

**The role of Inclusive Education in the teaching of Mathematics in
High Schools: An Investigation**

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requirements for the Master of Education Degree in the School of Education, University
of KwaZulu-Natal, South Africa.**

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January 2014

Statement

As the candidate's supervisor I agree / do not agree to the submission of this dissertation.

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I, Yolisa Mazwai, declare that:

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Abstract

Currently South Africa has been experiencing a decline in terms of Mathematics performance in high schools, especially at the end of the grade 12 year. This has been my experience as well; I have observed the school that I worked in failing to keep the Mathematics results over the years at 100%. Teaching and learning recently has not helped to achieve the desired results (which is a good mathematics understanding and a good, quality pass rate). This has resulted in a blame game circulating between parents, teachers, learners and the Department of Education. The response was to provide another option to assist teachers to work with at schools and in their classrooms as well so as to improve this problem hence the introduction of inclusive education. Inclusive education has been introduced through Education White Paper 6 (DoE, 2001); it clearly states that classroom educators are the primary resource for achieving the goal of inclusive education. This implies that teachers need to be empowered to change their attitudes, refine their teaching practice and where necessary, develop new attitudes and teaching practices (Naidoo, 2005).

This study sought to explore teachers' understanding of inclusive education and also how their understanding influenced their teaching. A qualitative case study method of data production was used. The data was collected through individual interviews and structured observations in the classroom. The study was conducted in one district in the province of KwaZulu-Natal. The participants were four high school Mathematics teachers from one selected school. The study was informed by social constructivism and Vygotsky's Zone of Proximal Development.

The findings revealed that one teacher has a clear understanding of what inclusive education is, two teachers misunderstood inclusive education and the last one had no understanding at all. It also revealed that in the classroom all three teachers that were observed did implement a learner-centred approach, though there were still learners who were not catered for.

The study concludes that the Department of Education should look at how teacher's knowledge and understanding about inclusive education and mathematics can be developed. It is also recommended that the Department of Education looks at providing teachers with adequate support in inclusive classrooms in dealing with large classes.

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LIST OF ACRONYMS AND ABBREVIATIONS USED

ACE:	Advanced Certificate in Education
BSc:	Bachelor of Science
CAPS:	Curriculum and Policy Statement
DoE:	Department of Education
DVD:	Digital Versatile Disc
EWP6:	Education White Paper
FET:	Further Education and Training
GET:	General Education and Training
HOD:	Head of Department
ICDL:	International Computer Driving License
ICT:	Information and communications technology
KNZ:	Kwa-Zulu Natal
LD:	Learning Disability
LRE:	Least Restrictive Environment
NCS:	National Curriculum Statement
OBE:	Outcomes-based Education
RNCS:	Revised National Curriculum Statement
SCLE'S:	Student – centred environments
SEN:	Special Education Needs
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
UKZN:	University of Kwa-Zulu Natal
ZPD:	Zone of Proximal Development

CHAPTER ONE: INTRODUCTION

1.1 Introduction

In this chapter, I will outline the research process and also give brief explanations of how the researcher conducted the study. I will also discuss the focus and purpose of the study, rationale, followed by the relationship between inclusive education and Mathematics teaching. I will further explain the theoretical framework employed in the objectives of the study and table key research questions. This will then be followed by the research methodology and design, sampling, ethical issues, limitations of the study and lastly the overview of the study.

1.2 Focus and Purpose of Study

The focus of this study was to explore the role of inclusive education in the teaching of Mathematics in high schools. It was hoped that the study would help both the researcher and the participants in gaining deeper understanding about inclusive education policies and related teaching strategies.

1.3 Rationale

In July 2001, the Ministry of Education adopted a new policy entitled Education White Paper 6: Special Needs Education: *Building an inclusive education and Training System* (Department of Education, 2001). This policy signified change in the education system of South Africa, as it had just gained its democracy. Through this policy statement, the South African government re-affirmed its commitment to acknowledging special needs education as an integral part of the general education system (Ntombela, 2006, p.102). The researcher feels that it is important for every educator to keep abreast with the knowledge of policies

that the Department of Education is implementing. It is also important for teachers to employ teaching strategies that align themselves with new policies. This understanding of inclusion should lead to involvement of all learners in the classroom. The researcher, a student studying an inclusive education module, was motivated by the knowledge gained from her studies to find out what can be done by teachers to make sure all learners understand mathematics. The researcher, as a Mathematics teacher at high school, wants to understand how teachers and learners are both embracing and also benefiting from inclusive education in their teaching and learning. The researcher, again from experience, thinks that some learners in our Mathematics classrooms appear to have a mathematics disability. As we no longer practise segregation we cannot separate them from the rest of the class. It therefore means that those learners (who are suspected of having mathematics disability) need us as teachers to work with them so that they gain better Mathematics understanding and achieve good results.

According to Cole, Jane, Wasburn-Moses and Leah (2010) direct instruction in Mathematics teaching is perceived to belong to special education and inquiry based teaching is seen as belonging to general education. It aroused my curiosity to understand the type of teaching strategies that can be used by teachers in their diverse classrooms. These types of teaching strategies should be employed by Mathematics teachers to improve the pass rate of Mathematics as well as improve Mathematics understanding for learners with Mathematics disability and aim to include all learners.

1.4. Inclusive Education and Mathematics teaching

Inclusive education was first introduced as a concept at the World Conference in Salamanca where many countries gathered together to discuss and adopt this new strategy and policy in Education. Thereafter South Africa also followed and adopted it in 2001 through Education White Paper 6. Education White Paper 6 (which addresses the policy of inclusive education) gives a broad definition of inclusive education and emphasises that some learners may

require more intensive and specialised forms of support to be able to develop their full potential. It goes on to say that learners are different and an inclusive education and training system is about enabling education structures, systems and learning methodologies to meet the needs of all learners. This policy acknowledges that learners have different learning needs, and therefore they will have different ways of grasping knowledge and their capabilities will be developed differently. Dixon (2006) in mathematics and inclusion argues that learning in a less restrictive environment benefits learners with or without disabilities in as much as all learners are likely to improve their academic performance and increase their communication and socialisation skills. She further defines what she refers to as the Least Restrictive Environment (LRE) as the educational setting that provides the greatest exposure to an interaction with education learners and persons without disabilities.

She emphasises the benefits of learning in the LRE for learners with special needs and states that they are great as it increases motivation, raises self-esteem, and improves academic achievement. Dixon (2006) investigates teacher roles in both general and special needs education and she argues that teachers should design and modify instruction to meet learners' academic and behavioural needs. She further argues that teachers should develop empathetic skills that provide empowerment that challenges the learners' learning ability. Swars, Stinson and Lemons-Smith (2009) investigate effective interventions between learners with learning disabilities (LD) and healthy ways for special education and mathematics teachers to collaborate. They advocate that inclusion will be successful if teachers consistently employ certain strategies that increase the academic progress of learners with LD.

These strategies include many types of interventions, such as early intervention, continued remedial intervention and interventions for difficulties in understanding word problems. According to Swars et al., (2009) there are instructional strategies that are beneficial to learners, including in the area of Mathematics, which consist of peer assisted learning that

can encourage low achievers to continue their attempts to master a skill. They further argue that this method also assists the teacher as it allows learners to be engaged with one-on-one assistance. The other strategy that they deal with is that of collaboration among professionals; this is viewed as a strategy for training and equipment. They further argue that this is the key to successful inclusion, as professionals use their knowledge of specific strategies to modify lessons for learners with LD and fill in the gaps between content knowledge and knowledge of effective strategies.

According to Cole et al, (2010) we are living and teaching at a time when more learners with disabilities are included in general education classrooms and held to the same standards as their general education peers than ever before. They continue to state that most people know that many learners continue to struggle with Mathematics, and therefore improving Mathematics instruction is of great importance. They say that there are two conflicting ways to structure Mathematics teaching and Mathematics classrooms, which are direct instruction and inquiry based teaching. They further argue that direct instruction is traditionally seen as belonging to special education and inquiry based is seen as belonging to general education. They say that teachers should help maximise all learners' learning and bridge the divide over the differing conceptions of Mathematics teaching and learning. Humphreys (2009) argues that inclusive education practices have led to worldwide discussion of how best to deliver a more equal education opportunity for all. He goes on further to say that teachers have had to move away from teacher-led teaching to pupil-centred learning. According to Humphreys (2009) inclusion is more about the state of mind than any specific educational arrangements; he says the process of learning is considered important as well as the content of what students learn. He further looks at the role of the teacher as an agent of change and at the heart of educational opportunity. He says that during educational change and paradigm shifts what matters the most are the teachers' beliefs in what should be taught and how they should

practise their art of teaching; without the informed teacher there can be no inclusive education.

Ntombela (2010) argues that an inclusive education is the one that responds to learners' needs, provides learning support, acknowledges differences among learners and maximises learner participation in the culture and curriculum of educational institution. She goes on to say that, in the context of the Outcomes Based Education (OBE) system in general and inclusive education specifically, all teachers are now expected to address individual learner needs and to provide all learners with quality education.

1.5. Theoretical Framework

This study sought to investigate what teachers know or understand about inclusive education, and how this knowledge influences their teaching. The theories that were employed were social constructivism and the Zone of Proximal Development (ZPD). The teachers' knowledge was evident in how some of them implemented teaching strategies that are in alignment with inclusive education. In my own view all teachers should always be searching for a kind of instruction that is optimal for every individual learner. In the process of teaching, especially now during the inclusive era, teachers should be sensitive to the fact that all learners are not the same, that they learn differently and therefore, that teaching, tasks, and assessment should take this into account.

Different learners will have different ways of grasping knowledge; their capabilities will be developed differently. Vygotsky's (1896-1934) Zone of Proximal Development (ZPD) states that a child follows an adult's example and gradually develops the ability to do certain tasks without help. He believes the role of education is to provide children with experiences that are in their ZPD, thereby encouraging and advancing their individual learning. Within Vygotsky's general conception of interaction between the more knowledgeable other and a

less competent person on a task there are three main aspects. These are generality assumption (applicable to learning all kinds of subject matter), assistance assumption (learning is dependent on interventions by a more competent other), and potential assumption (property of learner, which enables best and easiest learning). In an attempt to view teachers' understanding of inclusive education in their teaching, and how they develop their mathematics learners, all three aspects of the theory were used.

McMahon (1997) argues that social constructivism views learning as a social process. He emphasises the importance of culture and context in understanding what occurs in society and constructing knowledge based on understanding. He goes on to say that meaningful learning occurs when individuals are engaged in social activities. Enerst (1999) argues that social constructivist thesis is that mathematics is a social construction and a cultural product. He further says that the origins of mathematics are social or cultural. According to Vygotsky it is through the process of engagement with the adult that a learner is enabled to refine their thinking or their performances to make it more effective. It is then in the same breath that I wanted to understand whether and how mathematics teachers at high school use social interactions in their classrooms to promote learners' understandings of mathematics.

1.6 Objectives of Study

This study intended to:

- Investigate what Mathematics teachers know or understand about inclusive education.
- Establish how their knowledge and understanding influenced their teaching.

1.7 Key Research Questions

The key research questions that the study addressed were:

- What do Mathematics teachers know or understand about inclusive education?
- How does their knowledge or understanding influence their teaching?

1.8 Research Design and Methodology

The researcher chose an interpretive research paradigm. Cohen and Manion (2011) argue that an interpretive paradigm is about individuals on a small scale, it is qualitative and subjective (and there is understanding and explanation). They continue to say that in interpretive research there is interpretation of the specific through individual perspective, personal constructs, and negotiated meanings and there is practical interest. Scott and Usher (2011, p.29) argue that in interpretive paradigm the researcher takes everyday experience and ordinary life as its subject matter and asks how meaning is constructed and social interaction is negotiated in social practices. They further argue that in the interpretive paradigm the task of the researcher is to work with, and make sense of, the world, through the frames and pre-understanding of the researched. The epistemology of this paradigm is the one where the values of the participants as well as the researchers have become interlaced (Terre Blanche and Durrheim, 1999). Falconer and Mackay (1999) argue that the ontology in this approach is a subjective reality.

This paradigm worked well with this investigation as it sought to find out the Mathematics teachers' understanding of inclusive education. Using their own views the researcher saw how they reflected, defined and understood the meaning of inclusive education and mathematics teaching.

A research design describes the procedures for conducting the study, including when, from whom, and under what conditions the data will be obtained. Its purpose is to specify the plan

for generating evidence that will be used to answer the research questions (McMillan and Schumacher, 2010, p.20). Dooley (2002) argues that a case study research is a scholarly inquiry that investigates a contemporary phenomenon within its real-life context. I choose to use a case study as my style of research to investigate teachers' knowledge and understanding of inclusive education and how they applied this knowledge in their teaching. This style of research went well with what I intended to understand as I wanted to investigate this in a school (a real-life context) and to look at those practices that were employed by Mathematics teachers and that blended with inclusive education.

1.9 Sampling

Qualitative sampling is the process of selecting a small number of individuals for a study in such a way that the individuals chosen will be able to help the researcher understand the phenomenon under investigation (Gay, Mills and Airasian, 2009, p. 429). Purposive sampling, also referred to as judgment sampling, is the process of selecting a sample that is believed to be representative of a given population. In this type of sampling the researcher selects the sample using her experience and knowledge of the group to be sampled (Gay, Mills and Airasian, 2009, p.134). The participants were all grade 8 -12 Mathematics teachers (four in total) from the participating school. Purposive sampling was used as the researcher wanted to target information rich participants. The researcher has targeted one site knowing fully that it does not represent the wider population of high school Mathematics teachers and have no intentions of generalising the findings beyond the sample of this study. The researcher intends to make conclusions for the set of data that would be collected.

1.10 Data Production

The participants were constantly involved and negotiated with in terms of the preferred times for interviews and lesson observation times so that they would not be disturbed in their teaching. There were two classroom observations of each teacher for the researcher to see if

the teaching strategies employed by the teachers were learner-centered. These observations were structured; there was an observation schedule and detailed notes were handwritten by the researcher during the lesson. The observations took the whole lesson. In between there were one-on-one interviews which were done privately. Interviews were semi-structured. Three teachers were observed and four were interviewed.

1.11 Ethical Issues

McMillan and Schumacher (2010, p. 117) argue that ethics generally are concerned with beliefs about what is right or wrong from a moral perspective. They add that research ethics are focused on what is morally proper and improper when engaged with participants. The researcher made sure that throughout the research process ethical behaviour was maintained. Permission to conduct the research was requested from the Department of Education and the School Governing Body as well. Ethical clearance was granted by the University of KwaZulu-Natal, as this was a legal requirement for researchers. Participants were given letters of consent to sign, which contained details of the study and also clearly explained the option of participating and/ or withdrawing at any given stage of the research. All participants participated on a voluntary basis, were assured of confidentiality of the information and were informed that the information would be made public. The identities of the participants and the institution were not revealed as pseudonyms were used. Teachers were not observed under false pretence; the privacy of what happened in their classrooms was kept confidential.

1.12 Limitations

This study was conducted in a high school in Durban as it was convenient for the researcher. It was accessible; the environment was familiar as well. This study had limitations as research has proved that individuals behave in a certain manner when they know they are being researched. It means that during observations teachers might not reveal their free, true behaviour and they might have actually acted what they were doing during the observation

times. Some teachers would check thoroughly which classes they had before granting the researcher permission to observe. Others would change the content for that specific observation lesson and teach an easier lesson so that it would seem that learners understood and participated. There was problem of time and the availability of teachers as it was almost the end of the year and teachers were busy consolidating their work. There were end of the year activities, like prize giving that seemed to have suggested to both teachers and learners that serious teaching was over. In some classes the topics that were taught during the observations were revision topics so it seemed that there was increased participation. This was a small scale study, a case study that was conducted in one high school in Durban with four teachers as participants; there is no intention to generalize because the intention of the researcher was to gain a deep understanding of the phenomenon rather than generalizing.

1.13 Overview of the Study

Chapter 1 discusses the introduction, the focus and the purpose of study; it also looks at inclusive education and Mathematics teaching. This is then followed by the theoretical framework, the objectives of the study and research questions. Then there is the research methodology and design, sampling, ethical issues and also limitations of the study and a breakdown of all the chapters.

Chapter 2 looks at Inclusive education and Mathematics teaching. This chapter begins by focusing on inclusive education and OBE which is then followed by discussion of the policies on mathematics and inclusive education. Teacher development and inclusive education are also looked at. This is followed by Mathematics teaching and inclusive classrooms. The latter part of this chapter presents the theoretical framework and the conclusion.

Chapter 3 focuses on the research design and methodology. The chapter begins with the introduction followed by research design. The next issue looked at is the research paradigm,

specifically, the interpretive paradigm and the qualitative approach. Case study is then discussed, followed by sampling, the area of study, school sample, ethical issues and data collection instruments.

Chapter 4: presents and explains the research findings, and the analysis.

Chapter 5: this chapter presents the conclusion and recommendations.

1.14 Conclusion

This study is an attempt by the researcher to gain a deeper understanding of the role of inclusive education in the teaching of Mathematics at high school. In this chapter the researcher discussed the purpose and the focus of the study, rationale, objectives and research questions, theoretical framework, methodology, sampling as well as ethical issues and limitation of the study. This chapter is an introduction to the study. The next chapter looks at review of related literature.

CHAPTER TWO: MATHEMATICS TEACHING AND INCLUSIVE EDUCATION

2.1 Introduction

The previous chapter presented an introduction to the study. In Chapter 2 literature is reviewed to obtain an understanding of what other scholars have said about inclusion, Mathematics teaching and ways of increasing learner participation in our classrooms.

2.2 Inclusive Education in South Africa

Eloff and Ebersson (2004) indicate that the first democratic elections in 1994 introduced a new era in the history of South Africa. They argue that the newly elected government began to commit itself to developing a country that respects and values diversity and provides equal opportunities for all. They further argue that the Bill of Human Rights (in the Constitution of 1996) recognises education as a basic human right of every citizen, but more importantly propounds the right to equal educational provision for all learners, whatever their needs and differences. Pendlebury and Enslin (2004) argue that educational inclusion and political inclusion lie together at the core of social justice. They argue that inclusive education means overcoming the barriers to participation of all in education, so as to extend to all learners the human right to education and the right to participation in an inclusive polity. A similar perspective is shared by Engelbrecht, Green, Naicker and Engelbrecht (1999) who mention that inclusive education in South Africa is a constitutional imperative.

Engelbrecht (2006) argues that there is no one perspective on inclusion within a single country or school. He further indicates that, as a philosophy, the concept of inclusive education in the South African context embraces the democratic values of equality and human rights and the recognition of diversity. Engelbrecht et al., (1999) indicates that inclusive education in South Africa can be defined as a system of education that is responsive

to the diverse needs of learners. In the context of the researcher (South Africa) policy is set out in Education White Paper 6: Special needs education, which was published in July 2001. This policy is regarded as the present government's interventions towards changing those aspects of the apartheid education system referred to as 'special education' or education for 'learners with special education needs' (Lazarus and Howell, 2008).

Education White Paper 6: (the policy of inclusive education) gives a broad definition of inclusive education and emphasises that some learners may require more intensive and specialised forms of support to be able to develop their full potential. It goes on to say that learners are different and an inclusive education and training system is about enabling education structures, systems and learning methodologies to meet the needs of all learners. This policy acknowledges that learners have different learning needs, and therefore they will have different ways of grasping knowledge and their capabilities will be developed differently. This policy advocates that inclusive education and training is about enabling education structures, systems and learning methodologies to meet the needs of all learners (DoE, 2001).

Ntombela (2010) argues that an inclusive education is the one that responds to learners' needs, provides learning support, acknowledges differences among learners and maximises learner participation in the culture and curriculum of educational institution. She goes further to say that in the context of the Outcomes Based Education (OBE) system in general and inclusive education specifically; all teachers are expected to address individual learner needs and to provide all learners with quality education. These needs include academic inclusion in all subjects, including mathematics teaching and learning. Laridon., Jawurek, Kitto, Pike, Myburg, Rhodes-Houghton, and van Rooyen ((2007, p.xxv) state that inclusivity is about supporting all learners, educators and the system as a whole so that the full range of learning needs can be met. They further advocate that inclusivity focuses on creating a learning

environment that will benefit all learners and on developing teaching strategies that will benefit all learners.

2.3 International Perspective on Inclusive Education

Dyson and Forlin (1999) indicate that there have been two significant developments internationally in the education of learners with disabilities: first, the integration movement of the 1960s and later, the transformation of this into the “inclusion” movement. They argue that the international move towards inclusive education is a widespread reconstruction of notions of disability. They further that a starting point for inclusive education was the influential Salamanca Statement produced under the aegis of UNESCO in 1994, which increasingly serving as a key document in guiding inclusive development internationally.

Eloff and Ebersson (2004) argue that inclusion or inclusive education is an international trend with a core agenda of building a more just society and that inclusive education is both a result of and vehicle for this reform. They further argue that the concept of inclusive education has various meanings for people in differing times and context. Inclusive education in India is the practice of taking basic education into the slums where small classrooms are placed in homes with limited resources and committed teachers. This is referred to as a community form of inclusion. Teachers use songs and images that the children relate to and build on their everyday experience (Hick and Thomas, 2009, p. 190). In the British context inclusive education describes the process by which school attempts to respond to all individuals by reconsidering and restructuring its curricular organisation and provision and allocating resources to enhance equality of opportunity. Through this process the school builds its capacity to accept all pupils from the local community who wish to attend and, in so doing, reduces the need to exclude pupils (Frederickson and Cline, 2002, p. 66).

In England the concept of inclusive education means increasing the participation of all students in a neighbourhood in their local school and reducing their exclusion from mainstream curricular, cultures and communities. Thailand promoted the idea of 'education for all' in 1990 and after that in 1994 there was the UNESCO conference in Salamanca, Spain, which led to a statement that proposed that the development of schools with an 'inclusive' orientation is the most effective means of improving the efficiency and the cost effectiveness of the entire education system (Booth and Ainscow, 1998, p.3). In my own view, no matter where one is, generally inclusive education puts the needs of the children first. Jenkinson (1997, p140) argues that inclusive schooling implies that all children, no matter how severe their disability or how intense their needs, can be accommodated in the regular class in their neighbourhood school, the school they would want to attend if they did not have a disability. She states that inclusive schooling is not synonymous with integration or mainstreaming nor is it concerned only with the education of students with disabilities. She further states that the philosophy underlying inclusive education is that schools have a responsibility to meet the needs of all children, and that teachers should be able to differentiate and adapt curriculum and instructional strategies to suit the differing needs and abilities of each child in the classroom. She also argues that inclusive schooling is challenging yet geared to children's capabilities and needs as well as any support and assistance they and/ or their teachers need to succeed in the mainstream.

Jenkinson (1997) further argues that the primary aim of inclusive schooling is to eliminate altogether any other type of service, including special education and special educators as a system of provision. She asserts that inclusive education brings together several aspects of education; it is rights-focused and can be considered the ultimate education outcome of the principle of normalisation. She argues that inclusive schooling begins with the premise that every individual has the right to participate in the mainstream of society and enjoy the same

privileges, benefits and opportunities as his/her age peers. Jenkinson (1997, p. 141) argues that inclusive schooling claims to be child-focused, it is founded on the premise that all children, regardless of disability, are capable of learning and should be given the same opportunities to achieve, through learning to the best of their abilities. She further states that the concept of inclusive schooling thus requires a breakaway from traditional concepts of teaching and learning to embrace programmes that enable children with differing needs and abilities to work together.

Hayward (2006) mentions the principles of inclusive education which, she says is a process by which schools, local authorities and others develop their cultures, policies and practices to include all pupils. She further states that in inclusion the interest of all pupils must be safeguarded. She asserts that the inclusion agenda and context has shifted from pupils with Special Education Needs (SEN) to those with a full range of barriers to learning including those that have learning difficulties, mental health issues, significant challenging behaviour, attendance and punctuality issues and many more. Norwich (2008, p. 19) argues that inclusion is described as being about participation, not just placement or location. He further indicates that in the United Kingdom inclusive schooling can refer to (i) a recognition of individual achievements (ii) recognition of individual achievement (iii) an appreciation of diversity (as normal and positive),(iv) the physical location of children in schools,(v) the educational experience of children and (vi) the emotional well-being and social interaction of children.

2.4 Outcomes-Based Education

Engelbrecht et al., (1999) assert that Outcomes-Based Education was implemented in South Africa as the new curriculum to facilitate the transformation of the education system in general. They mention that it is a useful vehicle for implementing inclusive education. Outcomes-Based Education (OBE) defines what learners are expected to learn, and then is

used in the design of an educational system to ensure that they have maximum opportunity to learn. Outcomes-Based Education further implies that the conditions and opportunities for learning must be created within the system in order to enable and encourage learners to achieve the stated outcomes. OBE therefore focuses on what a learner is able to do successfully at the end of their learning experience (Booyse & Du Plessis, 2008, p.51). The new system of Outcomes-Based Education introduced new teaching methods, which are called outcomes-based instructional models and are based on methods for adapting curriculum and instruction to respond to individual student differences (Ainscow, 1991, p.163).

OBE introduced new concepts to education and classroom teaching and some of those concepts are individual learning, expanded opportunities and experiential learning (Booyse & Du Plessis, 2008, p.13). OBE also has principles which guide the teachers with respect to how the content is taught, teaching style, use of learning material and assessment. In OBE teaching means providing learning experiences and guiding, supporting, mediating and facilitating the learner. OBE teaching style involves critical thinking, reasoning, research, reflection and action. Assessments in OBE are continuous and based on a variety of techniques apart from formal testing (Booyse & Du Plessis, 2008, p.15). One of the things that OBE introduced as well during teaching is what is referred to as establishing a positive learning environment. According to Killen (2000, xvi) the learning environment should be made safe, inviting and comfortable for learners, large and well equipped. He ascertains that teachers should recognise and respect the diversity of languages, cultures, values and attitudes that learners bring to the classroom and they should be supportive of them all.

2.5 Policy on Mathematics teaching in inclusive education

The revised National Curriculum Statement grades R-9 policy on Mathematics defines Mathematics as a discipline that enables creative and logical reasoning about problems in the physical and social world in the context of mathematics itself. The policy further states that its purpose is the contribution to personal development through a deeper understanding and successful application of its knowledge and skills, while maintaining appropriate values and attitudes (DoE, 2002). The National Curriculum Statement for Grades (10-12) (NCS) states that it aims to develop a high level of knowledge and skills in learners. It further states that social justice requires the empowerment of those sections of the population previously disempowered by the lack of knowledge and skills. The NCS further adopts an inclusive approach by specifying minimum requirements for all learners. It acknowledges that all learners should be able to develop their full potential provided they receive the necessary support. It states that the intellectual, social, emotional, spiritual and physical needs of learners will be addressed through the design and development of appropriate learning programmes and through the use of appropriate instrument (DoE, 2003).

The NCS Grades 10-12 general learning programme guidelines for Mathematics (DoE, 2003) states that the curriculum for the subject Mathematics is based on the view of the nature of the discipline of Mathematics that enables creative and logical reasoning about problems in the physical and social world and in the context of Mathematics itself. It states that Mathematical problem solving enables learners to understand the world and make use of that understanding in their daily lives. It also states that mathematics enables the learners to solve problems related to statistics, inclusivity, current matters involving conflicting views and environmental health issues. It argues that the purpose of Mathematics is to provide powerful conceptual tools to analyse situations and arguments, make and justify critical decisions and take transformative action, thereby empowering people (DoE, 2003).

2.6 Teacher development and Inclusive Education

In my own view teacher development is one of the most important things that the Department of Education and the government should focus on as changes in education are taking place. According to Engelbrecht, Green, Naicker and Engelbrecht (2008) teachers in the mainstream classes have to accept that it is no longer desirable or acceptable to refer learners who are experiencing barriers for expert help elsewhere. They further argue that ways of accommodating them have to be found in the classroom. Porter (1997, p. 77) asserts that the classroom teacher is considered the primary resource in instructing students. He goes further to say this requires teachers to continually refine their skills or knowledge. Engelbrecht (2006) advocates that research in South Africa, as in other countries, has indicated that teachers play one of the most influential roles in the successful implementation of inclusive education. There are many curriculum changes that the Department of Education has introduced such as Curriculum 2005 based on the Revised National Curriculum Statement (RNCS), OBE, inclusive education, the National Curriculum Statement (NSC), and most recently CAPS. Stofile and Green (2007) argue that it was assumed that the introduction of these changes would enable teachers to implement inclusive education more effectively. All these curriculum changes need teachers to adapt to new instructional methods that suit the new curriculum in their classroom, and that can only be possible if teachers are continuously trained. Vaughn, Bos and Schumm (2011, p.372) argue that in order for Mathematics teachers to be influential as they teach there should be provision of pre-service and professional development for them so that they are knowledgeable about Mathematics practice as well as effective instructional practice.

Stofile and Green (2007) argue that teachers in South Africa were trained differently in the past. They argue that the challenge is to equip teachers with skills and to strengthen their belief in themselves as lifelong learners within their profession. They go on to state that the

low morale expressed by the teachers will not disappear unless working conditions are improved and appropriate training is provided. Ntombela (2011) reports that workshops conducted by the Department of Education on (Education White Paper 6) were once-off orientation sessions lasting for two hours. She indicates that in these workshops one teacher was invited who would then cascade the new knowledge gained. This is a limitation in itself as one cannot know if the information disseminated is understood and/or communicated correctly.

2.7 Mathematics Teaching within Inclusive Classrooms

In my own view, now that South Africa has introduced Education White Paper 6, even teaching in our classes has to change. Learner diversity is one of the key issues that inclusive education in South Africa embraces (DoE, 2001). In my own view this means that in embracing that learner diversity it means that in our classes as teachers we will face learners with different abilities to be taught at the same time. These learners will range from the highly intellectual to the ones with difficulty or the ones with learning disabilities. Engelbrecht, Green, Naicker and Engelbrecht (1999) advocates that as more learners with disabilities and those who have experienced some form of learning breakdown are accommodated in ordinary classrooms, teaching is more likely to become more demanding. According to Cole, Jane, Moses and Leah (2010) we are living and teaching at a time when more learners with disabilities are included in general education classrooms and held to the same standards as their general education peers than ever before. Engelbrecht et al., (1999) argues that inclusion requires that these learners are not simply thought of with pity but viewed more positively, in terms of their abilities rather than their disabilities.

Smith (1991, p38) indicates that a learning disability refers to a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, spelling, writing or arithmetic resulting from a possible cerebral dysfunction and/or emotional or

behavioural disturbance and not from mental retardation, sensory deprivation, or cultural or instructional factors. On one hand Smith (1991, p. 257) argues that characteristics of adolescents with learning disabilities are the demonstration of areas of adequacy and strength as well as weaknesses. She asserts that many lack academic function from basic to successful levels. She further argues that by the time they reach adolescence there is a high probability that the indirect effects of a learning handicap have had a negative impact on self-perceptions and motivation. On the other hand Vaughn, Bos and Schumm (2011, p.147) argue that learning disabilities are heterogeneous, and it is difficult to list a set of characteristics that adequately describes all students with LD. They assert that some students are more different from one another in relation to how they learn. They further argue that there are however overriding characteristics which can help teachers identify these students, such as unexpected difficulty or low performance in one or more academic areas and ineffective or inefficient information-processing or learning strategies in the area(s) of difficulty.

Dixon (2006) argues that learning in less restrictive environment benefits learners with or without disabilities so much that all learners tend to improve their academic performance and increase their communication and socialisation skills. She further defines the Least Restrictive Environment (LRE) as the educational setting that provides the greatest exposure to an interaction with education learners and persons without disabilities. She emphasises the benefits of learning in the LRE for learners with special needs and say they are great as it increases motivation, raises self-esteem and improves academic achievement. Vaughn, Bos and Schumm (2011, p. 9) indicate that the principle behind the least restrictive environment is that students are best served in the settings in which they can learn, ideally moving to less and less restrictive settings.

These environments where learner centeredness is promoted are also referred to as student-centred environments (SCLEs). Land, Hannafin and Oliver (2012, p. 3) indicate that SCLEs

provide interactive, complementary activities that enable individuals to address unique learning interests and needs and deepen understanding. They argue that such environments facilitate student- or self-directed learning by enabling students to productively engage with complex, open-ended problems. They state that student-centred environments are explicitly designed to support individual efforts to negotiate meaning while engaging in authentic activities. Land et al., (2012, p. 9) argue that student-centred environments scaffold student thinking and actions to facilitate ongoing management and refinement of what they know. They further state that such environments may use teacher-student or student-student interactions to model or scaffold reflection and performance. Dixon (2006) investigates teacher roles in both general and special needs education and she argues that teachers are responsible for helping learners achieve their academic goals. They should also design and modify instruction to meet learners' academic and behavioural needs. She advocates that general education teachers provide opportunities to experience the diversity of society on a small scale in a classroom. She further argues that teachers should develop empathetic skills that provide empowerment that challenges the learners' learning ability. She goes on to say that to work effectively in inclusive classroom, Mathematics teachers can employ a number of strategies that address the needs of learners with learning disabilities. Manins and Hardie (2009) are of the same opinion, advocating that in an inclusive classroom the teaching approaches and strategies need to cater to the diverse learning needs of the children. They argue again that the classroom environment must be welcoming and reflect the diversity of the children learning there.

Swars et al., (2009) argue that learners with learning disabilities often struggle with acquiring the needed skills to succeed at mathematics at their grade level. They further investigate effective interventions between learners with learning disabilities (LD) and healthy ways to collaborate between special education and mathematics teachers. They advocate that

inclusion will be successful if teachers consistently employ certain strategies that increase academic progress of learners with LD. These strategies include many types of interventions, which are early intervention, continued remedial intervention, interventions for difficulties in understanding word problems. According to Swars et al., (2009) there are instructional strategies that are beneficial to learners that are included for mathematics instruction, which include peer assisted learning that can encourage low achievers to continue their attempts to master a skill. They further argue that this method also assists the teacher as it allows more learners to be engaged on one-on-one assistance. They continue to say that peer assistance learning can encourage a low achiever to continue their attempts to master a skill. They advocate that this is the key to successful inclusion as professionals use their knowledge of specific strategies to modify lessons for learners with LD and fill in the gaps between content knowledge and knowledge of effective strategies.

Cole et al., (2010) argue that most people know that many learners continue to struggle with mathematics, and therefore improving mathematics instruction is of great importance. They say that there are two conflicting ways to structure mathematics teaching and mathematics classrooms, which are direct instruction and inquiry based teaching. They further argue that direct instruction approaches are traditionally seen as belonging to special education and inquiry based approaches are seen to belong to general education. They say that teachers should help maximise all learners' learning and bridge the divide between the differing conceptions of Mathematics teaching and learning. They also argue that there is a lack of confidence in teaching Mathematics and lack of persistence, low self-confidence, and negative attitudes towards problem solving in general from the learners side. They argue that in all educational settings learners with disabilities tend have difficulties in Mathematics.

Humphreys (2009) argues that inclusive education practices have led to worldwide discussion of how best to deliver a more equal education opportunity for all. He goes on further to say

that teachers have had to move away from teacher-led teaching to pupil-centred learning. According to Humphreys (2009) inclusion is more about the state of mind than any specific educational arrangements; he says the process of learning is considered important as well as the content of what students learn. He further looks at the role of the teacher as a change agent and at the heart of educational opportunity. He says that during educational change and paradigm shifts what matters the most are the teachers' beliefs in what should be taught and how they should practise their art of teaching. Without the informed teacher there can be no inclusive education. He advocates that central to inclusive curriculum is enabling learners to gain access to new knowledge at their own pace of learning. Therefore in my understanding this means that teachers need to understand how to give learners access to the same subject content but with different levels of response from the teacher. Ntombela and Raymond (2013, p.154) state that there are some specific teaching and learning strategies that can be used in classrooms to promote inclusive education.

They further state that these strategies are examples of effective strategies used by teachers to support learners in constructing their own knowledge and in using their skills to complete learning tasks and solve problems. There are strategies that can be used to teach in variety of settings and can be used by any teacher. These are first parallel instruction which is used in small group setting, secondly targeting only those who appear to need the skill and thirdly 'double dip', which is pre-teaching the strategy to target learners, then following up with whole class instruction (Raymond & Ntombela, 2013, p. 162).

Hammeken (1997, p.22) argues that the set-up of the inclusion classroom depends upon the teaching style of the classroom teacher. She continues to argue that there are three types of teaching and supplementary teaching. She advocates that the teaching environment depends upon the type of teaching system that will be used. She describes the teaching as follows, team teaching to plan, develop and teach the lesson, and supportive teaching. The learners

receive the instruction from the teacher, while modification and support are provided to the learners within the classroom setting by an inclusion assistant. The last form is supplemental teaching, where the inclusion assistance provides reinforcement and re-teaching of the skills needed. Cheminials (2006, p.44) states that in promoting inclusion and tackling underperformance the government indicates that inclusion is about valuing diversity and showing respect for all individuals. It also states that inclusion concerns all groups' pupils who may be underperforming because their personal learning needs are not being met. She indicates that inclusion requires individual teachers to think carefully about lesson design to ensure that barriers to learning are removed.

2.8 Theoretical Framework

In my own view teaching in the past has been very traditional, and has consisted of a one way instructional method. Learners used to take in everything the teacher says. Learners should take part in classroom activities, express their own views and reflect on their own experiences. The teacher's role would be that of a facilitator rather than authority (Booyse & Du Plessis, 2008, p. 10). Vygotsky's theories require teachers and learners to play untraditional roles as they collaborate with each other because both are influenced by the contexts in which they live, teach and learn. Instead of teachers dictating meaning to learners for future recitation, teachers should collaborate with learners in order to create meaning in ways that learners can make their own (Booyse & Du Plessis, 2008, p.19). Over the years as education policies have been reviewed, teaching methods have changed as well. Dyson and Millward (1997, p. 60) advocate that teaching now demands a more constructivist view, in which learners are seen as collaboratively building their own understanding rather than following predetermined paths of rote learning. Bell and Harris (1994, p. 129) advocate that learning is seen as a shared experience focused around the learner.

According to Vygotsky's promotion of learning model, learners play an active role in learning. He argues that the teacher and older children play important roles in learning, and that teachers should typically be active and involved. He further states that roles of the teacher should include collaborating with his/her learners in order to help facilitate meaning construction in learners. In this study I want to investigate what teachers know or understand about inclusive education and how this knowledge influences their teaching. The theories I will employ are social constructivism and the Zone of Proximal Development (ZPD). The teachers' knowledge will be evident in how they implement teaching strategies that are in alignment with inclusive education. In my own view all teachers should always be searching for a kind of instruction that is optimal for every individual learner. In the inclusive classroom teachers interact with different types of learners who have not necessarily been diagnosed medically as having a problem, but are struggling with understanding a learning instruction or task. In the process of teaching, especially now during the inclusive era, teachers should be sensitive of the fact that all learners are not the same, that they learn differently and therefore, that teaching, tasks and assessment should take this into account.

Different learners will have different ways of grasping knowledge; their capabilities will be developed differently. Vygotsky (as cited in Pjil et al., 1997, p. 132) believes that learning cannot be separated from socio-historical practices and the teacher's role is to draw children forward into an understanding of culture through engagement with the zone of proximal development. Bentham (2002, p.10) argues that Vygotsky's Zone of Proximal Development (ZPD) states that during the learning process children start out by not being able to perform the task on their own. After a certain period a child follows an adult's example and gradually develops the ability to do certain tasks without help. The teacher serves to guide children as they encounter different learning challenges. He also advocated that the ZPD is the level in

which a child learns what she/he is capable of learning. Vygotsky's technical definition is that it is the gap between what the child can accomplish on his/her own and those accomplishments that could be achieved with adult guidance. He further states that the ZPD is very important, because it fosters confidence when a child can accomplish something new to what the child already knows. Keeping a child in the ZPD requires attention to his/her current abilities and success and well as areas of difficulty. Vygotsky believed that children could have a different Zone of Proximal Development for different subject areas. Bentham (2002, p. 16) argues there are two key concepts outlined by Vygotsky which have a particular relevance to teaching; the ZPD and scaffolding. She argues that these two views place an emphasis on effective instruction as the key to the learning process. She further states that instruction needs to be targeted to the individual's ZPD. Vygotsky focused on children's cognitive processes that are still growing and advised teachers to keep learning tasks centred on, or focused above each respective child's ZPD (Bigge & Shermis, 2004, p 129). They further argue that a child with a larger ZPD will do much better in school than others.

Vygotsky believes the role of education is to provide children with experiences that are in their ZPD, thereby encouraging and advancing their individual learning. He also believed that children grow into the intellectual life of those around them. Within Vygotsky's general conception of interaction between the more knowledgeable other and a less competent person on a task there are three main aspects. These are generality assumption (applicable to learning all kinds of subject matter), assistance assumption (learning is dependent on interventions by a more competent other), and potential assumption (a property of the learner, which enables the best and easiest learning). In an attempt to view teachers' understanding of inclusive education in their teaching and how they develop their mathematics learners all three aspects of the theory will be used. In my own view as a mathematics teacher, teaching learner's

mathematics is about teaching how to reason logically. Learners in mathematics classes need to think and identify an interrelationship between mathematical problems. Mathematics deals with thinking, as it deals with mental activities that help to formulate or solve problems. Thinking involves critical and creative aspects of the mind and underlying the most complex of Mathematical equations are simple logical principles (Fisher, 2005, p. 3). According to Fisher (2005, p.3) learning to think is not achieved in isolation from others; it takes place in a social context that is influenced by culture and environment, therefore a thinking child is a social child. Ernest (1999) argues that mathematics is discovered. Frederickson and Cline (2002, p. 334) advocate that at every level good practice in school Mathematics should include exposition by the teacher and discussion between teacher and pupils and between pupils themselves. The statements above provide evidence that in Mathematics classes teachers should apply social skills to interact with their thinking learners.

McMahon (1997) argues that social constructivism views learning as a social process. He emphasises the importance of culture and context in understanding what occurs in society and constructing knowledge based on understanding. Culture should also be created in classrooms by Mathematics teachers as they introduce a sitting arrangement that allows learners to socialise. The physical classroom, based on Vygotsky's theory, would provide clustered desks or tables and workspace for peer instruction, collaboration and small group instruction. It is not only the physical classroom that matters; the instructional design should also be structured to promote and encourage learner interaction and collaboration (Booyse & Du Plessis, 2008, p. 19). They go on to say that meaningful learning occurs when individuals are engaged in social activities. According to Ernest (1999), the social constructivist's thesis is that Mathematics is a social construction and a cultural product. He further says that the origins of Mathematics are social or cultural. He further states that one of the principles of

radical constructivism is that knowledge is not passively received but actively built up by the cognizing subject.

Smidt (2009, p. 10) argues that we are all influenced by other people and their ideas and values throughout our lives. She asserts that often the influence comes about through seeing some people as role models or through wanting to do something that someone we admire does. According to Ainscow (1991, p.20) the constructivist approach to learning views learners as active and interpretive, and learning as a covert, intellectual process involving the development and restructuring of existing conceptual schemes. In the constructivist approach teaching affects learning through pupils' thought processes, which means that teaching influences pupil thinking, and pupil thinking mediates learning. He states that the way in which teaching affects learning in classrooms is typically through the curriculum tasks that teachers present to learners. He also states that since learning takes place within complex social settings it is necessary to assess the impact of social processes on learner's classroom experiences. He further suggests teachers and pupils are in continuous process of adaptation to each other and the classroom environment.

In the constructivist view of learning, where meaning is personally rather than universally designed, there are constructivist-inspired learning, strategies and environments which includes student-centred learning, inquiry-based learning and self-directed learning (Land, Hannafin & Oliver, 2012, p.5). Puri (2006) indicates that children are active by nature and any process or method that is not based upon the student activity is not in accord with the progressive educational theories. She argues that child-centred approach gives freedom to the child under the creative and sympathetic direction of a teacher. According to Vygotsky it is through the process of engagement with the adult that enables learners to refine their thinking

or their performances to make it more effective. Vygotsky argued that the lifelong process of development was dependent on social interaction and that social learning actually leads cognitive development (Vygotsky, 1978). It is then in the same breath that I want to understand whether and how Mathematics teachers at high school use social interactions in their classrooms to promote learners' understandings of Mathematics.

2.9 Conclusion

This chapter discussed Mathematics teaching and inclusive education. It explored as well issues related to both inclusive education and Mathematics teaching. It looked at inclusive education in South Africa, followed by the international perspective on inclusive education. It also mentioned OBE, Policy on Mathematics teaching in inclusive education and teacher development and inclusive education. It finally discussed Mathematics teaching within inclusive classrooms and the study's theoretical framework. The next chapter will explore the research design, methodology and the data collection methods which were chosen for this study.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

As indicated in Chapter Two, the inclusive education policy is concerned with the provision of support to all learners. In accordance with this policy, the study was concerned with the implementation of inclusive strategies in the teaching and learning of Mathematics at Siyavaya High School. To that effect, the study's objectives were to investigate what Mathematics teachers know or understand about inclusive education and to establish how their understanding and knowledge of inclusive education influences their teaching. The critical questions that the study sought to answer were what teachers know or understand about inclusive education and how their knowledge or understanding influences their teaching.

Methodology refers to the theory of getting knowledge, to the consideration of the best ways, methods or procedures, by which data that will provide the evidence basis for the construction of knowledge about whatever it is that is being researched is obtained. It is concerned with the description and analysis of research methods rather than with the actual, practical use of those methods (Opie, 2004, p. 16).

This chapter is also meant to describe the research paradigm, approach and the research style that the researcher has used. The selection of participants and the description of the site will be discussed as well. Thereafter the generation of data, the instruments used to generate data and data analysis strategies and to arrive at a conclusion will be discussed. The last thing to be discussed in this chapter will be the ethical issues and limitations of the study.

3.2 Research Design

A research design is the plan of how the researcher will systematically collect and analyse the data that is needed to answer the research question. It is an important plan which is also flexible, non-linear and is influenced by practical considerations. It is the designed and planned nature of observation that distinguishes research from other forms of observation (Understanding Research, 1999, p. 57). Creswell (2008) describes a research design as a specific procedure involved in the last three steps of the research process which are collection of data, data analysis, and report writing.

3.3 Research Paradigm

A paradigm is a loose collection of logically related assumptions, concepts, or propositions that orient thinking and research (Bogdan and Biklen, 2007, p. 24). Opie (2004, p. 18) argues that there have been two main paradigms that have influenced educational research which are the scientific, positivist, objective, quantitative paradigm and the interpretive, naturalistic, subjective, qualitative paradigm. Different researchers employ different lenses for viewing and understanding the world. According to Cohen *et al.*, (2010, p. 45) educational research has different approaches that rest on different paradigms such as the positivist, the interpretive and critical theoretical foundations, or on a combinations of these. They argue that data collection is based on two broad paradigms, which are the qualitative and quantitative approaches. This study is located in an interpretive paradigm and a qualitative approach is employed as a means of data collection and answering the research questions.

3.3.1 Interpretive paradigm

This research has been guided by the interpretative, naturalistic, subjective, qualitative paradigm. Cohen and Manion (2011) argue that an interpretive paradigm is about individuals on a small scale; it is qualitative and subjective (and there are understandings and

explanations). They argue that interpretive paradigm is about human action continuously recreating social life. They continue to state that in interpretive research there is interpretation of the specific through individual perspective, personal constructs, and negotiated meanings and there is practical interest. An interpretive paradigm is a paradigm where there is understanding and describing meaningful social action, reality is subjective and constructed and truth is many. In the interpretive approach the researcher researches people's behaviour, attitudes, beliefs and perceptions (Understanding Research, 1999, p. 40).

The epistemology of this paradigm is the one where the values of the participants as well as the researcher become interlaced (Terre Blanche and Durrheim, 1999). Falconer and Mackay (1999) argue that the ontology in this approach is a subjective reality. According to Maree (2007) the interpretivist perspective is based on certain assumptions which are, that human life can be understood from within, that social life is a distinctively human product, that the human mind is the purposive source or origin of meaning, that human behaviour is affected by knowledge of the social world and that the social world does not 'exist' independently of human knowledge.

The ultimate aim of the interpretivist research is to offer a perspective of a situation and to analyse the situation under study to provide insight into the way in which a particular group of people make sense of their situation Maree (2007). The reason that the researcher has chosen this paradigm is that it works well with my investigation as I need to find out the high Mathematics teachers' understanding of inclusive education. Using their own views I will be able to see how they reflect, define and understand the meaning of inclusive education and Mathematics teaching.

3.3.2 Qualitative approach

The researcher employed a qualitative approach and the research style is a case study. Qualitative research presents facts in a narration with words. Bogdan and Biklen (2007, p. 37) advocate that qualitative researchers attempt to objectively study the subjective states of their subjects. They again argue that qualitative researchers try to interact with their subjects in a natural, unobtrusive, and nonthreatening manner. Qualitative researchers investigate small, distinct groups such as all the participants in an innovative school, all the students in a selected classroom or in one institution. It is based more on what is called a “naturalistic-phenomenological” philosophy, which assumes that multiple realities are socially constructed through individual and collective definitions of the situation. It is more concerned with understanding the social phenomenon from the participants’ perspectives. In qualitative research, the researchers become ‘immersed’ in the situation, present or past, and the phenomenon being studied. The qualitative researcher believes that human actions are strongly influenced by the settings in which they occur (McMillan and Schumacher, 1993, p. 15).

Check and Schutt (2012, p. 188) argue that the qualitative approach focus on human subjectivity, on the meanings that the participants attach to educational events. According to Gay, Mills and Airasian (2009, p. 7) the qualitative approach is characterised by the collection, analysis, and interpretation of comprehensive narrative and visual data to gain insight into a particular phenomenon of interest.

They again assert that in this approach all meaning is situated in a particular perspective or context, and that different people and groups often have different meanings, none of which is necessarily more valid or true than another. They argue that problems and methods in the

qualitative research tend to evolve as understanding of the research context and participants deepens; as a result the hypothesis is not stated before data are collected.

They further explain that in the qualitative approach data collection occurs in a naturalistic setting over an extended period of time. They argue that for researchers in this approach to achieve the detailed understanding they seek, they must undertake sustained in-depth, in-context research that allows them to uncover subtle, less overt, personal understandings. Check and Schutt (2012, p. 15) advocate that qualitative educational research is often guided by an interpretivist philosophy.

In order for the researcher to uncover personal understandings, different procedures were used and a case study. According to Check and Schutte (2012, p. 190), qualitative researchers often used a technique called the 'case study'.

3.3.3 Case study

This study utilized a case study to investigate how the inclusive education policy has influenced the teaching of mathematics at Siyavaya High School. Dooley (2002) argues that a case study research is a scholarly inquiry that investigates a contemporary phenomenon within its real-life context. He asserts that a case study research is a legitimate type of research that can embrace more than one case. He further argues that a case itself is an account of an activity, event, or problem and it usually describes a series of events that reflect the activity or a problem as it happened. Case studies aim to describe 'what is like' to be in a particular situation. Johnson and Christen (2008, p. 49) indicate that a case study research can be used to address exploratory, descriptive, and explanatory research questions. The researcher aimed to capture the reality of the participants' lived experiences of and thoughts about a particular situation (Cohen, Manion and Morrison, 2000, p.182). I chose to use a case study as my style of research to investigate teachers' knowledge and understanding of

inclusive education and how they are applying this knowledge in their teaching. This style of research complimented my intentions as I wanted to investigate this in a school (real-life context) and look at practices that are employed by Mathematics teachers in their classrooms (natural setting), which are in line with inclusive education.

3.4 Sampling

Johnson and Christensen (2008, p. 223) argue that a sample is a set of elements taken from a larger population according to certain rules. They again argue that sampling is a process of drawing a sample from a population. Creswell (2012, p. 2006) argues that in qualitative inquiry, the intention is not to generalise to a population, but to develop an in-depth exploration of a central phenomenon. He asserts that this is the reason why the qualitative researcher purposefully or intentionally selects individuals and sites. He further argues that in purposeful sampling, researchers intentionally select individuals and sites to learn or understand the central phenomenon.

Purposeful sampling applies to both individuals and sites (Creswell, 2012). The researcher targets a specific group knowing that it does not represent the wider population, it simply represent itself. Savenye and Robinson (2004, p. 1049) indicate that a qualitative approach tends to interpret results of a study, rather than applying generalizability to other situations and settings.

In this research the researcher has used purposive sampling when selecting participants in relation to their relevance to the research question, 'The role of inclusive education in Mathematics teaching'. The participants are four grade 8 -11 Mathematics teachers, all the Mathematics teachers at the one site. Two of those selected are highly experienced in terms of qualification and teaching years and two are fairly new in the teaching profession but qualified in mathematics teaching. As Creswell (2012) argues, the standard procedure used in

choosing participants and sites is whether they are information rich. The researcher has targeted one site knowing fully that it does not represent the wider population of high school Mathematics teachers and has no intention of generalising the findings, but aims to acquire in-depth information from information rich people. The researcher intends to make conclusions for the set of data that would be collected.

3.4.1 Area of the study

The study was done in the urban area of Durban in the eThusini district because this is where the researcher resides and has been teaching in this district for almost seven years now. The researcher has experience of the Mathematics results changing over the years, which mostly is the dropping performance in Mathematics compared to other subjects at the school.

This issue is evident in the school with regard to grade 12 learners, that when the researcher arrived at the school and even prior to her arrival, the school used to obtain 100% pass rate in Mathematics. This has continued to drop until recently the school's Mathematics matric pass rate was 60% and the overall school pass rate was 90%.

3.4.2 Level of class studied

The researcher focused on grades 8-11 because that is where most of the foundational teaching should be done thoroughly in order for a learner to achieve the best results in grade 12. The researcher felt that the grade 12 failure or pass rate strongly depends on what and how teaching was conducted in the lower grades.

3.4.3 Sampling procedures

The participating school was chosen because it is nearer to the researcher's home and that means it would be easy to access the school. The community that is being researched here is composed of learners who are mostly Africans; there are a very small percentage of White,

Indian and Coloured learners. Most of these learners are not English home language speakers. Due to changes in the policies of admission and inclusion, the learners at this school come from far, wanting to leave the township schools for a better environment as a result there are generally large classes ranging from 36 to 41 in most classes. Most of these learners come from middle class homes and a few from working class homes. The School Governing Body has employed a few additional teachers and this reduces the workload for teachers and class sizes for learners in the classes.

Most learners travel long distances to school by taxis or by bus as they come from nearby townships which are renamed Plati and Bassi. The long travelling and transport issues that the learners have contribute to the high rate of late coming and absenteeism. It also contributes to the high number of learners who do not do homework because they arrive home late and still do their daily chores like cooking etcetera. Even though these learners stay far away some of them still like to do extra-mural activities like sport, debating societies, which again means that they will arrive at home very late sometimes. Many of these learners come from single parent homes, either through divorce, death or most commonly through having an absentee father.

The school serves a mostly middle class community but sometimes has very little funds to run the school as the majority of parents do not to pay fees. The selected school is renamed Siyavaya High School.

3.5 Ethical Issues

Ethics in research are very important, particularly with research involving humans. On one hand McMillan and Schumacher (2006, p. 142) argue that ethics generally are considered to deal with beliefs about what is right or wrong, proper or improper, good or bad. On the other hand Johnson and Christen (2008, p. 101) argue that ethics are the principles and guidelines

that help us uphold the things we value. Bassey (2010, p. 73) indicates that ethical behaviour should be looked at in three ways, respect for democracy, respect for truth, and respect for persons. The researcher has throughout the research process ensured that ethical behaviour is maintained and has maintained respect for democracy, truth and persons. The researcher was permitted to conduct the study after being granted ethical clearance from the University of KwaZulu-Natal; this is a legal requirement for those who want to conduct research.

The researcher has also asked for permission to conduct the research from the Department of Education, the school, and the participants as well. Participants were given letters of consent to sign, which contained details of the study whilst also clearly explaining the option of participating and/ or withdrawing at any given stage of the research. All participants participated on a voluntary basis, were assured of the confidentiality of the information and were informed that the findings of the study would be made public. The identities of the participants and the institution are not revealed as pseudonyms are used. Teachers were not being observed under false pretence; the privacy of what happens in the classrooms will be kept confidential and not to be used as to expose participants in an unprofessional manner.

3.6 Limitations

This study was conducted in a high school in Durban as it was convenient for the researcher. It was accessible; the environment was familiar as well. This study had limitations as research has proved that individuals behave in a certain manner when they know they are being researched. It means that during observations teachers might not reveal their free, true behaviour and they might have actually acted what they were doing during the observation times. Some teachers would check thoroughly which classes they had before granting the researcher permission to observe. Others would change the content for that specific observation lesson and teach an easier lesson so that it would seem that learners understood

and participated. In one of the observation lessons Mr Mason asked the class what they were doing in the previous lesson. After the learners mentioned the topic he then told them to put it aside as they were going to cover something else for the lesson. There was a problem of time and of the availability of teachers as it was almost the end of the year and teachers were busy consolidating their work. The other time factor was that the researcher is a part time student who is working full time, so data collection had to be done after school or during the researchers' free lessons if there were on that particular day. When work was done or during free time if there was on that day. There were end of the year activities, like prize giving that seemed to have suggested to both teachers and learners that serious teaching was over. Prize giving at Siyavaya High School mostly occurs shortly before exams commence so most teachers and learners know that it is revision time, and as a result some learners do not attend school. In some classes the topics that were taught during the observations were revision topics so it seemed that there was increased participation than other classes observed where lessons were taught for the first time. This was a small scale study, a case study that was conducted in one high school in Durban with four teachers as participants. The researcher had no intention to generalize because her intention was to gain a deep understanding of the phenomenon other than generalizing.

3.7 Data Collection Instruments

Bogdan and Biklen (2007, p. 117) explain that data refers to the rough material researchers collect from the world they are studying; it includes material the people doing the study actively record. They also argue that data are both evidence and the clues gathered carefully. They add that data involve the particulars with which a person needs to think soundly and deeply about the aspects of life they need to explore. The instruments that the researcher used in this study are observations and interviews. The researcher has permitted triangulation in this study. Robson (2002, p .371) indicates that triangulation is the use of multiple sources to

enhance the rigour of the research; there are four types of triangulation (data, observer, methodological and theory triangulation). In this study the researcher has employed data triangulation, where both observations and interviews were used to collect data (Robson, 2002, p. 174). He asserts that triangulation helps to counter all of the threats to validity. He goes on to say that using data triangulation helps in addressing different but complementary questions within a study. He argues further that data triangulation enhance interpretability. However Robson (2002, p.175) indicates that it also opens up possibilities of discrepancies and disagreements among different sources. Observation is the process of gathering open-ended, first-hand information by observing people and places at a research site. Observation as a form of data collection has both advantages and disadvantages.

Advantages include the opportunity to record information as it occurs in a setting, to study actual behaviour. A disadvantage will be that a researcher is limited to a particular site and situation where he/she can gain access (Creswell, 2012, p. 214). An interview is a two-way conversation in which the interviewer asks the participants questions to collect data and to learn about ideas, beliefs, views, opinions and behaviours of the participant (Maree, 2007, p. 87).

In this study data was generated through semi-structured interviews and structured classroom observations. Prior to the observation the researcher arranged with the teachers regarding classroom observations that it would be suitable for both the participants and the observer according to their time-tables. The researcher wanted to make sure that she secures two different grades from the teachers, preferably a lower and a higher grade where possible. Observations were conducted, whereby two lessons per teacher were observed.

During the observation the researcher followed an observation schedule (see Appendix A) and recorded detailed notes about teaching and learning. The observation was structured as

the researcher had an observation schedule in place in order to have a clear idea about the issues to be observed. The researcher spent the entire lesson in each class; each lesson is 55 minutes in length and the total time spent on observations was about 330 minutes. The researcher managed to observe 3 mathematics teachers; the fourth one was not observed as it was difficult to find a time that was suitable for both the observer and the teacher. In between classroom observation the researcher conducted interviews. The interviews were one-on-one, which lasted 30 minutes or less for each participant. The interview questions were compiled and administered by the researcher (Appendix C).

Each participant was interviewed once and asked nine questions; as they were interviewed the researcher was recording and all the data that was gathered was handwritten. At the end of the session the interviewees were then given their responses to read so as to make sure that they were not misquoted. The interview was conducted in a space where the researcher was with the interviewee only in order to avoid disturbances.

Cohen *et al.*, (2011, p.423) argue that for the interviews to proceed comfortably distractions should be minimised. Some responses were probed in order for the interviewer to seek clarity and as responses were given. As the interviews were in progress the researcher was recording the information by handwriting it. The interviews were conducted in English as the participants are teachers and they were comfortable with and understood the language. The participants were all asked the same questions. The copy of the questionnaire was provided to the teachers so that they could re-read when they did not understand the question. So the researcher took almost two hours interviewing in all.

3.8 Conclusion

This chapter has outlined the research design, research paradigm, interpretive paradigm and qualitative approach. It also discussed case study, sampling, how data was collected, ethical issues and limitations. The information gathered in this chapter will be dealt with in the next chapter. The next chapter will present the data analysis.

CHAPTER FOUR: RESULTS AND ANALYSIS

4.1 Introduction

This chapter presents the findings from the data that was gathered using data collection methods discussed in Chapter Three. This study intended to investigate what teachers know or understand about inclusive education and also how their understanding influences their teaching. Firstly, the responses from the teachers' interviews will be presented followed by the presentation of the teachers' practices in their classes which were gathered through classroom observations. Finally, findings from both the interviews and the classroom observations will be discussed.

The study sought to answer the following research questions

1. What do teachers know or understanding about inclusive education?
2. How does their knowledge or understanding influence their teaching?

4.2 Responses from the Teacher's Interviews

4.2.1 Teacher's knowledge and understanding of inclusive education

In this section the researcher will look at responses given by teachers when they were asked questions regarding their knowledge or understanding of inclusive education. Teachers were requested to respond to questions which probed their understanding of inclusive education, by means of an interview schedule (which appears as Appendix C). Teachers were given the pseudonyms Mr Mvovo, Mr Mason, Mr Buhlebakhe and Mrs Thulekile. There were four teachers who were interviewed; out of the four two had knowledge and understanding of inclusive education, and one had a basic or informal knowledge and the last one had not heard about it, had no knowledge of inclusive education and had no understanding of the

concept. Some teacher's knowledge was gained through formal training through a training institution such as a university or training college. Others gained knowledge through other teachers or workshops, which was another limitation as research has proved that cascading information sometimes leads to limited understanding.

Ntombela (2006) argues that the ineffectiveness of the cascade model and the teachers' limited understandings of inclusive education were well illustrated at Mangelengele School. Mangelengele School is the name of the school that Ntombela (2006) wrote about. This means that if the cascade model brought about limited understanding in one school, even in our case it is because the information that was cascaded to Mrs Thulekile was not a true reflection of what inclusive education is all about.

Mr Mvovo is a very well- seasoned teacher; he is over 50 years of age. He is a qualified Mathematics teacher who has recently transferred to Siyavaya High School at the end of last year (2012). Mr Mvovo claims to know and understand inclusive education and he said he received formal training,

Yes, two years ago when I registered for ACE at UKZN Edgewood campus, inclusive education was one of the modules.

Mr Mvovo's comment reflected that his understanding of inclusive education was directly linked to a teacher-centred approach although this clearly shows a limited understanding of the concept of inclusive education.

When the learners are given activities/ tasks I check during the lesson and if I find a common problem I stop and explain that to the whole class.

Mr Mvovo's comments on inclusive education as a teacher-centred approach raised an important issue of teacher training as he was asked what, in his opinion, was needed to implement inclusive education. Engelbrecht (2006) argues that this policy (EWP6) provides a framework for systematic change where strategies are orientated towards building the

capacity of the system to respond to the full range of barriers to learning, including disabilities that exist among children in the country. She goes on to state that once again; the training needs of teachers are seen as priority. Mr Mvovo said,

In most cases, especially educators of my age (above 50) they are still applying the old method, teacher centred; more of our teachers need to be trained so that it does not become a one man show. At times when you are checking the learners and you say well and show them that it is possible for them to understand.

The concept of a 'one man show' that Mr Mvovo is referring to is the teacher-centred approach that teachers apply as a result of their lack of training. The teacher-centred approach that Mr Mvovo refers to that other teachers are still using echoes Engelbrecht's (2006) sentiments when he argues that this teaching style does not accommodate unique individual education needs in their classrooms.

Mr Mason is a young teacher who has just started teaching at Siyavaya High School four years ago. He has recently trained for his degree in education at UKZN Edgewood campus. He is a qualified Mathematics and Accounting teacher. Mr Mason also showed knowledge of inclusive education and showed a good understanding of the concept of inclusive education. In addition to completing a module on inclusive education he had also completed a module on social justice,

Yes, I received training; there was a module which we did at Edgewood it spoke about including learners with barriers, and also social justice (2007)

Mr Mason's understanding was very good and in line with what inclusive education is about, as he said,

I understand inclusive education means learners must not be segregated in any way whether race, gender, intellectual capabilities, language and also their financial status, like the children that are coming from homes where things are well go to Glenwood.

Mr Mason, however when asked about what was needed in his opinion to implement inclusive education cited the issue of language and cultural diversity in our country as a problem and the issue of time. I think this is what teachers in the mainstream could be experiencing diversity as Dixon (2006) indicates that general education teachers provide opportunities to experience diversity of society on a small scale in the classroom. He said,

Maybe in other countries it is easy e.g. China, there are not many languages, not many cultures. In KZN you may have learners who understand better Sotho or Xhosa and maybe the person facilitating speaks in English. Time is needed as well. I need more time, a lot of resources, new textbooks, visuals, not writing on the board all the time, and smaller numbers.

Mrs Thulekile is also a seasoned teacher, has been in the teaching field for a long time approximately 19 years. She is a qualified Mathematics and Science teacher. In all her formal training in education she has never received formal training in inclusive education. She is an HOD at Siyavaya High School. In the last three years, starting in 2010, she studied computer integrated education over and above her Honours degree in Mathematics and Science but still, even this did not include a single module on inclusive education. Mrs Thulekile did not receive formal training on inclusive education but she did state that she has heard about it so she had some knowledge as she said,

Yes I have heard about it, but I never received training, I recently registered (2010) for computer integrated education, but there was no inclusive education module.

Ntombela (2006) asserts that teachers as key agents of the intended implementation of EWP6 displayed limited and varied understanding of the new policy and the concept of inclusion. She also had a limited understanding as to what inclusive education is about because she said,

My understanding of inclusive education is that the Department is encouraging all schools to include every learner so my understanding is that we must teach all learners in every situation or condition.

In Mrs Thulekile's opinion of what is needed to implement inclusive education she said,

I think all schools have to be able to accommodate all learners with different challenges, physical (disabled), emotional challenges; I mean that all schools have to have counsellors to attend to those learners. There are learners who are not happy, the situation at home for some of them makes feel that they are not accepted in the world.

It appears that Mrs Thulekile just like Mr Mason is raising the issue of resources as an important issue in order for inclusive education to be implemented. Mr Buhlebakhe is a young Mathematics teacher who joined the school in 2009, his qualification is in Engineering, and he had never heard about inclusive education and has never been trained in it. When I asked him if he has ever heard about inclusive education and what his understanding was he said,

No, none, (tell me about your qualification) mine (qualification) is not in education; it is a BSc Electronic Engineering and I have no understanding.

He said he had no training and no understanding. He could not respond to any question based on understanding of inclusive education or what is needed to implement it, as he said,

All my answers rest on number one so I will not be able to answer.

4.2.2 How has their understanding influenced their teaching?

This study also wanted to establish how the teachers' understanding influences their teaching. Is their understanding being translated into a certain teaching approach that the teachers have adopted as a result of inclusive education? Teachers were now asked questions that meant to probe about teaching strategies, whether they have changed or not. These questions were 3, 6, 7, 8 and 9 of the questionnaire that is attached as Appendix C. Question 3, which asked about

how inclusive education training has helped teachers was approached in different ways by the teachers.

Mr Mvovo implied that his teaching methods have translated from a teacher-centred approach to a learner-centred approach. He said,

Yes, when I am teaching I make sure that my teaching does not become a one man show, I make sure that the learners are participating, as I would check, if there are problems but as the time goes on they will be sorted. Inclusive education is a teacher/learner involvement, learners must contribute.

Mr Mvovo is one of the teachers who had formal training on inclusive education, when commenting on anything with regard to it, it seems like he always refers to it as if it is an approach to teaching. When asked how he relates Mathematics teaching and inclusive education he seems to imply that the Mathematics textbooks do not mention inclusive education in their different chapters, he said,

That as a teacher you have to decide how to approach each topic. (Interview transcripts are included as Appendix B).

Still referring to inclusive education as an approach to teaching or a teaching strategy when asked of new teaching strategies that he has adopted he said,

Yes, the curriculum changes, you need to use your own discretion as it delays you if you follow exactly inclusive education.

Once again when Mr Mvovo was questioned on how inclusive education would help in the delivery of the curriculum he mentioned discovery learning as he said,

Normally I would say I would ask learners to go and make some research, make their own discovery, I will give them a key word, I will write a list thereafter I try to involve their discovery, that would be one way. It is either they ask parents, sister, library, Google. They apply any of the resources they have. Once they do that I tell them the aims or goal of the research and it makes it easy to introduce the topic. Even the teaching will flow they will come with different meanings, so I categorise them in

terms of their findings and then make conclusions but everything they discovered is implemented.

In my own opinion Mr Mason is the one teacher who is really knowledgeable about inclusive education, and the approaches that can be used in conjunction with this policy. However he is again the one who has a negative attitude and low morale towards its implementation. When asked about his new teaching approaches as a result of his training he said,

No it is not practical because in a classroom it is impossible to adjust your teaching, to accommodate every learner, intelligent, slow learners, maybe the slow learners I talk to them practically, but after that I must push the syllabus, and pressure coming from the Department, do you know why it is not possible in a mainstream school? It is because the Department has pre-set dates of exams and submission of marks and term ends on a certain day. Sometimes not even the capable learners can cope with the requirements by the Department. For an example, the Department wants all learners to know certain parts of the syllabus like functions and other topics.

He also understood very well that discovery learning is the teaching approach that should be used in the classrooms now. Again he saw this as a waste of time and that it is better if his teaching strategies did not change, as he said,

With me they did not change I still teach the same (how) (I still deliver the lesson) OBE was always talking about group work, first of all 20 minutes of the lesson is wasted putting learners in groups, the classroom is too small, some learners do not face the board, they start playing, they think group work is a game. OBE was about discovery learning. That learner must discover, mina, I teach the learner they did not discover I give them my information and examples and through practice, they master what I teach them.

Mr Mason is very clear about what should happen but it appears that he is not at all prepared to change his teaching method under his current working conditions.

He understands that inclusive education should help increase the pass rate. He said,

It should help to increase the pass rate and also for that individual learner not to fail and be an outcast but to be like normal children.

He agrees that inclusive education and the learner-centred approach to teaching should help to increase the pass rate but he also said that despite all these changes (with OBE and CAPS) his teaching style has not changed. He went on to say that despite all that is needed from him, he still needs to meet deadlines. He argued that maybe if he had a class with ten learners he would try, but not with his current class of 40. Mr Mason sees the many requirements from the Department: the submission deadlines, the finalisation of each terms work (syllabus coverage for each term), common assessments set by the Department, the lack of resources, compulsory admission of as many learners as possible in a public school, all these as an obstacle in terms of inclusive education being successfully implemented. It is the same reason that Ntombela (2011) indicates, that careful planning and preparation needs to take place to ensure that such a system is implemented appropriately, including the development of new strategies for educators and school development. The other issue that emerged out from the interview with Mr Mason is that of attitude and low morale; though he has been thoroughly trained and understands what needs to happen his mind-set has not moved from teacher centred approach as being the way to deliver the curriculum. Stofile and Green (2007) argue that low morale expressed by teachers will not disappear unless working conditions are improved and appropriate training provided (refer to 2.6). Mr Mason saw the relationship between mathematics and inclusive education in terms of the Department introduction of mathematics literacy. He said,

Let me first speak about how the Department has tried to relate the two by having maths lit for those learners who can't cope with pure maths, because some learners can't do maths from a young age because they can't think abstractly. Maths is a subject where it is difficult to include learners with barriers like physics, for them to do they have to do another maths, like a filtered down one.

Mrs Thulekile when asked about the teaching strategies came up with a totally different angle altogether. She seems to suggest that in inclusive education technology should be used as a strategy so as to include all learners.

When asked about how inclusive education should help in our deliverance of the curriculum she said,

inclusive education should be something that would help educators to be able to help all learners for example Mr Mathi is now using the ICT equipment in his class, and the response was excellent, it was accommodating all the learners, the weaker were listening, even the ones who normally interrupt were paying attention.

She again mentioned technology as the new teaching strategy when she was asked about the new teaching strategies that should be adopted as a result of these curriculum and policy changes. She said,

I would say the new teaching strategies is that learners can be taught by technology even though the teachers can be there because technology does not substitute the teacher, but the teachers can be there to explain and the learners can do the work on their own and you also give them a chance to explain to each other those who understand it more, it involves learners more in a subject.

In Mrs Thulekile's understanding of new teaching strategies it appears as well that she understands that a learner-centred approach is the method that embraces the concept of inclusive education, but with the use of technology in her case.

Mr Buhlebake, even though he said he had no understanding of what inclusive education is, when asked about teaching strategies he positively expressed that teaching strategies have definitely changed. He associated new teaching strategies with teaching for the outcomes that one wants to achieve as he said,

Yes, I think they have, well all your planning and deliverance is centred around making sure that the child meets the outcomes, so even you design assessment around the outcomes.

I agree with Mr Buhlebakhe as even research indicates that OBE introduced new teaching methods which are called outcomes based instructional methods, which are based on the methods for adapting curriculum and instruction to respond to individual student differences (refer to 2.4). He also indicated that there is more learner activity now as he said,

Definitely, there is more learner activity in my lesson, every opportunity I have is to get learners to be involved other than me delivering the content its almost trying to make them learn through investigation and through interaction with the peers as well.

Mr Buhlebakhe expressed the relationship between maths and inclusive education as a link to OBE as he said,

So I have a little understanding that it is linked to OBE, similarly to my No.7 I teach in a way that you deliver the outcomes.

4.3 Results from the Teacher's Interviews

Looking at the data collected through interviews one could conclude that four findings emerged. The first one was that of misconception of what inclusive education is. Mr Mvovo from time to time referred to inclusive education as a teacher-centred approach but nothing else. His understanding is based on what teaching strategies should teachers adopt in order to embrace inclusive education, not on what inclusive education is holistically.

Inclusive education is about supporting all learners, educators and the system as a whole so that the full range of leaning needs can be met. The second finding that was evident was that of limited understanding (inclusive education being used with technology) in order for the learners to be included. Mrs Thulekile on both her understanding of inclusive education and teaching strategies indicated that technology can help while the teacher explains in between. This in a way is also a misconception and it also reveals limited understanding. Inclusive education is not only about using technology as all schools even those without resources are supposed to be inclusive schools. Inclusive education can use any kind of support that a

teacher can employ to make sure that all learners are included, not technology only. It can rather be explained that the concept of inclusive schooling being challenging yet geared to their capabilities and needs as well as any support and assistance they and/or their teachers need to succeed in the mainstream

The third finding that came out was that of attitude and low morale. Mr Mason knew and clearly understood what inclusive education was but he totally refused to change his attitude and mindset. This he qualified by mentioning the demands placed on him by the Department, large classes, and lack of resources. Ntombela (2010) argues that changing beliefs, attitudes, and behaviours, takes time as these are deeply grounded in the paradigm/s people subscribe to.

The last finding was that of no knowledge of inclusive education at all. Mr Buhlebakhe, a young teacher qualified as an engineer who has been teaching for five years now (employed by the School Governing Body), still has not heard of or been trained on inclusive education. Teacher development is one of the most important things that the Department of Education and the government should focus on as changes in Education are taking place.

This is now an old democracy as it came to power in 1994, changes in education were endorsed a long time ago and the process of implementation has been under way. The newly elected government began to commit itself to developing a country that respects and values diversity and provides equal opportunities for all.

4.4 Observation from the Teachers' Classrooms

Each teacher was observed twice; structured classroom observations were used to gather data. An observation schedule was used as the researcher observed in the classroom. The

observation schedule gave an opportunity for the researcher to focus on different aspects that occurred during the teaching and learning process. The observation schedule is included as Appendix A and the observation transcripts are included as Appendix B.

4.4.1 Organisation and seating arrangement

In all three classes it was observed that desks were arranged in rows and learners were sitting in twos or threes in their desks. The seating was in no particular order as learners sat as they pleased, with their friends, usual places or where space was available. This seating arrangement in all three classes was due to large numbers, as all the classes that the teachers taught numbered 40 or more. In Mr Buhlebakhe's class there were lots of educational charts (Mathematics related, motivational and informative, about social issues as well like relationships) on the wall, however, on Mr Mvovo's wall there were no charts at all. Mr Mason had a few mathematical charts and few learners' projects hanging on the wall. Teaching aids that were used in classes were by Mr Mason and Mr Mvovo were the white board and the textbook, over and above these two Mr Buhlebakhe gave learners worksheets and he used a overhead projector as well.

4.4.2 Lesson introduction and learner involvement

All the teachers introduced their lessons by recapping what was done in their previous lessons. Mr Buhlebakhe started by asking questions from an exercise (homework) that was given from the previous lesson as he was teaching and marking this concept again. Mr Mvovo, in one of his lessons, was addressing issues of limited understanding raised by his learners after their mathematics control test. He started by reminding learners that the background of some questions they did not understand had been covered in lower grades (grade 8 and 9). In another lesson when his learners arrived he already had work written on the board. He started by explaining and thereafter asked learners questions.

In one of Mr Mason's lessons before he started teaching he first gave an opportunity to those who were absent to write a test, he then attended to the rest of the class. He then instructed the rest of the class to write the date in their books, introduced the topic to them, and during the introduction asked those questions. In Mr Mason's other lesson he started by revising the previous grade work on the topic that he was teaching, he reminded them about grade 10 data handling terms.

4.4.3 Involvement of learners with mathematics disability

In all three classes observed, learners were generally hyperactive. They were mostly excited and screamed out answers when they were asked. All the teachers tried to control and correct this behaviour by calling out names of the learners when asking questions. They tried a lot to discourage hyperactive learners from speaking out of turn. This was manageable for a period but then some learners kept going back and answering without being asked. In each of these classes this behaviour meant that those who were shy and not understanding were left out because they could not embarrass themselves and reveal that they did not know while the rest of the class understood. In all classes it was observed that there were a handful of learners who did not really participate in the classroom activities, like answering or raising their hands. They were quiet and kept on taking down either notes or copying corrections from the board. Though all the teachers tried asking different learners as far away as possible but they could not ask everyone most probably because they all deal with large classes.

4.4.4 Class environment

It was observed that in all three classes the environment was welcoming. All teachers were friendly and warm to the learners but professional as well. Some teachers had special names they used to call their learners, others shared jokes as the teaching was progressing, while others just made the teaching and learning environment light and interesting by how they

handled learners in their classes. All these things were in line with a learner-centred approach that OBE promotes as a result of inclusive education. One of the things that OBE introduced during teaching is what is referred to as establishing a positive learning environment, the learning environment should be made safe, inviting and comfortable for learners; large and well equipped (refer to 2.4). These environments are also said to be less restrictive environments.

As Dixon (2006) argues, these environments improve learners' academic performances and increase their communication and social skills. She emphasises that these environments increase motivation, higher self-esteem, and improve academic achievement (refer to 2.6).

4.5 Results from Classroom Observations

It was clear from the observations that all teachers could not arrange their classrooms in a way that increased interaction amongst learners can be achieved. (In groups as group work and social constructivism is encouraged). This was because of the large class sizes and small classrooms and sometimes shortage of chairs in the classes, where one or two learners in a big class had to run to another class and get chairs for themselves. This seating arrangement as well meant that all teachers could not employ parallel teaching in their classrooms to promote inclusive education as suggested by Ntombela and Raymond (2013). They argue that parallel teaching is a teaching and learning strategy that can be used in small group settings in the classrooms (refer to 2.6). However all teachers in their teaching employed a learner-centred approach to teaching. This learner centred approach is referred to by Land, Hannafin and Oliver (2012) as the student centred environment (SCLE). They assert that these SCLEs provide interactive, complementary activities that enable individuals to address unique learning interests and needs and deepens understanding (refer to 2. 6). They all asked learners questions as they introduced their lessons, they all moved from the learners' previous knowledge and linked that knowledge with what they wanted to introduce. This means all

teachers understood and respected the premise of moving from prior knowledge and linking that to abstract knowledge when teaching. It was also clear that there is still a gap on how much the learners with disabilities are involved in the classroom. It was observed in each class that there were one or two quiet and shy learners. It looked like these learners were almost forgotten as the hyperactive ones took charge and had lots of fun participating in the classes.

4.6 Conclusion

The data that was collected gave a clear direction as to what teachers understood about inclusive education and also how their understanding influenced their teaching. The interviews revealed that three teachers were at different levels of understanding of what inclusive education is, and one, being an engineer in the teaching field, had no understanding at all.

It was evident from the interviews that there were still misconceptions amongst teachers, as Mr Mvovo only associated inclusive education with a learner-centred teaching approach, nothing more. It also came up that though Mr Mason had a clear understanding of inclusive education as he is a young man, who has been recently trained, his morale was very low and his attitude towards the successful implementation of inclusive education in our classrooms was not positive. Limited understanding of inclusive education through lack of training was also evident as Mrs Thulekile thought that successful inclusion can be achieved through the use of technology. Observations revealed that most teachers in actual fact do employ a learner-centred approach to teaching, even Mr Mason who was not so keen on discovery learning, because he thought it would waste his time. Observations revealed that there those very few learners who were either not noticed or forgotten because they were shy or a little quiet in those lessons. In the next chapter the conclusion based on the interpretation of the analysis will be given.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose and the objectives of this study were to investigate teachers' knowledge and understanding about inclusive education. It was also to establish how their knowledge and understanding influences their teaching. The first research question probed the level of teachers' knowledge and understanding of inclusive education. It was picked up through structured interviews of the type of teaching strategies employed by teachers in their classrooms as a result of their knowledge of inclusive education.

5.2 Summary of Findings

Four teachers were interviewed to probe their knowledge and understanding about inclusive education. It was clear from their responses that they were at different levels of understanding about inclusive education. There were limited understanding, misconceptions, no understanding and clear understanding. It showed as well that three teachers have heard and knew what inclusive education is, however one never heard and did not know what inclusive education is.

It was revealed as well that out of four teachers two received formal training on inclusive education, and two did not. It showed that, of these two that received formal training, one felt that the training did not help him as he felt that what he was trained on was not practical. The other teacher revealed that training helped him to translate his teaching from a teacher-centred approach to a learner-centred approach. It transpired from the interviews that there were negative attitudes and low morale. The interviews revealed that out of four teachers one understood inclusive education only as a learner-centred teaching strategy. One teacher understood inclusive education very clearly but perceived many challenges with regards to its implementation. The teacher cited large numbers in the classroom, time, resources, language

and cultural diversity, syllabus coverage and the meeting of deadlines as stumbling blocks to successful implementation of inclusive education. One teacher, although she knew inclusive education a bit either through the cascade model or media, however had limited understanding, as she thought that over and above what she knew technology should be used in the classroom in order for everyone to be included. The last teacher did not have any understanding about inclusive education.

It also became clear that one teacher believed that for inclusion to be successfully implemented more training needs to take place amongst teachers. It transpired as well that one teacher thinks that more time and a lot of resources are needed in order for inclusive education to be implemented. The other teacher felt that transformation of all schools to be inclusive schools could help facilitate the process of implementation, as she felt that all schools have to be able to accommodate all learners with different challenges. The fourth teacher, because he did not know what inclusive education is, did not know what was needed to implement inclusive education.

Three Mathematics teachers were observed twice teaching different grades and they were observed the whole lesson, for 55 minutes. The research found out through observation that teachers' teaching practices have changed however there were still gaps and limitations. It was very clear that in all the classes teaching space was a constraint to organising the space in such a way that learners could be actively involved with more learners thus promoting more social interaction amongst learners - a key to social constructivism. It was evident that the problem was space, large numbers, and sometimes shortage of one or two chairs. Observation revealed that teaching made use of teaching aids in their classrooms and some classrooms had charts. From this it shows that teachers can do more to work on the learning space and create an environment conducive to teaching and learning. It became clear that all teachers were

driven by a learner centred approach as they involved their learners a lot by asking questions when introducing their lessons.

It was clear as well that there was an oversight in terms of teachers paying attention to learners with Mathematics disability as teachers did not wait very long for responses. It was apparent that not all learners were deriving maximum benefit from the class activities. It is for this reason that Ntombela (2006) argues that there are many children who do not derive maximum benefit from the school system due to numerous barriers to their learning and development. She argues that some barriers are permanent, while others are situated in the learning context (in this particular case it is the classroom). It was also in a way not possible to always move along with these learners as the hyperactive ones tend to overshadow the quiet ones by speaking out of turn.

This situation needed thorough management on the side of the teachers. Teachers tried their best and failed when they reprimanded excited learners but this was difficult to manage as they were dealing with large numbers (above 40) in all classes. It was observed that two out of the three teachers tried to reach out to the quiet ones but that did not help a lot as the forward ones always gave out the answers loudly or corrected the ones being asked. Teachers tried their best to call out different names as possible when they were asking learner's questions but still they could not call everyone. It was also observed that all the teachers relied on prior knowledge to build up their next lessons as they kept on reminding or asking learners about either last year's concepts or previous lessons concepts. Teachers made an effort of going over the concept they were teaching before moving to the next one. The observations revealed that teachers were friendly, welcoming and professional as they were teaching which gave the learners an opportunity to be happy, free and open as well during the lessons.

5.4 Implications

Both interviews and observations revealed that there is still a gap in teachers' knowledge and understanding and a gap in the learner-centred approach being employed successfully in classes. Interviews revealed a lot about teachers understanding and one would say that three out of four need to be thoroughly trained on inclusion and one needs constant encouragement and support. Ntombela (2006) argues that for inclusive education to be successful, teachers will need to be skilled/ re-skilled so as to enable them to provide all learners with quality education and unlimited opportunities to succeed in learning. For correct training and support to occur it needs cooperation from everyone involved in education. It starts with teachers where they reflect, self-organise and gear themselves to be life-long scholars. Ntombela (2010) argues that, without adequate professional development, teachers cannot keep up to date with new knowledge in their field, and, as a result learners will be at a disadvantage. She argues that it is important that we encourage teachers to become lifelong learners since the field of education is, like other professional fields, dynamic. The school management systems should be composed of managers who understand inclusive education so for them to keep training and re-skilling teachers within schools.

The Department by now has to ensure successful inclusion as it should have statistics of teachers trained or not trained in inclusive education and should have a training plan in place to be achieved within a set period of time. Observations revealed that though teachers knew what they were supposed to do they were overwhelmed by the hyperactivity of learners and large numbers in their classes. Lack of support in the form of teacher aids and reduction of large numbers in public school created a limitation for learners deriving maximum benefit from a learner-centred approach. It was not only that, but due to the reason stated above it means that not all learners in these classes would be provided with experiences that are in their Zone of Proximal Development. Vygotsky (1978) indicates that the role of education is

to provide children with experiences that are in their ZPD. The last implication on the observation findings is that because of large numbers teachers become overwhelmed with discipline, and are as a result not keen on engaging learners in social activities in the classroom; as Mr Mason mentioned, this would waste time. This becomes a stumbling block for a successful inclusive classroom as constructivism places learners at the centre of the learning process. Meaningful learning occurs when individuals are engaged in social activities (refer to 2.7).

5.5 Recommendations for Future Research

This study was not able to discover as much with regards to teachers' knowledge and understanding of inclusive education and their understanding influencing their teaching as it was conducted in one site only. The use of a single case study means that the study cannot generalise the findings beyond the sample. The findings are only applicable to this site.

My proposed future research therefore could be a larger scale study looking deeper into how the teachers' knowledge and understanding about inclusive education can be developed. The proposed research could look into what can be done at all levels (Department of Education, tertiary institutions and school level) to fast track the training of all teachers in inclusive education by 2014, 20 years after democracy. The future research could also look into adequate support for teachers in inclusive classrooms in dealing with large class sizes.

5.6 Conclusion

I concur with Ntombela's (2006) assertions that energies should be channelled towards changing the ways teachers think about teaching and learning and how learners can be supported. This study found out that teachers still think that it is not possible to move from teacher-centred teaching to a learner centred teaching and also achieve every demand placed on them as teachers as well. Teachers' attitudes reflect that though they know what needs to

be done but from time to time they will switch back to traditional methods of teaching as they plead that they want to cover the syllabus and also meet their deadlines. Another possible study to counteract all these could be to look at how to streamline the curriculum planning in order to reduce teaching loads. Another study could also look at how a change in the curriculum at any level could be done in collaboration with its stakeholders. This is suggested as this was implied by Mr Mason that the Department is just placing demands on him to teach different curriculums at different times and meet all the deadlines.

It is implied in Mr Mason's responses that he adopts this attitude because he feels he was not consulted and no-one understands what he experiences at school and most importantly in his classroom. If issues like these are taken into consideration, the Ministry of Education will have very little success in changing schools significantly (Ntombela, 2006). Inclusive education is supposed to help in lifting up the standard of performance of all children especially those with Mathematics disability. It should also help with the pass rate in our schools as all learners become actively involved in their own learning. It is true that we can no longer continue to justify a system in which so many participants are destined to be losers (Ntombela, 2006). We can all claim that all schools have bought into the concept of inclusion and are practising it but this study has revealed that even today there are learners sitting in our classes who are excluded because of how the system operates. In this study it also clearly shows that there is a need for collaboration of inclusive education and Mathematics teaching.

In view of these findings, I therefore conclude that teachers do not understand what inclusive education is, and even those who have an idea, have misunderstood what it is all about. This means that there is a need for serious teacher development in how such an education should be practised and implemented. This has implications for school development, teacher development and resource provision. It also has implications for availability of support at

school and district levels so that teachers have access to knowledgeable support personnel.

Without these, inclusive education and its implementation will remain a dream in our schools

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Appendix A Observation schedule

Behaviour	Teacher A	B	C	D	E
Date					
1. How is the classroom organised? <ul style="list-style-type: none"> • Desks • charts • teaching aids 					
2. How is the seating arrangement of learners (groups, abilities or no order)					
3. How does the teacher introduce the lesson? Asking questions? Recapping? Giving Task?					
4. How long does the teacher wait for the response from the class? (are all learners given an opportunity to participate)					

<p>5. How often does the teacher involve learners with mathematical learning disabilities? (how are they motivated to say something)</p>					
<p>6. Does the teacher pay attention to learners with mathematical learning disability? How?</p>					
<p>7. Does the teacher spend time going over the concept again with the learners who are slower?</p>					
<p>8. How welcoming is the class environment? Does it encourage all learners to ask questions and/or seek for clarity?</p>					

Appendix B Interview Questions

1. Have you heard about inclusive education?
2. What training in inclusive education have you received in the past two years?
3. Has this training helped you in any way in your teaching? Please elaborate.
4. What do you understand about inclusive education?
5. What, in your opinion, is needed to implement inclusive education?
6. In your understanding how should inclusive education help in our deliverance of the curriculum?
7. Now that the Department of Education introduced OBE and then implemented inclusive education through EWP6, have teaching strategies changed in our mathematics classes? In what ways?
8. How do you relate Mathematics teaching and inclusive education?
9. Are there new teaching strategies that you have adopted as a result of these curriculum and policy changes?

Appendix C Ethical clearance



15 November 2013

Ms Yolisa Mazwai (112561299)
School of Education
Edgewood Campus

Dear Ms Mazwai,

Protocol reference number: HSS/0830/013M
Project title: The role of Inclusive Education in the teaching of Mathematics at Siyavaya High School: An Investigation

Dear Ms Mazwai,

Expedited Approval

In response to your application, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shamila Naidoo (Deputy Chair)

/ms

cc Supervisor: Dr S Ntombela
cc Academic Leader Research: Dr MN Davids
cc School Administrator: Mr Thoba Mkhemou

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101 YEARS OF ACADEMIC EXCELLENCE

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