleagues stated that homework was the responsibility of the learner (Aiex, 1996). Thus if middle school learners are considered capable of being responsible for their homework (with some assistance), Grade 11 learners should be able to take the responsibility for the completion of their homework.

However, by expecting parents to take some of the responsibility for homework completion, the parents are forced to become involved in their children's schooling. For the case study candidates, this was almost the only aspect of schooling in which the parents did become involved. Yet even there, their level of participation was minimal. They would encourage their children by telling them to work hard. They did not enquire about the amount or type of homework, or whether the learner had completed the work.

9.2.6 Effectiveness of homework

When comparing the amount of homework done to the amount of correct homework, the data showed that the learners generally had half or less of the work attempted correct, regardless of the amount attempted. Only a small percentage of ± 25% had had all the attempted homework correct and only 12% had claimed to have done all the homework assigned and had it all correct. Learners were thus not very effective in doing homework.

Of the minimal homework completed, less than a third of the learners had most of it correct. Almost 60% had only half or less of the homework attempted, correct. As most of the homework was not completed, half or less of only part of the homework results in very little homework being correct. Surely one could expect more than half the homework to be done correctly, as the work had presumably been taught during class and was given to reinforce and consolidate the learning having taken place there?

The effectiveness of the homework done thus appeared to be minimal. Homework which was done and for which only half the answers were correct would reinforce misconceptions and errors. If it can be assumed from the above that only easier homework was done, then such errors were made and misconceptions were formed in relatively easy work. There can be little benefit to the learner from such homework.

If homework, when done, is ineffective, it would explain Moyana's (1996) findings in his survey on Grade 10 learners. He compared the frequency of homework with Mathematics achievement and found no significant difference in achievement between learners who had frequent homework and those who had little or no homework. His findings were contrary to those in the literature (Cooper, 1994), where more frequent homework was seen to produced a positive effect on achievement. However, if the learners who did homework frequently (and regularly) did it ineffectively, then no difference would be expected between those doing frequent homework and those doing little homework.

While easy (incorrect) homework is considered ineffective and detrimental, certain Mathematical errors could result in the homework being a total waste of time. If the learner made an error that took him into entirely different Mathematical calculations or resulted in a simpler problem, the necessary practice would not be realised at all and the time wasted. The learner would thus receive no benefit from that homework. A simple example of such an error would be a miscalculation that changes a quadratic equation into a linear equation. The practice required in factorizing a quadratic equation would be lost.

The type of Mathematics in which the greatest number of errors occurred was Geometry. This was also the area considered the most difficult by learners and students (as discussed under 9.3) and the area in which little homework was assigned to the case study candidates. Thus, if difficult work results in little homework in which most errors made are due to lack of practice, a vicious circle is created from which it becomes increasingly difficult to escape. The less homework that is assigned or done, the less the practice, the more the errors, the more difficult the work, the less homework is assigned or done, etc.

When comparing only learners who had done all their homework, to the quantity of correct homework (Table 8.1.18), interesting questions arise. A higher percentage of learners who had done all their homework, claimed to have all or most of their homework correct (41,8%), than all the learners who had had all or most of the homework correct considered together, regardless of the amount of homework they had completed (24,9%). So those learners who completed all their homework, also had a greater chance of having it correct. There was thus a relationship between the amount of homework completed and the amount completed correctly. Learners who had completed most or all of the homework had a greater proportion of it correct, than learners who had completed less of the homework.

Does this indicate that completing all or most of the homework is beneficial to the ability to do the homework, or alternatively, that the ability to do the homework (possibly easy homework) results in most of the homework being completed? The first suggestion supports Wagstaff and Mahmoudi 's research (as quoted in Keith, 1982), which showed that assignment (or homework) completion was a good predictor of achievement, even above the amount of time spent on the homework. Alternatively, the second suggestion supports the supposition that the learners only did the easier work (see 9.2.4 and 9.2.6). As soon as the work became difficult the homework was not done. If the homework was easy, it was completed. Thus, the ability to do the work enhanced the probability of its completion.

9.2.7 Where or when homework was done

As established in the case studies, learners had no problems with where or when their homework was done. Homework was generally done in the afternoons or evenings, at home. Most learners worked on their own. Preference of with whom they would like to do the homework was not asked in the learner questionnaire.

This is contrary to what emerged with Møller's (1994a) case study candidates (Black high school learners in Soweto and Durban). The older learners preferred to study late at night when it was quiet and everybody was asleep. Only a few tackled homework shortly after school. Learners did homework alone, with a friend, a family member or study group. No dominance of any one choice was evident.

9.2.8 Time spent on homework

The time spent on homework by the case study candidates was generally less than one hour to an hour. The majority of the learners in the learner questionnaire (70%) also spent 15 minutes to one hour doing homework. However, 30% of the learners (included in the above 70%) spent 30 minutes or less on Mathematics homework. Thirty minutes being the time considered sufficient for Grade 8 and 9 learners by Kroeze (1989) and less than sufficient for Grade 11 learners (Smith, 1988; Kroeze, 1989 and Marquis, 1989). Only 15% of the learners had spent 1 to 2 hours on their homework and 3,7% had spent more than 2 hours on their homework (Table 8.1.9).

In his study on 382 Grade 12 learners at 10 High Schools in Soweto, Mathe (1991) found that 43% of the learners spent one hour or less on their (Mathematics) homework. 19% spent two to three hours on their homework while 38% claimed to spend over three hours on their homework. It was assumed that this referred only to Mathematics homework as the study targeted Mathematics learners and focused on problems in that subject. These figures were for Grade 12 (Matriculation) learners and not Grade 11 learners. However, it would seem that learners in Soweto spend considerably more time on their homework than those in this study did.

The National Assessment of Educational Progress in the USA (NECTL, 1993) reported that 22% of the learners (aged 17) did no homework, 13% did not do assigned homework, 28% did less than one hour of homework and only 25% did one to two hours of homework per day. Twelve percent of the learners did more than two hours of homework. The homework referred to here covered homework in general and not only Mathematics homework. Although more learners did not do any homework than in this study, a greater percentage spent one to two hours on their homework.

The times recommended for homework in Grade 11 vary. The Forum of Educational Organization Leaders (Washington, DC. as quoted by Strother, 1984) recommended two or more hours per day for high school learners. Keith (1986) suggested 90 minutes to 2½ hours per day for Grades 10 to 12. Kroeze (1989) felt that up to an hour of homework for Mathematics alone was necessary for Grades 11 and 12. In the Hagborg (1991) study of the time spent on homework by high school students, the group doing homework reported spending an average of 62,09 minutes on daily homework (self reports). Cooper's (1994) guidelines for school districts recommended four to five mandatory assignments per week, each lasting (in total) between 75 and 120 minutes, for Grades 10 to 12.

As most of the above recommended times are for homework in general, and only Kroeze (1989) recommended a time range solely for Mathematics homework, a time of approximately one hour was accepted as the appropriate time period for Mathematics homework for this study. Contributing to this decision was the impression given by the case study candidates that they mostly did Mathematics homework and little other homework.

Yet, many of the Grade 11 learners spent less time on homework than recommended for younger learners. Only 40% spent 45 min - 1½ hours, a reasonable time expected of Grade 11 learners, on their homework.

9.2.9 Time and achievement

Goldstein (1960), Keith (1982) and Keith and Page (1985) agreed that the time spent on homework was seen as an indicator of achievement and had a direct positive effect on Mathematics. In his study on high school seniors' achievement, Keith (1982) found that time spent on homework contributed significantly to student grades, even after controlling for race, family background, ability and programmes of study. Cooper (1994), in his review of the literature, found that time spent on homework had the greatest positive effect for high school Mathematics and improved the grades of learners who spent additional time on homework. Møller (1994a) found that her case study candidates who spent an average of 107 minutes on homework, on their diary day, had done well in their mid-term examinations. Candidates, who had spent only an average of 88 minutes on the day's homework, had a lower achievement. She thus suggested that spending time on homework did produce the expected results, but also stated that learners who achieved well were possibly encouraged to sustain good homework habits by their good marks. (Also see Powers *et al*, 1985 below).

Koch (1965 as quoted by Cooper, 1994) found that Mathematics concepts favoured longer assignments while problem solving favoured shorter assignments for Grade 6 learners. For Grade 9, 10 and 11 learners Anthony (1977 as quoted by Cooper, 1994), found a significant effect favouring shorter assignments. Cooper (1994) also reviewed studies, which lend no support to the notion that longer homework assignments lead to higher achievement in Mathematics. However, in his own correlation of research from the literature, Cooper (1994, p 25-26) found a definite positive relationship between homework time and achievements. His conclusion was that small amounts of homework for high school learners are of little value. The correlation was done on homework in general and was not restricted to Mathematics homework.

Thus, combining the recommended times for homework and the claims that homework has a positive effect on achievement, one would expect that learners spending additional time on homework would achieve higher marks in Mathematics. However, when looking at the percentage of learners in this study spending 45 to 90 minutes on Mathematics homework, the trend appears to be reversed. Of the learners achieving 61% and above, approximately only 30% spent the recommended time on their homework. Approximately 50% claimed to have spent half an hour or less on their homework. The lower achievers tended to spend more time on Mathematics homework than the higher achievers.

The above can be interpreted in at least three ways. It is possible that the effect of homework on Mathematics achievement is not as great as claimed in the literature, or even that it has a detrimental effect on performance. This reasoning follows from the controversial findings in the literature on the effects of homework on achievement. LaConte (1981), Friesen (1979) and Barber (1986) claimed that research had not shown a clear-cut advantage for assigning and doing homework. Cooper's (1994) summary of research reports suggested that homework had a small effect on Mathematics achievement (for primary schools), and that the effect was greater for computational or conceptual skills than for problem-solving skills. (However, Cooper also found that the time spent on homework had the greatest positive effect for high school Mathematics and improved the grades of learners who spent additional time on homework).

Alternatively, the higher achievers needed to do less homework than the lower achievers as they could do the work. They thus needed less practice than the lower achievers. Lastly, the higher achievers were more efficient at doing the work and thus needed less time to complete the same amount of work than the lower achievers. The problem whether additional homework time is detrimental to performance or whether brighter learners simply finish assignments in a shorter time period than the slower learners has been questioned in the literature of studies showing a negative effect of homework time on achievement (Cooper, 1994).

The last explanation is in line with Cooper's (1994) observation from reviewed literature, that the effect of homework is negative in relation to the time needed for the homework. Learners needing to spend much time on the homework do not benefit as much from the homework as those being able to complete it in a shorter time period. However, the question of cause and effect arises here. Do the lower achievers spend additional time on homework because they struggle with the work and thus do not benefit as much? Or do they benefit less due to the amount of time they need to spend on the work? A given amount of time does not necessarily ensure achievement. It does, however, create an opportunity for achievement that may not be possible without it (NECTL, 1993).

Thus, in summary, learners may need to spend a certain amount of time on homework. That time needs to bear a positive relation to the amount of work done. If a learner spends a lot of time on the homework, but the time is not constructively used for the amount of work done, then the effect would tend to be negative on achievement. The learners of this study were therefore probably spending too much time on their homework for the amount of work done. The effect of the time spent thus may have had a negative effect on their achievement.

This line of thought leads to the question on the motivational effects of doing so much work and yet achieving so little. Powers *et al* (1985) pointed out that high school Mathematics learners who attribute their success to effort tend to have greater motivation to achieve further than those who do not link success with effort. They also found a small tendency for learners who attribute their failure to lack of effort to be less motivated to achieve. How then would learners feel who spend a lot of time on homework, are aware that additional homework contributes to success and yet do not achieve?

9.2.10 Time versus amount of homework

Fifty percent of the learners felt they had completed all or most of the homework in 15 - 45 minutes (Table 8.1.11). If the learners' perception of time and homework completed is correct, this could be another indication that too little homework was given. It would also support the emergent pattern in the case studies that only one to six problems were generally given as homework. As less homework was given when the problems were difficult than when it was easier, learners would finish the work in the same amount of time. This, too, is confirmed by the learner questionnaire where little difference in the time spent on homework was shown for easy or difficult homework. Easy homework was completed in 15 - 30 minutes by nearly half the learners while difficult homework was completed in 15 - 45 minutes by approximately the same number of learners. Only a small number of learners spent additional time on more difficult homework than on easier work.

Only in Trigonometry and Geometry did candidates generally spend more time on homework. These were also the two topics in which the homework was considered difficult by most of the learners (Table 8.1.21) and in which less homework was completed than in other topics (Table 8.1.4). Could the thought of difficult homework that would need additional time have demotivated the learners, so that they completed less of the homework?

9.2.11 Time versus with whom homework was done

When the time and the quantity of homework done was compared to with whom the homework was done, an interesting pattern emerged. Learners who worked on their own generally completed the homework in a shorter time period. Groups tended to take longer doing the homework, with learners working with a friend falling in-between the two. Most participants working on their own also perceived themselves as completing all the homework, compared to those working with a friend or in a group.

This confirms the observations made in the group case study. Learners in the study group spent a long time settling down before they commenced work. Discussion of the problems also resulted in the use of additional time, as such discussion did not take place for learners working on their own. The benefits of such discussions are not disputed, provided that the learners have enough knowledge to have a constructive discussion without reinforcing misconceptions. (Also see 6.2.7. for a discussion on groupwork versus working alone).

Purely from a perspective of time and quantity of homework completed, the learners working on their own appeared to be more efficient at doing homework than learners working with a friend or in a group. They generally spent a shorter period of time doing the work, presumably working faster or wasting less time than those working with others did. However, being efficient does not imply that they were effective.

Yet the benefits of groupwork should not be totally rejected because group work among the learners appeared to be less efficient than working alone. If the learners were capable of constructive Mathematical discussions during group work or while working with a friend, added benefits of socialisation, a larger range of methods and solutions (especially in Geometry) and exchange of ideas would make group work more effective than working alone. Whether present teaching methods produce learners capable of such effective group work in Mathematics is a question not attended to in this study.

9.2.12 Mathematics easy or difficult?

Learners were also asked to state whether they found the subject Mathematics easy or difficult. A relatively high percentage of 32% claimed it was easy. The fact that a greater percentage found Mathematics "easy" than generally passed Matriculation Mathematics could be due to two factors. Firstly, the candidates were in Grade 11 and not in Grade 12. Secondly, Grade 10 and 11 tests and examinations are set internally by teachers whose style and standard is known to the learners, while the Matriculation examination is externally examined. However, viewing the perception of Mathematics difficulty in relation to learners' marks suggests a third scenario.

What was most surprising was the number of candidates who had failed Mathematics and yet claimed to find it easy (Table 8.1.23). How did the effect of only doing the easier homework and leaving out the difficult work influence this impression? Were these learners trying to maintain self-esteem in the face of their peers, themselves or me as suggested by Vuyiseka? Was their perception of the amount of work they did and their achievements so skewed that they saw this as a true reflection of the subject? How did the learners view cause and effect in relation to homework and achievement?

The astonishment that failing learners considered Mathematics easy was compounded when pass rates of Grade 11 and Grade 12 were compared. The standard of assessment in Grade 11 appeared to be lower than in the final Matriculation examination. How would failing learners who found Grade 11 Mathematics "easy", fare in Grade 12? One could assume that they would put in little effort for an easy subject.

Although most of the case study candidates understood that they did homework in order to understand the Mathematics, learners may still have viewed the cause and effect of hard work → understanding → high marks differently to educational norms. They may have felt that 'putting in the time' → high marks even though they didn't understand the work. If they didn't realize that a certain amount of rigour was necessary in order to achieve, then spending the correct amount of time on the subject would appear to be sufficient to pass.

9.2.13 Extra lessons

Although the frequency of homework assigned showed no trend to increase in the higher Grades, extra lessons did. Very few extra lessons or extra time was spent on Mathematics in Grades 8 and 9. Time was given only at the teacher's convenience or when absolutely necessary. Even when time was given, many learners failed to attend. Marquis (1989) found that Grade 9 learners, even when aware that extra help was needed, often found other appealing things to do. Learners need constructive suggestions from the teacher to help them make use of extra lessons.

In Grades 10 and 11, extra lessons became more regular than before while in Grade 12, extra lessons appeared routine and perhaps excessive. However, the change in frequency of extra lessons from Grade 11 to 12 was not as drastic as in Thembani's case. Thembani had no additional lessons in Grade 11 but had Mathematics before school, after school, weekends and holidays in Grade 12. As his class expressed dissatisfaction with the Grade 11 teacher, it could be assumed that the contrast was in part to compensate for lack of tuition time in Grade 11. Did the Matriculation teacher feel that the class needed such excessive Mathematics tuition to catch up on work missed or not sufficiently reinforced in the previous Grade?

Judging by the comments made by Thembani and the study group, such intense tutoring may well have led to what is called a "satiation effect". The potential for any activity to remain rewarding is limited. By spending increased time on a subject, learners may become overexposed to its academic tasks. This then undermines good attitudes and strong achievement motivation (Cooper, 1994).

9.2.14 Completion of syllabi

The tendency to complete the syllabus also increased in the higher Grades. Only 20% of the teachers interviewed had completed the syllabus in Grade 8. The percentage increased slightly with each subsequent Grade through 22%, 45%, 36% and 90% respectively. Only at Matriculation level did the majority of the teachers complete the syllabus. The higher percentage for Grade 10 is ascribed to the less complex work dealt with in Grade 10 as opposed to the greater variety and quantity of new work done in Grade 9. An example in support of the above statement is the introduction of factorisation in Grade 9, which is built upon in Grade 10. Grade 10 also sees the integration of learners into Standard and Higher Grade for the first time. In Grade 9 all learners are taught on Ordinary Grade.

It would appear that additional effort was made by learners and teachers to do homework, give and receive tuition and to complete the syllabus as the learners moved up through the Grades, with maximum effort made in Grade 12. What then happened to the work and effort left out in earlier years?

If difficulty was experienced in completing the syllabus, it may be assumed that there was little or no time to include work not dealt with in the previous year. Learners would thus experience gaps in their Mathematical knowledge. This would no doubt have an effect on later work, as work in the higher Grades generally builds on basic work and foundations laid in lower Grades. A simple example is that children cannot be expected to multiply numbers unless they can first add, as multiplication is in essence repeated addition.

Such gaps in learners' Mathematical knowledge may also explain why work was considered easy and understandable when explained in class, but difficult and confusing when attempted for homework (see case studies). A teacher generally mentions various concepts in class, during the explanation of a problem, which would temporarily bridge knowledge gaps and thus bring understanding. As such knowledge and understanding has never been reinforced - by practising previous work on which it is based - it is not retained by the majority of learners and is lacking when homework is attempted. Homework is thus difficult and previous examples are not understood well enough to be used in clarification.

As reasons for not completing the syllabi, teachers often chose "syllabus too long" and "time too short". The teachers were thus aware that time was essential for the completion of the work. Yet, from the case studies, it would appear as if any excuse possible was used not to teach or not to have classes - by teachers and learners. Seen in this light, the lack of extra lessons in the lower Grades showed that teachers made little effort to rectify the situation. By the time an attempt was made in Grade 12, it may well have been too late.

In Grades 8 to 11, teachers also put the blame on learners for not completing the syllabus. The predominant reason given was that the learners "work too slowly". Six teachers claimed that "learners don't understand that part anyway" while seven claimed that "learners don't want to work."

Their idea that learners "work too slowly" supported the observations made with Mongesi and Nonthembeko while observing them doing homework. These observations were investigated further and are discussed under "Timing of homework".

That "learners don't understand that part anyway" does not mean that work of greater complexity should not be done. It needed to be presented clearly and concisely with extra time made available for learners questions and practice (Smith, 1988/89).

Learners not understanding a section of work could be due to work or homework having been missed in previous Grades. Resistance to work and homework is natural in most children but can be entrenched when role models show similar tendencies. Teachers being away or not coming to class would exacerbate this situation. Other reasons given by individual teachers support the above reasoning.

9.2.15 Work left out

That basic work essential to later Grades was left out, was confirmed by teacher responses to a question on which sections of work had not been completed. The basics to Geometry were often neglected in all Grades, explaining the lack of Geometry homework shown in the case studies. If learners were incapable of doing the homework because of a lack of foundational work, it is senseless giving homework.

Ratio and proportion, a section largely neglected in Grades 8 and 9, forms the foundation for work in Geometry and Analytical Geometry in Grade 12. In Grade 10, parts of Algebra (eg. exponents and inequalities) were neglected by some teachers, which are needed in Grade 11 and Grade 12. Linear programming is left out in Grade 11 by seven of the nine schools and exponents, surds and Trigonometry are again neglected by some. How are learners to attain Matriculation standards if foundation work is so neglected? The ability to do homework, especially alone at home, becomes impossible.

A learner, who begins a learning sequence by performing poorly on the first step, performs even worse on the second step because he lacks some of the prerequisites. Without additional time spent restudying these prerequisites, he misses additional prerequisites at each successive step. It would be a better investment in the long run to give learners what they need up front rather than try to make up for it at a later stage (NECTL, 1993). The decline in school performance and attainment found by the older learners in Møller's (1994b) study of Black high school learners could well be due to such knowledge gaps, as well as the outside interests attributed to it by Møller.

Learners without a sound foundation in Geometry have little to no knowledge on which to build in higher Grades. They have little possibility of gaining insight and proving riders if intuitive proofs and theory have not been dealt with. That learners generally struggle with Geometry is common knowledge amongst Mathematics teachers and is certainly my personal experience. Even the majority of students at the College of Education where I teach cannot do Geometry and find riders impossible to prove. Ironically, such students can pass Mathematics and become teachers of Mathematics without ever becoming proficient at Geometry.

Steyn and van der Westhuizen's (1993) reasoning that lack of completion of relevant syllabi contributed to the lack of achievement in Black education thus seems substantiated.

Another aspect of not completing the syllabus or of leaving out certain portions of the work, may be a language issue. As Education policy says that learners should be taught in English from the fourth grade, the teachers and learners are expected to do Mathematics in the second language (or sometimes third language). Language has been shown to have a critical impact on Mathematics learning (Garaway, 1994). In Italy, language is now seen to be at the heart of the heuristics and planning of problem solving, and not only of the expression of Mathematical concepts (Garaway, 1994). Thus, teachers may be leaving out sections of work due to the English required in them. Examples would be Linear Programming and Euclidean Geometry.

9.2.16 Extra time for Matriculants

Of the teachers asked whether it was true that more attention and time was devoted to the Matriculants than to the other Grades, 87% (34/39) agreed with the statement. Many clearly stated that they gave more attention to the higher Grade than the lower Grade if they taught two different Grades. This was generally to the detriment of the lower Grade, especially if they were teaching Matriculants, as they would teach the Matriculants during the periods assigned to the lower Grades.

It thus appears that homework, tuition and sections of work were neglected in the lower Grades by teachers and learners alike. There was a slight tendency to increase tuition and the completion of work in the higher Grades. However, it was only in Grade 12 that a real effort was made by learners and teachers to work to an acceptable standard. Learners thus missed out on work due to a number of reasons. These include not doing homework, missed school time or classes and unfinished syllabi.

The Soweto study on Matriculants by Mathe (1991) suggests support for the above deductions. The Matriculants in the study spent considerably more time on Mathematics homework than the Grade 11 learners of this study. However, whether this is due to the learners living in Soweto, being in Grade 12 or a combination of these or other factors cannot be ascertained.

9.3. Time learners spent on problems and common errors made

The aim of this follow-up study was to establish the speed at which learners solved (homework) problems. No studies have been documented of research comparing the amount of homework and the time spent on that homework (Cooper, 1994). Nor were publications of studies comparing these variables found since 1994. This could thus well be the first time that actual 'homework' problems have been timed.

The time reportedly spent on homework, for the number of problems assigned for homework, indicated that the case study candidates took a relatively long time to complete problems. This was again confirmed by the responses in the learner questionnaire. However, both case study candidates and learner questionnaire responses depended on the learner perception and self-reports of the time taken for homework. This is a similar problem experienced by many researchers in the field (Hagborg, 1991; Cooper, 1994). By using "timed homework" it was possible to time the learners as they did the problems, thereby eliminating some uncertainty in the data.

The type of errors made by Nonthembeko during the homework observations also caused concern, as most seemed to have their origin in previous Grades. As such errors led to loss of marks and therefore achievement in Mathematics. It was possible that this contributed to the lack of achievement of many Black learners. The responses to a question on the completion of the syllabi in the teachers' questionnaire had also shown that not all the work was covered. Learners were thus left with gaps in their knowledge which would be needed in future Grades. An important issue that needed attention thus became the type of errors made by Grade 11 learners in general.

9.3.1 Completion of work

The high percentage of learners not completing the timed problems or simulated homework ranged from 18% to 57% for the problems assigned. Even for simple conversions of Trigonometric functions to co-functions, some failed to complete the work properly.

This supported the emergent pattern, as seen from the case studies, that homework was mostly not completed. If such high percentages were unable to complete the work while aware that they were observed and would hand in the work, how many learners completed the homework when unobserved, knowing that the work may or may not be marked, and certainly would not be taken in?

Reasons observed for not completing the simulated homework were, lack of a calculator, previous errors making further calculations impossible and lack of Mathematical knowledge. Learners not having a calculator at school, may have had one at home. Although it is probable that some may have left their calculators at home, some learners may well have been without one altogether. One must then ask oneself what learners without calculators do when doing homework alone at home.

In his study on Soweto Matriculants, Mathe (1991) reported that 83% of those questioned did not have a calculator and 94% did not have mathematical instruments. They would find coping during homework, tests or examinations without a calculator difficult. The lack of calculators and mathematical instruments would influence achievement considerably in the higher grades where Algebra and Trigonometry require the use of a calculator, as the use of trigonometric-, logarithmic- and surd tables are no longer taught at schools.

9.3.2 Time taken to do the problems

The time taken to do the simulated homework problems was generally well over the expected time limits calculated for the work. In Algebra, in all four classes, less than half the learners finished within the recommended time frame. In two classes, less than 3% of the learners fell into this category. Between 17% - 77% needed more than twice the expected time.

In Trigonometry, 45% - 76% of the learners did manage to hand in their work within the time limit calculated according to the mark allocation. Yet 7% of one class still exceeded the time limit by more than twice the recommended time.

The higher percentages for work completed within the expected time in Trigonometry could be due to two factors. Both Trigonometry problems were timed at KWL High School, although during different years and with different teachers. The learners at KWL may have worked faster than learners at other schools did. The second factor concerns Trigonometry versus Algebra. Learners may work faster when doing Trigonometry. Trigonometry is introduced to learners in Grade 10 and requires only basic algebraic calculations. Learners are thus unhindered due to work missed in previous Grades or misconceptions picked up in previous years (see teacher questionnaires). Lack of confusion or greater understanding would therefore allow faster work.

As Bracey (1989) pointed out, some of the reasons for assigning homework are the practice to increase speed, mastery or the maintenance of skills. The amount of homework done is thus considered to influence the speed at which the work can be done. Learners receiving or doing relatively little homework would probably do it more slowly than those receiving or doing much homework would, as they would lack the practice that increases speed.

9.3.3 Efficiency of homework

The high percentage of learners not completing the work or not working within the expected time frames showed that homework was not done effectively or efficiently by the majority of the learners. This supports the observations made during the case studies and the findings of the learners' questionnaire.

The small number of learners completing the work within the expected time frame and the large number needing more than twice the amount of time is cause for concern. With promotion and examination procedures for High Schools and Matriculation as they are at present, tests and examinations take place within strict time limits. Learners not able to work at a pre-ordained speed are put under greater stress and penalised in such a system. A learner who cannot finish a problem within a set time (roughly calculated according to the marks allocated to each problem) will probably not finish the examination paper. Marks would be lost due to unfinished or unattempted problems - over and above the loss of marks due to Mathematical errors. Although the times set for each problem are roughly allocated, the times set for the examination paper are exact - 120 marks for two hours in Grade 11 and 150 marks for three hours in Grade 12 in the Eastern Cape.

According to the current system, the learners thus worked too slowly or accomplished too little within a set time frame. The above analysis supported the suspicions, aroused during the case studies and the teachers' reasoning that learners "work too slowly" was a cause for them not being able to complete the syllabi. A question for further research would be whether the learners really worked too slowly or whether the system expected them to work at an unrealistic rate.

9.3.3.1 Unnecessary work

Much time was spent by the majority of learners on writing out calculations in full, where mental calculations should have been sufficient. No Grade 11 learner should still need to show the division by a coefficient on both sides of the equation when solving for a variable. Grade 11 learners could also be expected to be able to calculate the square or cube of 1 and 2 mentally, as well as the multiplication of simple fractions. Either the learners really need the visual stimulus for these calculations or they are encouraged to show the calculations by their teachers. From personal experience during teaching practice I am aware that student teachers include the visual calculations in their explanations during teaching. This even though they are not taught to do so in Mathematics or Mathematics Method at College.

Further unnecessary time was spent on redoing problems or sections thereof in an identical manner with identical errors. No reason for this was found in the error analysis with the possible exception of an attempt at neatness. As the second attempt usually ended up looking much like the first, even this was questionable. However, the learners concerned may have been attempting to order their thoughts, although with little apparent success - possibly supporting the notion that mental work without visual calculations came with difficulty.

9.3.3.2 Careless mistakes

Problems copied incorrectly, careless mistakes and mathematical nonsense lead to time used ineffectively. This was especially so if the errors resulted in the problem being simplified (eg. $3x^2 - 3x + 2$ copied as $x^2 - 3x + 2$), the problem being impossible to solve or needing different Mathematical methods. In each case the reason for assigning the problem as homework would have been lost and the necessary practice and reinforcement of new knowledge learnt wouldn't take place. Marks during tests and examinations would also be lost, resulting in time wasted under these circumstances. However, if the error allowed further, similar calculations as required in the original problem, the time spent on the problem during homework would not be entirely wasted. However, in a test or examination scenario, marks would still have been lost.

9.3.3.3 Mathematical errors

Mathematical errors made by the learners seem to have originated predominantly in previous Grades, especially in Grade 8. Even for Trigonometry, a number of errors were made which originated in Grade 10. As only a brief introduction to the topic is made in Grade 10 and little pre-knowledge is required, such early misconceptions and errors are unnecessary and avoidable.

The errors originating in previous years could well be due to the lack of tuition time in lower Grades and neglect of the lower Grades as indicated in the teacher questionnaires. That such missed work is carried along over the years and not learnt later is evident by the errors made in work covered in classes as early as Grades 6 and 7! The Trigonometry errors and misconceptions carried over from Grade 10 will no doubt cause further errors in Grade 12 Trigonometry homework, tests and examinations.

Reasons for learners working too slowly, and thereby inefficiently, include the use of unnecessary long written methods, unnecessary rewriting of problems and the ineffective use of time due to careless mistakes or Mathematical nonsense. Further loss of time is due to confusion resulting from unnecessary errors made as a result of work missed or not completed in previous Grades, resulting in ineffective homework.

It could be suggested that such inability to do Mathematics, as was demonstrated in the problems done for this study, imply that the learners have no grasp of the work. Homework therefore becomes an attempt at coming to grips with the subject instead of the practice session it is meant to be (Cooper, 1994). The learners may spend part of the time meant for homework on trying to understand work that they cannot do. This would also explain why learners appeared to do homework inefficiently and why higher achievers spent less time on homework than lower achievers, contrary to trends found in the literature. It is also supported by the comments from the case study candidates that work was understandable when done in class but difficult when attempted for homework.

9.4 Summary

Stated briefly, the four follow-up studies confirmed many of the patterns discovered in the case studies and contributed additional information to questions that arose from the case studies. The patterns confirmed were:

- Teachers assigned too little homework.
- Learners received too little homework.
- Learners did less homework than was assigned as they didn't always do the homework assigned.

- Only ± 50% of the learners received homework every day.
- Learners did not do the difficult homework.
- Learners did not complete assigned homework but left work undone.
- The homework done was ineffective, as much of it was incorrect.
- Homework was generally done at home, in the afternoons or evenings.
- Learners did homework inefficiently ie. completed too little homework for the amount of time spent on it.
- Homework done when working alone was more efficient then when done with others.
- Learners did not consider homework a waste of time.
- Learners had a different understanding of ability and achievement than the relationship of hard work and understanding → achievement.
- Learners made many errors when doing homework. These errors were due to
    - unnecessary work
    - careless mistakes
    - misconceptions originating from previous Grades.

A pattern not readily confirmed was that the learners spent approximately the correct amount of time on their homework. The case study candidates had spent approximately one hour (or less) on their homework. However, only 50% of the learners completing the learner questionnaire had spent the recommended amount of time of approximately one hour on their homework, while 30% had spent less than 30 minutes on the homework.

Additional information to questions that arose from the case studies:

- A large proportion of the homework completed was incorrect. There was a relationship between the amount of homework completed and the amount completed correctly. Learners who had completed most or all of the homework had a greater proportion of it correct than learners who had completed less of the homework did.
- Learners were not benefiting much from homework as it was done inefficiently
- and ineffectively.
- There was no positive correlation between time spent on homework and

achievement for the learners in this study. Learners able to complete the homework in less time seemed to benefit more from the homework than those needing to spend more time on the homework.

- No general tendency of an increase in the frequency of homework was found as learners moved up in Grades, with the exception of the Matriculation year.
- The learners only started viewing homework seriously in Grade 12, by which time it was probably too late to be of any real use.
- Teachers viewed syllabus completion as increasingly important as the learners progressed up through the Grades, resulting in the syllabus being completed only for Grade 12. All other Grades had work left out, which impacted on the work in the later Grades.
- Learners experienced gaps in their Mathematical knowledge due to syllabus and homework incompletion throughout high school. Mathematical errors made by the learners predominantly originated in previous Grades, especially in Grade 8.

CHAPTER TEN

SOME CONCLUDING REMARKS

10.1 Introduction

This study has described and interpreted learners' perceptions of Mathematics homework and how they went about doing their homework. At the onset, ten case studies were done where learners kept a diary on various aspects of Mathematics homework, and were interviewed. Their parents and teachers were also interviewed in order to triangulate the data. The data from the case studies was then analyzed and the emergent pattern described. Certain parts of the pattern were prominent and clear, but it was felt that other aspects needed to be confirmed, rejected, and/or expanded. Further information was needed to do this, and four additional follow-up studies were initiated. The data from these studies supplied information to clarify questions that arose from the case studies and facilitated the generalization of the data.

10.2 Major findings, implications and recommendations

According to the case study, learner questionnaire and teacher questionnaire findings, learners received too little homework too infrequently. Only 50% of Grade 11 learners received homework every day while many teachers considered it normal to assign homework only three or four times a week. Even less homework was received when the work was considered difficult, or when it was Geometry. There was also a discrepancy between the amount and frequency of homework that the teachers assigned and that which the learners perceived they had received. Learners reported receiving less homework than the teachers reported assigning. The infrequent and small quantities of homework assigned and done may thus be one of the reasons why the learners were not achieving in

Mathematics. This would be supported by the National Education Commission's (USA) findings on time and learning (NECTL, 1993). They found that educational opportunities were unequal among the different kinds of schools because learners in the lower-achieving, poorer, and predominantly minority schools got less homework. Teachers need to be made aware of the need to assign regular daily homework (Coulter, 1979) while the learners need to realize that all homework should be done.

Although the learners received little homework and the case study candidates claimed to have enough time to do their homework, learners often did not complete their homework. They would leave problems incomplete or undone, especially if they were considered difficult or if they did not understand the work. Such work was then copied from another learner. Learners thus did less homework than was assigned (even when they perceived they had received the correct amount of homework). Leaving homework incomplete may imply that learners are not being as successful as they could be. If success is accepted as being '1% inspiration and 99% perspiration', then homework completion could make a difference to success in Mathematics. Renzulli (Conference on Gifted Education, 1984 pers com.) showed that task completion and commitment were critical factors for success and career achievement. Learners who are not committed to tasks and do not complete them, lose the potential to be successful. This is supported by the relationship of much homework completed versus much homework correct that was found among the learners. Learners who completed most of the homework had a greater proportion of it correct than learners who only completed some of the homework. Homework incompletion has implications that reach beyond homework, as lack of task completion has consequences in the home environment, the work environment and even in relationships. As such, learners' (and teachers'?) acceptance of incompleted tasks can eventually have an effect on the general economy as those learners move out into the workforce.

Other than the little homework assigned and done, another problem with homework was the teachers' and learners' attitudes towards it. Learners only started viewing homework seriously in Grade 12, by which time it was probably too late to be of any real use. Teachers, too, only increased the frequency of homework assigned to daily homework in Grade 12. The same trend was seen when considering syllabus completion. Work was omitted in all Grades with the exception of Grade 12. The impact of omitted work was not taken seriously, resulting in learners experiencing gaps in their Mathematical knowledge. How then could they be expected to do homework correctly and to benefit from it? It would surely be a better investment in the long run to give learners what they needed to be successful up front, rather than trying to make up for deficiencies right at the end (NECTL, 1993). One way to encourage both learners and teachers to work more diligently throughout the Grades would be to introduce provincial, regional or school-clustered examinations at levels prior to Grade 12, possibly at Grade 7, 8 or 9.

Another problem with the homework was that it was often done incorrectly, with a myriad of mistakes. A large proportion of the homework that was completed contained errors due to carelessness and misconceptions originating from previous Grades. This implies that the work omitted in previous Grades has a great impact on the ability to do homework in later Grades. Teachers had the tendency to leave out sections of the work in lower Grades and to spend excessive time trying to give learners enough information and knowledge to pass during the Matriculation year. However, by then it is too late. The effects of such inadequate high school preparation are difficult to overcome (Gray and Taylor, 1989). It is not possible to make up for four years of inferior teaching in one year, after the learners have reinforced mistakes and misconceptions during homework, tests and examinations. This view is supported by the low success rate of the Bridging Course learners who needed Matriculation Mathematics (see Chapter One). Teachers need to realize that the earlier Grades are as important as the Matriculation year and that they give the foundation that makes success at Matriculation level possible.

Telling teachers to assign daily homework, and learners to complete it, is all very well but not very useful if learners make mistakes while doing the work and are unable to do the more difficult work. Teachers thus need to be made aware of the consequences of leaving out work (even that considered to be irrelevant during that Grade) and encouraged to spend the time needed to complete each Grade's syllabus. However, the question which remains is whether learners did more of the homework because they could do it correctly or whether they did it correctly because they did more homework than other learners.

Homework was thus done ineffectively, resulting in learners not gaining much by doing the work. Doing incomplete or incorrect homework does not give the learner the practice or knowledge for which homework is designed (Lee and Pruitt, 1979; Cooper, 1994). It is especially the difficult homework that enables a learner to cope with examination questions and achieve in Mathematics. It should not be ignored or avoided, by the teacher or by the learner.

Due to the socio-cultural differences involved in the South African school population, the policy in South Africa was not to structure the homework situation formally. It was left to the individual schools to set their own homework policy, in consultation with the Inspector of Schools and the professional teaching body. The wishes of the parent body could also be taken into consideration (Junor, 1989). According to the Handbook for Principals (Cape Education Department, 1982), it was the duty of the principal and staff to see that discretion was used when assigning homework. The principal needed to ensure that one teacher did not overload the learners with homework to the detriment of the other subjects. He also needed to ensure that teachers, in general, did not make unreasonable demands in respect of homework. This aspect was seemingly taken to heart by many of the teachers, to the detriment of Mathematics learners, as shown in this study. Due to the present homework situation and the time of the previous decisions on homework policy, it is recommended that the issue of a homework policy be reconsidered. It is important that such a policy includes daily quality homework for all Mathematics learners.

However, despite doing little, incomplete, copied and ineffective homework, the learners did not consider homework a waste of time. They claimed to understand that they could benefit from homework and could articulate how it would benefit their studies. Reasons given for doing homework were that it gave practice, increased Mathematical skills, taught the relevant theory while it was being used and helped in achieving good marks. Yet extra work was only done by the minority of the case study candidates, and then only on occasion. Were the learners merely saying what they knew they were expected to say? Had they learnt the reasons for homework by merely repeating what they had been told, without having internalized the concept? Judging from the lack of rigour with which the homework was done, this may well be the case. That in turn suggests that the education system is such that learners have been taught to give the 'right' information without needing to give it much thought or internalizing the knowledge. The implications for Mathematics would be that the learners learn the 'recipe' to solve a problem without considering why that method is used, whether it is the best method to use and what the practical value of the solution is. Curriculum 2005 and Outcomes Based Education (OBE) are to be South Africa's solution to this problem (Department of Education, 1997). However, it will take years for OBE to reach a level at which it is implemented with success. It is recommended that teachers start applying intense pupil participation in lessons and encourage learners to think independently in the mean time.

The case study candidates all expected higher marks for tests and examinations than past achievements had proved them capable of. Despite doing little homework and not completing it, they thought that they should be able to achieve higher marks than they had been achieving. They thus appeared to have a different understanding of time spent on the work, understanding of the work, expected rigour applied to the work, ability to do the work and the resultant achievement. They seemed to think that 'putting in some time' was enough to achieve in Mathematics and did not consider the efficiency or effectiveness of the homework they did. Whether homework was done correctly, was completed or copied seemed to be irrelevant to them, as long as they had spent some time on it. Once again the ineffectiveness of the homework is highlighted.

Similarly, the passivity with which the learners appeared to learn falls into the same category. During groupwork, the majority of the group members would watch while a few members did the thinking. Even in the classroom, it appeared as if learners just sat, listened and copied off the board, making classwork "easy" and homework "difficult". Although teaching methods were not a part of this study, it is recommended that teachers look critically at their approaches to teaching and not wait until OBE is formally introduced into the upper Grades. At the same time, the learners need education in the value of quality and rigour in any task that is done.

The case study candidates appeared to have spent the recommended time of approximately one hour on their Mathematics homework. However, of the learners who responded to the questionnaire, only 50% had spent approximately one hour on their homework. Thirty percent had spent 30 minutes or less on their homework. When comparing the time spent on the homework to the few problems assigned, it becomes clear that the homework was done inefficiently by many of the learners.

Although the literature shows a positive correlation between time spent on homework and achievement (Bracey, 1989; Harborg, 1991; Keith and Page, 1985; Marquis, 1989 and Ziegler, 1986), no such trend was evident in this study. Learners who had spent less time on set problems, had achieved higher marks. Thus learners working more efficiently seemed to benefit more from homework than those spending more time on the problems. This effect would also explain why Moyana (1996) found no significant difference in the time spent on homework and achievement in the Grade 10 Northern Province learners in his study. The need thus exists to make learners aware of the time and effort required while doing homework. Time spent on homework that is not done efficiently and effectively is generally time wasted.

The acceptance of 'putting in the time' but not doing efficient and effective work has far greater implications than those limited to Mathematics homework. If learners view 'putting in the time' as a normal work ethic, it may imply that their parents view it as a way to get by. Such lack of responsibility and diligence could have a major impact on home life, socio-economic status and the overall economy of the country. If a large proportion of the workforce is left to believe that merely 'putting in the time' is sufficient to achieve, then it bodes ill for individual development as well as the economic development of the country as a whole.

But how does one teach learners to do homework efficiently and effectively? The most appropriate recommendation would be to start such working habits at an early age, possibly in Primary School. However, short-term solutions were sought in this study and the recommendation is thus to give Mathematics learners (and their teachers) a course on the appropriate study methods for Mathematics. Such a course would have to emphasize the efficient use of time while doing problems, the rigour needed in tackling homework problems and the effort expected in order to achieve in Mathematics. It would have to address the concepts of time versus quality time and internalization of knowledge through reasoning and application.

Learners also did not discuss school or schoolwork with their parents. The attitude among the case study candidates and their parents was that parents cannot help their children with their schooling as they were generally uneducated. The only contribution made by the parents was to tell their children to go to school and to work hard. Even interest in marks, achievement or progress seemed minimal, as the parents knew very little detail about such matters. Parents also had very little contact with the people teaching their children.

Parents need to be made aware that encouragement and support of learners is important. This does not mean that the parents need to be capable of assisting them with schoolwork, but that motivation and moral support should be given and an interest in the learner's school and schooling should be shown (Campbell and Mandel, 1990). Such support is more important for high school learners than parental pressure, monitoring of homework or help. A child who perceives parents' interest in his life and achievements feels that he is valued. He will in turn see himself as valuable and act accordingly. He will strive for positive reactions from the people with whom he associates and feel that he is able to share his successes.

Parents thus need to be informed that they should participate fully in their children's learning by motivating them and giving them psychological support and to become involved in their schooling by getting to know the teachers. The best way of informing the parents would be to make extensive use of the media, such as radio or television. Trying to work though the schools is not recommended as parents have little contact with the schools and learners do not discuss school matters with their parents. As many parents are also illiterate, sending letters or circulars would not have the desired effect.

Taken as a whole, this study has shown that the poor Mathematics pass rates cannot be viewed independently, without taking various factors into consideration. These factors include the unrest at ex-DET schools and the lack of a culture of teaching and learning at those schools. When considered in this context, the poor pass rate becomes understandable. However, it is not enough merely to understand how it came about. The Matriculation Mathematics pass rate must increase if South Africa is to move forward, educationally and economically.

Homework was seen as a possible tool for increasing the pass rate over the short term. It was considered to be an area in which learners could contribute to the changes in the pass rate directly, without relying on long-term changes in their parents' economic status or the upgrading of teacher qualifications and facilities. This study has shown that there is potential for improvement in the way in which the learners do their homework. This could be accomplished by showing learners how to work more efficiently and effectively when doing Mathematics homework. Such a change in learning habits could be brought about by addressing the problem at an early age, ie. in Primary School. However, as the study was aimed at helping learners in the shorter term, it is suggested that study orientation courses that will teach the learners how to do their homework in a manner which is efficient and effective be developed and given.

10.3 Areas for further research

Although generally working alone and all case study candidates having someone they could turn to for assistance with the work, many would have preferred to work in a group while doing the homework. Possible advantages and disadvantages of working in a group have been discussed in Chapter Six but the question of the effectiveness of such groupwork remains, especially when considering the Mathematical abilities of the group members (or even the persons rendering assistance) and the passivity of some members. The study also showed that learners working with others or as a group did homework less efficiently than learners working on their own. With the educational trend moving towards groupwork and co-operative learning (Department of Education, 1997), a detailed investigation on the inefficiency of learner's work when working in groups needs attention.

Another area that requires attention concerns the rate at which the learners worked. It was considered to be "too slow" according to the teachers' expectations and in comparison with the rate of work expected during Mathematics examinations. However, the question remains whether the learners work too slowly or whether teachers and examination standards expect learners to work at an unfairly fast rate.

The issue of homework completed versus homework correct instigated interesting questions. It was found that the learners who had done most or all of the homework also had most of it correct. In contrast, learners who had only done some or half of the homework had a lesser proportion correct. Did the learners do more homework because they were able to do it? Or were these learners able to do the homework correctly because they did more homework than other learners? These are interesting questions that will need to be answered if homework is to contribute significantly to learners' Mathematics achievements.

Another issue that needs investigation is the apparent tendency for learners to listen passively during groupwork, or in the classroom, rather than participating actively in the learning process. Merely listening and watching while a problem is done will not assist the learner when he needs to do the problem alone, either for homework or during an examination. An example is the need for an LCM when adding two algebraic fractions. The learner may understand that an LCM is needed and may have accepted the LCM used for the problem dealt with in the classroom, but be unable to find LCM's for the homework problems. Had he actively found the LCM for the explained problem, he would have an idea how to go about finding LCM's. As finding LCM's is part of the Grade 7 and 8 syllabi, the teacher will not necessarily have dealt with it during that Grade 9 lesson. This would explain why many learners found the work easy in class but difficult for homework.

The relationship between the factors mentioned in this study and achievement in Mathematics need to be investigated. To what extent does little, incomplete or incorrect homework impact on achievement? What difference does active versus passive learning make to success? How is responsibility for homework and the internalization of the reasons for homework linked to success in Mathematics? An indication that a causal relationship exists between quality homework and good results could be obtained by comparing homework habits at schools with good results versus those with poor results.

10.4 Limitations and strengths of the study

Unfortunately depth of information was lacking in certain areas of the case studies. Repeated attempts made throughout the duration of the study failed to obtain in-depth information or to promote critical thinking and insight among the candidates. The learners appeared not to think deeply about homework or their understanding of it and so could not articulate any deeper thoughts on the topic.

It was also not possible to ask all the necessary questions, as some questions only became evident during the lengthy, detailed process of analysis. By then it was impractical to ask the questions as retrospective questions would have been out of context to the learners, who were no longer orientated towards the study and would have had to rely on memory and facts supplied to give an answer. As a result, the need to gain further information led to the follow-up studies. This also changed the focus of the study from an attempt at gaining in-depth information to the ability to generalize the findings.

The limitations of the study did not allow for further investigation into a number of issues. The reason why difficult homework was left undone was merely speculated upon. No follow-up questions were asked on this issue, partly due to a time constraint and partly due to the learner's apparent inability to answer such questions with the required depth. The aspect of doing homework in groups was debated but not dealt with in detail. Even the case study on the study group did not provide enough information to effectively argue the issue.

However, the strengths of the study outweigh its limitations. The follow-up studies brought with them additional information, the confirmation or rejection of patterns discerned in the case studies and the detailed investigation of actual

Mathematics homework problems. Set problems could be analysed for the time taken to complete them and the errors made in those problems. Thus, detailed analysis of the time spent on the work and problems experienced by the learners during 'homework' could be done. This, in effect, gave greater insight into Mathematics homework than the case study analyses and could explain why the time spent on homework did not have the same effect on achievement for these learners as that reported in the literature. No such detailed or similar analysis of homework could be found in the existing literature, yet its contribution to the insight into problems that the learners experienced with homework was substantial.

The timing of the learners, while they did set problems, helped to determine how slowly the learners worked and why they worked so slowly. It emphasized the magnitude of the problem by showing the large number of learners who worked below the rate expected by examination standards. The analysis of errors made it possible to discover how many mistakes the learners made, the type of mistakes they made and why they made those mistakes. The analysis went beyond the usual categorization of a problem being merely correct or incorrect and as such contributed immensely to the insight obtained into the problems experienced with Mathematics homework (and the Mathematics pass rate).

On the whole, it is felt that this study has identified factors that could improve the quality of Mathematics homework, which could subsequently assist learners in improving their Mathematics abilities in the short term. As such, it has contributed to knowledge on the manner in which homework is viewed by the learners in the study and on how it should be viewed by them. The factors identified in order to increase the effect of Mathematics homework include increased frequency and quantity of homework, increased efficiency in doing homework, increased effectiveness (correctness and rigour) of homework and the need for moral and psychological support from the parents. If this study results in the development of study orientation courses that address the above factors, much will have been accomplished. Improving learners' attitudes to homework would teach them work methods that could benefit them in life outside the classroom. Task completion and commitment, acceptance of responsibility towards one's own contributions and acknowledgement of the consequences of work not done or left incomplete are vital life skills if one aims to succeed in business or a career.

Further, if a relationship exists between poor Mathematics results and inefficient and ineffective homework, then study orientation courses that improve the quality of homework done could benefit the learners in Mathematics achievement.

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Van Rensburg, J. (1994) Subject Advisor: Mathematics, Department of Education and Training, Regional Office, Port Elizabeth.

APPENDIX A

Introduction

The following is a reporting of an individual case study. All case studies were written out in the same format, which was then used as the basis for analysis. In each study an attempt was made to preserve as much of the actual data as possible, so as to transmit the atmosphere of the interviews and tone of the diaries. However, including each case study was considered too bulky and so it was decided to include only one case in the Appendix as an example of the case studies. This would allow readers to experience some of the personality of the candidate and the richness of the information, thereby gaining insight into the use and analysis of the data.

In the case study the information is reported in chronological order. The reason for this is to give readers the information in the same order in which it was received. Readers will thus be able to analyse the data, beginning at the same starting point as I did. However, the same topics occur repeatedly in different interviews and in the diary summary, as they were discussed with the learner, the parents or the teacher. This may make the assimilation of facts appear clumsy and give an impression of confusion.

The repetition of topics is also due to the rephrasing of questions for the confirmation of attitudes or behaviour. Similar answers to rephrased questions suggested confirmation of the previous answer and thus internal validity. Contradictions in answers to similar questions suggested two possible interpretations: Either that the learner had changed an attitude or behaviour - possibly as the Hawthorne effect wore off - or that one or both answers could not be accepted as a true representation of the facts.

A third reason for the odd sequence of the reporting and the repetition of topics is the random way in which the questions were arranged for the interviews. This was done with the purpose of confirming answers, attitudes, behaviour and data received. For example, the following two questions would not be asked consecutively, but be separated by other questions:

"How long does it take you to do your Mathematics homework?"
"How many problems do you generally get for homework?"

If the questions followed each other directly, the learner may be influenced in his answer to the second question by his answer to the first question.

If the learner claimed to spend two hours on his homework, he may feel that he needs to state a higher number for the number of problems received. Thus, if three to five problems were generally received, he may be inclined to say five. This would then give the impression of four, five or six problems being assigned, rather than three, four or five problems.

If the questions were separated by other questions, the learner may not be as aware of the connection between the two questions. He may thus answer the second question with "three to five problems", not thinking that he needs to correlate this to the two hours spent on homework.

By reporting the data in this manner, readers can analysis the data of this case study for themselves if they choose to do so. Their own interpretations could then be compared to that presented in the synopsis and discussion chapter.

The language, sentence formation and vocabulary used are similar to that used by the learners. Their manner of speaking and vocabulary was often retained in the case study reports to allow the readers to experience the interviews 'more closely' and thereby attain more insight into the interpretation of the data. The resulting phaseology does not read very well but also gives the reader some idea of the candidates' English competency. An example is: 'He did homework every day although sometimes it would be wrong and sometimes right'.

CASE STUDY LOYISO NT

Loyiso was a Std 9B (Grade 11B) learner at KMGX High School in 1996. The entire class clapped when I asked for him on the day following the completion of the initial questionnaires. They seemed to interpret being selected for the project as a positive step.

Loyiso was of average height and well built. He appeared very quiet. I put this down to his embarrassment at the fuss being made by the class. As was the norm, I asked if he was willing to be part of the project. On confirmation, I handed him the diary and showed him the questions I needed him to consider as he wrote the diary. I emphasized the need to start the diary on that day by opening it at the current date. I would keep in contact with him by phoning him.

Giving Loyiso his lift home to see where he lived was somewhat embarrassing as he approached the car in such a hesitant manner that I was unsure if it was he. I actually asked him three times if he were Loyiso. He looked awkward in the car and admitted to feeling shy. He no longer looked so big and now wore an earring. He said school was OK and that he was coping with Grade 11.

Loyiso wanted me to drop him off at a friend's house so that he could pick up his school bag. I asked that he show me his house first so that I could visit him there in future. Before getting out of the car, Loyiso asked if I knew of anyone who needed odd jobs done. I said I would make enquiries.

Loyiso has one brother, three years younger, who was then attending Std 7 (Grade 9) at an ex-CED (White) High School. He had been selected for this High School from his Primary School in Std 5 (Grade 7). Loyiso does not have any sisters and thus has a very small family consisting only of his father, brother and himself.

He lived in KwaDwesi, an up-market township, in a smallish, white painted corner house without a wall, fence or garden. The house looked scruffy in comparison to its neighbours. It was quite a distance from the school to which Loyiso usually walked.

DIARY SUMMARY

Loyiso had kept a regular diary with emphasis on classwork and homework. The class received homework more often than not and often did classwork. Much time was spent on homework corrections, which often took up the entire lesson. For example, in May, corrections for Geometry multiple choice questions took two days. A test was also discussed for two periods, rewritten and then that test again discussed for an entire period.

On February 23 Loyiso thought that most of the class would pass the second test. However, most failed although Loyiso had passed. He put his pass mark down to having "practised very much".

Homework and classwork appeared to be plentiful when given, with anything from one to ten "exercises" (presumably problems) for homework. Loyiso never specified whether an exercise refers to a whole exercise, to parts of an exercise or to problems. On one occasion 2 "exercises" took him 2½ hours to complete. The teacher did homework corrections when the work was more difficult.

Examples of new work were usually done by the teacher who routinely did one to three