

CHAPTER ONE: INTRODUCTION

1.1. Background

South Africa has moved from a traditional educational system to a reform-oriented educational system which is called “Outcomes-Based Education” (OBE). This new educational system has introduced a new curriculum; the principles of which are outlined in various policy documents – particularly the National Curriculum Statement (NCS).

Implementation of the new NCS began in 1997 for General Education and Training (GET) band (grades 0-9) and in 2006 for Further Education and Training (FET) band (grades 10-12). Mathematics is recognized for empowering learners to become active participants in the new democracy within the GET band by introducing Mathematical Literacy, Mathematics and Mathematical Sciences (MLMMS) since the Revised National Curriculum Statement (RNCS) was introduced. Similarly, learners are offered Mathematics or the newly introduced Mathematical Literacy as compulsory learning areas within the FET band (Graven & Venkat, 2007, 67). Many changes are outlined in the curriculum statement, in terms of content, the approaches used to teach this content, and means for determining whether learners have understood what has been taught.

A key aspect of change concerns the way the key implementers of the curriculum - teachers - are conceptualized. According to the NCS (Department of Education, 2003) teachers have a ‘*new face*’, and are expected to be:

mediators of learning, interpreters and designers of Learning Programs and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists (Department of Education, 2003, 5).

‘The kind of teacher’ who is referred to in the NCS; that is, ‘*the kind of person*’ notion which is being at a given time and place, can change from moment to moment in interaction (Gee, 2001). Gee (ibid) uses ‘*identity*’ instead of ‘*the kind of person*’ notion. According to Gee identity can change from context to context, and can be unclear and unstable. Although *the kind of teacher* appears to be defined generically in the NCS, Gee sees the notion of who the teacher or person is as having a potential to change in different

contexts. Therefore, the above mentioned ‘new face’ of the teachers in Mathematics¹ (M) contexts is expected to be different from the ‘previous face’; moreover teachers are required to take on a different kind of ‘identity’. This means that the way teachers need to see themselves in terms of their roles and who they are and need to be will be different from the way they saw themselves with respect to the old curriculum. The way M teachers are also conceptualized in the new curriculum policy has many demands for what M teachers do in their classroom practices.

1.2 Statement of purpose

The purpose of the study is to investigate the teaching and learning of M in secondary schools with respect to the identity of M teachers from learners’ perspectives. More specifically, this study aims to explore the M teacher’s identity in South African policy documents and related literature and compare M teachers’ identities in practice. The findings from this study might help to inform education researchers and policy makers about the relationship between policy and practice in terms of M teachers’ identities particularly at the Further Education and Training (FET) band.

1.3 Rationale

According to Naidoo and Parker (2005), teachers’ attitudes are the result of their personal pedagogic identities. Although Naidoo and Parker’s (2005) study was concerned with the implementation of Common Tasks for Assessment (CTA) in 2002 and explored teachers’ attitudes towards the CTA and its policy, they assumed that teachers’ attitudes were intertwined with teachers’ philosophies and ideologies, which in turn are linked to their identities. Naidoo and Parker’s study showed that there was a major tension between teachers’ *personal* identities and teachers’ *official* identities.

Jita and Vandeyar (2006) showed that although the new mathematics curriculum as elaborated in the NCS brought with it many changes in policy, the classroom practice has been left out in terms of application of the envisaged changes. Although the curriculum

¹ I use M abbreviator instead of using Mathematics in this study.

was changed from a teacher-centered approach to a student-centered approach, its implementation has been a problematic issue in terms of application. According to Jita and Vandeyar (2006), the implementation of the new curriculum requires teachers to reconstruct their identity. That is to say a ‘new face’ is expected of teachers.

Naidoo and Parker (2005) and Jita and Vandeyar (2006) compared teachers’ personal pedagogic identities with the teachers’ official identities constructed by policy. However, their studies were focused on the General Education and Training (GET) band. My study is related to these two previous studies, but focuses at the Further Education and Training (FET) band. The assumption here is that teacher’ identities at the GET level might differ with those at the FET level because of differences in the nature of the depth as well as breadth of the mathematical knowledge being dealt with at these levels.

Parker (2006) made a textual analysis of new mathematics curriculum document (NCSM, 2003) for FET band. Parker (ibid) raised the question of what changes in orientation to knowledge and pedagogy were required of FET mathematics teachers. Parker also emphasized that orientations one and five (these orientations are explained in chapter two) are not in focus in the learning outcomes (LO) and assessment standards (AS) of the NCSM which contradicts upfront commitments of education for critical democratic citizenship and indigenous knowledge systems. Parker agreed that successful implementation of the new curriculum is dependent on internal changes in teachers’ orientation to knowledge and meaning, and thus identity as noted in previous studies (Adler & Parker, 2005; Naidoo & Parker, 2005).

This study is concerned with exploring what we know about teachers’ identities in the new curriculum by looking at what is stated in the curriculum policy documents. Since the implementation of the new curriculum started in 2006 at Grade 10 level and was taking place in Grade 11 in 2007, a challenge exists for the implementers of the new curriculum (teachers), in terms of meeting its expectations. In NCS (2003) for M, teachers are expected to be ‘mediators’ of learning rather than being ‘presenters’ or ‘producers’ of knowledge. Therefore, as Manson and Mwakapenda (2007) argued in their

study, teachers' old 'chalk and talk' identity should be changed into a form of pedagogic identity that involves 'discussion, conversation, and argumentation'. In this way, teachers are no longer 'transmitters' of knowledge.

The study will also investigate an aspect of teaching that is less known about M teachers' identity in the FET band. That is - how the identity that is portrayed in curriculum policy translates into actual classroom practice. This study aims to explore the challenges of the implementation of the new curriculum from learners' perspectives in terms of how they view the implementers, i.e. teachers, of the M curriculum in the FET band. There are not many studies that have undertaken a comparison of teachers' identity in terms of policy to their identity in terms of actual practice at the FET level in the South African context. Therefore this study aims to contribute to the field.

1.4 Research questions

This study focuses on exploring secondary school M teachers' identities in policy (NCS) and practice. More specifically, this study attempts to address the following research questions:

- How are identities of M teachers described in the new curriculum policy documents?
- How are these identities demonstrated in practice?

I will compare two sets of teachers' described identities in M in this research: firstly, as prescribed in the National Curriculum Statements and related literature, secondly, as perceived by learners. The key reason why this study explored teachers' identities from learners' perspectives was because the involvement of learners is accorded a central role according to the OBE principles. Therefore teachers' identities in practice were observed from learners' understandings and images of their teachers. I used a "Draw a Mathematics Teacher Test" and semi-structured interviews to understand learners' understanding of teachers' identities in practice. The aim of the study was to find similarities and differences between the two identities: what the curriculum policy and

related literatures say about teachers' identities and what learners say about M teachers' identities.

Teachers develop their identities based on experiences and understandings of their practices. Therefore, in order to address the second research question, I looked at teachers' demonstrated identities in practice through the images that learners might have formed of these teachers.

1.5 Organization of the research report

This research report is structured as follows. Chapter one introduced the study and the research questions that guided the study.

Chapter two details the theoretical framework and literature review. Moreover, I explored what policy documents said about M teacher identity as well as what recent articles about the teachers roles in the new curriculum said in relation to M teacher identity in policy documents.

Chapter three introduces the research approach that was used in this study. Furthermore, I addressed the issue of validity and reliability of the study. What made this study trustworthy and whether the ethical issues were addressed properly in the study is also discussed in this chapter.

Chapter four is about how the data collection process was handled. The data collection tools; Draw a Mathematics Teacher (DAMT) Test and semi-structured interviews and how they were administered is discussed in this chapter. Moreover, the context of the data and methods to analyze the data is briefly mentioned in this chapter.

Chapter five addresses how the data was analyzed. More specifically, learners' DAMT Test results and semi-structured interviews were analyzed by using typological and inductive analysis methods.

Chapter six introduces the discussion of the findings from chapter two and chapter five. More specifically, research questions were explored in terms of trying to find some answers to them.

And, lastly chapter seven is about the summary of findings and recommendations for the future studies. Moreover, limitations and reflections of the study are addressed.

CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

In this chapter, firstly the theoretical framework that was used for this research is explained. Secondly, how M teachers' identities in the policy documents were described is explained. Thirdly, a review of the literature on M teachers' identities is presented in the South African context. I then show how the literature I have reviewed leads to the first research question posed in the study.

2.2 Theoretical Framework and Identity in Literature

I located my study within a situated paradigm. In this paradigm, learning is considered not as a process of internalization of knowledge by individuals, but as a process of becoming a member of a sustained community of practice (Lave, 1991, 18). Within this situated framework, teachers' identities are constructed by teachers through their experiences and education that they received (Hatch, 2002, 8). On the one hand, the Oxford dictionary defines identity firstly as 'who somebody is' or 'what something is', and secondly as 'the characteristics, feelings, or beliefs that distinguish some people from others'. On the other hand, Merriam Webster describes the identity as 'the sameness of essential character, individuality'. These basic definitions give us some understanding of identity that is, aspects of our character, feeling, beliefs, and behavior that make us different from other people. The sameness of essential character is taken as 'core identity', which I explain in the next paragraph.

Gee (2001) defines identity by using "the kind of person" notion. According to his understanding, identity is 'being' at a given time and place; it can change from moment to moment in interaction; it can change from context to context; it can be ambiguous and unstable. Gee also talks about people's multiple identities and core identity. Core identity explains that although we carry different identities (multiple identities) in different social contexts, one of our identities (the core identity) is predominant in a particular context.

According to Gee (ibid), identity may be categorized into four types: Nature (N)-Identity, Institutional (I)-Identity, Discourse (D)-Identity, and Affinity (A)-Identity. This study addresses the notion of N- Identity and mainly I-Identity of M teachers in the school context. The N-Identity is about our natures (biology) or genes that we have no control over it. An example of an N-Identity is gender. A teacher's core identity in the class is I-Identity rather than N-Identity. The 'I-Identity' is not about our nature or accomplishments – it is more about the positions we occupy in the community that come with certain responsibilities and behaviors. Teacher's I-Identity is constructed by policy documents, teacher education and teacher's experiences from participation in the school community. Little investigation in the past has been undertaken concerning I-Identities of M teachers' in the FET phase in the South African context, and this study broaches this interesting aspect of M teacher's identity from learners' perspectives.

Boaler and Greeno (2000) posit Positional (P)-Identity as the ways in which people understand and perform their positions in a social context. This definition is similar to Gee's I-Identity, because both address social position. Boaler & Greeno agree with Holland (1998) about figured worlds that are places where agents get together to construct joint meanings and activities. Therefore, the community of practice is a part of a figured world and agents are participants. Although Boaler & Greeno studied learners' identities in traditional and reform-oriented teaching environments, this study will focus on teachers' identities from the perspective of a reform-oriented teaching approach. Moreover, this study is concerned with M teachers' identities and positions in practice. An understanding of M teachers' I/P-Identities is essential in the South African context since the South African Education system moved from the traditional/didactic to the reform-oriented/discussion-based approach, now named outcome based education (OBE).

According to Jansen (2001, 1) teachers' identities can be expressed as 'the way teachers feel about themselves professionally, emotionally and politically given the conditions of their works'. Policy impacts teachers professionally because teachers need to understand their own capacity to implement not only policy, but also to engage in the roles that policy dictated. The emotional basis for teachers' identities is comprised of their feelings

towards policy in terms of its implementation. Since teachers are the ones who face the challenges of everyday school life, their feelings and responses to these challenges are crucial to the policy. And lastly, politically teachers need to understand the authority of the NCS and how they react to the expected reform. These above-mentioned three bases of teachers' identities are linked to teachers' role of being "interpreters and designers of Learning Programs and materials" as well as teacher's I/P -Identity.

According to Jansen teachers' identities, post apartheid, have three important components: teacher as liberator, teacher as facilitator and teacher as performer. As a liberator the teacher is supposed to be a knowledge producer, be in charge of the classroom, empower the learners and be professionally challenging. This role is related to teachers' being 'leaders, administrators and managers' as mentioned in the NCS. Although being the liberator used to be a key role for the teachers, this role disappeared with the appearance of outcomes-based education (Jansen, 2001, 242). Currently the teacher as facilitator is the key person to OBE. In Jansen's words:

Teachers would, in this image, slowly but deliberately move back from centre stage into an invisible position on the margins of the classroom: facilitating a learning process in which young minds took charge of their own learning, designed their own materials, invented their own learning opportunities, and occupied the centre of what was to become 'a learner-centered classroom' (Jansen, 2001, 243).

The teacher as facilitator does not play a central role as presenter and lessons are ideally no longer teacher-centered and content-centered. Teaching approaches are to be learner-centered and outcomes-based. Jansen observed that teachers were expected to move out of the role of all-knowing transmitters of knowledge, to become mediators and facilitators 'of the educational experience', in accordance with the NCS. Lastly, the teacher as a performer means that:

Teachers are not conceived as a facilitator-on-the-side but an officially regulated performer whose actions are not only identifiable but measurable against set standards or outcomes or performances determined by the state (Jansen, 2001, 243).

According to Jansen, the policy does not only expect teachers to facilitate learning, but also demands that teachers perform according to the set standards. On the latter point the

NCS describes teachers as being ‘assessors, and subject specialists’ (Department of Education, 2003, 5). Therefore accepting the role of being ‘facilitator’ and ‘mediator’ is still a challenging issue for M teachers.

Nasir (2002) uses Markus and Wurf’s (1987) definition of identity as an amalgamation of self-concept, self understanding, and evaluating oneself in relation to others. However Nasir adds to this definition the suggestion that identity is influenced by social environments. According to Nasir identity is neither purely an individual’s property, as Markus and Wurf claim; nor can it be completely attributed to social settings. He suggests that identity develops through both individual participants and social practice, which is similar to Wenger’s (1998) standpoint. Wenger discusses three modes that characterize how identities are constructed within a community of practice: engagement, imagination, and alignment. Picking up on this discussion, Nasir describes ‘engagement’ as how a newcomer participates in a community of practice; ‘imagination’ as how one sees himself/herself as being connected to a broader community of ‘doers’; and ‘alignment’ as how one aligns himself/herself in order to meet the expectations of the new community of practice.

In this study, the concept of ‘*identity*’ is taken into consideration as a combination of the above mentioned key approaches (Gee, 2001; Boaler & Greeno, 2000; Jansen, 2001; Nasir, 2002, Wenger, 1998) (See Figure 1). Identity is a complex phenomenon which is shaped by both individual agency and social context. That is, when identity is mentioned as a framework for this study, it does not merely refer to the teachers’ self or N-Identity, but especially those teachers’ I/P-Identities in the social context (particularly M classrooms). Teachers’ I/P Identities are developed through engaging themselves to their new roles in the new curricula and reform-oriented school context, imagining themselves as implementers of the new curricula and aligning their positions in the social context according to demands which are set by curriculum documents in South Africa.

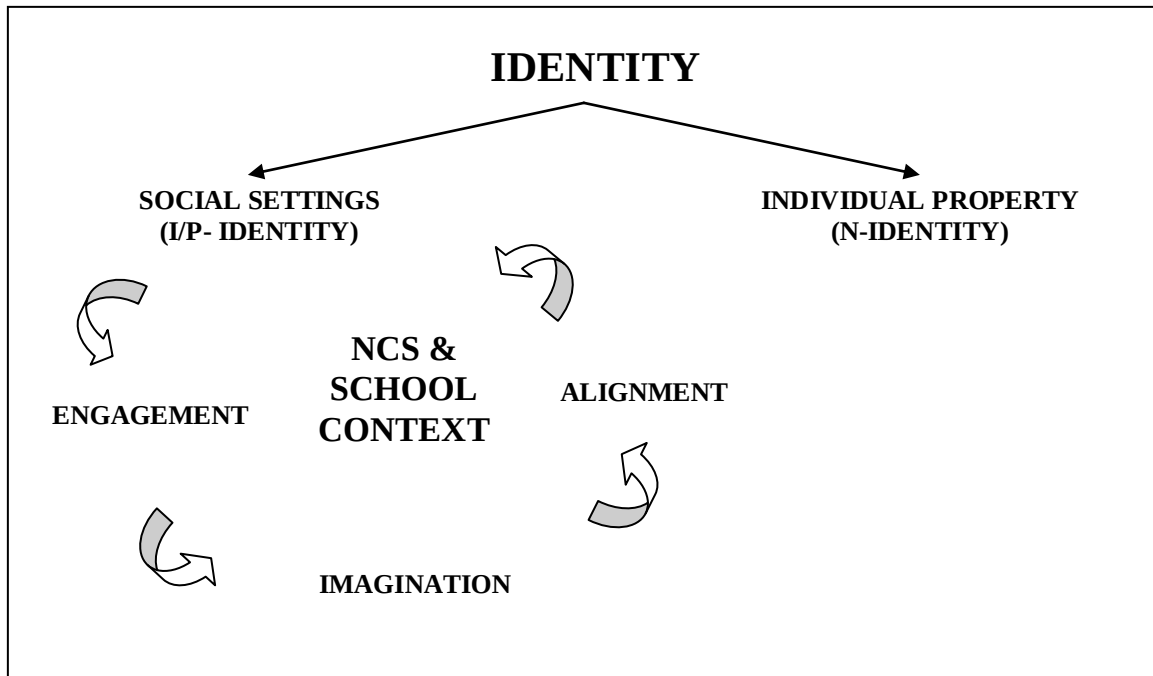


Figure 1: Identity map for the research

2.3 Identity in Policy

This section explores teachers' identities in policy documents, particularly the National Curriculum Statement (NCS, 2003), and related articles. Therefore the first research question of this study is attempted in this chapter. The NCS illustrates a new teacher image that makes demands on teachers that may conflict with their present identities. Many education policy documents worldwide have idealized the teacher image, whether explicitly or implicitly. The South African education policy documents also describe the typical OBE teacher (Jansen, 2001, 1). In this section, I explore the teacher's identity as discussed in the South African policy documents. It is important to investigate this perspective so that I can link projected teacher identity in policy to teachers' actual identities in the classroom.

2.3.1 Definitions of terms used in the NCS

The terms of 'OBE' and '*the kind of teacher*' are used a lot in the NCS and policy documents. Therefore these two terms need to be explained before unpacking the teacher's identity as described in the NCS and policy documents.

2.3.1.1 What is OBE?

Outcomes based education (OBE) is an education principle upon which the new South African Education system is based. The NCS grades 10-12 general mathematics and mathematics literacy document describes OBE as follows:

Outcomes-based education (OBE) forms the foundation for the curriculum in South Africa (Department of Education, 2003, 4). It strives to enable all learners to reach their maximum learning potential by setting the Learning Outcomes to be achieved by the end of the education process. OBE encourages a learner-centered and activity-based approach to education (Department of Education, 2003, 5).

OBE requires a shift in teaching pedagogy. Therefore it is connected directly to teachers' identities because the implementers of OBE are teachers. Teachers' identities have therefore been prospectively altered by the requirements of OBE. Since the lessons should be more learner-centered and activity-based rather than teacher-centered, teachers must rethink and change their identities in the new teaching practice.

2.3.1.2 'The kind of teacher'

According to NCS teachers are expected to be;

mediators of learning, interpreters and designers of Learning Programs and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists (Department of Education, 2003, 5).

Here NCS describes various teacher identities which are generic and applicable to all subject teachers. Teachers are at the center of the transformation to the new education system. The NCS demands that all subject teachers have the above-mentioned roles in the Norms and Standards for Educators document. However, most of the above-mentioned roles existed in the old policy documents – being a mediator is a key role of the OBE teacher. These expectations make many demands on the teachers – particularly with respect to altering their pedagogy. Because the 'pedagogy' is ways, activities and methods of teaching, pedagogic identity is a part of teacher's I/P-Identity. The following table summarizes and compares a traditional pedagogic identity with the expected pedagogic identity of the teachers:

Table 1: Comparison of Pedagogic Identities of the Traditional and Reformed Teacher (Manson & Mwakapenda, 2007)

Traditional Pedagogic Identities	New Expected Pedagogic Identities
“Chalk and Talk”	Discussion, conversation, argument
Teacher transfers knowledge to student	Teacher mediates learning
Behaviorist	Social constructivist/socially negotiated

In the table teachers’ pedagogic identities may be classified into two groups: traditional and expected. The traditional pedagogic identity presents the teacher as a presenter of knowledge, where the teacher is at the center of the learning taking place. However, according to the new expected pedagogic identity, the learner and not the teacher is the focus of learning. Teachers should encourage and create more discussion, conversation, and argumentation in the learning environment, rather than playing the ‘chalk and talk’ role. Traditionally teachers were transmitters of knowledge. In this study, mediating is taken into consideration as facilitator which is common to Jansen’s (2001) understanding of mediating. The new expected pedagogic identity expects teachers to mediate the learning process. Teachers are supposed to encourage learners to take charge of their own learning by empowering learners as mediators. Traditionally teachers’ pedagogic identities tend to be behaviorist in nature, whereas their new expected pedagogic identity should follow a social constructivist orientation. According to the NCS, M teachers and other educators should be subject-qualified, dedicated and competent. What it means to adopt the above mentioned six roles (identities) for M teachers is a main concern of this study. Although these roles are generic and open to different interpretation, the following explanation is taken into consideration in terms of what these six roles mean for M teachers:

1. Mediators of learning: As a mediator M teachers are expected to empower learners by giving them responsibility for their own learning. That is, M teachers should be mediators or facilitators of ‘the educational experience’, and as Jansen (2001) has stated, the NCS (2003) demands that teachers move out of the role of all-knowing, transmitters of knowledge. However what is meant by being ‘mediator’ which is one of the key new expected roles of teachers is not defined and used only once in NCS (ibid). Therefore my standpoint of being mediator in the research is Jansen’s (ibid) approach and

understanding of being mediator or facilitator which I explain in further detail later on in this chapter.

2. Interpreters and designers of Learning Programs and materials: Since mathematics is like a foreign language to the learners, M teachers should be more sensitive when they teach mathematics. I believe that teaching mathematics is like interpreting another language to the learners. M teachers must recognize barriers to learning, such as the mathematics level of a learner, economic situation and language. Moreover NCS expects M teachers to be competent enough to interpret, plan and design all the learning programs and activities by considering the context of the learning environment although there is not much explanation in the curriculum on ‘how’ to do it which is a big challenge for M teachers (Parker, 2006)

3. Leaders, administrators and managers: According to the NCS, M teachers are supposed to be leaders and in charge of the classroom. Leading and managing the classroom should be done in a way that learners can participate more in the learning process (Jansen, 2001). This role of the mathematics teacher is one of the main I/P-Identity which requires teachers to be on top of everything in the classroom context such as administrating the learning process, design of the classroom, managing the classroom in terms of learning and controlling learners’ behaviors etc.

4. Researchers and lifelong learners: As Manson & Mwakapenda (2007) emphasized, teachers should be life-long learners themselves, in order to improve their teaching skills and to meet learners’ needs and educational policy requirements. Hence M teachers are expected to be researchers and find ways to understand and improve the teaching and learning process, so that all learners may be accommodated.

5. Community members, citizens and pastors: M teachers should know the society in which they live, and they should not confront the values of the society. In order to be a successful educator, M teachers are required to ‘be with’ the community and to ‘be one of them’ in order to be accepted and respected.

6. Assessors and subject specialists: Since the new education system promotes ‘Outcomes-Based Education’, M teachers are expected to assess if the learners attained the planned outcomes at the end of a learning period. Consequently the teacher as

‘subject specialist’ should perform and assess reform-based lessons according to the set standards (Jansen, 2001).

2.3.2 The Mathematics Teacher Identities and New Curriculum Reforms

According to Naidoo (2005, 1) ‘Personal pedagogic identity’ is informed and shaped by teachers attitudes which is linked to teachers philosophies and ideologies. Although Naidoo & Parker focused on the implementation of Common Tasks for Assessment (CTA) in 2002 and teachers’ attitudes to the CTA and its policy, their assumption was that teachers’ attitudes are intertwined with their philosophies and ideologies, which in turn inform their identities. Moreover, Naidoo & Parker’s research revealed that mathematics teachers’ personal pedagogic identities conformed to the absolutist philosophy (Manson & Mwakapenda, 2007, 22). According to the absolutist philosophy, mathematics has certain, absolute and unquestionable universal value which is an accurate system of a pure timeless truth. Naidoo and Parker showed that there was such a tension between this personal pedagogic identity and the official identity outlined in the NCS that teachers refused the new official identity clearly and they resisted compliance with it. According to Naidoo and Parker, teachers’ personal and official pedagogic identities oppose each other where teachers’ personal identities fall into absolutist subject philosophy of the subject identity. Manson and Mwakapenda agreed with some of Naidoo and Parker’s reported trends that teachers are not ready to change their pedagogic identities. The fact that they emphasized in their words:

Teachers did not relate to the fact that students could discover ‘given’ mathematics for themselves. Nor were they aware of the social and political nature of mathematics in society. With this type of belief system, it was unlikely that their subject and pedagogic identities would change, in spite of the opportunities for change provided by the new curriculum (Manson and Mwakapenda, 2007, 22).

Jita and Vandeyar (2006) noted that the NCS contains many policy changes from what was documented in the past; but how these changes impact on teaching practice has been left unexamined. While the curriculum has moved from a teacher-centered and content-centered approach to a student-centered and outcome-based approach, the practical application of these and their implementation is still problematic. Although Department

of Education provides OBE training sessions for the teachers, implementing OBE and reconstructing the new expected identity is still a problematic issue since the teachers come from a content and teacher centered approach. According to Jita and Vandeyar (ibid) the NCS considers mathematics in three ways. Firstly, mathematics is a discipline which enables logical and creative reasoning. Secondly, mathematics is a changing and growing human activity learned through social interactions. Thirdly, acquisition of mathematical knowledge is for its own sake. According to Jita and Vandeyar (ibid) these three components represent a fundamental shift from the old curriculum. As a consequence of describing changes to how teaching and learning should be viewed by those implementing the new curriculum, the NCS has an expectation that teachers will develop new identities. This would ideally develop through individual practice and through social practice. New teacher identity may be achieved via teacher engagement, imagination, and alignment with the concept of OBE, and also by participating in the emergent teacher community of practice. OBE requires mathematics teachers who emphasize less content and manipulation of operation and symbols, and more problem solving and reasoning (Jita, Vandeyar 2006, 2). Jita and Vandeyar claim that in order to implement the new curriculum, teachers need to reconstruct their identity, because “*the kind of teacher that is envisaged*” (Department of Education, 2003, 4) requires teachers to show a ‘new face’. Although Naidoo and Parker (2005), and Jita and Vandeyar (2006) compared teachers’ personal identities to the official identities constructed by policy, this comparison was done for GET band. There are not many studies about comparing teachers’ identities in policy and practice in the FET band, which will be the focus of this study. The level of mathematics and required teacher’s identity in the FET and the GET is different. Because emotional and mental level of learners is different, the context is not the same per se. In my opinion teachers probably experience different problems in the FET and GET in terms of implementation of the new curriculum - especially making lessons learner-centered. Therefore, observing M teachers’ identities in the FET phase from this perspective is critical to this study.

Parker (2006) examined features of the bias and focus of the new mathematics curriculum document (NCS, 2003) for FET band. She showed that the new mathematics

curriculum had a hybrid combination of the social logic of competence and performance based models. According to Parker (ibid), the new curriculum is dominantly characterized by a competence model of pedagogy whether learners can expose what they know at the end of learning process. Additionally, the critical point in competence model (OBE) is about hierarchical relations between teachers and learners where teachers are supposed to focus on facilitation, accommodation and the classroom management role. In other words, learners are responsible for their own learning in competence model. Moreover, teachers should be competent in order to interpret mathematics curriculum to the practice. Parker (ibid) also emphasizes that although NCS characterizes above mentioned roles of teachers, these roles in the curriculum documents are so generic and there is no elaboration what is meant by these roles (which is also my argument). Parker (ibid) used the term ‘*emancipatory*’ nature for the new NCSM which is based on the assumption of the *meaning* is transparent to the teachers where they can understand what is meant by OBE, learner-centered pedagogy etc.

Furthermore, Parker (ibid) pointed out the other significant change in the new curriculum in terms of orientations to mathematical knowledge. According to Parker (ibid), the mathematical orientations in GET (Graven, 2000b) were also present in the FET band with some differences. These new extended orientations in the NCSM are:

1. Mathematics for critical democratic citizenship. It empowers learners to critique mathematical applications in various social, political and economic contexts.
2. Mathematics as more structured form of applied mathematics. It is extended from real life and local contexts. It has utilitarian value and can be applied to many aspects of everyday life, including problem solving and mathematical modeling.
3. Mathematics as practice, a disciplined, rigorous and systematic way of thinking about, viewing and structuring the world, and communicating in the world.
4. Mathematics as mathematical conventions, skills, algorithms, and structures as a primary focus of study that must be learnt.
5. Mathematics as a human activity which is produced historically in the cultural and social contexts.

First orientation emphasizes how mathematics empowers learners; especially the ones disadvantaged previously, since understanding mathematics can help the learners to make sense of society which was one of the main aims of the NCS, that is, social transformation. The emphasis of second orientation for FET is focusing on establishment of appropriate connections between M and its application. But Parker (ibid) highlighted

that although NCS focused on application of mathematics, transferring everyday knowledge into mathematics was absent. The third orientation can be seen as a practice that is a rigorous and systematic way of thinking, viewing and communicating the world from mathematics perspective. The fourth orientation views the mathematical structure as the focus of study. That is mathematics is a discipline which is unique to construct the knowledge which does not necessarily require daily life application but rather for further study of gaining the scientific knowledge. Moreover Parker defined the fifth orientation which is mathematics as a human activity which is produced historically in the cultural and social contexts. The last orientation values the indigenous mathematical knowledge which is produced historically by social interaction in the South African context. After identifying these five orientations to mathematics, Parker analyzed all learning outcomes (LO) and assessment standards (AS) in the NCS for mathematics (NCSM) in terms of the five orientations. Her analysis showed that over 95% of the LO and AS indicates some form of the fourth orientation with mathematics as a structured discipline to master in order to access further studies. Parker's analysis also showed that NCS had a clear focus on orientation two (50%) and orientation three (46.1%) though these orientations were a new focus in the new NCSM and new to most of the teachers. Moreover, Parker also emphasized that orientations one and five were not the main focus in the LO and AS of the NCSM which contradicted upfront commitments of education for critical democratic citizenship and indigenous knowledge systems. Therefore, it can be said that adopting and implementing these new orientations to mathematics into the practice is a big challenge for teachers. Therefore, Parker (2006) agrees with the previous studies (Naidoo & Parker, 2005; Jita & Vandeyar, 2006) which indicate that adoption of the new orientation to the mathematical knowledge and pedagogy requires major changes in the identities of teachers.

2.4 CONCLUSION

The implementation of the new curriculum began in 2006 at the Grade 10 level, and was taking place in Grade 11 in 2007. However many South African authors are of the opinion that there was not enough training of teachers at FET level for this implementation (Jansen, 2001; Naidoo & Parker, 2005; Jita & Vandeyar, 2006; Parker,

2006). More specifically, the new curriculum documents project a different kind of teacher who is expected to implement the new curriculum, but government did not realize that this would require a time investment more than a monetary investment. Time to alter identities from the ‘old’ to the ‘new’ was not given (Jansen, 2001). Therefore implementing this new curriculum has been experienced to be a problematic issue. Many educators have struggled to incorporate the new curriculum (NCS) principles into their daily teaching. In Jita’s (2006:2) words:

Changing practice is never easy, for it involves reconceptualizing one’s knowledge and beliefs about a particular subject. Changing practice in the mathematics classroom involves changing one’s mathematics identities.

In this chapter, firstly I explained the framework for the identity concept. That is, teacher’s identity is approached from mainly I/P-Identity perspective which is developed through teacher’s engagement-imagining-alignment of the new roles in the NCS and reform-oriented school context. Secondly, I explored the first research question of “*how identities of M teachers are described in the new mathematics curriculum policy*” in the NCS and related literature. The NCS mainly described six types of expected generic identities in the data to see in: *mediators of learning, interpreters and designers of Learning Programs and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists*. Besides the six generic identities of M teachers, I explore teacher’s subject specific identity in the data from Jansen (2001) and Parker (2006)’s perspective in chapter five. That is teachers are not at the centre of the teaching/learning experience rather teachers are mediators² (or facilitators), accommodators and classroom managers of the educational experience. In addition, teachers are expected to be competent so as to interpret mathematics curriculum into the practice. Although the NCS makes certain demands on teachers and describe the ideal teacher’s identity, as argued elsewhere (Jansen, 2001; Naidoo & Parker, 2005; Jita & Vandeyar, 2006; Parker, 2006) there is still much tension between teachers’ personal and traditional pedagogic identities and teachers’ official and new expected identities, within the South African context.

² I take being ‘mediator’ role as being ‘facilitator’ role in this study.

Reconstruction of new expected identities is still in progress for teachers and typical ‘chalk and talk’ and ‘transmitter and producer of knowledge’ roles or identities of teachers still persist.

This study explores what images of M teachers’ M learners have in terms of teachers’ identities in the following chapters. Since OBE is student-centered, observing mathematics teachers’ identities from learners’ perspective might be more appropriate rather than teachers’ self understanding of their identities.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

In this chapter, I explain the research approach that was used in the study. Furthermore, I address how I ensured that the study is trustworthy in terms of validity and reliability. Thereafter, I address the ethical issues related to the study.

3.2 Research approach

A qualitative approach was used to explore M teachers' identity in policy and practice. Since the study was concerned with understanding a human problem, where identity is a complex phenomenon, the study was conducted in a natural setting where the teachers worked in the school. In order to understand teachers' identities, I closely observed, through careful documentation, and thoughtful analysis, people's words and actions, so that I could discover patterns about the teachers' identity in practice that emerged. A qualitative study allowed me to investigate the research problem in terms of the meanings people make of their experiences and bring to the study.

A case study design was an appropriate research approach in this study as it allowed me to investigate M teachers' identities in classroom practice from learners' perspectives. Opie (2004) describes a case study as:

'an in-depth study of interactions of a single instance in an enclosed system' (p.74).

Furthermore, Opie (2004) also describes a few important constituents of a case study. Firstly, data collection should be systematic. In this study, learners were first given a draw a mathematics teacher (DAMT) test, after which a preliminary analysis of the learners' drawings was done. Thereafter some learners were selected for interviews in order to help me to gain more insight into their mental images of M teachers. Secondly, because the study was a case study, the focus was on a real situation with real people, that

is, the M teachers' identities in practice. Thirdly, as the researcher, I was familiar with the environment. Therefore the key features of a case study were present in this study.

3.3 Validity

In order to ensure the research is rigorous, the researcher should firstly address issues of bias, validity, reliability and trustworthiness. Secondly, if a research does not produce 'better knowledge' that can be relied on and can be used wisely for a good purpose, it can't be called a rigorous study (Griffiths, 1998). In this section the study will be analyzed in terms of bias and validity.

3.3.1 Bias

My position in the school was a possible source of bias in the study. I had multiple identities in the school, such as being a deputy principal and being one of the M teachers at the same time. Because one grade 10A and one grade 11A M classes were involved in the study, and I taught the grade 10A class, administering the DAMT Test to the learners who I was teaching could have been problematic. Therefore, at first I intended to administer the DAMT Test to the class that I was teaching, the grade 10A class, as a pilot study. Later on I realized after collecting and finishing the preliminary analysis of the piloting and the grade 11A class' drawings, that the learners' drawings from the pilot group were more insightful than the other learners' drawings, in terms of M teachers' identities in classroom practice. I believe that being their M teacher had turned out to be an advantage, in terms of gaining their cooperation, rather than seeing their reluctance towards expressing their mental images. Hence, I decided to use pilot study learners' drawings as part of the data.

I also carried a researcher-identity during the research process. I informed the learners that I was there as a researcher during the administration of the DAMT Test and interviews. Even so, my own identities were so salient in this relationship that the influence of these on the way in which the research participants responded cannot be completely eliminated. However, it needs to be noted therefore that being an insider

brings some advantages to the study, such as easy access to the research site, as well as the disadvantages described above.

3.3.2 Validity

Understanding the research problem is more fundamental in qualitative research than traditionally-understood validity (Maxwell, 1992). Thus, understanding M teachers' identities in policy and practice by doing research should construe an objective reality that should make sense to the reader. According to Scaife (2004) validity in research is about the degree to which a method or instrument actually measures what it is supposed to measure. Before discussing issues of validity, I want to explain the DAMT Test as described in the literature in order to address why DAMT Test was chosen as the research instrument for this research.

3.3.2.1 Draw-A-Mathematics-Teacher-Test (DAMTT) in the literature

In this section, I justify the use of the DAMT Test as an instrument in this study. Picker and Berry (2000) used DAST (Draw a Scientist Test) to understand learners' images of mathematicians. They had two goals: (1) to design and develop a tool to explore learners' images of mathematicians; and (2) to compare findings they obtained through use of the same tool held by lower secondary learners in five countries. They found that, with small differences, the lower secondary learners in all five countries had certain common images of mathematicians, that is, they are invincible and cannot be questioned. Picker and Berry suggested that examination of people's images of situations help to understand their beliefs, assumptions, understandings and expectations. I believed that implementing DAMT Test in this study could help me to understand learners' mental images of M teachers in terms of identity.

Thomas, Pedersen and Finson (2001) conducted a similar study using DAST which explored pre-service science teachers' experiences and resulting mental models and beliefs. They asked pre-service teachers: (1) to draw a picture of themselves as science teachers at work; and (2) what the teacher does and what the students do. They found that

pre-service teachers brought their mental image of science teachers from their most recent memories of themselves as science teachers.

Although Draw-A-Scientist-Test (DAST) (as cited in and Picker and Berry, 2000 and Thomas, Pedersen and Finson, 2001) was used by many researchers, Utley & Showalter (2007) were the ones who used the Draw-A-Mathematics-Teachers-Test (DAMTT). They investigated preservice elementary teachers' illustrative representations of how they saw their future M classroom and expressed teachers' and learners' actions. Utley & Showalter (ibid) found out that the majority of preservice elementary teachers still envisioned a classroom as more teacher-centered than student-centered; even though preservice teachers received a preparation program to change their thinking in terms of a teaching approach.

It is important to understand why I explored teachers' identities from the learners' perspectives. Vithal and Gopal (2005) suggest that OBE is a student-centered approach, and therefore what learners say and experience within OBE is crucial for understanding how they perceive the teacher in South Africa today. They add that learner-centered approaches were not discussed most of the time in the literature:

'The learners' experience of classroom practice is the dimension of C2005 [is] most poorly served by research' (Vithal and Gopal 2005 p. 46).

This stand point of Vithal and Gopal (ibid) suggested to me that using the DAMT Test could help me to capture learners' mental images of M teachers. All above mentioned studies have the similarity to my study in terms of capturing teachers' identity in practice from learners' perspectives. I therefore used DAMT Test in order to understand how M teachers' identities were perceived in practice through learners' mental images. Furthermore, the DAMT Test would enable me to understand through learners' perspectives whether M teachers' identities had shifted from the traditional, that had been characteristic of previous classroom practices, to more progressive, where M teachers were expected to incorporate learner-centered pedagogies.

3.3.2.2 Validity Methods Used in the Study

Piloting

Before implementing the DAMT Test, I piloted it with grade 10A class. This helped me to ascertain the appropriateness of the data collection tools. Similarly, before starting the interviews I also ran a pilot interview with L10 in 10A class to ascertain whether or not I needed to adjust the interview environment and questions.

Face and Respondent Validity

According to Griffiths (1998) using ‘face validity’ and ‘respondent validity’ are ways to confirm whether research is valid or not. If the data from the study *sounds* right or *feels* right, then the findings can be deemed reasonable and accurate, and the study is said to have face validity. Since the drawings of the learners represented their M teachers’ images (identities) that they envisioned, the data from the DAMT Test had face validity. After collecting data from the DAMT Test, I used some of the tests whilst interviewing the learners who had drawn those images. Thus the study had respondent validity.

Descriptive and Interpretative Validity

Descriptive validity is what a researcher reports after having seen or heard (Maxwell, 1992). In my case study, teachers’ identities were captured and described through the DAMT Test and accompanying interviews. My description of the teachers’ identities based on data from the DAMT Test was confirmed in the interviews. Also, as a researcher my descriptions are informed by theory. In order to address interpretive validity, the researcher does not only describe the practice, he also interprets meanings of the practice in the language of people studied (Maxwell, 1992). Hence, I interpreted the data from the DAMT Test and interviews and also tried to construe these meanings with the help of participants’ responses by doing semi-structured interviews.

Triangulation

According to Hitchcock & Hughes there are four ways to triangulate data. Three of them are valid to my study. Firstly, data may be collected from more than one subject. In my

study I collected data from grade10A and grade11A M classes. Secondly, where ‘theory triangulation’ involves more than one theoretical framework I used a socio-constructivist approach within a more general situated approach for my study. Finally, ‘methodological triangulation’ involves the use of more than one data collection method. In this case study, I used the DAMT Test together with learner interviews. Since I undertook my study from a qualitative approach, there was a ‘human factor’ which included many other unknown variables. Therefore a hundred percent validity was also unachievable (Scaife, 2004) for this study.

3.4 Reliability

Scaife (2004, in Bell, 1999 p. 103) describes reliability as:

‘The extent to which a test or procedure produces similar results under constant conditions’

Since the DAMT Test was used in this study as research instrument, I have discussed features of consistency and repetition of the DAMT Test. However, this study is a qualitative study, and a typical definition of reliability may not be appropriate to the study. The originality of the qualitative study pays more attention to understanding a human problem, which is unique and can change from person to person, and can not be replicated. In this study 38 learners participated to complete the DAMT Test task, and all of them understood the task in terms of drawing a M teacher in a classroom while he or she was teaching M. Therefore, the data gathering process, DAMT Test and follow up semi structured interviews produced similar results in similar conditions, as Scaife (2004, 103) specified, and the research was considered reliable it was satisfactory in terms of learners’ understanding of the task and visioning their mental images.

3.5 Ethical considerations

In my understanding, ethics are systems of beliefs and principles that need to rule or limit a researcher when conducting a research especially that involves humans. This research ensured that minimal harm was done to research participants (Sikes, 2004). In this study, I was very careful about ethics during all research processes. In order to minimize

possible dangers to the study, the following ethical precepts were addressed, through the Wits University Education Ethics committee:

- A researcher's paramount responsibility is to those studied. Where there is conflict of interest, they must come first. Therefore, I did everything within my power to protect my informants' physical, social and psychological welfare and to honor their dignity and privacy.
- The aims of the investigation were communicated as much as possible to informants.
- Informants remained anonymous. None of the participants' names was used for the study.
- Questions asked were not insulting or embarrassing. All the questions were transparent and applicable to this criterion.
- The use of research tools was fully understood by the people concerned. They were free to reject them if they wished to. Results were consonant with the informant's right to welfare, dignity and privacy. During the interviews I used video recordings and all the learners saw and gave permission to use them for the study.
- There was no exploitation of informants for personal gain.
- The privacy and wishes of informants were respected at all times.

Furthermore, an information letter (See Appendix B) was given to the school principal describing the aims of the research and requesting permission for me to conduct the study in the school. An information and consent letter was given to and signed by all participants and learners' parents or guardians (see Appendix C and D). All parties indicated that they clearly understood that participation of learners in the study was voluntary, and that they could withdraw at any time during the study.

Grade 10A and 11A learners had been selected to participate in the study because these were the grades in which the new FET curriculum was already being implemented in 2007. By examining their responses to the DAMT Test, it was hoped that insight may be gained concerning what they thought about how M was being taught to them. The

participants chose to take part after listening to an information session about the study. They were told that the study was for education purposes only and that all the information would be treated with confidentiality and anonymity.

No risks to the participants were anticipated. The tests and interviews were conducted in a supportive and comfortable way. For confidentiality purposes, the M teachers were not allowed to view any of their learners' drawings. It was possible that some of the drawings might reflect identities of their current teachers. Therefore, there was no conversation between me as researcher and the teachers in connection with the results and analysis of these drawings.

Confidentiality was also guaranteed. All the participants were given the guarantee that the information collected would not be used for any other purposes except for the study. After the study, all documents including tests, interviews and video tapes would be kept securely locked and destroyed after three years from the time of completion of the study. The names of the participants were not used in the report. Pseudonyms were used in the reporting and presentation of the data in the report.

Lastly, the school in which I conducted the study was a 'trust school'. I obtained permission from the trust to do the study (see Appendix 5). All the participants, the school and the trust were informed that the end results of this study will be reported to the Wits School of Education in the form of a research report for a Master's degree in Mathematics Education. Further reporting of the results will take place in journal and conference publications and seminars.

3.7 Methods of Analysis

Both typological and inductive analysis methods (Hatch, 2002) were used to analyze the DAMT Test and interviews responses. The content analysis of the NCS and related literatures in connection with the first research question was provided to me with some typologies of M teachers' identities to use to analyze the data. More specifically, teachers' six roles mentioned and the subject specific roles from the literature in chapter two are the pre-determined typologies to analyze DAMT Test and interviews data.

Having these pre-determined typologies helped me to identify patterns, relationships, themes within them (Hatch, 2002), although not all these typologies were observed in the data. After identifying the key issues, patterns and themes in the data, I used these patterns with the support of data excerpts from the DAMT Test and the interviews to describe emerging insights. In the event that I obtained different typologies from the pre-determined ones, I used inductive analysis. First, I identified themes from the DAMT Test and the interviews. I then identified domains which had semantic relations with the next theme. After completing analysis on the domains, I searched for themes across the domains and hoped to obtain patterns, themes and typologies (Hatch, 2002). Finally, I compared these typologies with the pre-determined ones in order to identify and understand how teachers' identities were demonstrated in practice from learners' perspectives.

3.8 Conclusion

In this chapter, the methodology that was adopted for the study is briefly explained. In the following chapter, I explain 'research design' which includes 'data collection' and 'data analysis' and also challenges that I faced as a researcher.

CHAPTER FOUR: RESEARCH DESIGN – DATA COLLECTION AND DATA ANALYSIS

4.1 Introduction

In this chapter, I explain the research design - how data collection and data analysis processes were addressed for the study. Furthermore, I explain piloting DAMT Test and semi-structured interviews as well as the main data collection. Also, I address how the data is going to be analysed. Lastly, I mention the challenges before/during/after the interviews.

4.2 DAMT Test

4.2.1 Context of the study

The study explored the identities of M teachers described in the NCS grades 10-12 general M document (NCSM, 2003) compared with how they were demonstrated in practice. The first component of the research process for this study was analysis of the NCS policy document and related articles which are addressed in chapter two. In order to investigate teachers' identities as demonstrated in classroom practice, I asked grade 10A and 11A learners to provide me with an idea of the kinds of images they have of mathematics teachers. The grade 10A learners had experienced less than one year of implementation of the new FET curriculum, whereas the grade 11A learners had experienced more than one year of the new FET curriculum in 2007.

The study was conducted at an independent boy's high school having 200 learners, in October and November 2007. The school had one grade 10 and one grade 11 M classes (10A and 11A). I had been teaching mathematics at the school since August 2005 and was a deputy principal since the beginning of 2007. Hence, knowing the school and the students made implementation of the study at the school easier. Especially the learners from the grade 10A class were well-known to me because I taught them M in grades 8 and 9. Although I had never taught the grade 11's, they were cooperative because as their deputy principal I had a good relationship with them. Thus, being familiar with the

learners and having their support helped me to establish a good “relationship” in order to facilitate effective implementation of the study, and increased quality of data.

4.2.2 Piloting DAMT Test

DAMT Test was piloted with 19 learners from the 10A class after school was over for the day. All of the learners (19 out of 19) participated voluntarily to the study. I believe that it was because of our good relationship that I observed more cooperation from the 10A than from the 11A class. Completion of the task took approximately 30 minutes.

The purpose of the pilot was to check whether the DAMT Test task was clear to the learners. The only explanation made before I gave the DAMT Test to the learners was to go over the task questions. The first was, ‘draw a picture of a mathematics teacher while he/she is teaching in a classroom’. The second was, ‘explain your drawing in terms of what the teacher is doing’. All the pilot learners’ responses to the task were relevant and meaningful for the study. Thus, I decided to include the data from the piloting as part of original data for the research report. Moreover, most of the learners drew their current FET mathematics teachers while they were teaching in a mathematics classroom. I arrived at this conclusion because the gender of the teacher in the drawings was matching to learners’ current teacher’s gender and FET subjects were on the board in the drawings. For this reason there was no need to change the DAMT Test instrument or the questions of the DAMT Test. Figure 1 below shows an example of a DAMT Test drawn by learners in the pilot study.

LEARNERS' TEST

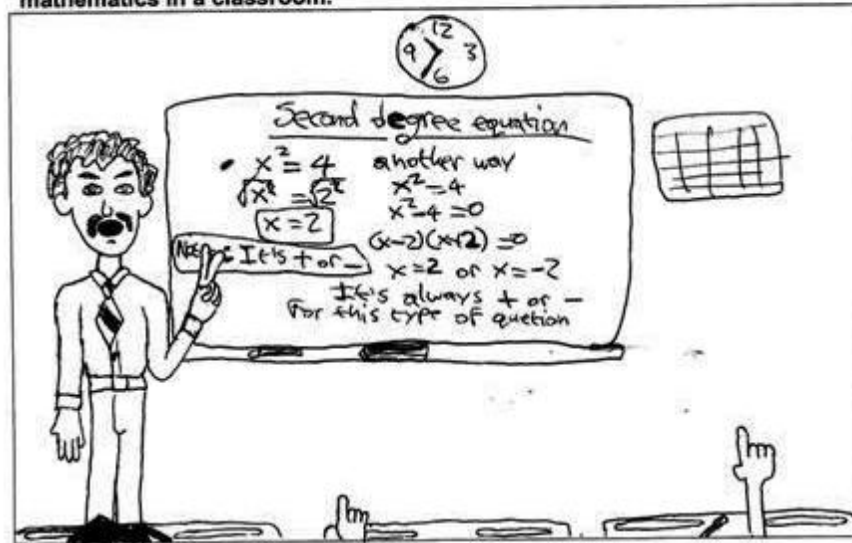
Please answer the following questions as honestly as possible. Your detailed responses will be much appreciated.

Name:

Date:

Class:

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The teacher is explaining Second degree equation and asking questions

Figure 2: An example of DAMT Test from the pilot study (L1's drawing)

4.2.3 Administration of DAMT Test

I conducted the DAMT Test with grade 11A class between second and third week of September 2007. 19 out of 22 learners participated voluntarily in the study. Completion of the DAMT Test took two weeks. The DAMT Test was prepared and administered as a research instrument that was a one-page task which included two questions. The first was 'draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom'. The second was 'explain your drawing in terms of what the teacher is doing' (See Appendix 6). Both these questions helped me to address the second research question. The drawing task attempted to determine what learners think about how M teachers teach M in practice. The learners' drawings enabled me to try and understand

how they see M teachers and what they expect and experience from those teachers particularly with respect to the context of the new M curriculum. The second question in the task was deliberately an open-ended one in order to enable me to gain more information about how learners perceived M teachers' teaching. One other reason for posing the second open-ended question was to ensure that my description and interpretation of their drawings matched what learners think of teachers. The instrument was duplicated one week prior to its implementation to reduce any potential disruptions to the data collection process. The participants required between thirty and forty-five minutes to complete the DAMT Test. They answered the DAMT Test questions individually in their classrooms in their empty periods or after school hours. The instrument was clear to the learners since overall 38 participants could answer the questions. The sample groups were informed 2-3 days before they were given the DAMT Test task.

I explained to all of the participants that the study was a research study and I was present there as a researcher, neither as their mathematics teacher nor as their deputy principal. Furthermore, as part of ethical procedures, learners were asked to bring their parents' consent form for the study. All of the thirty-eight learners had signed the consent forms and had also brought their parents' consent forms. I emphasized that the study was for research purposes only, that their participation was voluntary, and they could leave the study whenever they wanted to. As it happened, all of the learners completed the study. I introduced the DAMT Test to the learners on the task day. Completion of the task took thirty to forty minutes as I expected. During the task some of the learners asked me if they could draw any mathematics teacher. The only explanation that they were given was to draw a M teacher in a M classroom while he or she was teaching and to explain their drawing in terms of what the teacher was doing. I did not give them further instructions so as not to influence their responses.

4.2.4 Preliminary analysis of DAMT Test

When all of the learners had completed the DAMT Test task, a preliminary analysis of the data was done. There were three main parts to the preliminary analysis:

4.2.4.1 Labeling: In order to protect learners' identities, learners' drawings were coded L1 to L38 (i.e. learner 1 to learner 38).

4.2.4.2 Scanning: All of the DAMT Test tasks were scanned into my computer. At first most of the scanned drawings were not legible. This problem was not expected. Not to interfere with the originality of the data, the drawings were not taken back to the learners. Instead I decided to redraw and rewrite on learners' drawings and writings without changing the originality of the data to overcome the problem. When all the drawings were scanned again, they were all legible and useful for the study after all.

4.2.4.3 Identifying common themes: First typological analysis methods were planned to analyze the data. Official generic identities of teachers, which were mentioned earlier in chapter two (Mediators of learning, Interpreters and designers of Learning Programs and materials etc.), were the teachers' expected identities in the practice to be sought. In addition, five mathematical orientations that Parker (2006) indicated are explored through the drawings. Since not all of the six teachers' expected identities were explicitly present in the data, inductive analysis was needed to supplement the typological analysis. The learners' drawings and explanations were checked to see if there were some common themes presented. All learners' drawings were categorized into five groups according to the following themes:

1-2 What is the teacher doing and saying? In order to capture teacher's identity, all the drawings were observed in terms of what teachers were doing and saying as part of their position in the classroom. The following descriptions were used: explaining, asking, commenting, talking, frustrated, disciplining, homework giving or answering, assisting, helping. After identifying common descriptions, I grouped the related descriptions to reach common themes across the data. To be able to describe "The kind of person" metaphor, what a teacher does and says was the key issue for the analysis. For example, the teacher is *explaining* second degree equation and *asking* questions to the learners in figure one.

3-4 What is learner doing and saying? This part was important to understand whether the lessons were teacher-centered or student-centered. Since the study concerns FET level mathematics teachers' identity in policy and practice, seeing learners'

positions in terms of the new curriculum was essential. The following descriptions were used: disruptive, thoughtful, solving, listening, and homework doing, solving, commenting, confused, participating, and answering. After identifying common descriptions, I addressed the common themes in order to determine whether lessons were teacher or student centered. For example, the learners who are visible in the figure one are participating in the lesson by raising their hands and/or asking/answering the question posed to them.

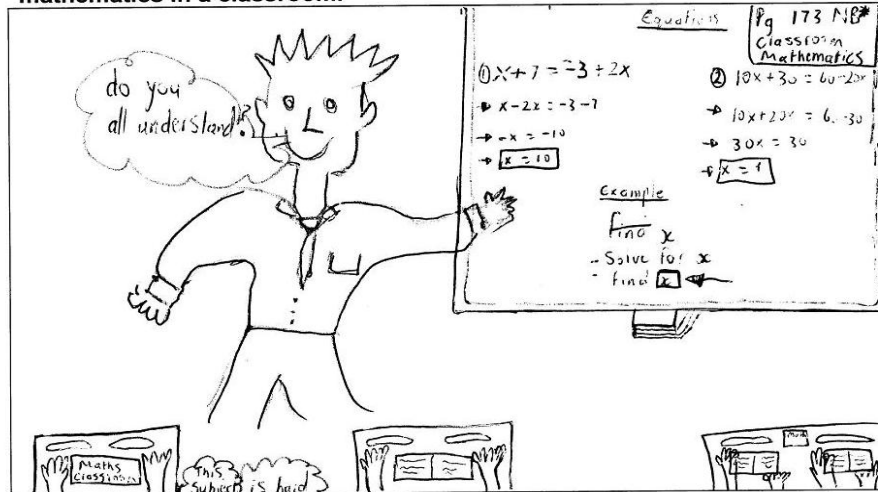
5. ***What mathematics/orientations are involved?*** Firstly, the mathematics in the drawings allowed me to check if the subjects in drawings were FET subjects. For validity purposes also classifying drawings according to FET/GET subjects helped to confirm the data was relevant to the study. Moreover, the study was situated in FET band, therefore in order to justify learner's drawings represented their FET M teacher identity, this part was essential to the study. Secondly, what orientations part allowed me to see what mathematical orientations (Parker, 2006) were present in the data since there was a mathematical topic on the board that teacher was teaching in most of the drawings.

4.2.5 Samples of Preliminary Analysis of DAMT Tests

In order to give a sense of how the learners' drawings are interpreted, I explain three of the learners' drawings in this part (L10, L22 and L34). In figure three, the teacher (male) stands next to the board and explains first degree equations. The teacher is also asking learners whether they all understand (the subject). Meanwhile, learners are listening to the teacher while their textbook or notebooks are open. One learner is thinking that the subject is difficult. The topic on the board works across both GET and FET bands. Mathematics is viewed as a set of conventions, skills and algorithms that must be learnt; therefore mathematical orientation four is present. Furthermore, L10, in words, describes the teacher as explaining/solving questions and expects the textbooks to be brought. The lesson is mainly teacher centered since teacher is at the central stage next to the board and presenting the lesson.

In figure four, the teacher (female) stands next to the board and explains factorization of an algebraic expression (transformation graphs is homework). The teacher says that ‘you are always complaining that you don’t understand but all you do is to talk’. Teacher also seems to be frustrated because of the learners. Meanwhile, the learners are talking to each other and having question marks which indicate they don’t understand the subject.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The teacher expects us to always have our texts book.
He is explaining to us equations and ~~is~~ giving tricky examples to benefit us. We solve more than 15 questions in a lesson.
He tries to make us understand as far as possible.
People find maths hard but our lessons are very enjoyable if you participate and listen.

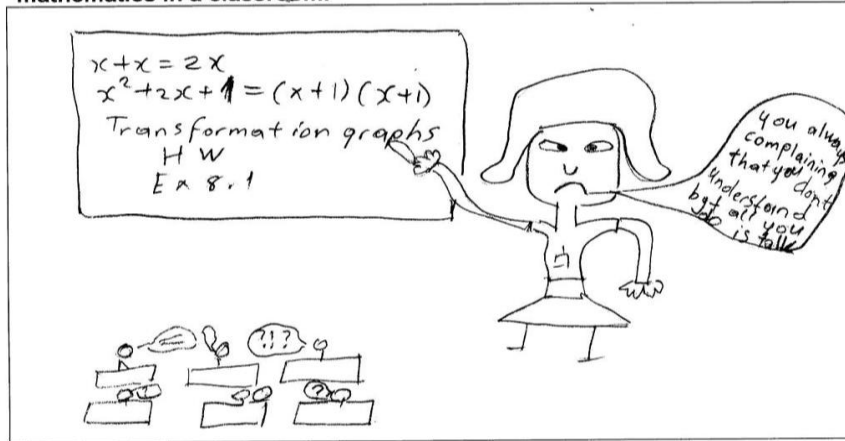
Figure 3: L10's drawing from 10A

M orientation four is present since M is viewed as a set of conventions, skills and algorithms since there is no application of the algebraic expressions present. According to L3, the teacher is frustrated because of learners' lack of interest and not understanding the subject. Mainly the lesson is teacher centered, although there are indications of the teacher seeking and checking for learner understanding.

In the figure five, the teacher (male) is next to the board and explaining some sort of equations. Teacher is also saying to the learners ‘don’t worry class; it might seem long but it really easy’. The learner in the drawing seems to be confused and lost. The theme

of the picture is 'M is good for you', although it is not clear whether the learner is presenting this as the teacher's view. Again, a key idea coming through is that while teacher is making attempts to explain and get learners to understand, learners remain confused. Although which orientation is predominant in the drawing is not clear

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The teacher is trying to conduct her lesson in the maths period but all the students do is talk. She is now frustrated that they do not understand the subject but they always talk

Figure 4: L22's drawing

because of the complexity of the work (according to the L34), orientation four might be present since L34 views mathematics as a set of conventions, skills and algorithms that L34 has no understanding of it. Primarily, the lesson is also teacher centered.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The teacher is explaining the work as if it were really simple and easy but it is confusing and the students get lost.

Figure 5: L34's drawing

In the following chapter, I explain how this descriptive analysis of all the DAMT Tests leads to the common themes. These common themes are meant to address the second research question which is about teachers' identities in practice from learners' perspective.

4.3 Interviews

4.3.1 Context and administration of the interviews

After a preliminary analysis of the DAMT Test responses, I selected four learners in total from grade 10 and grade 11 classes to interview individually. The aim of the interviews was to obtain more insight into learners' responses to the DAMT Test. Before conducting the interviews with the four learners, I undertook a pilot interview with one learner, Learner 10 (L10). The aim of doing the pilot interview was to validate the interview questions and pre-empt any possible problems that might occur during the interviews.

When I was ready for the interviews, I made appointments with the four interviewees. Three of the interviews took place after school hours. One of the interviewees had an exam and he was therefore interviewed before school ended. All the interviews took place in a comfortable location in a grade 12 classroom. Since the grade 12 learners were busy with their final exams, their classroom was available. Only the interviewee and I as researcher were present in the interview room. A maximum of two interviews were scheduled for each day. The interviews took approximately seven to fifteen minutes.

All interviews were video recorded; so that not only the words, but also body language would be captured in order to observe fully the learner's understanding of M teacher's identity. Before the interviews took place all four interviewees agreed that the interviews could be video-recorded. Completion of the interviews took two weeks. Not a lot of time was needed to organize because the videos were directly transferred to my computer. The data and most of the interviews were transcribed easily. I watched each interview twice and then started to transcribe it. A few sections across all interviews were inaudible.

At the beginning of each interview the interviewee was asked to explain his drawing. Later on, some follow up questions were asked to clarify the details in their drawings and explanations. Some of the learners, such as L4 and L13 started to explain briefly about their drawing which usually included the main theme of their drawings.

4.3.2 Selections of learners

The DAMT Test was administered to the students of two M classes. It was difficult to select the interviewees since most of the DAMT Test responses were relevant to the study. However I used the following criteria to select the interviewees:

- Since the implementation of the new curriculum began in 2006 at Grade 10 level, and that in Grade 11 was taking place in 2007, I thought that equal numbers of students' voices from grade 10 and grade 11 classes should be heard. Therefore I selected two learners from each grade.

- After preliminary analysis of the DAMT Test responses, I selected eight DAMT Test responses which were more relevant to the study than the others in terms of having different themes; rather than having common ones.

Another reason for doing these interviews was to check the respondent validity. Taking the DAMT Test responses back to the learners and asking them about their responses gave me an opportunity to validate if my interpretation of the responses corresponded to their interpretation of their own responses.

4.3.3 Challenges

I had some challenges to address during the interviews in relation to having valid and reliable data. Organizing interviews and collecting the data was not as simple as I had expected both research methods required some experience and skill. These were some of the challenges that were experienced during the interviews:

Semi-structured Interview: I had some questions to address before the interviews with respect to M teachers' identities in classroom practice. These included: "What is the teacher doing? Why do you think he is doing what he is doing? Can you say more about the drawing" or "What is the teacher saying? Why do you think he is saying that?" The challenge was that sometimes the learners' responses directed me to some areas which were not relevant for the study. However I asked the learners follow-up questions to direct the interview towards the teachers' identities.

Explanation of DAMT Test: It was a challenge for me as a researcher to stop myself explaining more about the interview questions. I was concerned that if the questions were explained in more detail, the learners' responses could have been affected. Therefore keeping questions simple and understandable was a challenging consideration for me.

A quiet place: The learners who were outside of the classroom were noisy after school hours. Therefore having a quiet place for interviews was problematic. Transcribing noisy parts of the video recordings was difficult.

Limited time: Only two interviews were organized after school hours for each interview day because the students had transportation problems. Hence the available time to finish

the interviews was limited. However, all the interviews were completed within five to fifteen minutes.

Replacement of one of the interviewees: One of the interviewees did not show up at the scheduled time and place. Thereafter, he did not come to the school for the following two days. I replaced him as a prospective interviewee so as not to postpone the study.

Transcription: I ran four interviews, with each taking under fifteen minutes. Each interview took between three and five hours to transcribe. I struggled to find time to accomplish this task.

4.3.4 Interview questions and analysis methods

Since the interviews were semi-structured, these were the questions that were planned:

- What is the teacher doing? Why do you think he is doing what he is doing? Ask the learner to say more.
- What is the teacher saying? Why do you think he is saying that? Ask the learner to say more.
- What is the learner doing? Why do you think he is doing what he is doing? Ask the learner to say more.
- What is the learner saying? Why do you think he is saying that? Ask the learner to say more.
- What mathematics is involved in the DAMT Test response?

Although these were the main questions, I did not ask these questions to the learners directly. I made the interviews feel like a conversation and I planned to get the answers of these questions indirectly. Each interview had a main theme, which originated in the preliminary analysis of the DAMT Test responses. I also tried to address issues about the main theme of each drawing by asking unstructured questions. Before the interviews, the only explanations they were given were to speak up and answer the questions about their drawings in as much detail as possible.

Both typological and inductive analysis methods were used to analyze the interviews' data. Since each interviews had a theme beforehand from the analysis of the drawings,

these pre-determined themes were sought in the data with relation to six teacher roles (typologies) which were addressed in chapter two.

4.4 Conclusion

In this chapter, the data collection and analysis processes that was adopted for the study is briefly explained. In the following chapter, I will explain ‘data analysis’ which explains in detail what the data gathered from DAMT Test and semi-structured interviews mean in terms of teachers’ I/P-Identity in practice.

CHAPTER FIVE: DATA ANALYSIS & DISCUSSION

5.1 Introduction

In this chapter, the DAMT Test and semi-structured interviews responses were analyzed in detail. Both inductive and typological analysis methods were used to analyze the data. Firstly, preliminary analysis of DAMT Test responses was analyzed in depth to reach common themes and discuss them in detail. Secondly, interviews responses of the selected learners were analyzed in terms of these themes. While these analyses were done, common themes and patterns which emerged from the analysis of DAMT Test and interviews were presented and discussed.

5.2 Analysis of DAMT Test

5.2.1 Summarizing DAMT Test Responses

Preliminary analysis of DAMT Test responses which were summarized in Table 2 had five exploratory questions leading to the categories:

- 1-What is the teacher doing?
- 2-What is the teacher is saying?
- 3-What is the learner is doing?
- 4-What is the learner is saying?
- 5-What mathematics/orientations are involved?

In order to reach common themes and patterns in terms of teacher's identities, first DAMT Test responses are explored through these five exploratory questions in this section. The questions 1, 2 and 5 were central for understanding teachers' identities in practice. Although, the questions 3 and 4 were helpful for understanding whether the lessons teacher or student centered, they were also important for observation of learners and consequently a classroom context, in terms of understanding teachers' identities.

The teacher's descriptions were named in this part as a result of the first five questions. For example, teacher in the figure two (chapter 4, pg32) is a male teacher and explaining the subject and asking a question to the learners. I tried to be more descriptive rather than

evaluative when elaborating the drawings. In order to reach the teachers' descriptions firstly the above mentioned five questions were taken into consideration. Thereafter, the second question of the DAMT task which was learners' explanation of the drawing also helped me to confirm my descriptive interpretation of the learners' drawing. For instance, according to L1's drawing (chapter 4, pg32), teacher is a male teacher, and *explaining* a second degree problem. Learners are *participating* by raising their hands in the lesson. Moreover teacher is at the *center* of teaching and learning activity such as next to the board, *explaining* the subject and learners are *listening*. So, teacher in the L1's drawing can be described as *explainer*, and having a largely *teacher centered* pedagogy even though learners are participating and taking responsibility of their own learning. Therefore, all analysis in the table below is based on description of the drawings and learners' explanation of the drawing rather than any other assumptions. The following Table 2 summarizes the data of the 38 DAMT Test responses from grade 10A and 11A classes:

Table 2: Summary Table from DAMT Test responses

LEARNERS	1. WHAT IS TEACHER DOING?	2. WHAT IS TEACHER SAYING?	3. WHAT IS LEARNER DOING?	4. WHAT IS LEARNER SAYING?	5. WHAT MATHEMATICS/ ORIENTATIONS ARE INVOLVED?	TEACHER'S DESCRIPTIONS ACCORDING TO THE LEARNERS
L1	Explaining, asking	Teacher is explaining a second degree problem	Participating by raising hands (asking or answering).	N/A	Solution of second degree equations, factorization(FET), orientation 4	Explainer, Teacher centered
L2	Explaining, asking	"Any questions boys?"	Participating, confused	"I do sir"	Area of three dimensional objects and trigonometry (FET), orientation 4	Explainer, teacher centered
L3	Explaining, asking	"Who got the first answer?"	N/A	N/A	Basic geometry, finding angles on the parallel lines(FET&GET), orientation 4	Explainer, teacher centered
L4	Explaining, knowing the subject	Explaining mathematics learning	Not understanding, Confused	N/A	There is triangle and equation on the board, but mainly conceptual understanding (FET&GET), orientation 3,4	Explainer, subject specialist, teacher centered
L5	Explaining, teaching	Explaining /teaching trigonometry	Learner is bored. Waiting the lesson to finish.	"When will this lesson end?"	Trigonometric functions and trigonometric graphs(FET), orientation 4	Explainer/teacher, teacher centered
L6	Explaining, commenting, not giving good examples	Explaining or posing the question.	Confused, no understanding	N/A	Algebraic expressions, triangles(FET), orientation 4	Explainer, subject specialist, teacher centered

L7	Explaining (very good at that), commenting	“Equals to 90 degree”,	N/A	N/A (From the explanation student thinks teacher is good at teaching)	Basic geometry, angles, polygons, triangle (FET&GET), orientation 4	Explainer, subject specialist, teacher centered
L8	Explaining, assisting	Explaining subject	N/A	Listening to the lesson	Basic geometry, similarity (FET&GET), orientation 4	Explainer, assister, teacher centered
L9	Explaining, Commenting, assisting, giving extra lesson	“Please ask for help if you get stuck”	Asking questions to the teacher (L9 thinks that the teacher concerned about their passing with high marks)	“Sir what X^2 mean” “Sir are you going to give us homework”	Factorizing algebraic expressions, triangle (FET), orientation 4	Explainer, assister, concerned, teacher centered
L10	Explaining tricky examples, solving, commenting	“Do you all understand?”	Listening, opened textbooks	“this subject is hard”	First degree equations (FET&GET), orientation 4	Explainer, subject specialist, teacher centered
L11	Asking, explaining	Explaining	N/A (one learner did not understand), learner thinks teacher is very good in teaching	N/A	Trigonometric ratios(FET), orientation 4	Explainer, subject expert, teacher centered
L12	Explaining	Explaining	N/A	N/A	Phytogoras theorem, right triangle (FET&GET), orientation 3, 4	Explainer, teacher centered
L13	Explaining, commenting	“Chinese”	Listening, confused	N/A	Graphs of Functions: parabola, straight line(FET), orientation 4	Explainer, teacher centered
L14	Explaining, frustrated	N/A	N/A	N/A	Trigonometry (FET), orientation 2, 4	Explainer, teacher centered
L15	Explaining, managing, being on time(caring), being kind, humoring, being calm, competent	Explaining	N/A	N/A	Triangle, equation(Geometry, Algebra) (FET&GET), orientation 4	Competent, caring, subject expert, kind, explainer, have sense of humor, teacher centered
L16	Explaining	Explaining	N/A	N/A	Basic geometry, phytogoras theorem (FET&GET), orientation 2, 4	Explainer, teacher centered
L17	Explaining, motivating	Asking question	Participating, answering	N/A	Nature of the graph: cosx, sinx, tanx graphs (FET), orientation 4	Explainer, motivator, teacher centered
L18	Explaining, asking	“Find the intersection point and the parabolas coordinates for both equations”	N/A	N/A	Parabola, hyperbola, line, nature of the graph (FET), orientation 4	Explainer, teacher centered
L19	Explaining, commenting, frustrated	“Sigh... When will they learn?”	Confused	“L.O.L”	First degree equation (FET&GET), orientation 3	Explainer, frustrated, teacher centered
L20	Explaining	N/A	N/A	N/A	Pythagoras theorem, trigonometry (FET), orientation 4	Explainer, teacher centered

L21	Homework checking, assisting	N/A	Doing homework, one is at board, one is with teacher	N/A	Functions (FET)	Assister, learner centered
L22	Explaining, talking, angry to learners	“you always complaining that you don’t understand but all you do is talk”	Disruptive, talking to each other, having question marks	N/A	Algebraic Expressions (factorization), transformation graphs (FET), orientation 4	Explainer, speaking, angry, teacher centered
L23	Talking, Explaining, assisting	“Va”	One is doing homework on board, one is confused not understood	N/A	Algebraic Expressions (FET&GET), orientation 4	Assister, explainer, learner centered
L24	Talking to learners, explaining,	“Boys!!! Pay attention”	Disruptive, talking to each other, playing around	N/A	Functions, parabola, graph of line, $E = mc^2$, trigonometry (FET), orientation 4	Classroom manager, explainer, teacher centered
L25	Explaining	N/A	N/A(L25 thinks that teacher explain extensively and properly)	N/A	Equations (FET&GET), orientation 4	Explainer, competent, subject expert, teacher centered
L26	Commenting, explaining	“Math is easy but you should practice it”	N/A(L26 thinks teacher is convincing learners that maths is doable)	N/A	Algebraic Expressions (FET), orientation 3,4	Explainer, subject expert, teacher centered
L27	Explaining	N/A	N/A	N/A	Trigonometry (FET), orientation 4	Explainer, communicator teacher centered
L28	Explaining, commenting	“Study boys!!! Read your formula”	Listening, commenting(L28 thinks also teacher is cool and calm)	“But sir...”	Equations (FET), orientation 4	Explainer, cool and calm, teacher centered
L29	Explaining, talking	“...and that’s the answer”	N/A	N/A	N/A	Explainer, teacher centered
L30	Explaining	N/A	N/A(L30 thinks the teacher is very jolly)	N/A	Operations on Numbers(FET&GET), orientation 4	Explainer, jolly, teacher centered
L31	Explaining (not doing good job)	N/A	Bored, not understanding	N/A	Equations (FET&GET)	Explainer, teacher centered
L32	Explaining	N/A	N/A	N/A	Equations (FET), orientation 4	Explainer, teacher centered
L33	Explaining	N/A	N/A	N/A	Parabola, operations (FET), orientation 4	Explainer, committed, teacher centered
L34	Explaining, commenting	“Don’t worry class it might seem long but it really easy.”	Confused, lost (L34 draw the teacher as very competent)	N/A	Equations (FET), orientation 4	Explainer, speaking, competent, teacher centered
L35	Commenting, Explaining	N/A	N/A	N/A	orientation 3	Animal figure, explaining, teacher centered
L36	Explaining	N/A	N/A(According to L36 the teacher is a committed one)	N/A	Algebraic Expressions (FET), orientation 4	explainer, committed, teacher centered
L37	Explaining, homework redoing	N/A	N/A	N/A	Equations (FET), orientation 4	Explainer, teacher centered
L38	Explaining,	N/A	N/A	N/A	Parabola, hyperbola,	explainer,

	disciplining				trigonometry (FET), orientation 4	discipliner, teacher centered
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5.2.2 Moving from Summary Table to Common Descriptions

When Table 2 is analyzed in greater depth, the following common teachers' descriptions can be arrived at Table 3:

Table 3: Table of common descriptions from DAMT Test responses

TEACHER'S DESCRIPTIONS	NO OF LEARNERS	%
EXPLAINING / TEACHING	37	97.4
TEACHER CENTERED	36	94.7
ASKING / ANSWERING / SPEAKING	18	47.4
SUBJECT SPECIALIST / EXPERT / COMPETENT	8	21.1
COOL / CALM / JOLLY / FRUSTRATED / KIND / HUMORING / ANGRY	6	15.8
CONCERNED / CARING / COMMITTED / MOTIVATING	5	13.2
ASSISTING / HELPING	3	7.9
LEARNER CENTERED	2	5.3
ANIMAL FIGURE	2	5.3
DISCIPLINING	1	2.6

According to Table 3, common descriptions are categorized in the first column and then secondly the number of the learners' drawing and lastly percentage of these descriptions. Most of the drawings (97.4%) mentioned that the teacher in the drawing was *explaining* a mathematics subject. Explaining involved teaching revealing what topic is being taught to learners. According to 36 learners' drawings (94.7%), teacher was at the center stage; next to the board and teaching mathematics subject to the learners. This suggested that learners' experiences involved a teacher-centered pedagogy. 47.4 % of the drawings involved the teacher speaking, asking or answering. The other descriptions of the teachers were not the major ones. I want to emphasize an important concern here before moving into common themes and patterns from these descriptions. All of my descriptions were meant to be descriptive rather than being evaluative. For example, there are only 5 drawings (13.2%) that explicitly mention the teacher as concerned, caring, committed or motivating. Does this mean rest of the other teachers in the 33 drawings was not having one of these attributes? If the learners did not explicitly draw or speak about being concerned, caring, committed or motivating in their drawings, then I did not take these attributes into consideration. Thus all of these common descriptions of the teachers were interpreted from the DAMT Tests by a descriptive approach according to the meanings that the learners attached to the drawings and the explanations.

5.2.3 Moving from Summary Table to Common Descriptions

In order to explore teachers' identities from learners' perspectives, the question 'what do these common descriptions mean in relations to identity?' should be explored through inductive and typological analysis approaches.

5.2.3.1 Perceived identities from common themes

Table 3 is the summary of teachers' common descriptions. Since these common descriptions were arrived by learners' descriptions of how they saw their teachers in the classroom while he/she was teaching, the identities we are leading to should be called 'perceived identities' rather than 'factual identities'. Following Table 4 and Table 5 are common themes which are arrived at by organizing similar descriptions inductively from Table 3:

Table 4: Table of common themes as result of common descriptions

COMMON THEMES	COMMUNICATOR	PEDAGOGIC	SUBJECT SPECIALIST/ ACCOMADATOR	EMOTIONAL	FACILITATOR
KEY DESCRIPTIONS FROM DAMT TESTS	Speaking, asking, answering, explaining, teaching, disciplining	Teacher-centered, Learner-centered	Expert, competent, concerned, caring, committed	Cool, calm, jolly, frustrated, kind, humoring, angry-animal shape	assisting, helping

Table 5: Table of common themes in terms of teachers' identities

COMMON THEMES		NO OF DRAWINGS	%
COMMUNICATOR		38	100
PEDAGOGIC	TEACHER CENTERED	36	94.7
	LEARNER CENTERED	2	5.3
SUBJECT SPEACIALIST/ ACCOMADATOR		13	34.2
EMOTIONAL		7	18.4
FACILITATOR		3	7.9

In Table 4 and Table 5, very first theme is communicator one which includes *speaking, asking, answering, explaining, teaching, and disciplining*. When all these descriptions collected under being communicator theme, all drawings 38 out of 38 (100%) had being

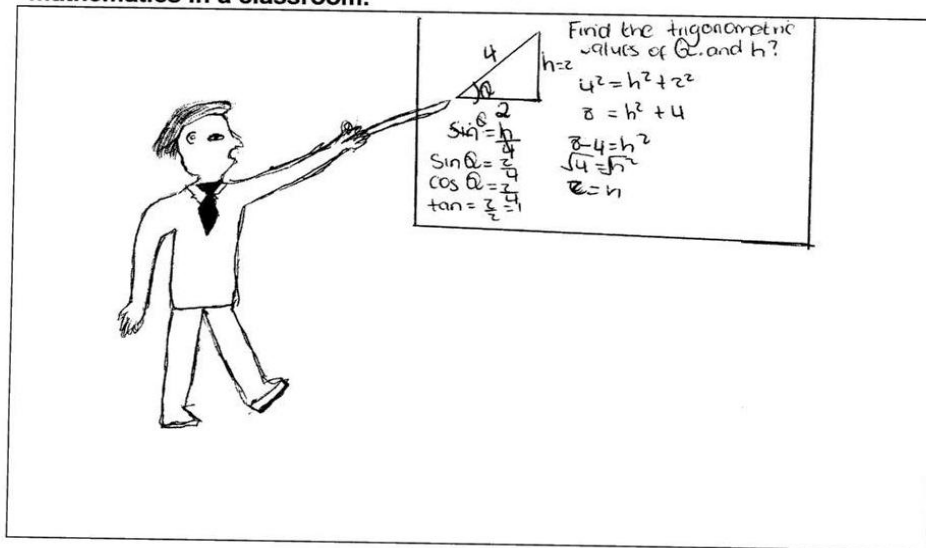
communicator as part of teachers' identity in a mathematics classroom. Communication does not only include *speaking, asking, answering* but also *explaining, teaching, and disciplining*. Would it be possible for a teacher to teach, explain, assist, help or discipline without a way of communication? Of course one would say no to this question. Moreover, communication includes all types of body gestures besides the verbal activities. Therefore mathematics teacher's first and the most important perceived identity is related to being a communicator in the classroom. Although this perceived identity in fact is present in the mathematics classrooms, being a communicator is not explicitly described in the NCSM. Therefore it is significant to ask 'What is expected from the mathematics teacher as a communicator? Or how can a mathematics teacher communicate with learners in order to meet the demands which are set by NCSM?'

The second common theme from Table 4 and Table 5 is teachers' pedagogic identity. According to Table 5, 94.7% of the drawings confirmed that teachers had teacher-centered pedagogic identity where only 5.3% of the drawings had learner-centered pedagogic identity. Although NCSM was meant to be having learner-centered pedagogy, practical application of this pedagogy is not produced (as expected) in the classroom according to the learners. That is, teachers did not move back from the center stage to the facilitative position by facilitating the learning activity and learners did not take charge of their own learning as Jansen (2001, 243) described the new role of the teachers. This result agreed with Jita and Vandeyar (2006) where they stressed that although NCS moved from teacher-centered and content-centered approach to a student-centered and outcome-based approach, the practical application and implementation is still problematic. Therefore it becomes a central question to ask whether it is possible to make mathematics teachers practice learner-centered pedagogic identity in a mathematics context.

Being subject specialist or accommodator is the third theme which includes the descriptions of being *expert, competent, concerned, caring, and committed*. 13 learners described their teachers in line with one of these descriptions. While teachers are explaining mathematics, it is expected to accommodate all learners as subject specialist

where teachers required being competent, committed, concerned and caring in order to meet expectations and demands from both learners and NCSM. Mathematics teachers were described as needing to adjust their explanations in order to improve learners' understanding. If this adjustment is visible to the learners, then the learners perceive themselves to understand concepts better, therefore teachers are being identified as 'subject specialist or expert', which was a theme used by 34.2% of the learners in this study.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The teacher/Mr Kurt asked a question about trigonometry, how to find trigonometric values and he is getting answers from the students on how to find h. Then he writes it down on the board using the Pythagoras theorem. One student did not understand and now he is showing him how to find (h) which was equals to 2. He is also explaining the trigonometric values using the numbers in the right triangle. Then starts by pointing the triangle so they can understand how to find trigonometric values using the numbers in the triangle. "Mr Kurt is very very good in teaching."

Figure 6: L11's drawing

For example L11 in Figure 6 describes the teacher as 'very very good in teaching' since the teacher in the drawing accommodates all learners in his explanation.

The fourth theme is the emotional one which includes being *cool, calm, jolly, frustrated, kind, humoring, angry*, and *animal shape* from Table 3. These descriptions were explicitly mentioned in the drawings or explanation of the DAMT Test responses. Therefore it is clear that learners visualized or verbalized their teachers' emotional disposition as part of their identities. Although it is only explicitly visible in 7 drawings (18.4%) (See Table 5) those teachers are emotional, this suggests that for some learners, as human beings, teachers' emotions are present in the classroom context as part of their N-Identity or I/P-Identity. Thus it is a challenge for mathematics teachers to control their emotions in the classroom context not to be maybe perceived as frustrated, angry etc. Even though NCSM and literature that I visited did not emphasize the emotional aspect of mathematics teachers, I think it is important to ask to what extent teachers' emotions affect mathematics teaching and learning.

The last theme was the facilitator one and only 3 learners (7.9%) explicitly draw or mentioned that the teacher in the drawing was either *assisting* or *helping* to the learners. Since I talk about this identity in-depth in 5.2.3.2, I refer this theme to the next section. In section 5.2.3.1 I tried to observe the data in terms of what data is telling me about mathematics teachers' identities rather than trying to see pre-determined typologies I wanted to see in the data. The following section is about constructing relations between these common descriptions from Table 3 and typologies from chapter two, that is, generic and subject specific identities of the mathematics teacher.

5.2.3.2 Emerging Common Descriptions with Typologies

Teacher's identity in policy was explored in chapter two and generic and subject specific identities of mathematics teacher have been mentioned. Now it is time to emerge these typologies with the teachers' common descriptions. Table 6 summarizes emerging generic and subject specific identities with the data from Table 3:

Table 6: Emerging Generic Identities from NCSM

	MEDIATORS OF LEARNING	INTERPRETERS AND DESIGNER OF LEARNING PROGRAMS	LEADERS, ADMINISTRATORS AND MANAGERS	SCHOLARS, RESEARCHERS AND LIFE LONG LEARNERS	COMMUNITY MEMBERS, CITIZENS AND PASTORS	ASSESSORS, AND SUBJECT SPECIALIST
KEY DESCRIPTIONS FROM DAMT TESTS	Assisting , helping, (asking, answering, speaking, learner centered, explaining/teaching, subject specialist, competent)	Competent, subject specialist, concerned, asking, answering, speaking, explaining	Concerned, caring, committed, disciplining, competent, motivating, assisting, explaining, speaking	Subject specialist, competent	N/A	Subject specialist, expert, competent, asking, answering, concerned, caring, committed

There are a lot of overlapping descriptions to the generic and subject specific identities as shown in Table 6. Therefore it was difficult to classify relationship between common descriptions and generic/subject specific identities. Thus I did not give the number or percentage of the tables but rather showed the relationships in the table. For specific descriptions I will refer to the Table 3 and Table 5. In the first columns of the tables, being mediator/facilitator identity of a teacher is presented. Although the main description of being mediator is to be facilitating or assisting the learning activity and having learner-centered pedagogy, one can not say that teacher as mediator does not have the descriptions of *asking, answering, speaking, explaining/teaching, competency* or *being subject expert*. The NCSM requires teachers to have all six generic identities discussed in chapter two, of which ‘being mediator’ requires the most fundamental shift from the old to the new identity (Jita & Vandeyar, 2006). Therefore examining the teachers’ identities in practice from this perspective is the key aspect of the study. Therefore I want to explore and discuss the “being mediator” role in depth.

As indicated earlier in chapter two, teachers are not recommended to play a central role in the new teaching approach in South Africa. The traditional expected role of the teacher has changed since the implementation of the new curricula since 1997. As Jansen (2001) observed, the NCS demands that teachers should change from portraying the all-knowing, transmitters and presenters of knowledge to becoming mediators and facilitators of the educational experience. Being a ‘mediator’ requires teachers to establish an educational environment in which learners take responsibility for their own learning by discussing, exploring and being more active in the learning process, rather

than being passive receivers of knowledge. This new mediator role (I/P-Identity) of the teacher, expects the educator to be a kind of bridge between learners' prior knowledge and new knowledge by letting the learners try to see if they can learn new knowledge with/without a little help of the teacher (Nieman & Monyai, 2006). While mediating learning the teacher should be addressing the "telling dilemma" whereby a decision has to be made as to the extent he or she should provide information to the learners. Consequently, the teacher is ideally sensitive to the learners in terms of their needs and deficiencies, and adopts new teaching strategies to create a new friendly environment.

Another important aspect of being a mediator is to not generate solutions for the learners. Instead, the teacher will first allow the learners to try to solve a given problem. If the learners need guidance, then the teacher may illuminate the problem in a way that the learners can understand, to help the learners further explore the problem themselves. Being a mediator also requires the teacher to provide an environment which encourages good communication between learners. Since the desired teaching approach to be used in South Africa, as outlined in the NCS, is learner-centered and outcome-based, the teacher should promote a collaborative and interactive learning environment.

It is apparent from both Table 3 and Table 5 that only 3 learners (7.9%) imagined their teachers as an assister and consequently displaying aspects of a learner-centered pedagogy (5.3%). After above mentioned two paragraphs about being mediator role of a M teacher, I found only two DAMT Test meeting these expectations even though as a mediator, the teacher might also communicate which includes explaining, speaking etc. This indicates that the identity of the teacher as a mediator, according to the learners, is not the main teachers' identity. Being described as having teacher-centered pedagogy by 94.7% of learners in the study confirms that teachers are still seen to have 'chalk and talk' role, rather than a mediator role. Strongly linked to this identity is the teacher's one-way (teachers to learners) communicator role, as described by 94.7% of the learners. Therefore, it can be argued that most of the above-mentioned aspects of being a mediator were not present in the data from this study. Therefore, it can be argued that most of the teachers have not changed their traditional pedagogic identities. This result has similarity

with previous studies (Naidoo & Parker (2005), Jita & Vandeyar (2006), and Manson & Mwakapenda (2007)) which show that teachers' personal and traditional pedagogic identities and teachers' official and new expected identities in terms of being a 'mediator' do not correspond fully, and reconstruction of teachers' expected identities is still in progress.

Although Table 3 which was driven from Table 2 does not explicitly describe teachers as being '*interpreters and designers of learning programs and materials*', some of the descriptions of teachers implied, such as being *competent*, *subject specialist*, *concerned*, *asking*, *answering*, *speaking*, and *explaining* (See Table 6) suggest that this is the case. In order to interpret and design the learning programs, teachers should first have the knowledge of where competency, being subject specialist and concerning descriptions are relevant. Secondly, interpretation and designing only happens through communication where asking, answering, speaking and explaining descriptions are related. For instance, in order to interpret or design the learning programs or the materials, teachers must be competent enough and communicate in a proper language of instruction to the learners. According to the inductive analysis of Table 3, Table 5 implies all drawings had teachers having a communicator role. If the teacher communicates or interprets mathematical knowledge to the learners effectively, the teachers are being called *subject expert* by the learners. Conversely, a couple of learners pointed out in the interviews that communication problems existed between teachers and learners (L13 in 10A) and mentioned that the teacher seemed to be speaking in Chinese. Furthermore, in the interview with L4 in 10A (will be explained in interviews section), the learner explained that the teacher in his drawing was emphasizing the importance of '*conceptual understanding*' and '*procedural fluency*' to the learners. As part of having an identity of being interpreters and designers of learning programs and materials, teachers are supposed to make sure that teaching is not about only '*interpreting and designing*' but also it is about having learners see connections among concepts and processes and reproduce the knowledge in the given context. Therefore, it can be said that teachers being '*interpreters and designers of learning programs and materials*' identity was present in the data.

Another important aspect of being a teacher in the NCSM is to be a '*leader, administrator and manager*' in the classroom. Although all three concepts have not presented in Table 2 implicitly, there were many descriptions related to these roles of M teachers. In order for a M teacher to administer, lead or manage a mathematics teaching/learning activity, the following roles or descriptions should be present: *concerned, caring, committed, disciplining, competent, motivating, assisting, explaining, and speaking*. All of these are inter-related descriptions in terms of teachers being leaders, administrators and managers in the classroom. For instance, in order to be a leader, administrator or manager of the classroom, teachers need to communicate with the learners which include the descriptions of explaining, speaking, assisting, motivating etc. According to L15 teachers having eye-contact with the learners help them to have better classroom management where L15 describes the teacher as 'efficient'. Whether lesson is teacher or student centered; the teachers' administrator role was present in all drawings. Moreover, if Table 3 is considered in terms of having these descriptions, it is clear that all drawings have the roles of being leader, administrator or manager. Being manager is mostly understood as discipliner and controller of the classroom by most of the teachers even though it is much more. Being manager of the classroom requires teachers to be 'on top' of everything in the classroom, which includes managing the classroom context, learners' behavior, educational activities, communication through/between learners and much more. This identity of the teacher is not new: teachers were required to have this identity in the old curriculum too. Therefore, I suggest that the third teacher identity described in the NCSM document is demonstrated by the teachers referred to in the study.

There is no clear data specifically referring to teachers as *researchers* and *lifelong learners*. However, I argue that some of the descriptions made by the learners may be related to this identity. Teachers being subject experts, competence come from teachers being lifelong learners. This point is also supported by Manson & Mwakapenda (2007) where they emphasize that teachers should be life-long learners to improve their teaching skills in order to meet learners' expectations and educational policy documents. In other

words, teachers are expected to be life-long learners and researchers to find ways to improve the teaching and learning process, so that all learners can be accommodated. Therefore, the identity of being researchers and lifelong learners is not clearly demonstrated in the classroom practice, according Table 2 and Table 3.

Another important identity of the teacher described by NCSM policy document is to be *community member, citizen and pastor*. Teachers are expected to promote social values and develop responsibility to the community besides teaching. Although there is no clear mentioning of this identity in the Table 2 and Table 3, the following excerpt from interviews with L4 from 10A indicates that their teachers promote these values:

39. HB: Other than maths do you learn some other things from maths teacher? Other than maths?

40. L4: Other than maths. (pause) Like, like subjects sir, other than maths?

41. HB: Might be anything.

42. L4: Also we learn how to behave as well.

The learner in the excerpt said that ‘we learn how to behave’ This comment indicates that the teacher(s) to whom L4 refers do not only teach subject matter, but also attend to community values. Teachers are projected in the NCS as ‘*be[ing] with*’ and ‘*be[ing] one of*’ the community. There is no other indication besides this interview excerpt that the teachers in the study have an identity of being community member, citizen and pastor. Therefore I argue that this identity is not perceived as much as expected in the NCSM by the learners.

The NCS is based on OBE (Outcome-Based Education) which requires teachers to *assess* whether the learners have achieved the planned outcomes or not at the end of a learning period. This, in turn, requires teachers to be *subject specialists* in order to know what to assess and set standards that are reachable by learners. The NCSM policy document explains further:

‘Teachers’ assessment of learners’ performances must have a great degree of reliability. This means that teachers’ judgments of learners’ competences should be generalisable across different times, assessment items and markers. The judgments made through assessment should also show a great degree of validity; that is, they should be made on the aspects of learning that were assessed. (pg65)’ (Department of Education, 2003)

Therefore, assessments designed should demonstrate teacher’s being subject specialist and assessor, but it is the teacher who is responsible for this to be done correctly.

Although a teacher as assessor is not demonstrated explicitly in Table 3, Table 6 and Table 7, being subject expert is demonstrated by 8 learners (21.1 %). Besides being subject expert, the following descriptions were relevant to being subject specialist and assessors: *competent, concerned, caring, committed, asking, answering, explaining, and speaking*. Although competency and being committed may be easily seen in relation to the teachers' subject specialist identity, I want to focus on *asking, answering, explaining and speaking* from another perspective. While teachers are *explaining* subject matter they are also often informally assessing learners' understanding through this communication. They may adjust their explanations in order to improve learners' understanding. If this assessment and adjustment is visible to the learners, and the learners perceive themselves to understand concepts better, the teachers are being called 'good teacher, expert etc.' Therefore, it can be said that according to the learners; teachers had assessors and subject specialist's role.

Lastly, if the fifth category of the Table 2 is considered, what orientations to mathematics are perceived by learners is revealed in Table 7. Fourth column in the Table 2 was focused on what mathematical subjects/orientations were involved in the drawings. Therefore the subjects on the board, what the teacher saying about the subject and the learners' explanation were taken into consideration to categorize the drawings in terms of mathematical orientations.

Table 7: Summary of mathematical orientations

	Maths for Democratic citizenship	Maths as applicable through problem solving and modelling	Mathematical practices-ways of thinking and seeing the world	Maths as structured discipline- conventions and skills	Maths as historically produced human activity
No of DAMT	0	2	3	18	0
%	0	10.5	15.8	94.7	0

Almost 95% of the drawings indicated some form of mathematical orientation four, mathematics as a structured discipline involving conventions and skills to enhance in order to lead to further study was the main concern in the drawings. Only around 16% of

the drawings implied mathematical orientation three, mathematical practices that are a way of seeing and thinking of the world from mathematical perspective. And lastly mathematical orientation two was perceived by almost 11% of the learners that mathematics is applicable to the real life through problem solving and modeling. First and fifth orientations were not present in the drawings. While 26 of the drawings (68.4%) were about pure FET subjects, only 12 of the drawings (31.6%) were about both FET and GET subjects. We can draw two conclusions from these facts: Firstly, Table 7 indicates that although first and fifth orientations, mathematics education for critical democratic citizenship and mathematics as indigenous knowledge system, were new focused orientations in the NCSM, Table 7 confirms that those orientations were not perceived by learners. Therefore, it can be concluded that teachers failed to meet this expectation as interpreters and designers of the learning programs where Parker's (2006) study agreed to the same fact. Moreover, it is significant to compare teacher-centered pedagogy by 94.7% (See Table 5) and mathematics orientation four by 94.7% (See Table 8), and learner-centered pedagogy by 5.3% and mathematical orientation two by 10.5%. This comparison agrees on the study of Naidoo and Parker (2005) where they indicated the relationship between teachers' personal and official pedagogic identities opposed each other because teachers' personal identities fall into absolutist subject philosophy of the subject identity (See chapter two). Secondly, all the drawings represented FET mathematics classroom. Therefore, it can be said that learners visualized their FET mathematics teachers which is important for the validity purpose.

Now I want to unpack some of the perceived identities and descriptions of the teachers by analyzing four interviews.

5.3 INTERVIEWS

In this session I want to focus on four interviews. Although the interview data had variety of generic and subject specific identities of M teachers, the following concepts are the main focuses in the interviews: teachers as communicator, teachers as accommodator, teacher-centered pedagogy, and learner-centered pedagogy.

5.3.1 Analysis of L13's Interview

Teachers as communicator

L13's response to the DAMT task was as follows:

10. L: What's going on is that sometimes in maths, it's you know maths is one of the hardest subjects in South Africa. Most learners find it, maths is the hardest. So sometimes when the educator is teaching, it's as if the educator is speaking Chinese. So what apparently happens is sometimes the students are too afraid to ask and some just for the sleep. That's why half of the time they fail.

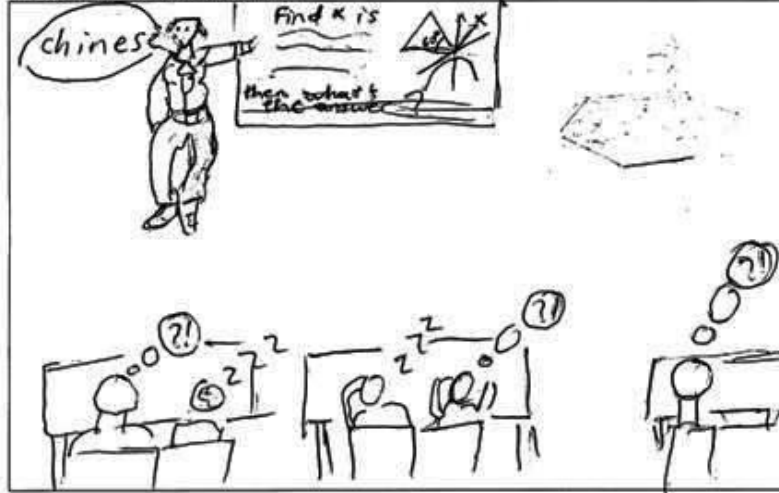
In Figure 7 and the interview extract the learner emphasized communication problems between the teacher and the learners. The subject that the teacher was trying to teach is like a foreign language to the learners and the teacher was not aware of the situation. The drawing, the learners' explanation and the interview with the learner point to the same theme of '*communication*' problems. L13 describes mathematics as one of the hardest subjects. It is like speaking Chinese. Understanding both mathematics and Chinese are viewed as difficult according to L13. The following excerpt also strongly supports this point (HB = interviewer):

23. HB: Can you open this Chinese thing to me more about why did you describe by Chinese?

24. L: Chinese is one of the most difficult languages to learn and it is one of the hardest to understand so if somebody is speaking English and another is speaking Chinese, there is no communication. There is no understanding. That's why I chose Chinese.

Teachers are the *communicators*, therefore as communicators they have to find out a way to explain mathematics in a 'language' that the learners can understand. The emphasis here is that teachers are supposed to be aware of learners' level of knowledge and understanding. If the teachers do not try to teach the especially hard subjects like mathematics in a proper language of instruction, then it is almost impossible for the learners to understand. In L13 words; half of them will only have the question mark in their mind and be afraid to ask questions, and the other half will lose the interest and some will fall asleep. Thus, according to L13 two subject specific identities, being *communicator* and *accommodator* are not perceived by M teacher in the drawing.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

Sometime lenders don't understand
Not because the teacher can't teach
but because the teacher is just
a bit too fast and it's as if the
teacher is speaking Chinese
and does take time to see
if ~~we~~ understands
maybe if the teacher was
just a bit ~~more~~ then things
might be better

Figure 7: L13's drawing

In the following excerpts, L13 pointed out some other descriptions of a mathematics teacher.

47. HB: And I don't see actually at the beginning you mentioned that, it is in their mind these question marks but none of them is.

48. L: It's raising their hands.

49. HB: Yeah. What was the point that you draw like that?

50. L: Because sometimes it is not like it's the teacher for but sometimes the teacher also gets *stresses* being asked the same questions over and over, and ends up becoming *irritated*. So one thing the learners never want is to irritate the teacher. So keep it up, close it up in their minds, sometimes if one learner ask the question, and you explain it better to that learner but the other, next one also doesn't understand the question, it would be very *frustrating* for the teacher to tell the same explanations over and over. So that's why learners sometimes become a bit afraid to ask the question, the same question.

Although the main theme of this interview is teachers as communicator, the following descriptions are about teachers' emotional identity: *stressed*, *irritated* and *frustrated*. According to L13, if the teachers are perceived to be *stressed*, *irritated* or *frustrated* because of repeating the same explanation over and over, then learners end up feeling afraid to ask questions even though they do not understand the topic. Therefore teacher should be aware of his/her emotions as communicator in order to have a healthy communication with the learners. The following excerpt indicates that learners do not learn the subject only from teachers:

63. HB: Are you only learning mathematics from the teacher?

64. L: No, sometimes like myself I sometimes find it easier to ask somebody that understands better to explain like maybe the whole chapter better to me. Hence I get a better explanation since he is my friend I become more relaxed and I learn much better. So, no I won't say it only the teacher helps even some of the bright student if they have friends.

This comment also gives insight into the teachers' identity, where if teachers can achieve being more *approachable* to learners for communication purpose, then the learners can learn more from the teachers. When teachers are *approachable*, the learners can be more relaxed and ask questions if they do not understand the subject, instead of being afraid to ask the questions.

The last point from the interview is that teachers are worried about not fully covering the syllabus, but they are not worried if the learners do not understand the subject. In the following extract this point is clear:

69. HB:... Can you tell me more about this "if the teacher was just a bit slower than things might be better"

70. L: Better. Sometimes this such little time in the year so that they carry out teacher, if the teacher was to cover everything, sometimes they like just pass on it. They, I wouldn't say do a rush job but they are a bit faster when any let's just say in ten chapters, only the learners would understand two or maybe ten. And these two the teacher went faster on it. Because there is such a need to cover everything, sometimes even though the learner does not fully understand, the teacher just moves on the next subject. So the learner still becomes clueless in the last subject before going to the forward.

L13 emphasizes in the extract that teachers try to teach everything in the syllabus even though the learners do not cope with the syllabus. So, the teacher as a *decision maker* should address the dilemma by deciding whether to cover the syllabus or not. According to L13, the teachers' choice should be on the learners' side, and teachers must make sure the learners understand the subject. The last point of L13 suggests that M teachers as a communicator, interpreter and designer of the learning activities should consider individual needs since the level of understanding for each learner might be different. '*Because there is such a need to cover everything, sometimes even though the learner does not fully understand*' excerpt emphasizes that learners feel pressured because of the teacher's concern about covering the syllabus although some of the learners don't understand the subject. According to L13, nurturing behavior is absent where teacher's ability to break the knowledge down, present it in such a way that the students can understand it and assimilate it. That is, awareness of the mental and emotional levels of the learners is critical. Therefore, being a communicator is an essential identity for a M teacher in teaching mathematics.

5.3.2 Analysis of L4's Interview

Teachers as accommodator

L4's response to the DAMT task was as follows:

6. L4: Students come to the class with some knowledge they need to learn. Like the question marks in their head, sir.
7. HB: Okay
8. L4: And the teacher has the information. Now the teacher has to pass the information to the students. And it shows here sir that 70% of understanding sir plus 30% of solving lead to straight passing.

There are two key points from the above excerpt: firstly, L4 believes that in order to accommodate to learners, teachers should be *experts* in their subject. This can be seen from the statement: '*the teacher has the information*'. Secondly, when L4 commented that '*... 70% of understanding sir plus 30% of solving lead to straight passing*', it brings to mind the 'conceptual understanding' and 'procedural fluency' strands of mathematical proficiency, as described by Kilpatrick, Swafford & Findell (2001).

According to Kilpatrick et al (2001) conceptual understanding may be described as ‘*comprehension of mathematical concepts, operations and relations*’ (p. 116). The mathematically proficient learner showing conceptual understanding at any level will have an integrated and functional grasp of mathematical ideas. Also, having conceptual understanding helps the learner to avoid many critical errors in solving problems; because he or she sees connections among concepts and procedures. Procedural fluency is described as ‘*skill in carrying out procedures flexibly, accurately, efficiently, and appropriately*’ (p. 116). It is concerned with applying procedures flexibly, accurately and appropriately. Therefore L4’s statement, ‘...70% of understanding sir plus 30% of solving...’ may be interpreted as speaking about conceptual understanding and procedural fluency. Therefore, L4 emphasized that the teacher’s identity shaped his approach to mathematics or another saying; teacher shaped his way of thinking towards mathematics to *accommodate* learners.

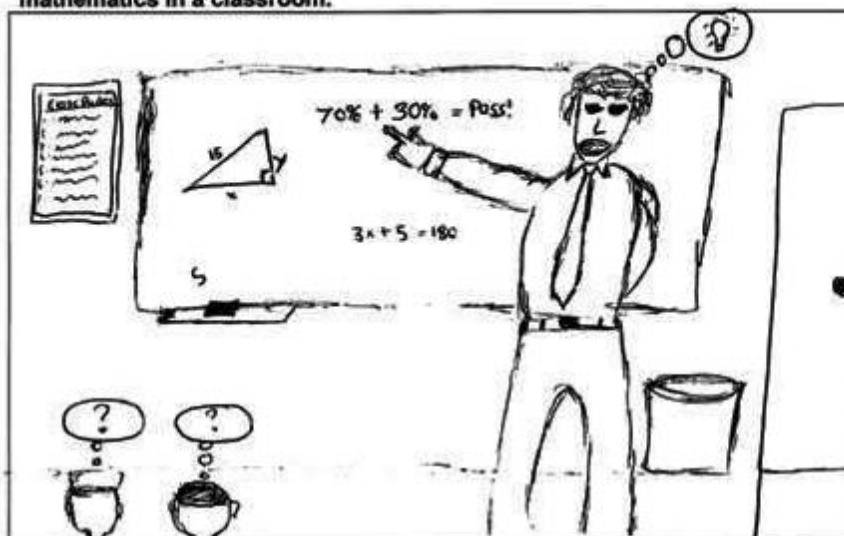
Moreover teacher’s description revealed in the following excerpt is that teachers are *subject experts* and have *knowledge*:

17. HB: Okay, I see the teacher is, there is a bulb here. What is this?

18. L4: Like I said earlier sir, the teachers have the information in like his ideas; now they need to take it to the students and the students here have question marks in their head. So like at the end of the class, the students will be having light bulbs as well. Yes that shows full understanding.

Teachers are seen as possessing knowledge. L4 expresses the teacher as *the subject expert* or *the knower* with a “light bulb”. Students are seen as not having the knowledge. The use of the question mark seems to indicate that apart from not having the knowledge, students have questions to ask. The answers must come from the teachers so that the result will be that students will have knowledge. When they have knowledge, they will have ‘light bulbs as well’. Having knowledge is compared to having a light bulb. This idea of a light bulb is important as it can be associated with students being in a new position in which they are able to see, given that it may not be possible to see if there is no light.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

This shows that through understanding students will gain knowledge, for they have none, but the teacher can help them out. The question marks represent students not understanding and bulbs shows the teacher knows, and therefore can give the teaching further.

And Best equation:

$$\begin{array}{ccccc} 70\% & + & 30\% & = & 100\% \\ | & & | & & | \\ \text{understanding} & & \text{solving} & & \text{pass} \end{array}$$

Figure 8: L4's drawing

Lastly, the following excerpt from L4 gives indicators about the teaching pedagogy of the teacher:

29. T: What is teacher's method here in maths classroom?

30. L4: Well, in maths classroom we, it is not just the teacher; it is based on the students mainly. So the students do the thing, well the teacher write on board, gives us a few examples, and then we do our own examples while learning...

Although Figure 8 gives an impression that the lesson is a *teacher-centered* one where teacher is at the center of teaching next to the board and learners are listening, this impression contradicts with '*in maths classroom we, it is not just the teacher; it is based on the students mainly*' which indicates the lesson is rather a *student-centered* one and the teacher is a *mediator* of the lesson. '*So the students do the thing, well the teacher write on*

board, gives us a few examples, and then we do our own examples while learning. (Pause) Well other classes they just give us papers, we do it on papers, we don't do it on the board' the excerpt shows that according to L4 the teacher is facilitating the learning activity where the teacher is giving some examples to guide the learners and allowing the learners to try to solve a given problem.

5.3.3 Analysis of L21's Interview

Learner-centered pedagogy: OBE type of teaching

L21's drawing and explanation shows that one of the learners is solving a homework question on the board. The teacher is assisting one of the learners who struggled with the homework while the other learners correct their homework. L21 explains further:

- 14. L: She selects one then or another learner or a volunteer to answer the homework questions.
- 15. HB: Okay.
- 16. L: With questions while she is checking the homework. And one of the learner is trying to do homework, she assist the learner.

The drawing and above excerpt emphasizes one of M teachers' identities – that of being a *mediator*. From the description that L21 gives, the lesson appears to be learner-centered. The teacher facilitates the learning process by letting learners be active in their own learning. The teacher as *mediator* and *assister* of learning, rather than being at the center of learning are two main characteristics of OBE type of teaching (Department of Education, 2003, 5). Later on L21 emphasizes that the teaching method is *effective*:

- 10. L: ... So I am so used to her and the system of teaching like this. And I feel like it helped me and all the learners because so far first term we were struggling with maths and everything. And second term she changed the style of teaching and it benefited us a lot. And now we understand a bit more.
- 36. L: I would say our math lesson is effective. Sometimes we don't do so much examples and exercises but from the exercises we have done we can simply understand what we need to do and theories that we need to do.

From this learner's description it may be understood that the lesson is based on understanding and not practicing large numbers of questions, in accordance with the requirements laid out in the NCS. The learners are at the center of learning. According to

L21, the learners benefit more when this teaching approach is used. The following excerpt tells more about this particular teacher's approach.

38. L: Okay; the teacher goes in the class, greet us and everything, some of the learners would be noisy but some of the learners will stop the noisiness from making noise. Then we start by sitting and everything, greeting her, how is she and everything. And after she asks if we have done homework. The person haven't done the homework usually is the one who will be demerited or the person who has the explanation. The explanation is that he does not understand or she asks why he did not ask his friends. But anyway the teacher will come to the learner who done the homework and she will ask you from the exercises done which exercises you did not understand.

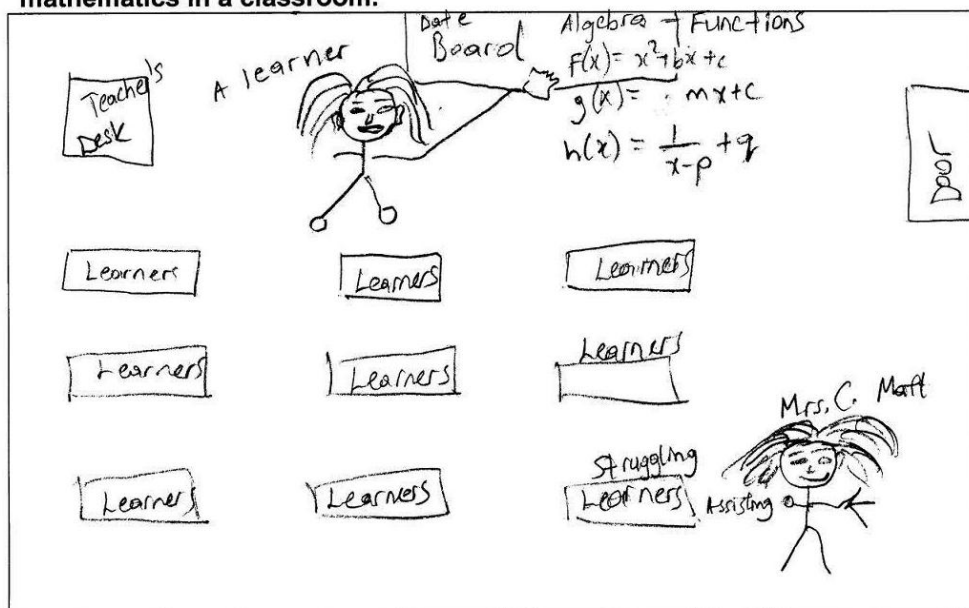
There are three important descriptions coming from this excerpt. Firstly, the learner emphasized that the lesson has a homework session either *giving* or *checking* homework. Secondly, the teacher *encourages* the learners to engage with other learners if they cannot do the homework. Lastly, the teacher is a *helper* if the learner gets stuck with the homework. All three descriptions collaborate with learner-centered pedagogy.

In the following excerpt, the teacher is the *manager* of the learning and using the learners as a teaching resource:

.....
48. L: Okay, the learners who actually understand what they're doing, Mrs. Cathy tells them to go ahead with other exercises leaving the students who are struggling behind. But she later covers learners who are struggling with ones who are front. The ones who really understand more often after school Mrs. Cathy will ask them to teach others and then the following day we will be on the same page. And we will get to understand the same day. And then she will test us with the tests.

She *manages* the teaching very well in terms of *balancing* the stronger and weaker learners. The stronger learners continue with the subject while the teacher works with the learners who struggled with the topic. She also uses the learners as a teaching resource by having them help each other. Thus, L21's drawing and interview confirms that the teacher has mainly assister and facilitator role in the class. Consequently, the idea of the teacher as a mediator of the teaching experience which we can call learner-centered pedagogy is present in this context.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

The educator is checking the homework. A learner was selected by the educator, to solve one of the ~~same~~ equations. One learner is struggling, The educator is there to help. At same time the other learners are correcting their homework. Everyone benefits from her style of teaching.

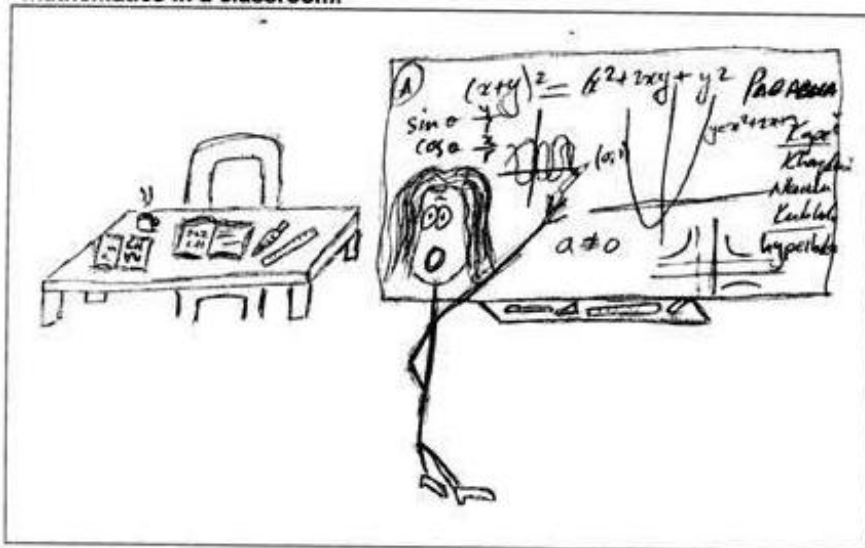
Figure 9: L21's drawing

5.3.4 Analysis of L38's Interview

Teacher-centered pedagogy

L38's drawing includes three objects: the teacher, the board and the teacher's table. The teacher is doing revision of functions and their graphs. It seems the lesson is a teacher-centered one – no students are present in the drawing. L38 also explains that the names written on the right side of the board are people who were disruptive during the lesson. There are some textbooks, an open book, a pen, a ruler and a coffee cup on the table.

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

Revision of Parabola and functions
in Mathematics, as the exams
approach. Explanations of Graphs (functions)
The names on the board are students
who are talking during the lesson.

Figure 10: L38's drawing

When I asked L38 to explain the drawing, he said that:

14. L: The drawing well, this drawing is representing, you know, our maths teacher. How the teacher is so determined and explaining the lesson. Because, you know, sometimes the teacher, they don't want to leave the students unattended to. So the teacher tries to attend so many topics at once, trying to satisfy the students' desire.

15. HB: Okay.

16. L: So it is representation of the striving of the teacher, of the dedication of the teacher to the job or her job.

According to L38, the teacher is a *determined, dedicated* and person who *strives* to teach well. The following sentence was interesting: "So the teacher tries to attend so many

topics at once, trying to satisfy the students' desire". Firstly, L38 emphasized that the teacher tries to attend so many topics at once. Secondly, the teacher also tries to satisfy the learners' expectation – the meaning of which is unclear. Do the learners expect many subjects to be covered at once, or do the learners expect to understand the topic? The following excerpt shows that since the exams were coming up, the teacher was trying to attend to and revise the topics as much as possible. In the following excerpt, the learner explains why there are no learners in the drawing:

43. HB: Alright, I don't see any students in this classroom. Is she just talking to herself or?

44. L: No, not talking to herself. Now the emptiness of the class, this symbolizes for me, the hard, the hard topic of maths, you know how difficult mathematics can be sometimes. So this emptiness represents for me the emptiness of mind of the students, do you understand? The students maybe clueless of the topic, they did not understand anything. That's why the face expressions, the eyes, the mouth you see like she is stressing too much to express the students but, because the students are empty, you see. They don't understand that's what the emptiness symbolizes.

45. HB: There is no parti..?

46. L: There is participation but you see because of the students have gone blank; it was a difficult topic so there is no clue over.

47. HB: What to ask.

48. L: What to ask, not to ask, you understand?

L38 describes emptiness of the class by the '*emptiness of mind of the students*' where the subject is too difficult for the learners to understand. Therefore I see conflict here in terms of '*the students' expectation*' and '*not understanding the subject*' from the drawing and the previous excerpt. From this conflict another question arises: Although the teacher is committed and dedicated to her subject, has she achieved the goal of learner understanding? Even if L38 appreciates the teachers' effort, it seems he still has the impression that mathematics is very difficult. The extent of teacher commitment does not seem to change the possibility that most of the learners will not understand the mathematics. Therefore, being committed and dedicated is sometimes not enough; the teacher should cover the work slower so that the learners can understand. Thus L38's explanation and the drawing indicate that the teacher has teacher-centered pedagogy.

5.4 CONCLUSION

In this chapter, I have analyzed DAMT Test and interviews in order to identify common themes and patterns in terms of teachers' identities from learners' perspectives. Firstly pre-determined descriptions of DAMT Tests (Table 2) were analyzed to reach common descriptions of M teachers (Table 3), Thereafter the common descriptions analyzed inductively to identify what type of themes were describing teacher's identity (See Table 4 and Table 5). Pre-determined themes from chapter two, more specifically teachers' generic and subject specific identities are sought in the data and applied to Table 6 and Table 7. While it was possible to analyze the data inductively and reach a certain percentage, it was not possible to number and percentage typological analysis results since there were a lot of overlapping descriptions. Therefore, Table 6 and Table 7 were analyzed and discussed in more general rather than specific terms. Although some of the pre-determined identities from NSC policy documents and related articles were present in the classroom practice, some of the expected identities for instance being mediator were not sufficiently represented in the practice. Moreover Table 8 identified the relationship between teacher's identities and mathematical orientations represented in the data. Lastly, four common themes from Table 4 and Table 5 were sought in the four selected interviews data. In this chapter, I mainly tried to address the second research question that is how pre-determined teachers' identities are demonstrated in the practice from learners' perspective. In the following chapter I will conclude these findings from chapter two by summarizing the findings and making recommendations for further study in M teachers' identities.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of findings

The purpose of the study was to investigate the extent to which teachers' identities in policy documents compared with those of classroom practice. In order to elicit teachers' identities from policy documents and related literature, firstly a literature review was done to illuminate how teachers' identities are described according to NCSM and recent research studies. Secondly, grades 10 and 11 learners were given a DAMT Test and semi-structured interviews in order to explore how pre-determined identities of the teachers are demonstrated in the classroom practice. Now, it is time to summarize all these findings and if possible to reach some conclusions.

6.1.1 Critical research questions and concept of identity

The following critical questions guided the study:

- a) How are identities of mathematics teachers described in the new mathematics curriculum policy?
- b) How are these identities demonstrated in practice?

In order to address these two research questions, firstly it was necessary to have a framework for identity. The concept of '*identity*' was mainly considered as a combination of Gee (2001) and Boaler and Greeno (2000) approaches. Teachers were who they were because of their positions in the school context which was named as I/P-Identity. Since identity is a complex phenomenon which is a result of both individual agency and social context, it is not meant only teachers' self or N-Identity, but especially those teachers' I/P-Identities in the school context. Moreover, I/P-Identities of a M teacher is developed through engagement, imagining and aligning their new roles in the NCSM.

a) Identity in policy documents and related articles

Teacher Identity in policy documents and related articles was explored in chapter two in detail. According to the NCS, teachers are supposed to have the following six identities:

mediators of learning, interpreters and designers of Learning Programs and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists (Department of Education, 2003, 2).

Moreover, this document also expects mathematics teachers to be qualified, competent, dedicated and caring. Considering these identities, Jansen (2001) stated that being '*mediators of learning*' is central to the new South African Education policy. Teachers are required to shift from the previous role of all-knowing, transmitters of knowledge to being mediators and facilitators of learning. Even though teachers are leaders, administrators and managers of learning, they are also supposed to empower learners in terms of being in charge of their own learning.

Naidoo & Parker (2002) investigated the implementation of Common Tasks for Assessment (CTA) and teachers' attitudes towards this implementation. Their research revealed that tension exists between teachers' personal pedagogic identity and teacher's official identity. Jita and Vandeyar (2006) emphasized that in order to achieve the new '*face*' of the NCS in terms of transformation of the existing teacher-centered teaching approach to a student-centered and outcome-based approach; teachers need to reconstruct their identities. Both studies focused on the General Education and Training (GET) band, whereas this study investigated teacher identity in policy and practice in the Further Education and Training (FET) band.

Although NSCM characterizes M teachers to have facilitation, accommodation and classroom management roles, these roles were not elaborated in the NCSM and left different interpretations (Parker, 2006). Moreover, according to Parker (ibid) adopting and implementing these new orientations to mathematics into the practice is a big challenge for teachers. Therefore, Parker (ibid) agrees on the previous studies (Naidoo & Parker, 2005, Jita & Vandeyar, 2006) which indicate that implementation of the new NCS to the practice for teachers require major change in teachers' identities.

Manson and Mwakapenda (2007) categorized teachers' pedagogic identities into two groups: traditional and new expected. Their study confirmed that tension existed between

the two identities in policy and practice. More specifically, according to Manson and Mwakapenda, teachers ‘chalk and talk’ and being ‘transmitter of knowledge’ identities were transferred into ‘discussion-based and outcome-based’ and being ‘mediator of learning’ identities. One can conclude from above mentioned studies that reconstruction of official teachers’ identity is not completed and is still in progress. Because changing one’s identity is not an easy process.

b) Demonstrated teacher identities in practice

The first research question required me to investigate the six teachers’ identities outlined in the NCS document. Firstly, I explored the existence and meaning of these identities using DAMT Tests semi-structured interviews. I reached the conclusion that although these pre-described identities are not explicitly present in the data, there are a lot of learners’ descriptions that can be related to. Since, it was difficult to build one-to-one relationship between pre-determined typologies and learners’ descriptions, the DAMT Tests were preferred to analyze inductively in order to observe demonstrated or perceived M teachers’ identities according to the learners. Figure 10 summarizes these perceived teachers’ identities:

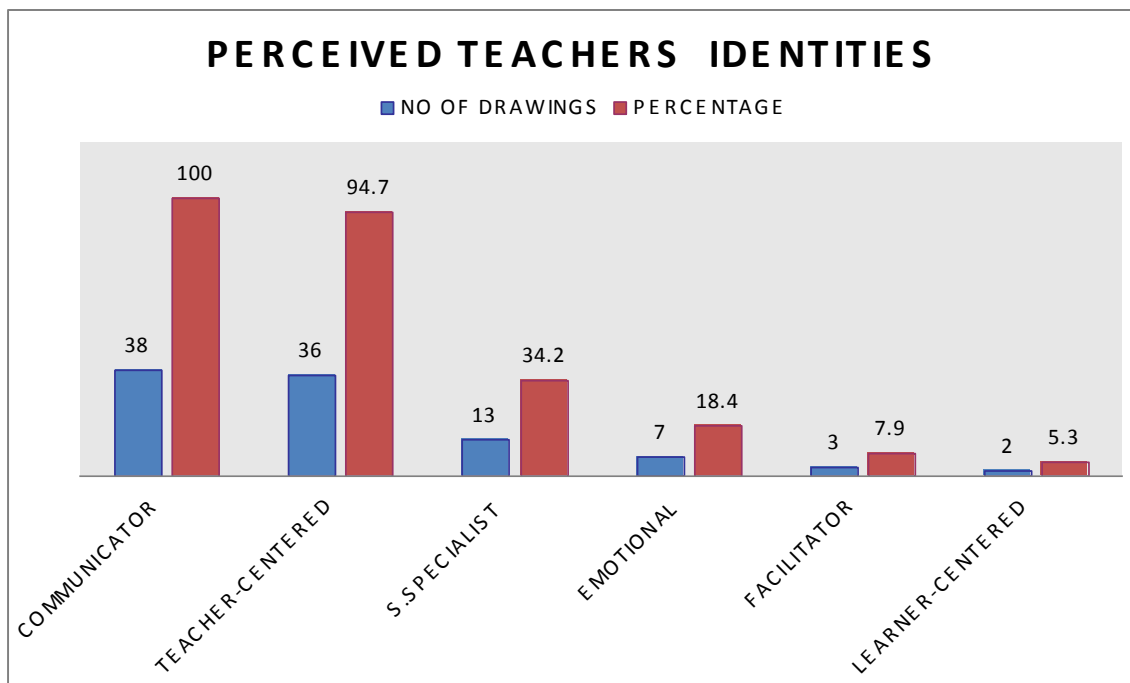


Figure 11: Perceived teacher identities from Table 5

Although, being a mediator is the main expected identity in the new policy documents and related articles, it is apparent from Figure 10 that only 7.9% of the drawings indicate teachers as facilitator and 5.3% of the learners in the study described teachers having learner-centered pedagogy. This showed that teachers currently do not have a mediator identity predominantly as part of their perceived identity. Moreover, it is clear from Figure 10 that all of the learners described teachers as being a communicators and 94.7% of the drawings indicated having teacher-centered pedagogy respectively showed that in general teachers have not shifted from a teacher-centered pedagogy to a learner-centered pedagogy. Therefore, it is a significant result as reflected in Figure 10 that although M teachers were not described as communicators and having teacher-centered pedagogy in the NCSM, this is predominantly the case in classroom practice from a learner's perspective. I believe that being 'interpreter and designer of learning programs and activities' and being 'leader, administrator and manager' and also being 'assessor and subject specialist' (See Figure 10) roles are pre-dominantly present in Table 6 (chapter 5, pg10). There was no clear indication of being 'researchers and lifelong learners' and being 'community members, citizens and pastors' in the data, however, some of the descriptions that were mentioned can be related to these identities.

6.2 Recommendations

6.2.1 Recommendations for classroom practice

Teachers carry multiple identities and their I/P-Identity should be pre-dominant in the classroom practice. Teachers should know what the I/P-Identity is in order to be more effective in the classroom, because this identity is recognized as important in our education policy. For instance, teachers should know what being a 'mediator' means and how one can have learner-centered pedagogy.

6.2.2 Recommendation for teacher education

This study has shown that tension still exists between teachers' personal and traditional pedagogic identities and teachers' official and new expected identities in the South African context. Therefore, in order to have practicing teachers move away from being all-knowing presenters of knowledge role to being mediators and facilitators of

educational experiences, they need to attend quality in-service training programs. According to Jita (2006), changing practice, which requires one to reconceptualise knowledge and beliefs, and therefore identity, is not easy or automatically accomplished because it is a requirement. Thus, education of new educators should be based on the new policy, even though most of the present learner-educators learned in traditional school environments. Meanwhile, we can be optimistic about tertiary education faculties which will have new comers at the end of 2008 who will have learned in an OBE system. It should hypothetically be easier for the new intake of learner-educators to construct such I/P-Identities.

6.2.3 Recommendations for further research

Using different research perspectives can enrich understanding of teachers' identities and bring new insights into the debate. Teacher's identities may also be analyzed by involving the teachers themselves, co-workers, parents, administrators, district officials and any other individuals who have any sort of relationships with teachers.

Moreover teachers' identities can undergo shifts as teachers participate in different contexts. Therefore analyzing teachers' identities from only an I/P-Identity perspective does not cover such a complex phenomenon, although the teacher's core identity in classroom practice is the I/P-Identity, As I stated in chapter 2, Gee (2001) describes other teacher identities – namely, Nature (N)-Identity, Discourse (D)-Identity, and Affinity (A)-Identity. These identities should be considered in order to gain deeper insight into teacher identity.

In addition, relationships between mathematics teacher's identity and gender in different contexts can be investigated in more detail.

6.3 Limitations of the study

In order to complete data collection timorously I could only interview four learners. I would like to have held focus group interviews that could have given me a deeper understanding of teacher's identity in classroom practice from a learner's perspective.

Another limitation for the study was my being away from the university and my supervisor. I was transferred from Johannesburg to Cape Town by the trust right after the completion of the data collection. Consequently, I could not be able to discuss my findings with my supervisor face to face.

One other limitation of the study was the relocation of my supervisor to another university. Therefore, I had my communication with my supervisor over internet which postponed my research in terms of getting feedback on time.

And lastly, working in an only boy's school and only looking at teachers' I/P-Identity rather than all identities though I/P-Identity was the core identity in classroom practice was another limitation in terms of generalizability of the study.

6.4 Reflections

I found this study quite interesting and I realized after the completion of my research report there is still much to explore in terms of teacher's identity in classroom practice. Identity is such a complex phenomenon that needs further studies, especially teacher's identity for the future of education.

The study was conducted in the school in which I worked for two years, which made the data collection process easier for me as a researcher. Therefore I would recommend new researchers to undertake their research in their school. Conducting the research in my school also helped me to reach high-quality data since my learners supported me fully in the data collection process.

I also found the transcript process challenging. Although all the interviews I conducted were 6-9 minutes, transcribing the data took a lot of time. An advantage that I had was that the video-camera that I used was able to download the interview videos into the computer directly. Transcribing the videos from the computer rather than the video-

player made the transcription process easier for me. I would recommend to new researchers the use of such technology to record interviews.

Although I planned extensively for this study, I discovered that I needed to make allowances for unplanned circumstances. Flexibility in the preparation of the study was critical for achievement.

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APPENDIX A:

Learners' test

Please answer the following questions as honestly as possible. Your detailed responses will be much appreciated.

Name:

Date:

Class:

1. Draw a picture of a mathematics teacher while he/she is teaching mathematics in a classroom.



2. Explain your drawing in terms of what the teacher is doing.

APPENDIX B:
INFORMATION LETTER TO THE SCHOOL PRINCIPAL

Dear Gurtug Yalvac, Principal of Horizon High School

I am planning to have a research study in Horizon High School in order to complete my Master of Education (Mathematics Education) at Wits University. Therefore, I request permission to carry out this study in your school. This research study is intended to address the following research questions for educational purposes:

-How are identities of mathematics teachers described in the new mathematics curriculum policy?

-How are these identities demonstrated in practice?

Teachers' identities are constructed by policy documents, training and teachers' experiences which are based on school community perceptions. In this study, I will compare the two teachers' identities: first as constructed by the new curriculum policy (NCS) for mathematics, secondly as constructed by learners and the learning community. This comparison will be made through learners' perspectives. Learners will be asked to complete a "Draw A Mathematics Teacher Test" (DAMTT – see Appendix 1). Since OBE is about student-centered education, teachers' identities in practice are likely to be observed from students' understandings and images of their teachers by using the DAMTT tool. Follow-up interviews with learners on their DAMTT responses will be undertaken. The participants will be selected from grade 10 and grade 11 learners. The participants will be asked through an information session if they would like to take part in the study. The participants will be told that the study is for education purposes only and that all the information will be treated with confidentiality and anonymity. The participants will also be told that they are free to withdraw any time.

No risks are anticipated of participants. Tests and interviews will be conducted in a supportive and comfortable way. Firstly, for confidentiality purposes, their mathematics teachers will not be allowed to view any of the learners' drawings. It might be possible that some of the drawings in the learners' diagrams might reflect identities of their current mathematics teachers. In that case, the researcher will be guard against these

being accessed by their teacher. No conversations will be made between the researcher and the teachers in connection with the results and analysis of these drawings. The participants will be given the guarantee that the information collected will not be used for any other purposes except for the study. After the study, all the documents including tests, interviews and audio tapes will be kept securely locked and destroyed after three years from the time of completion of the study. The names of the participants will not be used in the report. Pseudonyms will be used in the reporting and presentation of the data in the final report.

The end results will be reported to the Wits School of Education in the form of a research report for MEd (Mathematics Education). Further reporting of the results will take place in journal and conference publications and seminars.

Please feel free to ask me any further questions related to the study.

Sincerely,

Hakan Basbozkurt

APPENDIX C:
PARENT INFORMED CONSENT LETTER

Title of Research: Faces of Mathematics Teachers in Policy and Practice

Researcher: Mr. Hakan Basbozkurt

Dear Parent,

My name is Hakan Basbozkurt, one of the mathematics teachers and the deputy principle at Horizon High School. As part of my postgraduate studies at the University of the Witwatersrand, I am conducting a research concerned with the way mathematics teachers are described in the curriculum policy. I am interested to find out if what the policy says about teachers actually happens in classroom practice. In order to explore this, I plan to involve learners who learn mathematics in schools. I would like to seek your permission for your child to participate in this study. Participation in the study will involve learners' completing of a short task in which they will be asked to "Draw a picture of a mathematics teacher teaching mathematics". They will also be required to write something about their drawings. I anticipate that this task will be interesting for me as a researcher and mathematics teacher. Therefore, I plan to follow-up some of the learners' drawings with short interviews in which I will request the learner to talk to me about their drawing. These two activities will last for no longer than one hour in total, and will take place at school after school hours so as not to interfere with the regular school program. The interviews will be audio-taped by the researcher and later transcribed for the purpose of data analysis.

I anticipate that your child will enjoy and learn a lot about reflecting on learning mathematics in their classrooms through this task. I do not expect any harm to be caused to them through their participation. All the information I collect from the learners will be kept confidential, and will be seen only by me and the learners concerned. The data will be used for research purposes only, and will be published in journals and conferences,

with your child's permission. The learner will be free to withdraw their participation in the study at any time.

_You are most welcome to let me know if you will be interested in reading about what I have found from the research.

Please feel free to contact me (Hakan 0720404716) or my supervisor (Dr. Willy Mwakapenda 011-7173410) if you have any questions concerning the research at any time.

I look forward to allowing your child to participate in this study. If you are in agreement, please complete the slip below and give it to your child to bring to me.

Thank you very much for your cooperation.

Hakan Basbozkurt

I, _____, parent of _____, hereby agree to allow my child to be a participant of the research to be undertaken by Mr Hakan Basbozkurt. I understand that the purpose of the research is to investigate mathematics teaching in policy and classroom practice.

I acknowledge that

- The aims, methods, anticipated benefits and consequences of the research have been explained to me.
- I voluntarily and freely give my consent to my child to participate in such research study
- I give permission for my child to participate in the drawing task and interview with the researcher.

- I understand that results will be used for research purposes and may be reported in teacher and academic journals.
- I am aware that my child will be free to withdraw participation at any time during the study.

Signature: _____ Date: ____/____/____

APPENDIX D
STUDENT INFORMED CONSENT LETTER

Dear Student,

My name is Hakan Basbozkurt, one of the mathematics teachers and the deputy principal at Horizon High School. As part of my postgraduate studies at the University of the Witwatersrand, I am conducting a research concerned with the way the role of mathematics teachers are described in the curriculum policy. I am interested to find out if what the policy says about teachers actually happens in classroom practice. In order to explore this, I plan to involve learners who learn mathematics in schools. I would like to seek your consent to participate in this study. Participation in the study will involve your completing of a short task in which you will be asked to “Draw a picture of a mathematics teacher teaching mathematics”. You will also be required to write something about your drawings. I anticipate that this task will be interesting for me as a researcher and mathematics teacher. Therefore, I plan to follow-up some of the learners’ drawings with short interviews in which I will request the learner to talk to me about their drawing. These two activities will last for no longer than one hour in total, and will take place at school after school hours so as not to interfere with the regular school program. The interviews will be audio-taped by the researcher and later transcribed for the purpose of data analysis.

I anticipate that you will enjoy and learn a lot about reflecting on learning mathematics in your classrooms through this task. I do not expect any harm to be caused to you through your participation. All the information I collect from the learners will be kept confidential, and will be seen only by me and the learners concerned. The data will be used for research purposes only, and will be published in journals and conferences, with your permission. In my reporting of the research, I will not use any learner’s real names. You will be free to withdraw your participation in the study at any time.

You are most welcome to let me know if you will be interested in reading about what I have found from the research.

Please feel free to contact me (Hakan 0720404716) or my supervisor (Dr. Willy Mwakapenda 011-7173410) if you have any questions concerning the research at any time.

I do hope that you participate in this study. If you are in agreement, please complete the slip below and give it to me.

Thank you very much for your cooperation.

Yours faithfully,

Hakan Basbozkurt

I, _____, hereby agree to be a participant of the research to be undertaken by Mr Hakan Basbozkurt. I understand that the purpose of the research is to investigate mathematics teaching in policy and classroom practice.

I acknowledge that

- The aims, methods, anticipated benefits and consequences of the research have been explained to me.
- I voluntarily and freely participate in such research study
- I am willing to participate in the drawing task and interview with the researcher.
- I understand that results will be used for research purposes and may be reported in teacher and academic journals.
- I am aware that I am free to withdraw my participation at any time during the study.

Signature: _____ Date: ____/____/____

APPENDIX E
PERMISSION LETTER FROM THE TRUST (SEE THE ATTACHMENT)

APPENDIX F
ETHICAL CLEARANCE FROM WITS SCHOOL OF EDUCATION
(SEE THE ATTACHMENT)

APPENDIX G

INTERVIEW TRANSCRIPTIONS

Note: These transcripts are not corrected grammatically and recorded as it appeared during the interviews.

Time: 11 minutes

L4 INTERVIEW

1. T: Okay, good afternoon, welcome L. See you have got a very interesting drawing here. And the reason we are doing this interview is I want to know more about your drawing. Because it is very valuable drawing that you put here, your drawing and your explanations here. Just I want to know more about that okay? Just to refresh your mind, please just have your time, look at the picture and refresh your mind. When you are ready, I will start asking questions.
2. L4: Okay
3. T: You are ready? Tell me about your picture.
4. L4: Okay, my picture here sir, it shows that students..
5. T: Loudly please.
6. L4: Students come to the class with some knowledge they need to learn. Like the question marks in their head, sir.
7. T: Okay
8. L4: And the teacher has the information. Now the teacher has to pass the information to the students. And it shows here sir that seventy percent of understanding sir plus thirty percent of solving led to straight passing.
9. T: That's the thing.
10. L4: The main idea.
11. T: I see also hhhhh something here. What is this?
12. L4: That's part of the class which they added in; let me see, I think last term. The school rules, the class rules of the class, the things that need to be done in the class. Okay sir.
13. T: All right. Tell me what part of the classroom is here?
14. L4: What part of the classroom?
15. T: Yeah.
16. L4: Also, that's the board. When things that we do in the class, like recently in the class from grade 8 now until grade 10, things we have done in the class. And this 70% and 30% of 70% of understanding and 30% of solving leads to 100% pass is my understanding of things we do in the class. Yes, that's it.
17. T: Okay, I see the teacher is, there is a bulb here. What is this?
18. L4: Like I said earlier sir, the teachers have the information in like his ideas; now they need to take it to the students and the students here have question marks in their head. So like at the end of the class, the students will be having light bulbs as well. Yes that shows full understanding.
19. T: So this is just, is this going to happen just in here?
20. L4: What do you mean? In the maths classroom?
21. T: In the maths classroom.

22. L4: Well, it happens in the maths classroom, but in the maths classroom only. But in some classes it happens sometimes.
23. T: But I mean the maths part. I mean do the learners wanna learn in maths classroom during the lessons?
24. L4: Not only in maths lessons. They do learn in other classrooms.
25. T: What do you mean? Can you open that up for me?
26. L4: Like in for example in English as well sir. Students learn when the teachers also talking but the other subjects the teachers don't go into the lessons of the subject as such. They just give us papers and then we learn. In maths classroom like we do stuff on the board and we do stuff to for ourselves. Other classrooms we do stuff on the paper, we hardly write on board.
27. T: Is that the reason the subjects are different or maybe maths is different than other subjects? Is that the reason we learn together or?
28. L4: I think it depends on the teachers' teaching method. So that the students can understand.
29. T: What is teacher's method here in maths classroom?
30. L4: Well, in maths classroom we, it is not just the teacher; it is based on the students mainly. So the students do the thing, well the teacher write on board, gives us a few examples, and then we do our own examples while learning. (Pause) Well other classes they just give us papers, we do it on papers, we don't do it on the board.
31. T: Okay. If you look at the question "draw a picture of mathematics teacher while he/she is teaching mathematics in a classroom"
32. L4: Yes sir.
33. T: Is this teacher teaching mathematics at the moment.
34. L4: Yes. Well the teacher is teaching mathematics. But then sir also teaching us something, a thing you need in the mathematics exam and stuff, a thing you need in the future as well. Yes teaching true mathematics. Like in our maths classrooms. We learn things about maths but we also learn things that outside of maths as well.
35. T: You mean outside of maths like?
36. L4: Like you apply outside of maths. Like you can tell us something we didn't know. (pause) Yes.
37. T: Okay. (pause) Do you only learn maths in maths classroom?
38. L4: Like I said sir. We learn things like outside of maths. Like you can tell us something, for example sir, I am not saying you said it before, for example you can tell us okay three point fourteen which is pi, you can tell us three point fourteen is the same as the maths of something in chemistry. Something like that you can tell us like did you know three point fourteen is like maths of yes something like that thing we would know what we are doing in chemistry one day it tell our other chemistry teacher.
39. T: Other than maths do you learn some other things from maths teacher? Other than maths?
40. L4: Other than maths. (pause) Like, like subjects sir, other than maths?
41. T: Might be anything.
42. L4: Also we learn how to behave as well.

43. T: Can you describe your maths classroom a little bit more about the teachers, learners? How is the learning happening in the classroom?
44. L4: The learning sir?
45. T: Yeah in maths classroom.
46. L4: Like, Okay. (pause) It's okay it's the usual way, sir you are coming the class, greet us in the morning and then ask us how we and then, we sometimes we revise what we have done before. And or we go to subject straight away or homework as well. Well firstly you write questions, questions we solve them together. For understanding as well like seventy percent of understanding. We solve them together. Through solving students ask if they don't understand or not. And if they understand we go on and on like solve questions or our aim during the day I've noticed we have to reach about twenty questions a day which is like one question takes quite a while. Because we have to go in to the essence of the question. Yes that's it.
47. T: Okay. (Pause) Anything else you want to mention? Who is this teacher?
48. L4: The teacher is you sir.
49. T: The teacher is me.
50. L4: Yes.
51. T: So these heads are?
52. L: These heads are the students in the class. Which so I couldn't draw the students in the whole class. I just draw I drew the students in the front view but the all students in the class it is not just special students.
53. T: This is the maths classroom?
54. L: Yes.
55. T: You draw here kind of equation?
56. L: Equation, yes sir. Well equation is the things we've been doing in the class. Like for example here right angle of the, we are using Pythagoras theorem. Yes in the thing sir.
57. T: Why did you put these two specifically? And then the teacher is pointing out this percentage seventy percent plus thirty percent is passing?
58. L: Also why you are teaching here sir, why you are teaching these two sir, by the way these two are my favorite the Pythagoras and the equations. While you are teaching here you also add it some points, like you usually do, you add points, okay. By the way you can say something by the way this is going to be in the exam. Yes like you did here. While you are teaching and you said "Guys, 70% of understanding plus 30% of solving leads to straight pass" That's what I would talk.
59. T: So you emphasize the understanding that is more important?
60. L: Yes
61. T: Solving is representing (pause) if you understand then?
62. L: Yes you can solve much better.
63. T: Without understanding?
64. L: It will be quite hard for you to solve.
65. T: Okay, okay. It was quite interesting, I learned a lot from this interview. Thank you very much.
66. L: Thank you sir.

Time: 12minutes 22 seconds

L13 INTERVIEW

1. T: Alright, good afternoon, welcome.
2. L: Good afternoon sir.
3. T: See the reason we are doing this interview is you've got a very interesting drawing and I learned a lot and I want to know more about this drawing.
4. L: Yes sir.
5. T: Just to refresh your mind please just take a moment look at your drawing and your explanations that.
6. L: Yes sir
7. T: You refreshed your mind, it was so quick.
8. L: It's mine sir. I should know what is written on it.
9. T: Just tell me more about the picture, what is the teacher?
10. L: What's going on is that sometimes in maths, it's you know maths is one of the hardest subjects in South Africa. Most learners find it, maths is the hardest. So sometimes when the educator is teaching, it's as if the educator is speaking Chinese. So what apparently happens is sometimes the students are too afraid to ask and some just for the sleep. That's why half of the time they fail.
11. T: I see this, this. Who is this?
12. L: This is the mathematics teacher.
13. T: Mathematics teacher, and what is this place?
14. L: Sir this is the blackboard where he wrote the samples sir to find x sir. That was the question.
15. T: So what is this subject?
16. L: This subject sir. (Laughing) I can really say I forgot sir. It's mixture of hyperbola and its graphs and what's this yeah right angle sir. A fusion of both.
17. T: And the question is about finding?
18. L: X which is in between these two.
19. T: Alright. Who are these people?
20. L: This is the students that are clueless about what's going on.
21. T: Okay, clueless what's going on in terms of?
22. L: In terms of the subject sir. Sometimes they might see, they understand clearly but they might just find as its fusion of both. They might just understand one half of it or the other half but not the whole sum.
23. T: Can you open this Chinese thing to me more about why did you describe by Chinese?
24. L: Chinese is one of the most difficult languages to learn and it is one of the hardest to understand so if somebody is speaking English and another is speaking Chinese, there is no communication. There is no understanding. That's why I chose Chinese.
25. T: That's what's going on here exactly.
26. L: Yes.

27. T: Then the teacher is.
28. L: Speaking Chinese. And the learners are clueless because they can't understand what he or she is saying sir.
29. T: That's why you use this Chinese?
30. L: Yes sir.
31. T: To represent maths is;
32. L: Like Chinese it's just a language. Language barrier sort of but there is another barrier.
33. T: Okay, alright. It's very interesting. Can you tell me more about your maths lesson? How is the learning happening?
34. L: My maths lesson, I can say normal lesson is sixty minutes. Forty let's just say forty minutes of the time you are interested and eager to that but as the period goes you slightly become a bit more tired and you're focusless and you end up sleeping like one of these.
35. T: Is this z's ahooo?
36. L: Yes, representing sleep.
37. T: They are sleeping?
38. L: Yes
39. T: Okay, are all the learners happened these question marks as or some of them are sleeping?
40. L: No, it's like sir, I would say a greater portion of the class doesn't fully understand. And only those who are skilled on maths fully understand. That's why I made a ratio of almost most of the class not understanding or either sleeping.
41. T: Maths and skills, can you pull that up little bit?
42. L: Skills! What do you mean skills?
43. T: Maths skilled one understands you said.
44. L: Oh maths skilled ones. I could say, how can I put this one sir? Some people are gifted in maths and some in science. But the part is that you have to be passion for something to learn it. And some people like just doing it. So that's where the skills come. If you are eager and willing and if it's you're favorite subject, that's what I said. For maybe eighty percent maths is not their favorite subject. And for those who are skilled in it, that's why it becomes their favorite subject, and they are more eager to learn. Hence they get the idea, the picture much easier then the rest.
45. T: And the teacher is facing to the learner, can you tell me more about that.
46. L: The teacher... Imm. The teacher is trying all means to teach the class but you know sometimes they run out of ideas how to make maths more interesting. That's why he is facing them all. To make eye-contact sir in a way to see they clearly understand. But you know the student which is not in our head even though we don't understand.
47. T: And I don't see actually at the beginning you mentioned that, it is in their mind these questions marks but none of them is.
48. L: It's raising their hands.
49. T: Yeah. What was the point that you draw like that?

50. L: Because sometimes it is not like it's the teacher for but sometimes the teacher also gets stresses being asked the same questions over and over, and ends up becoming irritated. So one thing the learners never want is to irritate the teacher. So keep it up, close it up in their minds, sometimes if one learner ask the question, and you explain it better to that learner but the other, next one also doesn't understand the question, it would be very frustrating for the teacher to tell the same explanations over and over. So that's why learners sometimes become a bit afraid to ask the question, the same question.
51. T: The same question?
52. L: The same question. Because we learn in different ways. And our brain cells work differently and we get things differently. Some people is faster and some is slower.
53. T: Okay and do you only learn mathematics in mathematics classroom?
54. L: No sir. Like maths is everywhere just you don't know. You don't learn mathematics in the classroom. You only learn the basics, no. The basics you learn from everywhere, but the real (inaduble) mathematics in the classroom. Sometimes you just know the basics when it comes to the other part it become a little hard to learn sir.
55. T: Specifically if you talk about this classroom, this teacher and learning mathematics, is that only happening here in the classroom?
56. L: Sir I can't understand the question.
57. T: Just, is the learning also happening outside of the classroom with this teacher?
58. L: Teacher?
59. T: Yes.
60. L: It actually I have to say it only happens in the classroom.
61. T: What is the reason?
62. L: I am not sure, I am not clearly sure the reason but I am sure it only happens in the classroom.
63. T: Are you only learning mathematics from the teacher?
64. L: No, sometimes like myself I sometimes find it easier to ask somebody that understands better to explain like maybe the whole chapter better to me. Hence I get a better explanation since he is my friend I become more relaxed and I learn much better. So, no I won't say it only the teacher helps even some of the bright student if they have friends.
65. T: Is there anything else that you see in the picture and you want to mention? And this is the table of?
66. L: Of the maths teacher.
67. T: Maths teacher. What are those?
68. T: Sir, it's maths books, a ruler, pencils, and let me just say, the marker here and the maths set, here is the maths set.
69. T: Hiimmm, okay. And I also see in your explanation here, this this took my attention. Can you tell me more about this "if the teacher was just a bit slower than things might be better"
70. L: Better. Sometimes this such little time in the year so that they carry out teacher, if the teacher was to cover everything, sometimes they like just pass on it. They, I wouldn't say do a rush job but they are a bit faster when any let's just say in ten

- chapters, only the learners would understand two or maybe ten. And these two the teacher went faster on it. Because there is such a need to cover everything, sometimes even though the learner does not fully understand, the teacher just moves on the next subject. So the learner still becomes clueless in the last subject before going to the forward.
71. T: Some of the explanations, most of them you used blue pen. Just for these five words you used the pencil. Can you explain it? Just, Chinese, time, everyone, slower.
72. L: To add emphasis sir on how important this just is like (reading what he wrote) just is not I am not saying , I am adding emphasis, I am not saying the teacher is doing a rush job, going fast with everything but sometimes. They just taking too fast for the learner. And Chinese using emphasis as the understanding, what was sir using Chinese because it is a hard language to understand and that is why. And time; time being time is always needed. If the only 60 minutes in the lesson maybe it is not sufficient time for the learner to fully understand that chapter or that lesson. And everyone meaning not everyone is that clueless and not everyone is that brilliant not everyone knows the answers not everybody does know the answers. As slower I am not just saying as slower I am just saying like taking the back draw, step by step, revealing everything, finding the core, sir in such a way if I can use that term.
73. T: Okay, that's wonderful. Anything else you see that you want to mention from the picture and explanations?
74. L: No sir, I think I have covered everything sir.
75. T: Alright, and I learned a lot from his interview because the way you draw and explain it is not clearly maybe open to me that's why we did this interview. I really enjoyed and learned a lot. And I guess you were very comfortable with this.
76. L: Aaa sir it was okay.
77. T: Alright, thank you very much.

Time: 7minutes 50seconds

L21 INTERVIEW

1. T: Okay, good afternoon L, How are you?
2. L: Thanks sir, I am fine and you?
3. T: I'm alright. How was your day?
4. L: It was very long.
5. T: Very long?
6. L: Because we just finished writing the English test.
7. T: I know, I know. And next week exams are starting.
8. L: Yes, the exams are starting.
9. T: Okay, the reason we are doing this interview you drew very interesting picture here and your explanations and I found it very interesting and useful for my study. I just want to know more about this picture. Okay, do you need to refresh your mind? You can look at the picture and what you wrote.
10. L: okay sir. I would say that what I've drawn here is that our teacher Mrs. Cathy always does this in the maths period. So I am so used to her and the system of teaching like this. And I feel like it helped me and all the learners because so far first term we were struggling with maths and everything. And second term she changed the style of teaching and it benefited us a lot. And now we understand a bit more.
11. T: Okay, tell me more about this drawing. What is going on in the picture?
12. L: Okay, the picture Mrs. Cathy comes in, the teacher maths teacher.
13. T: Okay.
14. L: She selects one then or another learner or a volunteer to answer the homework questions.
15. T: Okay.
16. L: With questions while she is checking the homework. And one of the learner is trying to do homework, she assist the learner.
17. T: That's what is happening specifically?
18. L: Yes sir.
19. T: Alright, so this learner is look like hiii, is that female or male?
20. L: Ohh(smiling) It's a male sir.
21. T: It's a male, okay. The hair is little bit interesting. What is the subject here?
22. L: We are doing algebraic functions.
23. T: Okay algebraic functions.
24. L: We are starting, she was teaching us to write hyperbolas and that.
25. T: Okay, so this is your maths teacher.
26. L: This is our maths teacher.
27. T: You wrote here the teacher is next to the learner, and you wrote something on top of that, what is it?
28. L: "Struggling" the learner is struggling.
29. T: Okay, she is?
30. L: She is assisting them.

31. T: Okay, she is assisting the learner.
32. L: She is explaining.
33. T: You just wrote the others, you did not draw the learners, you just wrote learners. Why you did not draw, what was your intention? What was message in the picture?
34. L: Okay, I was just sending this message that you know actually I would draw it but it's not necessary. The necessary part is that a learner is having a problem with this subject. So the learner needs help and explanation. So the focus is on learner's need the most attention.
35. T: Okay. Can you tell me more about your math lesson? How is she, your maths teacher is teaching?
36. L: I would say our math lesson is effective. Sometimes we don't do so much examples and exercises but from the exercises we have done we can simply understand what we need to do and theories that we need to do.
37. T: Okay. Can you tell, describe me one of your math lessons? How it starts and how it goes on?
38. L: Okay; the teacher goes in the class, greet us and everything, some of the learners would be noisy but some of the learners will stop the noisiness from making noise. Then we start by sitting and everything, greeting her, how is she and everything. And after she asks if we have done homework. The person haven't done the homework usually is the one who will be demerited or the person who has the explanation. The explanations are that he does not understand or she asks why he did not ask his friends. But anyway the teacher will come to the learner who done the homework and she will ask you from the exercises done which exercises you did not understand.
39. T: Okay and she is assisting.
40. L: Yeah, she is assisting.
41. T: Tell me about this demerit, what is demerit?
42. L: Demerit is a system in the school; if you don't obey the rules of the school get the demerit. So like accumulates with behavior of the learner. So if the learner doesn't behave in the class gets the demerit, if it reaches a certain amount of demerit, you will be going to detention and things.
43. T: Okay. What about positive attitudes is there anything for that?
44. L: Yes there is positive attitudes we call them merit. Merits you can gain from doing your homework, being the best in a particular subject or project. If you get a certain amount of merits you can be offered cold drinks, certificate.
45. T: Okay I got it. So just this word from the explanation that describes what's going on and it says "everyone benefits from her style of teaching"
46. L: Yes.
47. T: Can you tell me more about that?
48. L: Okay, the learners who actually understand what they're doing, Mrs. Cathy tells them to go ahead with other exercises leaving the students who are struggling behind. But she later covers learners who are struggling with ones who are front. The ones who really understand more often after school Mrs. Cathy will ask them to teach others and then the following day we will be on the same page. And we will get to understand the same day. And then she will test us with the tests.

49. T: So is the teaching going on after the school, after the lessons?
50. L: Yeah.
51. T: Can you tell me more about that?
52. L: Okay, Mrs. Cathy probably will ask one of the learners. And learner will say okay. This break you come and you will meet together, well after schools. And you'll meet a few, you will ask them what is wrong? We will show you how it's done.
53. T: This is the student?
54. L: That's the student. And Mrs. Cathy will come and check if the student really did come. Mrs. Cathy will test you with a test. If you fail a test, she will give you second chance to write the test.
55. T: Oh really, that's good, that's wonderful. Is there anything here you want to mention? Anything else about your math lesson, the students, the teacher?
56. L: The students are fine but sometimes ih, they give you problem. Because sometimes you really don't understand the point, the topic. So you want to know about the topic.
57. T: Okay just checking if anything else is not covered. So it's a very simple drawing and the message is very clear. And I really learned a lot and it confirms, I just wanted to confirm what I understood and what you are saying now, so it's matching, it's interesting.
58. T: Basically while she is teaching normal lesson time, where is she standing, how is the teaching going on?
59. L: Maths teacher standing at board with normal lessons. She asks one of the learners to read from the textbook, if one of the other learners don't have the textbook.
60. T: Okay.
61. L: She even photocopies the textbook for the other people. Before she starts the lessons, she writes what you will do at home. And we start talking normal lesson.
62. T: First you cover the homework then you start the lesson.
63. L: Yes.
64. T: Okay, so I guess you covered almost everything, thank you very much. I really learned a lot, I appreciated this interview.

Time: 10 minutes 20 seconds

L38 INTERVIEW

1. T: Okay L, good afternoon. How are you?
2. L: Fine thanks and you?
3. T: I'm alright. So how was your day?
4. L: Long.
5. T: Long?
6. L: Yes it was long.
7. T: And boring or?
8. L: No, not boring but, you know just long. Not boring, it was long because we wrote a test today and it made a bit long.
9. T: Next week you start the final exams.
10. L: Yes, the final exams next week yes.
11. T: Almost the year has finished, ha?
12. L: yeah, actually it has finished.
13. T: Yeah, that's finished for you. Okay the reason we are doing this interview is you draw very interesting picture here and your explanation. I just want to know more about what you think about the drawing.
14. L: The drawing well, this drawing is representing, you know, our maths teacher. How the teacher is so determined and explaining the lesson. Because, you know, sometimes the teacher, they don't want to leave the students unattended to. So the teacher tries to attend so many topics at once, trying to satisfy the students' desire.
15. T: Okay.
16. L: So it is representation of the striving of the teacher, of the dedication of the teacher to the job or her job.
17. T: Okay, who is this person?
18. L: It is, this person is the maths teacher.
19. T: The maths teacher?
20. L: Yes.
21. T: Is this your maths teacher?
22. L: Yes, this is my maths teacher.
23. T: Okay, Mrs. Cathy?
24. L: Yes, Mrs. Cathy.
25. T: What are written on the board?
26. L: On the board, it is okay, some exercises of parabola, okay the topic of parabola. And some quadratic equations, graph, you know some geometric graphs, functions the exponential functions.
27. T: Yeah, this is parabola and
28. L: This is hyperbola graph.
29. T: Okay. There are some other things here?
30. L: They are names, student names.
31. T: What are those?

32. L: These names are normally the names of the students disrupting the class, they talk too much, right. For example, these are the students most of the time understands in the class okay? Then they talk, misunderstanding they are not thinking of the other students don't understand. So they talk, she is writing their names down, just indicating that you are talking. So these are the names talking, that's why their names.
33. T: Disrupting?
34. L: Yeah, disrupting the class.
35. T: okay, what does the teacher do about if they continue this disrupting?
36. L: Well, as you can see there is a line there. When the teacher writes your name down, you are expected to keep quite. But if they don't keep quite, she underlines their name.
37. T: Punishment?
38. L: Yeah, there will be some punishment. Maybe demerit or the break will be taken away.
39. T: Alright and this is, what is this?
40. L: This is the teacher's table and chair. It's complicated, it is very complicated. This symbolizes again dedication. Although she is unorganized but to show that I am not leaving here until I've got it through, until I fulfill my duty to the students. So this is just.
41. T: What are those on the table?
42. L: These, okay, textbook the maths textbook, and then this is the class register. Okay, then this is ruler and pen, pencil. This is the coffee. She likes the coffee; alright. that's the teacher's coffee.
43. T: Alright, I don't see any students in this classroom. Is she just talking to herself or?
44. L: No, not talking to herself. Now the emptiness of the class, this symbolizes for me, the hard, the hard topic of maths, you know how difficult mathematics can be sometimes. So this emptiness represents for me the emptiness of mind of the students, do you understand? The students maybe clueless of the topic, they did not understand anything. That's why the face expressions, the eyes, the mouth you see like she is stressing too much to express the students but, because the students are empty, you see. They don't understand that's what the emptiness symbolizes.
45. T: There is no parti..
46. L: There is participation but you see because of the students have gone blank; it was a difficult topic so there is no clue over.
47. T: What to ask.
48. L: What to ask, not to ask, you understand?
49. T: I see. Okay, about your explanation "revision of parabola..." Can you tell me more about what you wrote here?
50. L: "Revision of parabola and functions in mathematics, as the exams approaches" You see the teacher is trying to do, you know, exams are approaching so she is trying to do a revision. But because most of them are long days in between, no long periods between the days, a lot of students go blank. So they get tired, and the mind just completely shuts down. So if you look at the picture the emptiness

- again. So the emptiness symbolizes the shut down of the mind of the students. As the exams are approaching the teacher is trying to do revision but you see the students are not active in the class, participating in that way. And you see explanations of graph, functions, and the name of the students on the board who are talking during the lesson.
51. T: Maybe I also thought that specifically you addressed the question. Because if you refresh the question it is about.
 52. L: It's about drawing.
 53. T: It's about maths teacher.
 54. L: Maths teacher why he is teaching that way.
 55. T: Can you tell me a normal, regular maths lesson? How it is happening?
 56. L: In my class a normal maths lesson; we will get to the class, teacher will greet, and we greet each other. We sit down, and then do revision. How? Just doing one or two exercises from the homework, that will be kind of revision. And then we start the day's work. Get our homework, okay then how we work in between the lesson; the teacher just explain, and then the students do the application. Do you understand?
 57. T: Yes.
 58. L: And the students practice the application and there is interaction between the teacher and the students.
 59. T: So the teacher covers the theory part?
 60. L: Yes theory part.
 61. T: Application parts together?
 62. L: Yes together, all together. For example; the teacher normally does a big one exercises to lead the way and then the rest the students come in between, and also apply the application to theories if they understood, explain the other students you know, understand of teaching.
 63. T: Okay, is the learning only happening in the classroom?
 64. L: Learning? (thinking)
 65. T: Maths teacher, I mean, is her job finishing in the classroom?
 66. L: In the classroom, to us or just as general?
 67. T: To you, this maths classroom.
 68. L: Not really. Because there was a time for me, well bring up some curtain, so I remember we needed to do some measurements and some calculations, some hooks stuff something like that. So we should call most of the students does maths with mathematics. And she called us and "can you help me to count this, can you help me to calculate, approximate square meters" stuff like that. So it did not end in the classroom, see we carried on, you see, we also participated outside.
 69. T: If someone needs more helps what does happening for maths?
 70. L: For maths okay, in the maths lesson, normally if someone needs help we don't continue the lesson unless the students understand. But if they need serious help, then we need to continue a little bit because the time goes on, but the students attend the extra maths. But normally, you know, in our class most of the students we all move together with maths teacher with our understanding. So we wait for one another, we encourage one another, also the teacher. She waits, understands and explains but if a certain explanations need to be done, and then she, the

- teacher will approach, student you are supposed to come extra maths, because we are touching this topic, so that kind of things.
71. T: Okay, is there anything else about this math teacher, maths lesson, that thing you wrote on the board or about the picture you want to?
72. L: Is there anything else? Not really because I explained much in the beginning as I talked about the board. You see the board is full, the board is very full. So as I said it symbolizes the dedication of fulfilling her job, her duty.
73. T: Yeah, just what do you think about this study? Did you learn anything from this study?
74. L: This study (smiles) I can't say much because it's really.
75. T: You draw something and did you learn anything?
76. L: I can say it is going somewhere but I can't put my finger on it. Maybe I'll understand what is coming.
77. T: Now, you draw a picture of your lesson, do you, is this drawing is helping?
78. L: When I look at it, it does help me, you know.
79. T: How?
80. L: How does it help me? I look at the drawing and I see for example there are no students here. It's empty. Which means there should be more participation in the class for me, do you understand.
81. T: Yes.
82. L: And as students we should strive to participate, you know. The teacher was there, but the teacher can apply certain theories but we the students, the duty is for the students to apply, to do the application. Because the teacher can't do the application for us. Then this picture here told me as there is no student, we should participate, the students in the classroom, we should interact.
83. T: Even you draw this one you are giving yourself a message. You are learning something.
84. L: Yes
85. T: Okay, so it is a nice way to give yourself a feedback?
86. L: Yes, yes a feedback.
87. T: This is what's happening in maths classroom.
88. L: Yeah, it's kind of weird sir (laughing).
89. T: It's interesting, I learned a lot really. I just wanted to make sure what I learned from the picture is what you think, kind of confirming you know. What you think what I understood if it is matching each other. Alright, thank you very much.
90. L: It's a pleasure sir. Thank you very much.