

***CURRENT DIFFICULTIES EXPERIENCED BY
GRADE 10 MATHEMATICS EDUCATORS
AFTER THE IMPLEMENTATION OF THE
NEW CURRICULUM IN GRADE 9***

BY

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DECLARATION

I declare that this is my own work, except otherwise indicated.

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DECEMBER 2005

DEDICATION

This work is dedicated to my lovely late father Chithumuzi Alison and my mother Nokwaliwa Lilly, my wife Jabu, my two precious sons, Ngcebo and Sinenkosi and also to my only precious daughter ZamaZindela, S’busisiwe kwa-Malinga for love, care and encouragement they always offered to me.

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ABSTRACT

The purpose of this study was to establish current difficulties experienced by grade 10 mathematics educators after the implementation of the new curriculum in grade 9 (Senior Phase).

Qualitative approach, using questionnaires' as a research tool was employed. The study was conducted from twenty grade 10-mathematics educators in a variety of schools. The questions were based on the current difficulties that educators were experiencing in grade 10 after the new curriculum was implemented in grade 9 in 2002.

The research study was undertaken in different schools with different backgrounds in one District; UMgungundlovu of the Kwazulu – Natal Department of Education. These educators were from schools with the following backgrounds:

- Rural schools
- Township schools
- Former White schools
- Former Indians/ Coloureds schools

The findings of the study are presented and these are interpreted and discussed under two categories: these being the kinds of difficulties enunciated by grade 10 mathematics educators and the researcher's comments on the findings.

The Key Findings of this research study are the following:

Grade 10 Mathematics educators complained that they have problems in teaching mathematics in grade 10 learners because:

- Methods used in grade 9 are totally different from those they are using in grade 10.
- There is no linkage between grade 9 and grade 10-mathematics syllabus.
- Educators' lack training and teaching in outcomes – based approaches.
- The new curriculum does not prepare learners to do pure mathematics in grade 10.
- Learners cannot even work independently, only rely on the constant guidance from the educators and other members of the group.
- Learners find it difficult doing individual work and completing homework and other class work.
- Many learners drop out in mathematics classes and others even become worst in mathematics.

- The examinations or assessment (CTAs) which is an exit point from grade 9 to grade 10 have no value for the type of mathematics that is done in grade 10.
- Textbooks used in grade 9 have lots of activities and lots and lots of stories and less mathematics.
- Textbooks used in grades 8 and 9 are of poor quality and exercises are of pathetic quality.
- Educators in grade 10 have to teach grades 8 and 9 work because it was not taught.
- No clear focus on content part in grade 9, which form the basics of grade 10 mathematics.
- The new curriculum in grade 9 gives emphasis to very few topics.
- The level of mathematics that learners are exposed to, in grade 9 is far lower than the one they encounter in grade 10.
- No support from parents in terms of doing homework.

Finally, the recommendations are made for addressing the difficulties that are experienced by these educators as well as suggestions for further study.

LIST OF ABBREVIATIONS AND ACRONYMS

AMESA	Association of Mathematics Educators in South Africa
ASESA	Association of Science Educators in South Africa
C2005	Curriculum 2005
CTA	Common Tasks for Assessment
INSET	In- Service Education and Training
OBE	Outcomes- Based Education
Doe/DoE	Department of Education
KZNDEC	KwaZulu Natal Department of Education and Training
PEI	President's Education Initiative
PIMSTA	Pietermaritzburg Mathematics and Science Teachers' Association.
MASMTA	Mangaung Science and Mathematics Teachers' Association
MDAMSTAD	Mdantsane Mathematics and Science Teachers' Association Developmental
MLMMS	Mathematical Literacy, Mathematics and Mathematical Science
NSC	National Senior Certificate
NGO	Non-Governmental Organizations
GET	General Education and Training
FET	Further Education and Training
RNCS	Revised National Curriculum Statement
SAARMSE	South African Association for Research in Mathematics and Science Education
TLSM	Teaching and Learning Support Materials
ZPD	Zonal of Proximal Development

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APPENDIX A

Chapter 1

BACKGROUND TO THE RESEARCH PROBLEM

1.1 INTRODUCTION

It has been widely reported by educators that the implementation of Outcome based education (OBE) in mathematics classrooms did not proceed as planned. The training of educators by the Department of Education (DOE) often stressed the generic aspects of OBE. The new methods for teaching, learning and assessing are time consuming and often cumbersome. The emphasis on contexts masked the mathematics. As a consequence- limited emphasis is given to the mathematical skills and knowledge required for progression to grade 10.

If you were not involved in the teaching of Mathematical Literacy, Mathematics and Mathematics and Sciences (MLMMS) in grade 9 during 2001 and 2002, then it becomes essential to consult with the educators who were teaching grade 9 in those years. Due to the different emphases to given OBE in grade 9 and the time consuming nature of the implementing OBE, certain aspects of mathematics necessary for the Interim Curriculum in grade 10, 11, and 12 did not receive due attention. It is only through finding out from your colleagues what was done previously, that you would be properly informed of the shortcomings of the teaching in grade 9. Grade 10 educators need to give special attention to knowledge vacuums so that learners entering grade 10 classes may have the necessary “prior” knowledge required.

1.2 THE PURPOSE AND IMPORTANCE OF THE RESEARCH STUDY

The purpose of this study is to look at the current difficulties experienced by grade 10 mathematics educators after the implementation of the new curriculum in grade 9 in terms of content and methodology during the years 2003 to 2005. The researcher is also a concerned educator who had experienced some problems with the teaching and learning of mathematics by these learners. This study will also look at the GAPS between the work done in grade 9 and the work done in grade 10. The study will also look at the shortcomings mentioned above. How successful are grade 10 educators in helping these learners?

The Department of Education's officials said that educators' preparation and support would take two forms. Firstly all educators will undergo a short but focused orientation program conducted by department officials. The materials and approaches used for training of grade 10 mathematics educators in 2003 will be used for this orientation. The big question is: Did the DOE succeed in doing that and if so, were those training workshops sufficient to prepare educators for the transition from OBE to normal teaching methods? Secondly the DOE also promised that there would be an educator preparation in subject content to be conducted by suitable and carefully chosen providers.

The Department of Education promised to develop an educator training specification that will be used in the design and delivery of training programs. Higher education institutions and Non- Governmental Organizations (NGOs) should play a big role in this training. This training did not take place in the majority of the schools in the UMgungundlovu district. Very few workshops were held to assist grade 10 educators. The first group of learners under the OBE system reached grade 10 in 2003. These learners are required to do Interim Core Syllabus in grade 10 and not the new curriculum. The researcher thinks that, this may create some problems to educators since these learners were not thought the basics in mathematics in grades 8 & 9. The researcher's concern is that these learners were taught the new curriculum, in an OBE approach and using OBE textbooks and now in grade 10 have to switch back to the interim core syllabus.

There is a huge difference between the textbooks' contents of grade 9 new mathematics curriculums and grade 10-mathematics Interim syllabus. The grade 10 mathematics is based on traditional syllabus whereas grade 9 MLMMS is based on OBE. The process of the revision of the GET curriculum resulted in the review of date of the implementation of OBE in the FET band.

Oakes (2001:102) in his research findings concluded that many grade 7 Natural Science educators would not have expected capacities to implement the OBE and curriculum 2005 successfully. I have found very little information which is published, about current difficulties experienced by grade 10 mathematics educators in 2003 to 2005 and therefore I find that research in this area may assist the Department of Education to establish some measures to circumvent the resultant problems that are being encountered by grade 10 educators. Jansen (1999) asserts that OBE is driven by political imperatives, which have little to do with the realities of classroom life. He says that it will in fact undermine the

already fragile learning environment in schools and classrooms of the new South Africans. He also said that educators have not been allowed to conceptualize and make sense of OBE as curriculum policy. The management of OBE will multiply the administrative burdens on educators. The researcher thinks that Jansen's assertion is correct, when he says that educators have not been allowed to conceptualize and make sense of OBE since they are encountering more difficulties in the implementation process of OBE. Educators do not understand the new curriculum and this may cause some problems when the new curriculum is implemented.

The literature review has revealed that many authors writing about OBE have not emphasized educators' mastery of content knowledge. The mastery of content has not been identified as a variable for the successful implementation of curriculum changes.

Perhaps it is because these findings were discovered in contexts where this factor was not considered as relevant variable as most of the educators had a good mastery of the subject content. The problem may lie with learners that do not have enough background on the subject. The researcher thinks that this is obvious the case in the South African context and particularly for this research studies.

1.3 RESEARCH PROBLEM

The new curriculum has a completely different approach to learning and teaching from that which many educators have been accustomed to and have been trained to teach. This also applies to the experiences they have had as learners themselves and as educators. The researcher refers here to what their particular "mind sets" are as to what good Mathematics teaching is and their attitude to teaching Mathematics.

The big problem that the researcher is raising in this research study is that learners have been taught in an OBE style and learning the new curriculum in the senior phase, but when they reached grade 10 they have to be taught old syllabus using old approach in order to prepare them for the Senior Certificate examination which still required the basics of mathematics.

The researcher wishes to clarify that he started with several tentative hypotheses with regards to the difficulties experienced by educators in teaching grade 10 mathematics after the implementation of the new curriculum in grade 9. These hypotheses were subject to

modification in keeping with the qualitative methodology, which has been applied to this research study. These hypotheses were as follows:

- The new curriculum was implemented too quickly
- The new curriculum was supposed to be implemented in 2003 in grade 10 but it was not.
- The educators were not trained or received insufficient training for implementation of the new curriculum.
- Educators are not happy the way the new curriculum was introduced.
- Educators will have problems in teaching grade 10 mathematics.
- Educators will have difficulties in meeting the demands of the new curriculum as set out in the Mathematics policy document

Educators accustomed to the requirements of the old Mathematics syllabus in terms of their capacities as educators would be faced with many difficulties in the teaching of the Mathematics learning area of the new curriculum. The researcher has encountered some problems with the teaching of this learning area in grade 10, so suspected that he is not the only one and so wished to research this area so as to establish what problematic issues grade 10 mathematics educators were having after the new curriculum was introduced in the senior phase and to make some recommendations for its successful implementation.

1.4 RESEARCH METHODS

The researcher has employed a qualitative approach using mainly Questionnaires. Twenty grade 10-mathematics educators from variety schools participated in this study. Each educator was selected at random by the school in which she /he teaches. The sample in this research is a combination of all race groups i.e. Africans, Asians, Coloureds and Whites. The criteria were that the educator must have been teaching mathematics in grade 10 from that selected school between 2002 and 2005.

All the 20 participants were teaching mathematics in secondary schools in UMngungundlovu District of KZN department of education, where OBE is being implemented for the first time in grades 8 and 9 between the years 2001 and 2005.

1.5 THEORETICAL LOCATION OF THE STUDY

It seems that there is no basis for claiming that one view or another gives us a better account of how really are? And so one is free to choose or mix- and – match in whatever

way gains us an advantage in solving problems. Therefore, it will be helpful to consider those critical and important concepts from each theory that may be useful in guiding this research, in particular the extent to which such concepts might help in understanding the learning of mathematics. It is not easy to say exactly which of the four schools of thoughts i.e. *early Mainstream Cognitive Psychology [Behaviorist]*, *the Socio- cultural Perspective*, *Situated Cognition and Constructivism* better fit this topic since there is an overlap among these theories.

This study arises from personal experiences, other researcher's materials available and department of education's documents. This work will draw from the theory of Situation Cognition. The researcher has found this concept to be very useful together with the notion of apprenticeship [Lave, 1998:34] and Wenger [1991, 35]; Nunes (1993, 57) Rogoff (1990, 75). Situated Cognition will be used in this study to see how apprentices or novices learn through working with a Master or expert, and eventually become an expert in their own right.

This research will be based on the Constructivist theory more especially, the Negotiation of taken- as- - shared meaning (Cobb, Yackel and Wood, 1992; 65) in particular in the treatment of learners ' mathematical activities in the classroom situations. Richard's (1996, 65) explanation of the term when he says that Negotiation takes place only if the educator actively listens and consciously adapts to learners mathematical activity. He further argues that interaction in which the learners merely adopt the educator's language do not involve Negotiation. He then proposed that classrooms interactions should include what he termed the explicit Negotiation of mathematical meanings whereby the educator supports and encourages the learners to articulate their mathematical problems, interpretation and solutions. Using the notion of apprenticeship as a metaphor for learners' cognitive development, say in solving mathematical problems and within the context of school mathematics, and the learners as novices working under the guidance of the expert. Nevertheless, it is important to note that the educator, as an expert is still encountering some problems and developing breadth and depth of skills and understanding mathematics concepts in the process of carrying out the activities and guiding learners in them.

The third theory that will also form the basis of this research study is Vygotsky's socio-cultural perspective. Here Vygotsky introduced the idea of Zone of Proximal Development (ZPD) in a lecture given in March 1993 (Van de Veer and Valsiner, 1991; 56). The ZPD is

defined by Vygotsky (1978) as; the distance between the developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in the collaboration with more capable peers (Vygotsky, 1978; 86). A number of researchers (for example: Newton and Holtzman, 1993; 23) view the ZPD as the explanatory framework for learning as a whole. Both in the formal contexts, such as learning in schools and in the formal contexts such as learning outside schools in everyday situations.

1.6 STRUCTURE OF THE DISSERTATION

Chapter one gives a brief outline, which introduces the reader to the whole research study, and presents a background to the research problem. The second chapter reviews the relevant literature to the study. The third chapter concerns the methodological aspect of the study, which outlines the procedures and strategies that have been applied in the study. The data collected in this study are presented in chapter four with minimal comment. The interpretation and discussion of the results of the study is done in the fifth chapter. The sixth chapter serves to draw a conclusions and recommendations that are based on the findings and conclusions made.

1.7 CONCLUSION

As already mentioned, this chapter serves to introduce the reader to the research study. The background information serves to give some insight into the research problem. The information given thus far reveals that there are some difficulties with regard to the teaching and learning of grade 10 mathematics after the implementation of the new curriculum in grade 9. There are some obvious difficulties accompanying the implementation of the new curriculum, hence the researcher's interest in conducting this research study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will cover important information regarding the relevant aspects of Mathematics in the new curriculum; the difficulties experienced by mathematics educators in South Africa during the apartheid era; international problems or difficulties with secondary school mathematics education; the status of Mathematics in South Africa after the 1994 democratic election; Educators' abilities in the teaching and learning of mathematics. Factors influencing curriculum changes in mathematics and some difficulties of the new curriculum. The researcher found very little published information about the difficulties experienced by grade 10 mathematics educators from 2003 to 2005. The researcher therefore he find that the research in this area may assist the Department of Education (Doe) to establish some measures to circumvent the resultant problems that are being encountered by grade ten educators. This study will focus on a small sample of grade ten mathematics educators in Umgungundlovu district in KwaZulu- Natal Department of Education. The researcher will look at the experience of grade 10 educators with the teaching of learners who are the results of the implementation of the new curriculum in the General Education and Training phase (GET), back to pure Mathematics.

2.2 Relevant Aspects of Mathematics in OBE Style [New Curriculum]

2.2.1 Outcome Based Education as a Model in South African schools.

At present, learners in the Further Education and Training (FET) schools Grades 10-12 are being offered an interim core syllabus contained in the Minister's Policy Document, called REPORT 550 (1995). The curriculum was declared interim after it has been cleansed of offensive racial and gender biased undertones. The changes that have been made to the interim syllabi were not so different that they warranted the total overhaul of the curriculum. These changes are the differences between the Interim and new OBE curricula. These are the differences found in the principles on which the two are based, the beliefs and views about education, their aims, the way in which educators teach and learners learn, how the performances of learners is assessed and certificate is issued on completion of grade 12. The Department of Education (Doc.2, 1998, 2) states that South Africa has chosen the transformational Model of OBE. The Doe (doc.1; 1988; 3) refers to it as a

transformational model in the sense that the new curriculum is intended to transform the educational system.

2.2.2 REVISED NATIONAL CURRICULUM STATEMENT {RNCS} AND OUTCOMES

During the transition period between 2002 and 2005, the Policy of the current Senior Certificate did not change. This includes subject choices, the interim core syllabi, the prescribed National and Provincial Continuous Assessment Guidelines and the current Examination System. The dilemma that now exists relates to those learners taught using the *OBE* style up to the end of the GET phase and has to complete the FET phase using the Interim Core Syllabus. The OBE approach will be infused into our Learning, Teaching and Assessment of the interim Core syllabi in the FET phase. C2005 specifies sets of outcomes to be achieved in the different learning areas. These outcomes are much broader than what traditional subjects specialized educators customarily aimed at. The formulated outcomes as well as the new spirit of the new democratic constitution, as well as the elements of African Culture and traditions are to be reflected in the different learning areas of the compulsory phases of schooling.

2.2.3 Phasing OBE into FET Phase and managing the Transition (2002-2008) (Mathematical Resource Pack volume 1: April 2003)

The DOE has tried to accommodate some of the questions that are being asked by many educators about implementation of OBE in the FET phase in its resource pack. Some of these questions are covered in this section.

(1) Why was the new curriculum not introduced in grade 10 in 2003 as Expected?

Following a listening campaign in 2000, then the newly appointed Minister of education, Prof. Kader Asmal, set up a committee to review the implementation of C2005 in Further Education and Training (FET band). Following on the findings and recommendations of this committee, the Minister started a process of revising and strengthening the curriculum.

Some of the recommendations of the review committee were:

- Terminology used in curriculum 2005 to be revised and simplified.
- Language used to be simplified.

- The curriculum and its attendant documentation needs streamlining, the design features need to be rationalized, that teaching time be reallocated to languages and foundational mathematics and promotion of progression, pace and sequencing be enabled.
- Learning support materials are variable in quality and often unavailable, and then these need to be planned very carefully.
- Provincial Departments and school management teams to provide full support to educators in the classroom.
- The implementation of curriculum 2005 has been too rushed and therefore inadequate. The dates of implementation need to be considered.

The Cabinet adopted the Revised National Curriculum Statement (RNCS) for Grades R- 9 in March 2002. It was introduced in 2004. The process of the revision of the GET Curriculum resulted in the review of the dates of implementation of an OBE in the FET Band. The new OBE will be introduced into Grades 10, 11 and 12 in 2006, 2007 and 2008 respectively. The researcher is concerned about those learners who entered the FET phase during the years 2003 to 2005. These learners had to return to what are the so-called interim core syllabi. The new curriculum will be based on the same principles and design features of the Revised National Curriculum Statement (RNCS) Grades R-9 (schools).

(2) Why delay the introduction of the OBE to 2006?

System wide curriculum change is a huge and complex process. It needs to be planned properly and prepared for thoroughness. The process includes development of the curriculum statements and subject statements, the training and preparation of educators and support personnel, development and distribution of Teaching and Learning Support Materials (TLSM) and the provisioning of other appropriate resources. The introduction of the curriculum in 2006 will give the department enough time required to do this .The delayed implementation will ensure that sufficient attention is given to Foundation and Intermediate phases. (KZNDEC; 2003:3)

(3) What is happening with the learners getting into the FET band between 2003, and 2005?

The learners will enroll for the interim syllabi between 2003 and 2005. This means that these learners will sit for the ordinary Senior Certificate examination between and including 2003 to 2007. The department of education has produced an Educator Guide that

will be used to assist educators to support these learners during this period. This guide was used at national and provincial orientation and training workshops to equip grade 10 educators with competencies to introduce an outcomes-based approach to education and training into the interim syllabi. This is done through the infusion of the critical and developmental outcomes into the interim syllabi. The department will continue to assist all educators in the FET band to cope with the subject content demands. The researcher expresses opinion that these promises may never have been fulfilled in all of the nine provinces in South Africa. If all this training did take place a further question to be asked is: how many educators or learners benefited from such assistance?

2.2.4 The rationale of mathematics as a learning area of RNCS in the FET Phase compare to grade 10 interim syllabi.

There are changes that were made to the grade 10 mathematics 'apartheid curriculum. These changes include the offensive, racist and gender insensitive language and undertones were removed through the "cleansing process". The Senior Certificate has been improved in the last few years. The new outcomes-based approach to assessment has been introduced into the nationally examined subjects. The outcomes-based has also been introduced to teaching, learning and assessment of interim syllabi in both grade 10 (in 2003) and subjects in technical colleges. (KZNDEC; 2003; 2)

The major differences between grade 10 mathematics interim syllabi and RNCS in the FET are found in the principles on which the two curricula are based, the beliefs and views about education, their aims, the way in which educators teach and learners learn, how the performance of learners is assessed and the certificates issued on completions of grade 12 (for more information refer to site-based documents) (KZNDEC; 2003; 2)

The focus of teaching and learning data handling in the RNCS in the FET Phase is on the application of techniques already learned in order to investigate and solve problems. The learner is expected to deal with data in significant social, political, economic and environmental contexts with opportunities to explore relevant issues (e.g. HIV/AIDS, crime, abuse, and environmental issues).

The syllabus is aimed at fostering and developing the following specific aims of mathematical education:

- To enable pupils to gain mathematical knowledge and proficiency.
- To enable pupils to apply mathematics to other subjects and in daily life
- To develop insight into spatial relationships and measurement.
- To enable pupils to discover mathematical concepts and patterns by Experimentation, discovery and conjecture.
- To develop number sense and computational capabilities and to judge the reasonableness of results by estimation.
- To create an awareness of and appreciation for the contributions of all peoples of the world to the development of mathematics.

The researcher has noticed that among the aims and objectives for teaching and learning of mathematics that have been listed both the interim core syllabus and new curriculum do differ significantly. It is true that we did not have outcomes in the interim or old syllabus, but when one analyzes these outcomes, they were accommodated in the old syllabus in one way or the other. Although there are not exactly the same, one needs to make one's conclusions whether or not these aims are the same. The researcher has mentioned above that the differences are in the principles on which the two are based, the beliefs and views about education, the way in which educators teach and learners learn, and how the performances of learners are assessed and certificate is issued on completion of grade 12.

2.3 The History of Mathematics Education in South Africa: Apartheid era.

It is common knowledge that during the apartheid era, South African Education was segregated along racial lines. We had an education system that was content based, inflexible, oppressive and segregated in terms of disability; race and gender (Naicker; 1999; 93). The majority of the population in this country had very little or no access to proper education especially to subjects likes mathematics and natural sciences. South Africa had also restructured its curriculum in order not to be left behind by the other leading nations of the world.

According to Khuzwayo (2000) the historical research in mathematics education may appear not to have direct application to the classroom, it can find its way into classroom practice by changing the terms in which mathematics instruction is portrayed and it can present new insights into ways of dealing with problems in our profession. This is supported by his reflections upon his own research into the history of mathematics education in South Africa during the apartheid period (Khuzwayo; 2000). In a study

conducted by Khuzwayo (2000) the history of South African mathematics education for African Students during the apartheid period was done. It places the history of mathematics education in broader context by describing the general developments in South Africa during this period. The main question the study sought to address is: *How did apartheid ideology and political practice influence how mathematics was taught and learned in the past?* Much of Khuzwayo's work in this study was also determined by his experience as both a student and a teacher of mathematics during the apartheid period.

The apartheid policies of Nationalist government were explicitly engineered to create minority group control and to provide inferior education for the majority in order to sustain its position of social, political and economic subjugation. Educational resources were not only limited, but also differently distributed. Over the many years of apartheid, there was a continuous resistance to Bantu Education. The legacy of apartheid is possibly nowhere more evident than in the inequalities it has left in the education system. There has been a lack of provision of basic facilities for a proper education system, for blacks in particular. Mathematics education for blacks has never been in a healthy state in South Africa. (Khuzwayo: 2000; 310)

The minister of Native Affairs, Dr HF Verwoed, in a speech delivered on 17 September 1953 on the Second Reading of the Bantu Education Bill, said: *When I have control over native education I will reform it so that the Natives will be taught from childhood to realise that equality with Europeans is not for them. People who believe in equality are not desirable teachers for Natives...What is the use of teaching the Bantu child mathematics when it cannot use it in practice? That is quite absurd* (Khuzwayo: 2000; 310)

The Verwoed policies of gross discrimination meant that blacks were discouraged from taking mathematics as a subject, and many black students could also not offer mathematics as a subject through to the end of their high schooling studies since a number of schools did not offer mathematics at the senior secondary level. For instance, according to a report for the Department of Education and Training and the Department of Art, Science and Technology KwaZulu-Natal still had 156 high schools that did not provide mathematics in grade 12 levels by 1997 (Arnott, Kubeka, Rice and Itall 1997; 17). Not only was mathematics not offered and taken by pupil in all schools, but the way in which

mathematics was taught then as an abstract, meaningless subject, only to be memorized, was meant to further the apartheid philosophy which characterized all aspects of teaching in the past. The quality of mathematics teaching in black schools across South Africa has always been questioned. There was a shortage of adequately trained secondary level mathematics educators. Mathematics educators in black education had to contend with pupils who, with increasing age, experienced increasing deficits in their mathematical knowledge and skills. Furthermore, the number of black schools offering mathematics at senior secondary level has been drastically low, as has been the success rate of these pupils.

Since no blacks were included, it is not surprising that a proper and comprehensive database on the status of all mathematics educators did not exist, and has only begun to be developed since 1996. The times of missionary education and the pre-apartheid education era, is difficult to find, and it is hard to define what the specific focus areas of this research were. (Khuzwayo: 2000: 315)

Wilkinson's analysis of typical errors made by Standard 5 pupils led her to conclude:

Pupils' knowledge of mathematics was extremely low in all the homeland states; candidates had not mastered the basic mathematical concepts; many pupils could not overcome language obstacles (mathematics was taught in English, which was second language to all the learners) and also...the question papers did not take the cultural background of pupils into consideration to sufficient degree. (Wilkinson 1981; 150)

Although the researcher's study is not based on blacks mathematics education amongst blacks in South Africa; but he felt it necessary to highlight some of the difficulties that were experienced by the majority people of this country. It is for this reason that Wilkinson made recommendations, *inter alia, relating to:* determining chief aims, goals and objectives of mathematics education; introducing alternative teaching methods; reducing the straining effect of a foreign medium of instruction on learners' achievements in mathematics; and gaining support and cooperation of educators for reforms needed in mathematics education. Wilkinson maintains, for instance, that the cultural background of learners and of the particular community in which they grow up must be known before an

understanding of their problems in mathematics can be dealt with (Wilkinson 1981; 15). She cites Van den Berg, study that indicates that:

Black pupils probably have a flair for mathematics and they do have the potential that can be developed although it is doubtful whether many of these facts provide enough evidence of the true mathematical ability of black pupils in South African context. (Wilkinson; 1981: 10)

She further maintains that lack of creativity and originality on the part of the learners is explained in terms of their 'cultural background's points out, for instance, 'the unquestioning, almost slavish obedience expected from the learner dampens his initiative, originality and creativeness to a great extent' (Wilkinson 1981: 102). Wilkinson, also supported by Van den Berg (1980), suggests that individualized teaching of mathematics is not an appropriate strategy for use by educators and she supports a more group-oriented teaching methods: In this way teaching will be more at par with the traditional upbringing of the Black child' (Wilkinson 1981: 120). This is indeed one of the aspects that are emphasized by OBE, which was introduced in South Africa after the 1994 elections. The period between 1985 and 1990 was marked by debates about reforms and the state of education, and about the future educational needs of South Africa.

Another important feature of the 1980s was the emergence of the movement known as People's Education for People's Power (PEPP). With the advent of PEPP three subject commissions were set up, for Mathematics and Science, History and English. The life span of science in the mathematics and science commission, however, was very short. The mathematics Commission did not view mathematics as universal and neutral body of knowledge (Mphahlela & Khan; 1993). Lastly it is the researcher's opinion that holding our past, living our present and imagining and creating a better future lies at the heart of what could be called the ethos, of much of the research and development work in South Africa and so too in teacher education.

In South Africa during the early 1980s' grade 10 (former called form III or std.8) learners were writing external examination in all subjects including mathematics. According to the statistics the performance of learners in mathematics was bad especially in geometry

compared to the algebra sections. Educators were also experiencing problems in terms of teaching this section since most of them did not have qualifications in the subject. According to other researchers, mathematics is also a problem in other countries globally.

2.4 International Problems or Difficulties with high school mathematics teaching.

In October 1995 a report was published which had been produced by the London Mathematical Society, the Institute of Mathematics and its applications and the Royal Statistical Society. The report tackled the mathematics problems, critical of the way in which the mathematics curriculum has been developed during the last decade and recommended that a standing committee to be set which was to include a substantial representation from high education, to provide an overview of education in mathematics from primary school through university, and to ensure that sound advice and adequate support are provided to those involved in its organization and delivery. According to the report, one of the ‘serious problems perceived by those in higher education’ was ‘a changed perception of what mathematics is in particular of the essential place within it of precision and proof.

Geometry section is indeed a problematic part in high schools mathematics and educators are often heard lamenting the fact that their learners cannot do proofs that they do mathematics in a rote mode by memorizing procedures and proofs. In response, educators’ strategies are sometimes so modified as to place greater emphasis on the logical structure of mathematics, in an attempt to help learners not to accept rules without reasons. The hope is that when the reasoning behind each logical step is revealed, learners will no longer have learnt the super art thinking “deductively and rigorously” (Hanna; 1983: 29).

The structure of the British National Curriculum in mathematics is that of a single fixed hierarchy or ‘ladder’ of knowledge and skills. Their mathematics is made up of a few topic strands (Attainment Targets) with eight or nine levels. All learners in USA schools from 5 to 16 years of age are expected to work their way up this same ladder. A single mathematics curriculum specification serves for all, irrespective of age, aptitude, interest and need. Two important issues here are that firstly: mathematics itself is controversial. It can no longer be taken to be above dispute. This in itself is surprising, in the light of the traditional view of mathematics as objective, superhuman and eternal. Secondly,

mathematics is created by humans in their various cultures, and important contributions have been made in most parts of the globe, from China, India, Persia, Arabia and Africa, to the Americas and Europe. We need to understand that mathematics is not a white European product but is genuinely a product of all of humanity. It is true that to some people, mathematics was neither relevant nor meaningful. Some people did not appreciate that mathematics permeated their lives that their every action in some way connected to mathematics, that the beauty and harmony of their world was due in large measure to mathematics. Educators must be made more aware of the significance of language learning process and particularly of the importance of language in the learning of mathematics. (Lampert 1992:307)

2.5 The Status of Mathematics in South Africa after the 1994 democratic elections

The paradigm shift in teaching and learning of mathematics suggested in the new curriculum is the most important aspect of C2005 or RNCS. The government, after 1994 was keen to improve mathematics education in the country in an attempt to realize the vision of *Mathematics for all*. In this context, the researcher as a post –graduate student in mathematics education, thought of reviewing *the concept of mathematics for all in South African perspective*. The literature review revealed that the current situation of mathematics education in South Africa is not that encouraging even though there are concerted efforts by the government and non- governmental organizations like *Pietermaritzburg Math's and Science Teachers' Association (Pimsta)* to improve the status of mathematics education. The high failure rate in mathematics is still a problem in South Africa and is a concern to all interested in the future of our learners. In addition to the general unpopularity of the subject, the Euro- centism attached to maths, unqualified and under – qualified educators with low morale and commitment, lack of personnel in the education department to give guidance and support to the educators were identified as some of the reasons for the poor status of mathematics education in the country.

In the post – apartheid South Africa; the government claims that more attention is attached to the improvement of mathematics, science and technology education. The establishment of the department of Art, Science and Technology by the new government is portrayed as an attempt on its part to improve these subjects in the country. The 1996 white paper on Science and Technology acknowledges that the government “has a responsibility to promote Science; Culture, Science education and Literacy amongst both children and

adults and influence the attainment of equity by incentives for disadvantaged groups to study mathematics, science and achieve computer literacy” (Department of Art, Culture; Science and Technology as cited in Naidoo and Lewin; 1998).

Various non-governmental organizations such as PIMSTA; AMESA; ASES; MDAMSTADE and MASMATA (see Acronyms) are involved in various projects to try and improve mathematics education in this country. These organizations will only succeed in their efforts if the government support them and work closely with them. However it the researcher’s view that the mathematics education in South Africa is not improving as expected by all stake- holders.”The number of young people who study mathematics with any degree of understanding and proficiency has declined when it should have been increasing rapidly”. (Asmal, 2001 as quoted by Pretorius 2001; 19).

According to Volmink Mathematics education even before its professionalization has always been the domain of the select few...The social arrangements of early civilizations were such that only the rich, the powerful, the influential, had access to mathematical knowledge. From what Niss and Volmink suggest it becomes clear that until the 19th century only very few people who were identified to occupy political and administrative posts had access to mathematics education. However, following political changes in many parts of the world, public education system in many countries have undergone changes and more people started getting access to general education and to mathematics education (Niss; 1996). The effort of post-apartheid government in South Africa in making education compulsory, at least among the school –going population is an example.

In South Africa, since the 1994 election, more people are getting educational opportunities and access to key subjects like Mathematics and Science (Naidoo and Lewin, 1998).

According to a survey (South Africa, 1999/2000), the number of candidates who wrote mathematics examination at senior certificate level increased from 215 061 in 1996 to 279 702 in 1998, showing an increased of 30%. But out of a total of 552 862 students who registered for matriculation examination in 1998 only 279 702 students (only 51%) wrote the mathematics examination. A recent statistical study of students registered for the 2002 grade 12 examination in one education district in the Eastern Cape revealed that out of a

total 2 647 students, only 1 259 (48 %) were registered for mathematics. Out of the 1 259 students registered for mathematics only 35 (less than 3 %) registered on Higher grade.

These figures indicate that all is not well with mathematics education in South Africa. Even though the access rate to mathematics has increased in the post apartheid South Africa, the success rate is still a big problem. In a country like South Africa where the majority of the population had very little access to mathematics, *the call for Mathematics for All* can be considered very genuine and needs serious and urgent attention. One of the ways of making the subject more accessible to the public is by popularizing it in order to draw more people toward it. [Study the Rationale cited in the senior phase Policy documents (South Africa, 1997) Why including MLMMS in the new curriculum]. The policy document accepts MLMMS as a domain of cultural achievements of humanity, which has both utilitarian and intrinsic values.

The introduction of C2005 and making all learning areas including MLMMS compulsory during the GET band is another initiative by the South African government to improve mathematics education in the country. According to Kuiper (2000) “The new curriculum has clearly taken a large step in the direction of developing scientific and mathematical literacy.” It is hoped that making MLMMS compulsory will go a long way in improving numeracy among the young learners. In the new curriculum the largest share of national time (13 %) is allocated to MLMMS. National time represents contact time, learners’ efforts, preparation time and other time spent in each learning area and and show a relative weighting of learning programs within a phase (South Africa 1997; 27-28). In the RNCS the word MLMMS has been phased out and they will be using the word *Mathematics* instead.

The researcher thinks that there is very few change if any, between the status of mathematics before and after 1994. The government of the day has a lot still to do in-order to improve the status of mathematics in South Africa.

2.6 Educators' abilities in the teaching of Mathematics

2.6.1 Economic Growth and Inadequacy of Teaching and Learning Mathematics.

It is true that economic growth needs a strong mathematical, scientific and technological base. Hence a need to have mathematically, scientifically and technologically literate citizens who would provide a sustainable pool from which expertise can be nurtured. We cannot rely on importing scientific and technological expertise; we need home-grown expertise. A 1997 report by Edusource indicated that although 85% of mathematics educators were professionally qualified to teach, only 50% had relevant mathematics qualifications. The same report indicated that 84% of science educators were professionally qualified to teach; only 42% had the relevant science qualifications. The high fail rate of mathematics is also caused by lack of pedagogic knowledge (including assessment) and lack of subject/ discipline knowledge on the side of educators.

2.6.2 Unsatisfactory Levels of Participation and Achievement.

Although the National Senior Certificate (NSC) is problematic, it gives some indicators of the state of our education in South Africa. The NSC shows low levels of participation in science and mathematics Higher Grade especially among black African Learners. The NSC shows very low pass rate in mathematics and science again especially among black African Learners. For example in reality 35% passed Mathematics at both Standard Grade and Higher Grade in 2001. The other 11.6% which made to look the pass rate to 46.6% came from conversions to Lower Grade. In 2000, only about 3 000 black African candidates passed Mathematics Higher Grade out of 20 243 had written the examination and about 5 000 out of 33 657 black African learners passed Physical Science Higher Grade. The National Senior Certificate had been giving us glimpse crises, which had shown some great improvement in 2003 and 2004.

2.6.3 A call for unity in Mathematics, Science and Technological Education can be a Solution.

Many studies have shown that Involvement of Educators in professional Educators' organizations does bear fruits. School culture mediates the extent to which involvement in professional organizations is effective. We come from a period of division, largely based on race. In order to address problems, we need a critical mass in united thoughts and actions. Unity allows us to share both intellectual and physical resources in science and technology education. The existence of two national associations ASES and SASTE

together with provincial Associations e.g. Pietermaritzburg Maths and Science Teachers' Association (PIMSTA) in KZN, MDAMSTADE in Eastern Cape, MASMATA in Free State and many others with the same mission is unacceptable and immediate steps should be taken to ensure that science and technology educators belong to one fold, instead of the current factional fragmentation especially the two national Associations. The existence of associations like AMESA and PIMSTA have helped in improving in grade 12 mathematics especially in those schools whose educators have shown consistence participation in their workshops.

2.6.4 Educators' inaccurate conceptions of the nature of science subjects

Lederman (1992) conducted a review of research related to students and educators Conceptions of the nature of Science. He discovered that educators of Science subjects do not necessarily have clear and accurate conceptions of the nature of Science itself. He has made the following relevant findings with regards to the nature of Science:

- Science educators do not possess adequate conceptions of the nature of Science irrespective of the instruments used to assess understanding.
- Techniques to improve educator's conceptions have met some success when they have included either historical aspects of scientifically knowledge as direct attention to the nature of Science.

The researcher thinks that mathematics educators too need INSET in-order to improve their understanding of some of the concepts used in mathematics.

2.6.5 Effective ways of teaching Mathematics

Some educators believe that mathematics should be a silent activity with each of the learners always producing their own work, but other educator's valued discussion between learners. If we believe that learners learn through making sense of the world themselves, we would wish them to discover the essential relationship through interaction with an appropriate environment. Educators have to make sure that learners are actively involved in their learning so as to make sure that they have a clear understanding of each section presented to them. They need to be given clear instructions or directions when given an activity so as to do it with confidence. The specific outcomes of the activity again must be clearly given so that learners know what is expected of them at the end of the lesson.

Socio-cultural theorists relate activities to participation in socially and cultural organized practices. Another useful concept from the constructivists is what they refer to as the negotiation of taken of –as- shared meaning in particular, in the treatment of learner’s mathematical activity in the classroom situations. Learners usually learn better when they are actively involved in solving problems and exchanging ideas.

Brooke and Solomon (1999), through their observation of primary pupils, reveal that if education and play are integrated, learners will benefit more from simple instructional teaching. They also discovered that if learners are allowed to experiment and practice with tools they will become “budding child experts” as has been found in most Interactive Science Centers where children happily explain to their friends how things work. Skills learned through play and practice can be utilized to solve a set of tasks .The effectiveness of teaching mathematics in schools will only be possible if educators give their learners the work that will involve and lead them to eventually become experts in mathematical writing in the context of school mathematics. In this respect, learners could be given tasks that would allow them to be engaged in activities such as talking to each other, negotiating mathematical meaning and understanding of particular concepts, sharing ideas about the writing tasks such as why it has been done this way and not that way and so forth. Some mathematics educators and educationists have been very keen to look to learning theory for help in determining classroom practice, others have not been aware that there were theories, and yet others have reacted strongly against any suggestion that Psychology could possibly have anything to offer.

The researcher suggests that educators need to make their teaching more enjoyable, so that learners can enjoy their lessons and thus difficulty can be eliminated.

2.6.6 The Educators Status in the teaching and learning of Mathematics in the 21st Century

Recent Research in mathematics conducted by “Education 5-16” suggests the following:

- Pupils learn more when their educators know their attainment and can act on this information:

A study of infant educators found that the more educators knew about their learners’ mathematics knowledge, the better the learners were at word – problem – solving.

Knowledgeable educators questioned their learners about problem –solving processes and listened to their responses, while less knowledgeable educators tended to explain problem –solving processes to learners or just observe their learners’ solution.

The quality of praise by educators is as important as its quantity: When praise is used infrequently, given uncritically and without enthusiasm, and expressed in a very general terms, then it is at best ineffective and, at worst, can have damaging consequences for learners’ learning. What appears to be most important for praise to be effective is that it is:-

1. *CONTINGENT: the praise must depend on some particular thing the learner has done, rather than the learner’s general performance.*

2. *SPECIFIC: the praise should identify the specific behavior being praised, so that the learner is aware of what aspect of their work is being singled out for praise.*

3. *CREDIBLE: the praise must be sincere, praise that follows a “FORMULA” or which sounds insincere is likely to be ineffective, since learners can “SEE THROUGH” such praise very quickly.*

- Effective questioning can raise achievement: Although the use of extended “wait-time” for high level questions can increase learners’ achievement. Questions may not always be the most effective way to generate discussion. Analysis of the kinds of questions that educators ask in the classrooms have shown that many educators ask questions that test the ability of learners to recall facts and procedures rather than the ability of learners to apply, synthesis or explain their knowledge (often called High Order Questions).
- Careful choice of examples improves learners’ concept formation: The ideal examples to use in teaching are those that are only just examples and the ideal non- examples are those that is very nearly examples.
- Learning is more effective when common misconception are addressed, exposes and discussed in teaching: We have to accept that learners will make generalizations that are not correct and many of these misconceptions remain hidden unless the educator makes specific efforts to uncover them.

One of the most important findings of mathematics education research carried out in Britain over the past 20 years has been that all learners constantly ‘invent rules’ to explain the patterns that they see around them. For example it is well known that many learners quite quickly acquire the ‘rule ‘that multiplies by ten, one adds a zero. Learners then often;

over generalize 'their rules to situations that do not work. In the case of multiplying by ten, they apply it to decrease (e.g. $2.3 \times 10 = 2.30$). Similarly, learners may decide that multiplication always makes bigger, division makes smaller and then choose erroneously to multiply or divide according to their perception of whether the numbers need to get bigger or smaller. However, overcoming these kinds of misconceptions presents the educator with a dilemma. Whether teaching 'multiplying whole numbers by ten, in order to present learners with examples where adding a zero does not work, it would be necessary to start far from the original topic and it may involve mathematical ideas that are for the time being, beyond the learners' capacity to understand.

- Moving from practical to formal work is often far from that straight forward: Practical work can provide images that help learners' contextualize mathematical ideas. It can also provide experiences out of which learners can abstract mathematics. But research shows that these transitions are not always smooth. Learners have difficulty in contextualising formal mathematics and the ideas that they abstract from practical work may not be the ones the educator intended.

2.6.7 CONSTRUCTIVISM AND THE TEACHING OF MATHEMATICS

The constructivist paradigm emphasizes that in the teaching and learning process, the form in which the messages are received depends crucially upon the prior constructs of the pupil and the educator. Constructivists usually trace their intellectual lineage to Jean Piaget, and one finds frequent reference to Piaget. The view that learners construct their own knowledge of mathematics over a period of time in their own unique ways, building on their pre- existing knowledge. The emphasis in this view is on learners' *mental activity* the active construction of meaning in the basis of the multiplicity of experiences and social interactions they have, including those at school. The significant work based on this perspective is being carried out in the USA, by leading researchers including Paul Cobb, Ernst Von Glasersfed and Les Steffe. Constructivism in its most powerful form is more than a theory of learning .It is also a theory of *KNOWLEDGE*. Perhaps the leading exponent of this philosophical brand of Constructivism is Ernst Von Glasersfed. Barbara Jaworski provides the second chapter, where she grapples with the significance of constructivism for mathematics educator in the classroom. (Ernest, 1989 P.152)

Learning is not simple change in performance or behavior. Basically ways of helping within Constructivism there is a "generally accepted view that learners actively construct their mathematical ways of knowing as they strive to be effective by restoring coherence to the world of their personal experiences "(Cobb, 1994). In Constructivist approaches, learners are assumed to construct their own mathematical conceptual understanding as they take part in cultural practices, frequently whilst they interact with others.

This theory posits that learning involve active construction rather than passive absorption from the environment and it implies that learners 'experience the world in meaningful patterns and then construct meaning from those patterns. For this theory, evidence of learning has been in terms of changes in how person said they thought about problem of "productive thinking and reasoning" in mathematics. Most early work on mathematical problem solving is rooted in this theory (e.g. Polya and Hadamard 1945).

2.7 FACTORS INFLUENCING MATHEMATICS CURRICULUM CHANGE

2.7.1 BARRIERS TO CURRICULUM INNOVATIONS

It is important to recognize that educators already have knowledge and experience that will be needed for teaching and learning the new curriculum in mathematics. The DOE cautions against a "deficity model" which suggests that New Curricular EQUALS new Educators: Assert model" preferred by the department recognizes the expertise and experience that educators already have.

Usually whenever change is implemented, people resist and a number of difficulties arise. The difficulties that are common include the fear of change, unprepared ness for change, insufficient expertise to implement the change and many others. Several researchers including the following have studied the processes of curriculum change and have discovered that several difficulties arise when this process of curriculum transformation takes place.

Rust and Per Dalin (1990) construct a theoretical model of the logic employed by educators and others, in deciding whether to adopt or reject some proposed

change in practice. They mention that educators may be the main determinant of innovations having to do with factors such as curriculum or teaching style and that it is important that educators must play some role in all innovations affecting the school. They also mention that educators appraise or evaluate proposals in deciding whether to adopt some innovatory change or practice. They say that the educator's decision to accept or reject is a complex one and is usually guided by one or another theoretical perception. They say that theorists such as Marx have observed that people faced with making choices, make choices in situations not of their own choosing and these choices are largely determined by the material life surrounding them. With regards to C2005, the new mathematics curriculum is policy and the educators are compelled to accept it. All what is needed is to encourage them to accept it more easily.

Marsh (1992) reveals that when curriculum changes are implemented in schools the success of these changes depends much on the staff interests, organizational structures and resources. Different staff each has their own special identity based upon their attributes, informal and formal values and norms, leadership traits and organizational climate. The student of different schools will have certain characteristics in terms of socio-economic status, social orientation norms values and skills. The change will therefore not fit snugly to every school. The important reasons are that the ideas have originated from outside experts, the changes are difficult to manage, there has been inadequate planning, and the changes have not been understood by the educators and the parents. Marsh also reveals that for the curriculum changes to be successful they have to be more effective in improving learning, they have to be consistent with the values, experiences and needs of the recipients, must have been pilot-tested, must be shown practically where educators can see a live demonstration with learners, and the educators must have special training.

Rust and Per Dalin (1990) also refer to Doyle and Ponder (1977) who say that educators use three major criteria in deciding on an innovation. These being the following:

- I. Is the innovation instrumental in terms of classroom practice?

II. Is it in agreement with existing conditions?

III. What are the costs involved in using these innovations?

Doyle and Ponder (1977) also mention other worthwhile considerations, which are not included with their theoretical model. These being that educators choose to adopt changes using one or more of the following criteria:

- I. Information received by the educators must be perceived as adequate and accurate and there should be feedback channels for educators to communicate their experiences to the co-coordinators of the innovation
- II. The outcomes of the innovation must relate to the values of the educators in such a manner that they are perceived as beneficial.
- III. The innovation must be effective and reliable.
- IV. The innovation must be feasible.
- V. Some kind of pilot testing should have been done on the innovation.
- VI. The innovation should be adaptable.

They mentioned also that educators' earnings, status, self-esteem and working conditions often affect their ability to implement innovations. Some educators are often too busy with large classes and have no time to try out impractical ideas. It has also been noted that the low earnings and status of educators tend to demoralize them and discourages their commitment to harder work. It is also true that attitude can be favorable or unfavorable towards change and also refer to the positive or negative relationship towards people. For the successful implementation of change there has to be sustained contact between the curriculum initiators and the potential adopters of this change. This information indicates that there are some consistencies with regards to the difficulties that are experienced when curriculum changes are introduced.

2.7.2 FORCES THAT IMPEDE CHANGE

Some of the forces that impede identified by Henson (1995) are the following:

- Many educators view change as unmanageable.
- Time and resources have been insufficient.

- Educators are conditioned and socialized by the format of schooling they experienced and understand.
- Educators have not been properly prepared to deal with the complexity of restructuring schools.

2.7.3 FACTORS RELATED TO SUCCESSFUL CHANGE

Fullan (1991) makes the following suggestions for the successful implementation of change:

- A clear model exists for the proposed change.
- There needs to be a strong advocate for change.
- There should be an early active initiation establishing initial commitment, as an elaborate planning stage is wasteful of energy.
- Careful orchestration implementation requires the clear direction of many players; a group is needed to oversee the implementation plan and carry it through the correct alchemy of pressure and support.
- Early rewards for implementers.
- Ongoing INSET, to maintain commitment as behaviors often change before beliefs.
- It is subject to continuous INSET for new staff, to consolidate commitment.

The researcher agrees with Fullan's thoughts that, change requires the clear direction of many players. Educators were not fully involved in the planning of OBE and therefore problems are anticipated in its implementation. Educators are encountering some difficulties because they were not thoroughly trained.

2.8 IDENTIFIED DIFFICULTIES OF THE NEW CURRICULUM

2.8.1 The Critics of the New Curriculum in South Africa

Jansen (1999) asserts that OBE is driven by political imperatives which have little to do with the realities the of classroom life. He says that it will in fact undermine the already fragile learning environment in schools and classrooms of the new South Africa.

He gives the following reasons why he thinks, "OBE will fail":

- The language of innovation associated with OBE is too complex, confusing and at times contradictory.
- OBE as curriculum policy is lodged in problematic claims and assumptions about the relationship between curriculum and society.
- Teachers have not been allowed to conceptualize and make sense of OBE as curriculum policy.
- The management of OBE will multiply the administrative burdens on teachers.
- By organizing knowledge around discrete competencies, OBE overlooks the important cross-curricular and interdisciplinary demands encountered in learning a complex task.
- For OBE to succeed requires that a number of independent innovations be included in the new educational system simultaneously.
- OBE requires a radical revision of the system of assessment.

The researcher thinks that the implementation of OBE in grade 10 was also supposed to be implemented in 2003 to prevent difficulties that both educators and learners may encounter. The training of educators was not considered at all. The researcher thinks Jonathan Jansen is correct when he said the implementation of OBE would not go well.

2.8.2 FINDINGS OF THE C2005 REVIEW COMMITTEE

From the start of the implementation of the new curriculum great difficulties were experienced. In February 2000 the National Minister of Education, Professor Kader Asmal, announced the establishment of the Review Committee on C2005 to investigate C2005.

The Review Committee on C2005 (Chisholm et al., 2000) have summarized their main Findings as the following:

Regardless of the observed flaws of C2005 there seems to be a large majority of people who support the underlying principles of C2005.

The lack of clarity and conceptual confusion around C2005 stems from the complex language and confusing terminology used in C2005 documents, the overcrowding of the new curriculum with its many learning areas and the progression and pace.

It has been suggested that the curriculum and its attendant documentation needs streamlining, that the design features need to be rationalized, that teaching time be reallocated to languages and foundational mathematics and the promotion of progression, pace and sequencing be enabled.

Learning support materials are variable in quality and often unavailable.

Provincial Departments and school management teams provided for too little support to teachers in the classrooms.

There are variations in understandings of what C2005 is within and between schools, as well as amongst and between teachers, trainers and officials.

As a result of these problems encountered by educators there is limited transfer of learning into classroom practice. The implementation of C2005 has been too rushed and therefore inadequate.

2.9 RESEARCHER'S COMMENTS ON THE LITERATURE REVIEW STUDY

This literature review has revealed that many authors writing about OBE have not emphasized educator mastery of content knowledge. The mastery of content has not been identified as a variable for the successful implementation of OBE.

Perhaps it is because these findings were discovered in contexts where this factor was not considered as relevant variable as most of the educators had a good mastery of the subject content. The problem may lie with learners that do not have enough background on the subject. The emphasis on contexts masked the mathematics. As a consequence-limited emphasis is given to the mathematical skills and knowledge required for progression to grade 10. The researcher has found very little published information about difficulties experienced by grade 10 mathematics educators in 2003 to 2005. The researcher found that research in this area may assist the DOE to establish some measures to circumvent the resultant problems that are being encountered by grade 10 educators. The mastery of subject content will obviously then be considered variable in this research study.

2.10 CONCLUSION

This information served to introduce the reader to the new curriculum and the attendant difficulties of curriculum innovation. It is with this information in mind that the researcher will proceed to examine what difficulties this small sample of

educators in one district of Kwazulu- Natal is experiencing in teaching grade 10 mathematics as a result of the implementation of OBE in the Senior Phase.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter provides a detailed description of the design and methods used in this research study. Included in this chapter is a detailed description of the research sites; the participants involved and the research techniques used as well as their advantages and limitations. The tools and data collection process are also described, as the data analysis procedures.

3.2 THE SETTING /RESEACRH SITE AND CHOICE OF PARTICIPANTS

The study was conducted amongst 20 grade 10-mathematics educators, who are all teaching in high schools. The research was a combination of all race groups i.e. Whites, Africans, Asians and Coloreds. The criterion was that the educator must have been teaching grade 10 mathematics from that selected school between 2001 and 2005. No consideration was given to gender representation because they were volunteers. They were thirteen (13) males and seven (7) females participated in the study. Qualifications and experiences as a grade 10 – mathematics were also not taken into account for selection. The researcher aimed to get a varied sample of educators, as this would be most suitable for the purpose of this research study. Five grade 10 mathematics educators volunteered from each of the following secondary schools in the UMgungundlovu district of Kwazulu –Natal. The backgrounds covered were:

- 5-Deep rural schools.
- 5-Township schools.
- 5-Former Indians or Coloured schools.
- 5- Former Whites schools.

It is very important to note that the former Coloured, White and Indian schools are now fully integrated and are operating in a very different manner as compared to the period prior to 1994. Most of these secondary schools are now occupied by at least 50% of Black learners. There are still very few African educators in these schools. It is also important to note that there are no visible changes in township and rural secondary schools both in

terms of staff and learner enrolment is concerned. These schools are fully occupied by both African educators and learners.

The UMgungundlovu District has a functioning structure with the district director at head and his team of five circuit managers each responsible for five wards with Superintendent Education Management in each ward. It is a well functioning district with the usual problems associated with education e.g. shortage of mathematics educators and overcrowding in some schools.

The scenario, which the researcher has presented above, shows that the contextual situations in the schools where the study was undertaken varied. The researcher considered this situation most ideal for this particular study as the researcher thinks that it includes a wide range of contributing factors in terms of resources, teaching and learning facilities, different backgrounds of both educators and learners and different attitudes to learning and teaching ability. All twenty educators visited were in secondary schools teaching mathematics in grade 10. These educators were aged between 30 and 45 years.

3.3 NEGOTIATING ACCESS TO THE RESEARCH SITE

To obtain access to the research sites the researcher obtained permission from the Superintendent General of Education, the Director of Research and Strategy Development and ECMIS. This was done by means of a letter of request from the researcher accompanied by a letter from the University of KwaZulu-Natal- Edgewood Campus, authorizing the researcher to conduct the research study. Once the approval had been granted the researcher visited the principals of the schools where the research was conducted to get permission and to assess the conditions of schools in general.

The educators identified were then approached personally after obtaining permission from respective principals to give them questionnaires and informed them of the research. Once acceptance of participation was obtained from the educator concerned the questionnaire was then issued and procedures of how to complete them were given. The researcher then reassured participants that the research was for academic purposes and all information would be treated as confidential. This was confirmed by a written ethical clearance letter that their names as well as the names of their schools were not required and would not appear in the dissertation. The questionnaires were collected after two weeks.

The researcher initially planned that the questionnaires will be followed by in-depth interviews to get some clarity on certain questions from the questionnaires but most of the educators complained about time since they were busy marking the half- yearly examinations papers. The researcher was satisfied with the responses that he got from the participants and he then decided to cancel interviews and tape- recording.

The collection of questionnaires was not without problems. One educator pointed out that she would not be able to help me because my questionnaire is too long and too demanding. Two educators from different schools said that they would not be able to assist me because they were teaching grade 10 for the first time and they had little experience of teaching at all. The other two educators were sick and hospitalized. The researcher was fortunate to get replacements for these educators from other schools of the similar backgrounds.

3.4 METHODS

3.4.1 Qualitative Approach

This study employed a qualitative approaches and mainly questionnaires. For qualitative data the researcher used analytical inductive, analysis and constant comparative. The data obtained from different questionnaires was analyzed. However there is a greater diversity in the formats used to report qualitative research than the formats typical of quantitative studies. This is because of the many types of qualitative studies, and the fact that until recently not much educational qualitative research has been reported. While there is not a single mode for representing qualitative research, many of the published reports will have the major sections presented below.

In contrast to quantitative studies, however, these sections may not be identified clearly or are identified by descriptive terms related to the topic. To understand qualitative research it is necessary to carefully read the entire report. This is how you are able to identify with the researchers and understanding how they have come to their conclusions. The process by which this occurs is important, and to understand this process it is necessary to read from beginning to end. As with quantitative studies, there are certain questions that should be asked about the report to judge its quality. (Reinhardt C. and Cook T, 1979: 55 & 69)

The data from other references like DoE policy documents was also used and analyzed. This study was limited to twenty grade 10 mathematics educators.

3.4.2 Questionnaires {Advantages and Limitations}

In this study the researcher was using mostly open-ended questions so as to facilitate a diversity of responses. (See Appendix A) According to researchers a questionnaire is one of the best methods used by many researchers. It is widely used and useful instrument for collecting data providing structured, being able to be administered without the presence of the researcher and often being comparatively straightforward to analyze. The questionnaire is a widely used and useful instrument for collecting survey information, providing, structured and often numerical data. These attractions have to be counterbalanced by the time taken to develop, pilot and refine the questionnaire, by the possible unsophistication and limited scope of the data that are collected, and from the likely limited flexibility of response, though, as Wilson and McLean (ibid.:3) observe, this can frequently be attraction. The researcher will have to judge the appropriateness of using a questionnaire for data collection, and, if so, what kind of questionnaire it will be. (Louis Cohen *et. al*, 2000: 245).

Questionnaires were chosen because they are highly specific. They are accurate, versatile and provide ample data and feedback. Generally there is no right or wrong answer. The researcher has used open- ended questions because they are very attractive device for smaller scale research or for those sections of questionnaire that invite an honest, personal comment from the respondents in addition to ticking numbers and boxes. Open –ended questions also carries problems of data handling. For example, if one tries to convert opinions into numbers (e.g. so many people indicated some degree of satisfaction with the new principal’s management plan), then it could be argued that the questionnaire should have used rating scales in the first place. These are some of the rationale that made the researcher to choose these methods. (Louis Cohen *et. al*, 2000: 255)

CHAPTER 4

RESEARCH RESULTS

4.1 INTRODUCTION

In this chapter the findings will be discussed by presenting the views of educators in terms of their experiences about the current difficulties they are experiencing in teaching grade 10 mathematics, after the implementation of OBE in grades 8 and 9. The main data collected were qualitative in nature and consisted of 20 transcripts questionnaires schedules of which 20 educators from different backgrounds completed them as described in chapter 3. Some of the sub-questions were not used for this data analysis, but they were only selected to address the main issues.

The researcher has also given brief general profiles of educators who participated in the study. The findings of the questionnaires and the researcher's comments on respondents have also been presented. General comments to highlight the findings are also given. Descriptions and quotations from the data are presented in order to illustrate and substantiate the assertions made. The quotations are used to bring the reader closer to the study since the quotations not only reflect what was said, but also reflect how it was said.

4.2 General Profiles of educators who participated in the study

There were seven (7) females and thirteen (13) males participated in the study. Fourteen (14) of the educators have M+4 teaching qualifications and University degrees while six (6) of them have M+3 teaching qualifications. Six(6) educators have ages ranging between 20 – 30 years, ten (10) educators have ages ranging from 31 – 40 years and four(4) of them have ages ranging from 41 – 45 years. All the educators obtained their first teaching qualifications as full time students. Their teaching experiences also vary as follows: four (4) educators had experiences of between 2 – 5 years; eight (8) educators had 6 – 10 years teaching experiences, five (5) educators had 11 – 15 years teaching experiences and two (2) educators had 16 – 20 years of teaching experiences. There were 12 level one educators, 6 heads of department and two deputy principals who participated in the study.

4.3 Views of educators on the difficulties, which they experienced as, grade 10

Mathematics educators prior to the implementation of OBE in grades 8 and 9.

Most educators have indicated that there was not much to complain about because grades 8 and 9 educators were teaching normal mathematics. The following are some typical responses from some educators.

“There were difficulties but they were minimal in the sense that learners were used to the style of teaching which were similar even for different educators since educators were using the same methods (traditional teaching methods). Learners at grade 10 have to choose which stream will satisfy their careers of which some choose without knowing what each stream entails.”

“No there were no problems except that it was up to educators and learners on how to grasp the information and how educators translate it to learners.”

“Before the implementation of OBE there were few difficulties. Educators were used to the style and we were in the verge of devising strategies to overcome problems we encountered over the years but the OBE came in.”

Some educators indicated that even before OBE was implemented in grades 8 and 9 there were some major difficulties in teaching grade 10 mathematics. They said that learners have weak basic skills, which was a result from their mathematics background and lots of time was taken filling in those gaps. Poor- learner pre- knowledge at grade 10 level made it difficult for them to master the abstract parts of the syllabus. Some of the educators' responses as follow:

“Learners did not see it fit to apply mathematics in their situations in life, other than in realistic mathematics problems. Learners used to cram, which gave them problems in trying to master the skills and content.”

“Mathematics has always been a challenging subject to teach. Learners have always found mathematics abstract and irrelevant in their practical day to day lives. Only few learners really enjoy mathematics.”

“Learners lacked the courage to ask questions and they did not have the confidence to attempt a problem. Such focus was on getting the right answer. Learners did not have a peer group, where peer teaching and learning could take place.”

One educator talked about the larger number of learners in the classrooms as a difficulty, which hindered their working atmosphere. The relaxed attitude of learners and homework not being done as some of the difficulties they were encountering before OBE was implemented in grade 9. Another educator said that the general discipline of learners was also a problem and the content problems were far less prior to 1994 than they are today.

Learners who failed mathematics in grade 9 wanted to do it in grade 10 because of parental pressure. Some educators were forced to teach mathematics although they did not have qualification in it because of a shortage of mathematics educators. The syllabus in grade 10 is too long. The high failure rate in mathematics was a huge problem and people speculated that it was because mathematics was too theoretical and was not meant for all learners except the genius.

The researcher believes that schools also contribute on some of the challenges mentioned above since many schools did not have guidance or Life Orientation educators to help learners to choose correct subjects for their future careers. Learners only did what their parents suggested. There is no proper guidance many schools. Shortage of mathematics educators was also a cause of mathematics to be labeled as difficult subject. The researcher believes that the lack of knowledge of educators who were forced to teach the subject was also a cause for high failure rate.

4.3.1 Linkage between grades 9 and 10 mathematics syllabi, methods, and problematic sections before OBE was implemented.

Most of the educators said that there was a clear continuity in the syllabus. The work in grade 9 complemented that of the grade 10 syllabus. The content was coherent; educators taught what was to be useful in grade 10. Algebra and geometry taught in grade 9 was often revised in grade 10 briefly before progressing on to new work. Some educators also said that the content covered in grade 9 was basic and in grade 10, learners explored certain topics in greater detail e.g. *factorization*. These are some of educators' responses.

“Yes there was a link because there was a sequential development, the interim core syllabus ensured progression.”

“Yes as the syllabus was not group work orientated and learners were able to work on their own in the past. The syllabus was more structured and learners were taught fundamentals that are now the focus in Grades 8 and 9.”

The way the syllabus was designed made it difficult for a learner to start mathematics at grade 10 because concepts dealt with in grade 10 often depended on the work done in grades 8 and 9. It was only Trigonometry that was new in grade 10.

All the educators agreed that the methods used in grades 9 and 10 were the same but the only difference was that mathematics was taught to all learners (more practical) in grade 9 but only selected learners were doing mathematics in grade 10 and is more theoretical. They said that the emphasis was not on group-work rather it was on the content of the subject. However, an educator who wanted learners to think for themselves and to apply what they had learned often used the OBE style approaches even before OBE was implemented in South Africa. The methods used were the same depending on the level and depth of content required in grades 9 and 10.

Some educators said that the problematic sections in grade 10 were solution of equations, inequalities, functions and relations, algebraic fractions, geometry (problems with logical reasoning techniques), problem solving (most learners are afraid of them). Topics that are grasped easily by both educators and learners include factorization, finding products, linear equations exponents’ etc.

4.3.2 Educators’ views about switching/moving on to OBE style

Educators had mixed feelings about the implementation of OBE in South Africa with 50% of the educators supporting the implementation of OBE. The following are some of the reasons why these educators said that they supported OBE.

- Mathematics is made more relevant to learners although weak ones seem to be left behind more than they were in the past.
- It focuses on the holistic development of the learner.
- It is learner -centered approach giving the learner the opportunity to learn at his /her owns paces and learns from their peers.

- In South Africa the introduction of OBE aims to cleanse the education system of the past inadequacies caused by apartheid.
- It promotes learner participation which is an important strategy in mathematics through educators.
- Learners are assessed on a daily basis and do activities that are in practical and relate to what they know and do them as mathematics problems to solve.
- Enables them to solve problems that they will come across in their future careers.
- It is a good way of teaching but they should be a way of linking the GET and FET phases.
- OBE is good but educators need to go to a proper training and support workshops must be done regularly.
- OBE would have a direction if it were introduced smoothly as per phase and make sure that it progresses smoothly.
- It is a very good approach to teaching mathematics as long as educators teach know exactly what they are doing. It brings contents into the pictures, so those learners realize the relevance of particular sections in their daily lives. They therefore develop particular skills.

The researcher believes that although these educators supported the new curriculum but they felt that it was not properly introduced and thorough training of educators was not done. The researcher believes that it is good that there are some educators who are positive and who are supporting the new curriculum. The department of Education has to use these educators and give them more support by supplying resources to help them when implementing the new curriculum.

The following are the reasons why the other 50% did not support the implementation of OBE.

- OBE is completely unstructured with respect to mathematics.
- Educators, especially new ones have no idea of how to develop programs to approach mathematics in a logical and sequential way.
- The OBE textbooks are useless and the quality of exercises is pathetic and the bringing in of political issues in the teaching of mathematics is

trivial.

- OBE shows that it destroys the learners' future, since we are living in the so – called new South Africa. South Africa is still a developing country and OBE does not exactly fit. OBE needs well developed countries like United State of America, Britain etc.
- In OBE there is no clear focus on the content part, which form the basis of mathematics.
- At the present moment grade 12 is writing pure mathematics and it is learners that are affected not department of education.
- Educators were not thoroughly trained for the implementation of OBE.
- Learners in grade 9 are playing with mathematics concepts in groups and assessed in groups whereas in grade 10 most of the work must be done individually. Learners are ending up playing not learning in an OBE class.
- Most of the contents are left out in OBE where educators design their learning programs and some of them do not cover everything, which may be necessary, to lay foundation for grade 10.

The researcher is not sure whether these criticisms are justifiable or it is because these educators were not properly introduced to the new curriculum or it is because of lack of training to implement it or rather because they resist change. The researcher believes that some of these educators lack the subject knowledge and they do not have resources. It is true that the introduction of the new curriculum in South Africa was a good idea but the major problem is the implementation part of it and whether our government was thoroughly prepared for its implementation.

4.3.3 Relationships between OBE and Interim Core Syllabus

Educators had mixed feelings again about the relationship between the two concepts. One educator said OBE is an approach/method, which need to address all the concepts in a way of achieving outcomes from learners. Others said that with OBE a lot of activities assume some mathematics background, which is not there in the learners' minds. With the traditional curriculum, there is continuity in sections; thus making smooth learning and teaching to take place easily. In OBE, you cannot tell what the learner should know and did in the previous grades to progress to the next. OBE is based on mathematical literacy like understanding concepts.

In OBE content is still to be taught but in different way. Some educators said that there is very small link in the sense that OBE seems to concentrate in integrating the learning areas with less emphasis on concepts; whereas the old curriculum concentrated on the important concepts which act as basis to mathematics, learners encounter in grades 11 and 12.

One educator responded in the following way:

“In fact, there is a great link between OBE and the old curriculum but the problem is that OBE is phrased as if it is something new by using new terminology, not linking it with the existing one.”

In OBE educators facilitate whereas in old curriculum educators are teaching. Some educators said practitioners of OBE in South Africa do not provide a solid background in basic mathematics in grades 8 and 9. They also said the old curriculum was excellent and educators knew exactly what content to teach. The researcher believes that the department of education has a challenge of providing depth in-service training of mathematics educators.

4.4 The difficulties experienced by grade 10 mathematics educators after the implementation of OBE in grade 9

The following are comments and quotations of educators about some of the major difficulties they are experiencing in teaching grade 10 mathematics after the implementation of OBE in grade 9.

One educator said that the old syllabus gave emphasis to everything and OBE only give emphasis on few topics. Now learners are taught concepts in grade 10, which were not emphasised sufficiently in grade 9. It took longer to cover the grades 8 and 9 work using OBE methodology therefore they had “catching up” to do in grade 10. Some educators responded as follows:

“In grade 10 we are supposed to teach grades 8 and 9 work to make a link otherwise we had a huge problem with some of these OBE learners.”

“I found that I have to teach 3 syllabi in one year. Learners had no prior knowledge of mathematics in grade 10.”

“Learners have lost focus. No prior knowledge for the basics. They cannot even count.”

“When you are teaching grade 10, you always have a task from the beginning of each year to start with grades 8 and 9 work, for about two months before teaching grade 10 work. Even that time, when you teach grades 8 and 9 work, you need to go deep not just remind them because they do not even understand English.”

“In general learners are not prepared by the OBE paradigm to do pure mathematics in grade 10. The most basic concepts e.g. triangles; exponents solution of triangles are not known. As an educator of grade 10 I must go back to the basics that should have been taught in grades 5, 6, 7, 8 and 9. There is just no enough time to do this in grade 10. The style of learning seems to be difficult for learners because they are used to OBE method which is now different in grade10.”

The majority of educators said that learners do not have required basics. They cannot even factorize. They have lost focus, cannot work independently, no self-motivation, rely on the group and cannot think for themselves, lack confidence in their own abilities, and always look for constant guidance from the educator. The setting up of work is often illogical. Learners are unable to switch immediately to using old method. Learners find it difficult doing individual work as they are used to relying on the group or one person in a group to do the work. Homework is not done regularly. Learners lack the skills to complete work that requires a foundational understanding.

Some of the educators said the following responses as their difficulties with regard to the teaching of grade 10 mathematics.

“There are now more problems in grade 10 mathematics teaching than before.”

“Learners cannot add or subtract or do geometry or factorize. Mathematics done in grade 9 does not prepare them for grade 10.”

“Many learners are just promoted to grade 10 without being considered that he/she failed mathematics. They come to grade 10 thinking that even if they are not coping but, will pass at the end of the year as it happed in grades 8 and 9. Learners are not ready for

grade 10 mathematics because what they did in grade 9 is more of English and less Mathematics.”

“Background of mathematics concepts is totally lost. Learners are unable to do simple mathematics sums like; solve for x: $2x - 1 = 3$; to do this problem you need to know additive inverse and multiplicative inverse, without these concepts one cannot easily solve the problems in geometry, a lot of information/knowledge was not grounded for.”

Since learners did not have much conceptual knowledge, that made it difficult for proper mathematics lessons. Educators had to teach two or three years' work in one year because it was not covered in the previous years. Educators also mentioned that some learners are just left passive in OBE due to group work activities as a results they do not understand what to do in senior grades due to being exposed but involved in solving mathematics as individuals.

4.4.1 Views about learners' and educators' readiness of implementation of OBE.

The majority of educators clearly said that they were not or is still not yet ready about the implementation of OBE. About 90% Of educators said that no training of educators was done to help learners who were from an OBE style. Here are some of the comments that were raised.

- Educators were not trained how to handle these learners who are from an OBE style in grade 9.
- Training of educators was for a one-day workshop only and nothing in-details were said.
- Most of learners are not ready to do grade 10 mathematics.
- It is not accepted to say, learners are not ready but they are not ready, because the level of mathematics they were exposed to, in grades 8 and 9 is so low that dealing with pure mathematics in grade 10 becomes a myth.
- No resources are available to assist both learners and educators.
- We are not ready but we have no choice we have to do it.
- Learners are not adequately prepared for the content that they need to learn in grade 10.

- Learners do have basic skills but rely completely on group work. However learners find difficult in the workload as compared to grade 9.
- Learners are not ready because pass requirements from grades 9 to 10 have also changed making it easier for learners to pass.
- Learners cannot cope with the traditional mathematics done in grade 10. Learners in urban areas are fortunate to be able to access extra tuition to bridge the gaps.
- The RNCS is still unstructured. Its fundamentals flaw is still reliance on outcomes. Outcomes do not provide a logical sequential structure. The “END” rather than the “MEANS” is emphasized in OBE.

Some educators see no major problems about OBE. The other 10% of the educators who participated in the study made the following comments about their readiness of the implementation of OBE.

“Yes we are ready - in general there are some problems areas, but generally learners have been taught all the necessary work for grade 10 in grade 9.”

“We are coping by taking things step by step at a time. Even if learners are taught in an OBE style, they should still cover the same work and be able to cope with grade 10 work.”

“We train ourselves not by the Department of Education. We knew what grade 9 learners had to be able to do to progress.”

“In our school we make sure that learners are ready for grade 10. We use OBE approach, where possible but still cover the essential work that is necessary to progress to grade 10.”

“OBE style is not much different to what I see as ‘GOOD’ teaching from grades 1 to 12.”

“I say YES we are both ready because OBE touches some basics aspects needed in grade 10, but it does not emphasis or give more time and focus to it.”

“In our school we are ready because we had decided to stick to the old style of teaching and we are still using the traditional syllabus in grade 9.”

“I do things the old style even though OBE have been introduced .In our school we have decided to stick to the old traditional core syllabus even in grade 8 and 9.”

4.4.2 How has the change of grades 8 and 9 syllabus to OBE style affected grade 10 teaching and learning?

About 90% of educators said that the change of syllabus in grades 8 and 9 had affected a lot in terms of teaching and learning of grade 10 mathematics as explained above. Some educators said that grade 10 mathematics learners seem not to cope with the level of mathematics presented to them. The level of mathematics they are exposed to, in grade 9 is far lower than the one they encounter in grade 10. Learners are ill prepared for grade 10 content. One educator commented that many learners have a sense that they will pass despite the little effort that they put into their work. They come to grade 10 with a piecemeal content. Learners cannot see logical links that have to be developed. The example of the study of PARALLEL LINES (grades 8 &9) and PARALLELOGRAMS (grade 10).

Some educators commented as follows about the effects of OBE to the teaching and learning of mathematics in grade 10.

“Learners in grade 10 just choose mathematics, yet they do not know their capabilities in mathematics.”

“ In grade 10 you are talking about factors, and these learners do not know what type of ‘ANIMAL’ is that, because from the start in OBE, in grades 8 and 9 topics were mixed and you have seen them because you are an educator not a learner.”

“Nothing will be done even the Department of Education and the government is confused now; because we were trying to understand OBE for few years as educators, now it is going to be implemented in the FET phase. They confuse us as educators and leading us to also confuse learners. As we speak now OBE will be introduced in grade 10 next year but no training has taken place.”

“Many learners drop out and others become worst in mathematics.”

4.4.3 Views of educators about difficulties they are experiencing with the textbooks used in grades 9 and 10.

All the educators participated in the study have no problem with the textbooks used in grade 10. They said that the textbooks used in grade 10 are of high quality standard especially ‘Classroom mathematics’. The Content in grade 10 textbooks needs learners who had done pure mathematics in grade 9. One educator said:

“Grade 10 textbooks have less English sentences and activities but more mathematics. Grade 10 textbooks are more content focused and are preparing the learners for work that is expected in grades 11 and 12. These textbooks do not center on the hands, an approach of the discovery method. The textbooks have examples and content that is relevant to the syllabus and not to real life examples.”

The majority of educators said that the shift in focus from contents to skills leaves a huge gap in grade 9 content that the learners can handle when given situations that require clear understanding of mathematics content. All educators who participated in this study had many complains about the textbooks used in grade 9. They usually said that these textbooks do not cover the contents needed in grade 10. The following are some of the educators’ comments about grade 8 and 9 textbooks.

“Even though publishers try by all means to present all contents in a very practical way, they sometimes fail to cover a large scope of work or give enough practical examples of some basic concepts that learners have to master before they proceeds to grade 10.”

“The grade 9 textbooks need a lot of interpretations because grade 9 learners do not understand the language used.”

“These textbooks do not prepare learners for FET mathematics. They are based on mathematical literacy not on mathematics (pure mathematics).”

“Grade 9 textbooks with a lots and lots of activities and lots and lots of stories and LESS mathematics and very few contents.”

Educators also said that the grade 9 textbooks tend to focus on contextual problems i.e. as in real life situation. They said this lead again to content needed in grade 10 not being fully given to learners and it is all about how you plan for learners in grade 9 i.e. give more time on aspects needed in grade 10. The revised national curriculum statement was drawn up to rectify the problems that were being experienced by C2005. It aimed to address these issues, however, keeping the critical outcomes the same.

4.5 Educators' Views about the validity of Common Tasks for Assessment (CTAs) in terms of preparing learners for pure mathematics in grade 10

All the educators who participated in the study said that the COMMON TASK FOR ASSESSMENT are not appropriate for assessing learners for the type of pure mathematics which they will be doing in grade 10. They raised many concerns about these CTAs. The following are some of their concerns.

- The CTA's are completely irrelevant and invalid. They do not even follow the learning outcomes contained in RNCS.
- CTAs are broadly based on themes (example C in 2004 CTA, which talk about difficulties faced by a motor car industry). The pure mathematics is painfully contorted to follow the theme (example of percentage problem related to tax calculations).
- CTA's are more associated with the everyday life and in grade10, the syllabus is more content based.
- Based on graphs and some mathematics concepts and do not prepare learners to be able to do pure mathematics at grade 10 level.
- CTAs are very difficult to answer even for learners that are doing pure mathematics and even to us as educators, sometimes we fail to answer some of the questions from the CTAs.
- Mathematics done in CTAs is usually done in-groups and pairs whereas grade 10 mathematics is done individually.
- If learners only write CTAs as final assessment in grade 9, there is no hope that they would cope with the demanding grade 10 pure mathematics as presented in the syllabus.
- CTAs are general examples of the form of teaching that educators should present in their OBE teaching style but they are very limited in covering the work that learners should be exposed to, before they write their grade 10 examinations.

- CTAs have no value for grade 10 mathematics.
- We supplement these CTAs with internal examinations.
- Transition to grade 10 is difficult for learners since CTAs do not test content for grade 10.
- CTAs discourage or demotivate those learners who wish to do mathematics in grade 10 as a difficulty learning area.
- CTAs train learners to apply mathematics in many situations whereas in grade 10, learners only apply mathematics in structured mathematical problems.
- CTAs are useless, learners have to do them just to comply the departmental regulation and make the department happy.
- CTAs are designed to disturb learners' minds.
- I really do not think educators were represented in designing of CTAs.
- In 2002 (A Ramp project) has no bearing to 2003 (Robin Island) and nothing to do with 2004 (Car model manufacturing). To me these CTAs are more surveys towards finding results on a particular concept? There is no link at all with factors, products and even with menstruation that learners need in grade 10.

Until mathematics educators are fully involved when issues concerning mathematics are discussed, nothing new is going to work. This is a comment made by one of the educators who participated in the study:

“Looking at the three last years CTAs (2002, 2003 AND 2004), I have noticed that there is no clear direction on the goals and objectives regarding the issue of CTAs. I think there is a need to let these designers of CTA’s be aware of the fact that we are not teaching future quantity surveyors or engineers. We are actually teaching pure mathematics where learners would use it once they get into their specific careers or jobs.

The researcher suggests that it will be a good idea if the readers of this thesis can also look at these Common Tasks for Assessment for grade 9 (2001 to 2004: final examinations) so that the reader will be able to see what the educators are referring to as some of their major problems.

4.6 What can these educators do to address the difficulties/ challenges they are experiencing in grade 10?

Educators have different views about the way that these challenges can be addressed. Some educators made the following comments.

‘The national department of education must scrap OBE in mathematics and go back to content-based paradigm.’

“One deals with the challenges by putting his/her head on the block. By cheating a lot and teaching the learners in an old style, using an old curriculum. One does that for the sake of the learners, so-that they are able to conquer at grades 10 to 12.”

“One needs to go back because unlike other learning areas, the basics play an important part in mathematics understanding. Therefore no ways, one needs to teach 3 syllabi in one year, which might lead to learners hating the subject. One may as well teach more of grades 8 and 9 and less grade 10 which leads to grade 10 syllabus not completed and that transfers the pressure to grade 11 learners because they will have to start learning grade 10 before they start learning grade 11 syllabus.”

Some educators said that they have to organize extra classes and used other learners who understand better than others to overcome some of the challenges. As mentioned above most of educators have automatically switched back to the old style in terms of presentation and assessing .One educator said that in his schools he used to encourage other educators who are teaching grade 9 to stick to the old style since even the new OBE style (RNCS) does not have a clear direction. Some educators again made the following suggestions to address these challenges.

“In our ward we have a project to help educators and learners to strategies against the backlog that has been created due to the introduction of OBE in the junior phases. We have started as far back as ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION, to principles of logic (deductive and inductive) as applied in most of their mathematics.”

“We make extra worksheets that are easier than the exercises in the textbooks. I use a lot of examples to illustrate the new concepts, before the learners do sums on their own.”

“Some sections are repeated and some I just talk about briefly.”

“We clearly state that it is the learners’ responsibility to catch up what they do not understand. There is just not enough time to re- teach everything.”

“Lots of repetitive homework exercises given to drill in the basics. We pre- empty the challenges by looking first at the continuity from grades 8 – 12. “

“We make sure that we do not have a situation where most of the important sections were not covered in grade 9. Team teaching and getting support from fellow colleagues.”

“Every time when I start a new section I always start with the work of the previous grade in that particular portion. My introduction must always link to the work they learnt or know.”

“I follow the logical route – I am forced to go back to basics and I have to be very patient and not lose my temper.”

Some educators said that their experiences as mathematics educators have contributed a lot to this situation. They said even the so- called subject advisors acknowledged the wisdom of following the old curriculum in lower grades but in an OBE style. They also said that educators must teach pure mathematics in the first to the third terms and do away with OBE, so that they will have knowledge of mathematics. They said that they hold meetings with grades 8, 9 and 10 educators to help one another. They mentioned that they also trained each other adequately in ways of presenting their lessons in an OBE style in their schools.

One educator felt that grade 9 syllabus should be divided into “pure and life mathematics skills and the emphasis for those who will do pure mathematics in grade 10 should be on mathematics and others focus on life mathematics. One educator made the following suggestions about what need to be done.

“I think that educators should not be restricted to teaching the GET only but should also teach the FET phase. Then they will appreciate the continuity that is required.”

“Grade 9 learners should be a mixture of OBE and old curriculum.”

4.7 General comments on the findings

The findings of this research study have tried to answer the research questions that were set out for this research study. The researcher will try to highlight the key features that stand out, but details of these will be discussed in chapter 5 of this research study.

Looking at the results of this research, the researcher sees the educators as having some challenges about the teaching and learning of mathematics in grade 10 especially after the implementation of OBE in grades 8 and 9 between 2002 and 2005.

Most of the educators did not have major problems or difficulties in teaching grade 10 mathematics prior to the implementation of OBE. Mathematics is in general a challenging subject and indeed there were some difficulties even before OBE was introduced.

One thing the researcher has noticed is that these educators seem not to have the capacity to implement the new curriculum even in grades 8 and 9. The result is that they come up against many difficulties in grade 10 as far as the teaching of mathematics is concerned since these learners were used to the OBE style but now have to learn pure mathematics in an old style and using old curriculum.

The majority of educators in this study speak about learners who do not have basic required skills of grade 10 mathematics, or poor background from learners in mathematics at grade 10 level and as a result they find it difficult to do individual work with these learners, who are the result of the implementation of OBE in grades 8 and 9. Grade 9 is an essential grade for the type of mathematics, which is done in grade 10. If there is a mistake or an error in terms of teaching grades 8 and 9 then there is a possibility of encountering more problems in grades 10 to 12 mathematics. Educators also did indicate that they are not happy with the way OBE was introduced where grade 9 is doing new curriculum and grades 10 to 12 is doing old curriculum or Interim Core Syllabus.

What has been revealing in this research study is the fact that educators were not prepared or trained for this kind of the situation, even those who are teaching grade 9. It must be acknowledged that the educators have attempted to implement C2005. What is also a concern to the researcher is the fact that most of the educators stated that because of problems encountered in grade 10 they are discouraging grade 9 educators from teaching the new curriculum in grade 9.

The other problem is the final assessment of grade 9 learners using Common Tasks for Assessment. All the educators who participated in this research study were totally against the use of CTAs since they are not valid for the type of mathematics which is done in grade 10.

Educators also complained about the textbooks that are used in grade 9 as not good since they do not cover the work, which is done in grade 10.

4.8 Conclusion

The difficulties that the grade 10 mathematics educators have had after the implementation of OBE in grade 9 have been revealing. This chapter has served to merely present these findings and these will be discussed in greater details in chapter 5 that follows.

CHAPTER 5

DISCUSSION AND ANALYSIS OF THE FINDINGS OF THE RESEARCH

5.1 Difficulties Experienced by Educators Prior to the Implementation of the new curriculum in grades 8 and 9.

90% of the educators have indicated that there was not much to complain about because grades 8 and 9 educators were also teaching normal mathematics. Educators said that there were difficulties but were minimal in the sense that learners were used to the style of teaching and learning which was similar even for different educators since they were using the same methods. Some of the difficulties that educators indicated were that learners have had very weak basics skills, which were a result from junior levels and lots of time, were taken filling up those gaps. Poor background from learners' mathematics made them to find abstract parts of the syllabus more difficult to master. Learners used to cram, which gave them problems in trying to master the skills and contents. The researcher thinks that learners lacked the courage to ask questions and they did not have the confidence to attempt problems. The researcher also thinks that educators wanted learners to know correct facts, rather than mathematical concepts.

The traditional belief that underpins the notion that school teaching and learning prepares learners to use mathematics in everyday life contexts is that the abstraction of mathematics allows learners to transfer knowledge out of and into different situations. Lave 's studies have shown that this does not happen often, and Evans concludes that the transfer of learning from the school situation to everyday life contexts, as described within the traditionalist paradigm, is "pretty hopeless" (Evans; 1999; 6). Further evidence emanates from research studies (e.g. Boaler; 1998), which, amongst other things, investigated the problem of knowledge transfer from school situations to everyday life situations, and seems to indicate that much teaching, done in the traditional way, has disappointing results in this respect.

The evidence in the above paragraph indicates that the problem of learners failing to relate their mathematics with their real life situations is not new. Learners do not see it fit to apply mathematics in their situations in life, other than realistic mathematics problems. This research showed that even before the implementation of OBE in grades 8 and 9, there

were some difficulties that educators were experiencing with the teaching and learning of grade 10 mathematics. The researcher believes that these were general problems, which any educator could have experienced in any learning area. This emphasized the point that mathematics has always been a challenging subject to teach and to learn. Learners have always found it abstract and irrelevant to apply mathematics in their practical day to day lives. Only few learners really enjoy mathematics and it has been the custom that it must always be taught from known to the unknown.

5.2 Difficulty Experienced by Educators in terms of syllabi linkage and Methods between grades 9 and 10 and Problematic Sections in grade 10 before OBE was implemented in grade 9

All educators agreed that there was a clear continuity in the syllabus between grades 9 and 10 in the sense that there was a sequential development, the Interim Core Syllabus ensured progression. The way syllabi were designed made it difficult for a learner to start mathematics at grade 10 for there will be concepts that learners from grade 9 should know which make it easy for an educator at grade 10 to teach.

The majority of educators also agreed that the methods used in grades 9 and 10 were the same but the only difference is that mathematics is taught to all learners (more practical) in grade 9 but only selected learners are doing mathematics in grade 10 which is more theoretical. The researcher believes that the emphasis was on content – based and the educator who wanted his learners to think for themselves and to apply what they had learned often used the OBE approaches even before it was introduced in South Africa.

Educators also indicated that the problematic sections were geometry, functions and relations (Parabola and Hyperbola), solution of words problems, algebraic fractions and formulae.

(Taylor and Vinjevold, 1999:32) strongly suggest that educators' poor grasp of the knowledge structure of Science, Mathematics and other subject's acts as a major inhibition to teaching and learning of these subjects, and that this is a general problem in South Africa.

Educators stated that learners should be taught from what they know (Previous Knowledge) before something new is presented. Educators believed that previous

knowledge play a major role to learners' understanding of new concepts in mathematics. Previous knowledge also helps when teaching abstract concepts to learners. Educators believed that learners have problems with certain topics in mathematics because they lack background knowledge from grade 9. The researcher believes that there is no conclusive evidence that the lack of background knowledge is the result of OBE. It is stated above that various reasons could be given for poor pre- knowledge.

5.3 Educators Views about Implementation of OBE in mathematics as a Learning Area

According to the findings of this study 50% of educators who participated in the research study were happy about the implementation of OBE in mathematics in grades 9, although they do have some reservations. They said that, with OBE, mathematics is made more relevant to learners although weak ones seem to be left behind more than they were before it was implemented. Educators also said that the OBE style focus on the holistic development of the learner, because of it learner – centered approach; giving the learner the opportunity to learn at his/her own pace and learn from his/her peers. They indicated that OBE would have direction if it was introduced smoothly as per phase and make sure it progresses regularly.

The other 50% of the participants were not happy about the implementation of OBE in grades 8 and 9. The major reason that they gave was that the content done in grade 9 is totally different from the one that is done in grade 10. These educators clearly stated that OBE does not prepare the learners for the type of mathematics, which is done in grade 10. The researcher believes that this is not entirely quite true .There is a clear hierarchical development of the syllabus but it seems that these educators have not interpreted the OBE documents correctly. This in the main is due to poor training they received.

In grade 9 learners are doing new curriculum and in grade 10 they have to go back and do pure mathematics (Interim Syllabus).

Educators indicated that in the new curriculum there is no clear focus on the content in grades 8 and 9, which form, the basics or foundation of grades 10 to 12 mathematics. These educators also mentioned that the new curriculum is completely unstructured and one cannot tell what the learners should know or did in the previous grade to progress to the next.

The researcher has noticed that most of these educators thought that there is no clear link between grades 9 and 10 syllabi or curriculum, since the new curriculum in grade 9 does not provide a solid background for mathematics done in grade 10.

The researcher believes that the major problem that educators indicated was that they were not prepared for the new curriculum and the way it was introduced is totally unfair for those learners who are planning to do mathematics in grade 10. The findings that were presented above and in the previous chapter clearly show that grade 10 mathematics educators are not happy with the type of learners they are receiving from grade 9.

Ramphela stated the following:

“Why are South Africans unwilling to talk about the legacy of apartheid on the quality of the human resource base? If one accepts that Bantu Education discouraged, and in some cases prevented the teaching of Mathematics and Science in most schools, one could not be surprised, let alone embarrassed to admit that most educators would not have the required skills to perform at the appropriate level to prepare learners for the 21st century’s knowledge driven society.” (Ramphela, 1997: 21)

The researcher quoted the above statement because among the educators who participated in the study, especially those educators who come from former model C schools did not mention any difficulties about the implementation of the New Curriculum in grade 9. Some of these educators responded as follows in their comments:

“We are coping by taking things step by step at a time. Even if learners are taught in an OBE style, in our school they still cover the same work and are able to cope with grade 10 work.”

“We train ourselves not by the Department of Education. We know what grade 9 learners had to be able to do to progress to grade 10.”

The researcher believes that although 50% of participants were happy about the implementation of OBE, they were concerned about the training of educators and lack of supportive workshops from the Department of Education. Some of the educators have showed concern about grade 12 Senior Certificate Examinations since most of the work

done in grade 10 mathematics is also needed in grade 12 and it is the learners' future which would be affected if this problem is not addressed. The researcher believes that educators would be happy if the content part is also emphasized in OBE and if there was also Coherence between the grades.

5.4 The difficulties Experienced by grade 9 Educators After the Implementation of OBE

The majority of educators stated that they are experiencing more and more difficulties with grade 10 mathematics learners, since they lack basic skills for the type of mathematics which is done in grade 10. They indicated that OBE curriculum only give emphasis to few selected topics in grades 8 and 9 , so now you will find that what is most required in grade 10 was not covered or there was not much emphasis given to it in grade 9. The major difficulty that these educators are experiencing is that in grade 10 they are supposed to teach grades 8 and 9 work to make a linkage with grade 10 work , otherwise there had a huge problem with some of these OBE learners.

Many of the participants indicated that in general, learners are not prepared by the OBE teaching methods to do mathematics in grade 10. The most basics concepts e.g. triangles, exponents, functions and relations are left out in grade 9. Learners have lost focus; cannot work independently; no self motivation; rely on the group and they cannot think for themselves; also lack confidence in their own abilities; and always look for constant guidance from the educators.

Jansen (1998) points out that C2005 has the greatest likelihood of success in well-resourced schools with –qualified educators and better –prepared students. (Jansen; 1998; 15)

Christie (1999) says that the introduction of OBE into schools has been poorly planned, over hasty and educators have been insufficiently prepared. Christie believes that the government provided emergency training and materials to ensure that all provinces could start on same footing, however, in- service work with educators and schools has been minimal and resources totally inadequate (Christie, 1999:1).

What the researcher has observed is that there is a huge problem in secondary schools after the implementation of OBE. Many educators feel hopeless about the success of OBE and they have really pronounced that they are just teaching because they are the employees.

The statements above confirmed that educators were not thoroughly prepared for the implementation of OBE. Educators complained that they were not involved when OBE was planned.

5.5 Views about Educator and Learner – readiness for the implementation of OBE.

Looking back at the difficulties experienced by educators as discussed above, we have noticed that educators were not ready and so learners were not prepared to be ready for the implementation of OBE. Educators complained that they were not consulted in the preparation of the OBE and their non- involvement in decision making. Educators also complained about shortage of resources; inadequately prepared of learners for the content that they need to learn in grade10 and unstructured RNCS because its fundamentals flaw is still reliance on outcomes, which do not provide a logical sequential structure.

The researcher noticed that most of the educators who said that they are ready for the implementation of OBE are those who are from former white/model C schools. These educators emphasized that even if learners are taught in an OBE style they still cover the same work and be able to cope with grade 10 work. These educators do training in their own schools. The researcher suspects that these educators are teaching the Interim syllabus in grade 9 not C2005 as they said.

5.6 Views about Textbooks used in Grades 8 and 9 after OBE was implemented

All the educators that participated in this research study were very much happy with the textbooks that are still being used in grade 10. The major problem is with the textbooks that are used in the General Education and Training (GET) phase.

They indicated that these textbooks do not cover the contents needed in grade 10. The grade 9 textbooks need a lot of interpretations for learners and they do not prepare learners for grade 10 work. The information in these textbooks is irrelevant for the type of mathematics done in grade 10.

The majority of educators who participated in this research study indicated that these textbooks which are used in grades 8 and 9 do not link with the textbooks that are still being used in grade 10. They also indicated that, the level of such textbooks is far lower than those used in grade 10. Educators cannot even see logical link that has developed.

5.7 Views of Educators about the Validity of Common Tasks for Assessment (CTA) in Preparing learners for grade 10 Mathematics

90% Of the educators who participated in this study were against the CTAs. Educators said in one voice that these CTAs do not prepare learners for the type of mathematics, which is done in grade 10. They indicated that this type of Assessment is for mathematics literacy learners only. They also felt that CTAs are very difficult to answer by grade 9 learners. Most educators also felt that even learners who will be doing mathematics would not be able to answer such a paper and even the educators themselves mentioned that they need enough time to prepare themselves to answer such a paper. During examinations invigilators have to explain each question to assist learners.

They also said that CTAs are general examples of the form of teaching that educators should present in their OBE teaching style but are very limited in covering the work that learners should be exposed to, before they write their grade 10 examinations.

The researcher feels that many educators need to be involved and to have a say on designing CTAs. The researcher is also concerned if the Department of Education is aware of all these challenges. The researcher thinks that a survey needs to be conducted because even departmental officials discourage educators from relying on OBE and CTAs and encourage them to organize their own internal examinations. The researcher thinks that there are more things that need to be rectify about these CTAs.

5.8 Addressing the Difficulties that Educators are Experiencing in grade 10 Mathematics Teaching

Most of the educators are not against the implementation of OBE but the way it was introduced in GET and grade 10. The big problem is that grades 8 and 9 are doing the new curriculum and when they reach grade 10, they have to go back to the traditional curriculum. Educators felt that the new curriculum need to be reviewed in terms of looking at the linkage in between the grades, e.g. grades 9 and 10. What is done in grade 9 should lead to what will be done in grades 10, 11 and 12.

Many educators that are teaching grade 10 are working overtime to try to rectify the damages caused by the implementation of OBE in grade 9. Some educators said that they are now encouraging those educators who are teaching grades 8 and 9 to switch back to the Interim Core Syllabus for the benefit of learners. Some educators have decided to form

clusters to help one another and to strategies how they can address these challenges. They make extra worksheets, give more homework and organize extra classes. Some educators rely to their experiences as mathematics educators.

The researcher thinks that there is a major problem in schools out there because even Subject Specialists failed to help and discourage educators from using new curriculum in grade 9. The big question is “Who is supposed to help these educators”? if even subject specialists say that: ‘it is the instruction from above there is nothing we can do’.

The researcher thinks that these educators do not have tangible solutions on these difficulties that they are experiencing, except to switch back to the old curriculum in grade 9 until new curriculum is introduced in grade 10. As long as the curriculum designers have not considered the Coherent of syllabi between grades 9 and 10, this problem will not be solved. OBE was supposed to be implemented step- by- step or grade by grade in order to link the work of the new grade with the work of the previous grade. The researcher again feels that the findings suggest that more content should be added to the new curriculum.

CHAPTER 6

SOME CONCLUDING COMMENTS

6.1 INTRODUCTION

The purpose of this study was to establish what difficulties the grade 10 mathematics educators were experiencing in teaching grade 10 learners after the implementation of the new curriculum (OBE) in the Senior Phase. This study has established many difficulties that the educators were experiencing. These difficulties are listed from the following reflective comments and also the limitations of this study are emphasized. The researcher also gives the recommendations for successful implementation of the new curriculum and suggestions are made as how further study in this field would offer more conclusive evidence.

6.2 REFLECTIVE COMMENTS

The researcher's involvement as a grade 10 mathematics educator provided further insight to conclude that the educators were definitely having difficulties with the teaching of grade 10 mathematics after the implementation of the new curriculum in the senior phase particular between the years 2002 and 2005. Chisholm, *et.al.* (2000) have revealed some valid difficulties with the release of the findings of the Review Committee commissioned by the National Minister of Education; Professor, Kader Asmal in May 2000. The summary of the findings of the Review Committee on C2005 can be found in the literature review of this research study. In this study the researcher was trying to highlight the damages that have been caused by implementation of the new curriculum only in the Senior Phase and continuation with the Interim Core Syllabus in the FET Phase, especially to those grade 10 mathematics educators.

The findings of this study have revealed the kinds of difficulties that a small sample of grade 10 mathematics educators have experienced after the new curriculum was implemented in grade 9. The researcher has found very little that has been published on this study since the new curriculum was only introduced in 2002 in grade 9. Jansen (1999) also gives many criticisms of C2005. The researcher would like to view this study as a confirmation of what has already been discovered and a revelation of other difficulties that grade 10 mathematics educators are experiencing after the new curriculum was

implemented in the GET phase in 2002. These are accompanied by some recommendations that will assist in its successful implementation.

This study has revealed that the difficulties grade 10 mathematics educators experienced after the implementation of the new curriculum in grade 9 hinged on the following areas:

- No linkage between grades 9 and 10 syllabi.
- Methods used in grades 9 and 10 are totally different (from learner – centred approach (grade 9) to content – centred approach (grade 10)).
- Educators' qualification lacking in OBE training (lack of training for educators).
- Textbooks used in grades 8 and 9 are of poor quality and exercises are of pathetic quality.
- Grades 8 and 9 works are taught in grade 10 because it was not done in grades 8 and 9.
- No clear focus on the content part in grade 9, which form the basis of grade 10 mathematics.
- The new curriculum only gives emphasis to very few topics.
- Learners are not prepared by OBE paradigm to do pure mathematics in grade 10.
- Learners cannot even work independently, only rely on the constant guidance from the educator and other members of the group.
- Learners find it difficulty doing individual work and completing homework and other class work.
- The level of mathematics that learners are exposed to in grade 9 is far lower than the One they encounter in grade 10.
- Many learners drop out in mathematics classes and others become worst in mathematics.
- The examination or Assessment (CTAs) which is an exit point from grade 9 to grade 10 has no value for the type of mathematics, which is done in grade 10. (See Appendices B)
- Textbooks used in grade 9 have lots of activities and a lots and lots of stories and less mathematics.
- No support from parents in terms of doing homework.
- No prior knowledge from grade 9 mathematics, learners are just blank.

6.3 RECOMMENDATIONS FOR ADDRESSING DIFFICULTIES THAT GRADE 10 MATHEMATICS EDUCATORS ARE EXPERIENCING

The researcher acknowledges that the South African Government and National Department of Education have revised the new curriculum although nothing will be solving the problems raised above. The Review Committee made their findings and recommendations publicly known. The only thing that the review committee said is that the new curriculum will only be introduced in 2006 in the FET phase, especially in grade 10. The researcher, therefore, wishes to state that perhaps some the recommendations of this study will already be in the process of being addressed by the present Ministry of education.

The recommendations of this study will be based on the following:

- Grade 9 educators to teach Interim Core Syllabus in an OBE style
- Division of grade 9 syllabus into two parts
- Organisation of extra lessons and more work to be prepared
- Clustering of grades 9 and 10 educators in different wards
- Training and Preparations of educators

6.3.1 Grade 9 educators to teach Interim Core Syllabus in an OBE style

The researcher agrees with some of the findings that for the benefit of learners who will be doing mathematics in grade 10, grade 9 educators should use the Interim Syllabus during the first three terms of the year when teaching grade 9 learners but in an OBE style. This arrangement will only be made until 2006, when the new curriculum will then be introduced in grade 10. The researcher also recommend that learners must also write final examinations at the end of the third term, so that educators can be able to assist those learners who would like to do mathematics in grade 10. This will ensure that all the basics needed in grade 10 have been covered in grade 9.

During the fourth term, then learners can concentrate on Common Tasks for Assessment (CTAs). It is vital to note that these CTAs are not helping any learner at all especially those who will choose to do mathematics in grade 10. Educators to only use OBE approach, where possible and cover the essential parts that are necessary to progress to grade 10. According to the findings, because of problems and difficulties experienced by grade 10 educators some educators had decided to stick to the Interim Syllabus for the four terms and ignore the CTAs.

6.3.2 Division of Grade 9 Syllabus into two Parts

Another recommendation is that the grade 9 new curriculums should be divided into 'PURE MATHEMATICS and LIFE MATHEMATICS ' skills and the emphasis for those who will do pure mathematics in grade 10 should be on mathematics and others focus on life mathematics. The researcher is aware that this will not be easy since learners do not make subject choices at grade 9.

The researcher is also of the opinion that educators should not be restricted to teaching the GET phase only but should be allowed to teach the FET phase as well to ensure and appreciate the continuity that is required. Grade 9 works should be a mixture of pure mathematics and mathematics literacy to accommodate both choices learners, so that we would not come across the very same situation in future.

6.3.3 Organisation of Extra lessons and more work to be prepared

The findings also recommend that grade 10 mathematics educators have to re-organize themselves by organizing some extra classes and used other learners who understand better than others to overcome some of the challenges that were put forward.

The researcher agrees that educators must make extra worksheets that are much easier than the exercises in the textbooks. A lot of examples must be used to illustrate the new concepts, before the learners do sums on their own. Some sections need to be repeated and some to have just talked about briefly.

It is again the learners' responsibility to catch up what they do not understand. Lots of repetitive homework exercises have to be given to drill in the basics. Some educators emphasised that they follow the logical route and they are forced to go back to the basics and have to be very patient and not lose temper. Other educators rely to their experiences as mathematics educators to overcome some of the challenges.

6.3.4 Clustering of Grades 9 and 10 Educators in different Wards

The researcher thinks that more clustering of grades 9 and 10 mathematics educators in different wards can play a major role in solving some of these challenges. Educators need to help one another and strategies in their respective clusters against the backlog that has been created due to the introduction of OBE in the junior phases. Educators need to start as

far as Addition, Subtraction, Multiplication and Division in order to overcome some of these problems.

The researcher also recommend that educators need to network with educators in other wards, especially those who seem not to have more difficulties like former Model C / former White schools and find out how are there coping. These educators have to make sure that they do not have a similar situation in future, where most of the important sections or topics were not covered in grade 9. Educators in grade 10 have to make sure that they know what is happening in grade 9. It is the responsibility of the Subject Specialists to make sure that such networking is taking place even within the school. Team teaching and getting support from fellow colleagues is one of the recommendations in such a situation. Cluster co-ordinators have to invite experts and hold meetings every week to monitor the progress.

6.3.5 Training and Making Educators Prepared

The researcher thinks that as he has mentioned in the above paragraph, it is now high time that educators stand up and do things for themselves. Educators must not wait for somebody to come and train them. Educators can train themselves adequately in ways of presenting their lessons in an OBE style in their respective schools.

One educator said in one of her responses:

“We train ourselves, not by the Department of Education. We know what grade 9 learners had to be able to do to progress to grade 10”.

The researcher thinks that this statement suggest that we as educators could have done something to prevent the situation we are in now.

The methodology used by the department of education to train educators has been greatly the use of cascade Model of training. Educators encountered many problems with this Model of training. The Review Committee’s report also disfavours this model of training. The researcher agrees with the findings of the Review Committee on C2005 that the Cascade Model of training is problematic. Even educators have doubts about the capabilities of educator trainers used in the training process. The researcher also thinks that these doubts are well –founded as these educator trainers have been trained in a very short space of time themselves. The situation is further is exacerbated by the fact that educators are taken away from their schools to conduct these training.

Oakes (Oakes, 130; 2001) in his thesis made the following recommendations about the training of educators:

- Those other personnel with the necessary expertise and qualification should be employed to conduct the workshops to educators at the school level of training.
- That the educators be given accreditation for the learning that they undergo in these training sessions.
- That the training and learning of educators be linked effectively to the process of Development Appraisal and Whole school Evaluation.
- That the duration of the initial training of educators be extended to be longer than only one week.
- That the training sessions to include training in classroom practice.
- That the training and support be conducted on an on- going basis (Oakes; 2001; 130).

The findings of this study suggest that educators can cope by taking things step by step at a time and help themselves in their schools.

6.4 LIMITATIONS OF THIS RESEARCH STUDY

The researcher acknowledged that as an educator also teaching grade 10 mathematics he had preconceived ideas of difficulties experienced by grade 10 educators and this could have caused certain biases in the research study.

As has already been mentioned in this study there are limitations with regards to the use of Questionnaire as a means of collecting data. With regards to the questionnaires it is true that not all the information the researcher wanted to investigate, were given. Some educators did not understand certain questions because of certain key words that were used in the questionnaires. For instance the use of the word “PRIOR”. Some educators ignored this word in the sentence than they answered this question incorrect. (See question one of the questionnaires: appendices A)

Another problem was that the researcher initially planned that the questionnaires will be followed by in-depth interviews from few educators who participated in the study to get clarity on certain questions. This did not happen because the study was conducted during half – yearly examinations all the educators were busy preparing learners and they did not have time for an interview session since again some of them were writing their own

tertiary examinations. This then symbolizes that further information could also been gathered.

The participants could possibly also have withheld information. The questionnaire was long and the repetition of some certain questions on another level of the questionnaire were annoying to some participants without actually understanding the way the question is being asked. The questionnaire schedule, as also already indicated in this study, had some shortcomings, which further limited the research study.

6.5 SUGGESTIONS FOR FURTHER RESEARCH

It came out very strongly in this research study that Coherent of syllabus in between the grades should be taken into consideration. The emphasis on content in grade 9 mathematics needs to be considered again.

The researcher suggests that further studies will be very useful on the types of textbooks used in grades 9 and 10. This study has revealed that the textbooks used in grade 9 are not appropriate for the type of mathematics that is done in grade 10. Since this particular study could not explore this aspect in detail, it would be useful to research the impact of grades 8 and 9 textbooks to the teaching of grade 10 mathematics. Perhaps the next question will be are those textbooks appropriate for the type of mathematics, which will be done in grade 10 after the implementation of OBE (new curriculum) in the FET phase?

Perhaps a further study will be helpful to look at the connection between mathematics done in grades 9 and 10 after the implementation of the new curriculum in the FET phase. The study has revealed again that mathematics educators have complains that they are always excluded when decision are made about the subject that they teach. They are of the opinion that they are the ones who know better than any other person when it comes to the challenges and difficulties in the classroom and they feel that they need to play a major role and lead to decisions that are taken. The question that need to be answered is that “Who really takes decision that affect both educators and learners at the end of the day”? The research feels that an investigation needs to be made on such hot matters.

The researcher also suggests that a further study on the impact of writing mathematics Common Tasks for Assessment as an exit point to grade 10 needs to be conducted, more especially after the implementation of the new curriculum in the FET phase.

The researcher thinks that the kind of in-service training that educators receive contributes much towards their capabilities to implement the new curriculum. A useful study could be based on what is learnt in INSET and what needs to be learnt, by whom, and for how long, to make useful changes in mathematics.

6.6 CONCLUSION

This particular research study has identified some relevant difficulties which grade 10 mathematics educators are experiencing after the new curriculum was introduced in GET phase in 2002. The amount of assistance, which these educators need, is revealing and concerning. Without restating the difficulties, the researcher concludes by saying that if attention is given to these, this will greatly enhance the successful implementation of the new curriculum.

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APPENDIX A

QUESTIONNAIRE FOR GRADE 10 MATHEMATICS EDUCATORS

BACKGROUND

I'm studying for a M.Ed. (Mathematics Education) at the University of KwaZulu-Natal, Edgewood Campus and I'm now working on the research component of my M.Ed.

The title of my topic is: **CURRENT DIFFICULTIES EXPERIENCED BY GRADE 10 MATHEMATICS EDUCATORS AFTER THE IMPLEMENTATION OF THE NEW CURRICULUM IN GRADE 9 IN THE VULINDLELA DISTRICT OF KZN IN SOUTH AFRICA.**

I'm an FET Educator [grades 10 to 12] who is finding some problems in teaching Mathematics learning area to grade 10 learners, who are from grade nine or have been doing MLMMS in 2002 to 2004 and I don't think I am the only one! The big question is about those learners who are entering the FET phase, who are supposed to go back and learn the interim syllabus. We are aware that C2005 is now being improved and in any case we want to make it as successful as possible, to do the best that we can for our learners. I m trying to find out how other educators are getting on teaching grade 10 mathematics. I therefore, need your help in this. Kindly respond to the questions that follow.

Please be assured that the data collected from you will be used for research purposes only. Neither the school, nor the principal and educators will be named individually as sources of information. If you were willing, I would like to tape the interview so that we proceed more quickly as I won't be using up interview time writing notes, and will erase the tape once it has been transcribed.

Thank you for your willingness to assist me. I am very grateful for your time.

Yours truly,

Malinga Mxoleleni Alfred

M.Ed. [Maths Education] Student

University of KwaZulu Natal, Edgewood Campus.

Section A: Background Information

For Question 1, tick as appropriate:

1. What is your gender?

_____ MALE

_____ FEMALE

For Question 2, tick the appropriate age category:

2. What is your age?

_____ 20- 30

_____ 31- 40

_____ 41- 50

_____ 51- 60

_____ 61 +

3. Please list your qualifications in the order in which these were obtained.

Qualification	Year	Institution	Category	Full Time	Part Time

4. How much years-teaching experience do you have?

_____ Years

5. How many schools have you taught during your career?

_____ Schools

6. What is your official position at your school?

Section B: The Interim Syllabus for grade 10.

1. WHAT WERE THE DIFFICULTIES YOU EXPERIENCED AS A STD 8/ GRADE 10 MATHEMATICS EDUCATORS PRIOR TO THE IMPLEMENTATION OF OBE / MLMMS IN GRADES 8 & 9?

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A. Was there a link between grades 9 and 10 Syllabus? [Yes/no]: _____.

Briefly explain in which way:

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B. Were the methods that are used in teaching grade 9 learners the same as those that were used in grade 10? _____ [Yes/ no].

Briefly explain your answer:

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C. Which Topics/Sections were problematic in teaching and learning both to learners and educators?

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D. Which Topics/Sections were understood better by learners prior to the implementation of OBE?

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E. Were there any assistance rendered by Subject Advisors {Subject Specialists} to problematic sections? _____ [Yes/no].

What assistance [if any]:

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.....

F. Do you think it is a good move to switch on to OBE style? _____ [Yes /no]

Why?.....
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.....

G. Were learners compelled to do mathematics in grade 10? _____ [yes/no]

If yes what difficulties were experienced by educators from such learners?.....
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.....
.....
.....

H. What was the approximate pass rate in grades 10 mathematics?

Please tick, in the past 3 years before introduction of MLMMS the pass rate in grade 10:

0 --- 29 %	30 ---- 50 %	51 ----- 69 %	70 ----- 100 %
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Were there any difficulties that were encountered in terms of?

Teaching the

Subject?.....
.....
.....Methodology?.....
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.....

I. Is there a link between old curriculum and OBE?

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2. WHAT ARE THE DIFFICULTIES EXPERIENCED BY YOU IN GRADE 10 MATHEMATICS AFTER THE IMPLEMENTATION OF OBE/MLMMS IN GRADE 8 & 9?

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A. Which curriculum is presently being offered in grade 10 in your school?

B. Are there any changes that have been made to the curriculum that was used prior to 1994? _____ {Yes / no}

Explain:.....

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C. Were grade 10 /FET Educators thoroughly trained to help the first group that was entering grade 10 in 2003 and those entering in 2004? _____ Yes /no.

If yes in which way were they assisted?

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D. Are these learners from grade 9 ready to do mathematics in grade 10? _____ Yes/ no.

Explain your answer:.....

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E. In your opinion, is there any change between the present grade 9 syllabus [C2005]

And the Interim Core syllabus that was used before? ____ Yes / no.

Explain if any:

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F. How has that change affected grade 10 teaching and learning of mathematics?

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G. Learners in grade 9 have been taught in OBE style and they are again suppose to be taught in OBE style in grade 10. Have you been workshoped to this new method of teaching to accommodate these learners who are coming from grade 9? ____ Yes/no.

If not: How do you cope with this situation?

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H. Most of the sections in grade 10 Mathematics are also needed in grades 11 and 12 syllabuses.

What are your comments about the type of learners that are from grade 9 (taught in an OBE style), who must then sit for grade 12 External Examinations, in terms of:

READINESS FOR GRADE 10

WORK.....

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.....

CONTENTS OF THE TEXTBOOKS USED IN GRADE 9

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CONTENTS OF THE TEXTBOOKS USED IN GRADE 10

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COVERAGE OF CONTENTS NEEDED IN GRADE 10

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HOW DO YOU DEAL WITH THOSE CHALLENGES IN GRADE 10?

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I. The basics are very important in mathematics. How do you deal with a situation where most of the important sections were not thoroughly done or not covered at all in grade 9?

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3. THE FOLLOWING QUESTIONS ARE BASED ON COMMON TASK ASSESSMENT {CTAs}.

I. What are your opinions about the validity of CTAs in terms of preparing Learners to do pure mathematics in Grade 10?

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II. Do you think CTAs are appropriate for the type of mathematics done in grade 10? -
_____ Yes / no. WHY?

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III. Do CTAs really prepare learners for grade 10 Mathematics?

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4. WHAT CAN BE DONE TO ADDRESS THE DIFFICULTIES EXPERIENCED BY THESE GRADES 10 EDUCATORS?

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I. What is helping you to deal with the difficulties that you are experiencing in teaching grade 10 mathematics?

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***5. WHAT ARE YOUR GENERAL COMMENTS ABOUT THIS RESEARCH OR ANY
THING THAT YOU THINK IT WILL BE USEFULL IN MY RESEARCH?***

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