

**HOW SCHOOL MANAGEMENT TEAMS SUPPORT
MATHEMATICS TEACHERS IN PUBLIC SECONDARY SCHOOLS
IN GAUTENG PROVINCE**

by

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Submitted in fulfilment of the requirements for the degree

MASTER OF EDUCATION

in the

**DEPARTMENT OF EDUCATION MANAGEMENT AND POLICY
STUDY**

UNIVERSITY OF PRETORIA

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AUGUST 2014

DECLARATION

I, Tebogo Jillian Mampane, hereby declare that the dissertation, "How School Management Teams Support Mathematics Teachers in Public Secondary Schools in Gauteng Province", is my own original work and that all sources consulted and quoted have been acknowledged in the list of references.

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Date

DEDICATION

This dissertation is dedicated to my loving family: my late grandmothers, Jemima and Elizabeth Mampane; my late aunt, Felicity Mampane; my late uncle, Charles Mampane; my dearest daughter, Makgoshi Candice Mampane; my dear brother, Malcolm Karabo Mampane, and my dear mother, Dr Sharon Thabo Mampane, for their undying support. I appreciate the support provided and acknowledge that the role they played ensured the completion of my master's dissertation. Thank you for your patience, love and care.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the following people who supported me during my journey in completing this study:

- ❖ God, the Almighty, for granting me the strength and for guiding me in my studies.
- ❖ My family for their continued support, motivation and faith in me.
- ❖ My supervisor, Dr Teresa Ogina, for her patience and guidance - especially during difficult times. You have developed me into a better researcher. Thank you for believing in me.
- ❖ To my language editor, Prof. Walter Greyvenstein, for the meticulous way in which he edited this dissertation to enhance its quality.

ABSTRACT

The purpose of this qualitative descriptive study was to explore how heads of department support the professional development of mathematics teachers in public secondary schools to improve learner performance in Mathematics. Mathematics occupies a central role in future innovation and serves as a basic subject for many other disciplines. Teachers, too, require relevant education and development to be adequately prepared to handle and manage the teaching-learning tasks they are expected to carry out in Mathematics. While there is consensus about poor performance by matriculants in their Mathematics examination, the details of strategies and means to improve performance in Mathematics through professional teacher development remains under-researched. In this study, a qualitative case study design was used to investigate the professional development of teachers within a real-life context to gather comprehensive, systematic and in-depth information about the phenomenon, using semi-structured interviews. A total of eight participants, 2 mathematics HoDs and 6 mathematics teachers from two secondary schools in the Tshwane South District of Gauteng Province were selected, using purposive sampling. The research questions were concerned with understanding the concept, professional development; the HoDs' and Mathematics teachers' experiences of professional development; and the challenges experienced, and strategies used, by HoDs to develop the Mathematics teachers. The collected data was transcribed, categorized and presented as themes with direct quotations from the participants to support the themes. The findings of this study show that the two HoDs perceive profession development as workshops and training programmes initiated and conducted by the Department of Education and not as their direct responsibility. There was no evidence of school-based professional development programmes. The challenges that they experienced included the teachers' reluctance concerning, and resistance to, professional development. They recognized team work and peer support as effective strategies for developing Mathematics teachers.

ACRONYMS

SMT	- School Management Team
SGB	- School Governing Body
TPD	- Teacher Professional Development
PD	- Professional Development
DoE	- Department of Education
HoD	- Head of Department (Mathematics)
PCMI	- Park City Mathematics Institute
DSG	- Developmental Support Group
SACMEQ	- Southern and Eastern African Consortium for Monitoring Educational Quality
TIMSS	- Third International Mathematics and Science Study
ANA	- Annual national Assessment
DBE	- Department of Basic Education

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CHAPTER 1

INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

With the onset of democracy in South Africa, devolution of responsibility to schools and the growth of school-based management have impacted on the role and workload of school leaders (Rosenfeld, Ehrich & Cranston, 2009). The changes have resulted in principals of public secondary schools delegating greater responsibility to deputy principals and heads of department. As a result, the heads of department (HoDs) roles, like those associated with other school administration positions, have undergone significant changes - especially in terms of the professional development of teachers (Rosenfeld *et al.*, 2009). HoDs play a leadership role which is important to teacher development and is central in organisational success and improvement (Earley & Weindling, 2004). It may be challenging to achieve teaching competency without support and guidance in particular learning areas and HoDs are responsible for providing leadership in particular subjects, departments and phases (DoE, 2000; Ball & Cohen, 1999). According to Harris and Jensz (2006), HoDs have a direct influence on the quality of teaching and learning within subject departments and this has led to educational scholars and policy-makers, worldwide, emphasising the need for professional development and support opportunities for teachers to enhance their knowledge and instructional practice (Timperley, 2008).

The concept, Teacher Professional Development (TPD), is interpreted in different ways depending on various education traditions and contexts. In education systems where teacher education programmes are well established, TPD is a process which embraces all formal and informal activities that enhance professional career growth (Rogan & Grayson, 2004; Teclé, 2006). Teacher professional development and support is essential in improving teacher competencies in their classroom practices and it lies at the heart of nearly every effort to improve teaching and learning. Many

models that have been developed for teacher professional development do not achieve the envisaged learning goals, yet professional development is still seen as the best means to improve teaching practice (Supovitz & Turner, 2000). The Professional Development (PD) of teachers, often called in-service education or staff development, is conducted for different purposes and in various forms. Induction is part of professional development and, ultimately, aims at instituting an educational support system where HoDs are expected to professionally develop Mathematics teachers to succeed in helping learners perform well (Joseph & Reigeluth, 2010). HoD is the term and abbreviation that will be used in this South African study; in other countries the terms used are: middle manager, department chair and administrator (in the United States) and middle leader, subject leader and curriculum coordinator (in the United Kingdom).

Professional development and support given by HoDs should be systematic, well organized or arranged according to a set of plan of action and/or grouped in a system (Joseph & Riegeluth, 2010). According to Joseph and Riegeluth (2010), systemic change should reveal the meaning of professional development in the entire system as teacher development affects the entire body or system of education. Greenland (cited in Villegas-Reimers, 2003) identifies four categories of purpose for teacher development: upgrading teachers; preparing teachers for new roles; curriculum-related improvements or refresher courses; and certification for on-the-job training. Teacher development programmes are often delivered in the form of workshops, seminars, conferences and courses which aim to improve teacher competency (Department of Education & Training, 2005; Harwell, 2003; Collinson & Ono, 2001; Feiman-Nemser, 2001; Schulle & Dembélé, 2007; Villegas-Reimers, 2003). The competency of teachers depends on academic and pedagogic efficiency; ability, workload and commitment; teaching and learning resources and methods; support from education managers; and supervisor effectiveness (Rogan, Novak, Mank & Martin, 2002)). All these factors contribute to effective teacher professional development. In this study, the focus is on how mathematic teachers are supported Mathematics teachers which, I assume, is important in providing opportunities for

teachers to explore new roles, develop new instructional techniques, refine their practice and broaden their knowledge in teaching the subject.

The South African township of Gauteng province serves as the background setting of this study. The term, township is better understood as underdeveloped, urban living areas that were reserved, and are still residential areas, for Blacks, Coloureds and Indians. From the late 19th century until the end of apartheid townships were built on the periphery of towns and cities. Political and socio-economic changes after 1994 have attempted to improve the education system for all South Africans but a major problem facing township schools is poor academic performance. Although there is now a better distribution of education for all South Africans, the township schools still produce poor learner achievement as a result of a lack of commitment from the teachers and learners, among other factors. This study focuses on the role of HoDs in managing the professional development of Mathematics teachers in township schools and the strategies used to support the teachers. It further explores challenges experienced by the teachers and the HoDs. Joseph and Reigeluth (2010) highlight the link between teacher development and learner performance.

1.2 PURPOSE STATEMENT

The purpose of this study was to explore how HoDs support the professional development of Mathematics teachers to improve learner performance in the subject. The professional development of Mathematics teachers is a central function of HoDs in terms of school improvement; Mathematics is important for future innovation and it serves as a foundation subject for many other disciplines (Sowder, 2007; Lerman, 2001). Since the focus of this study was on teacher professional development by means of lifelong and continuous learning, professional development in Mathematics should be a continuous process which is aligned with a teacher's actual job.

1.3 PROBLEM STATEMENT

While there is consensus about the poor quality of the matriculation Mathematics results, there are only a limited number of studies that have explored some of the factors that, possibly, contribute to poor performance in Mathematics at a high school level (Ball & Bass, 2003). In my experience as a Mathematics teacher, the competencies and abilities of many Mathematics teachers do not meet learner expectations. Teachers need relevant subject knowledge and professional development to adequately prepare them to handle and support the teaching-learning tasks that they are expected to perform in the teaching of Mathematics. Mogari, Kriek, Stols and Iheanachor (2009) argue that teachers should have a deeper understanding of mathematical content; be able to interpret mathematical content in the context of their schools; facilitate meaningful learning; and have knowledge of learners' understanding of concepts and their learning difficulties. For teachers to reach acceptable standards and improved learner performance it is important that they all undergo professional development DoE (2000). This is in line with the department of education's expected standards and curriculum changes. Despite a recognition of the importance of professional development, what is currently available as TPD for teachers is inadequate, especially in the South African (SA) context (Borko, 2004). Despite the governments' huge budget on education and the provision of in-service training, school districts continue to hire teachers who are unprepared and ill qualified to positions outside their fields of expertise making the goal of improving learning outcomes in many schools not achievable (Johnson, 2006).

The problem of the development of teachers in Mathematics cannot be separated from the professional knowledge that the individual teachers possess. TPD assumes that Mathematics teachers have a sufficient knowledge of the subject matter and that they have successfully completed a minimum teaching qualification (Rogan & Grayson, 2004; Teclé, 2006). Instead of working with the assumption that teachers have a basic knowledge of the teaching of Mathematics, the TPD process

should improve teachers' academic standing as well as their acquisition of greater competence and efficiency to discharge their professional obligations inside and outside the classroom (Komba & Nkumbi, 2008). This study aimed to explore how HoDs support the TPD of Mathematics teachers in secondary schools. It intended establishing the strategies used by HoDs in the TPD of Mathematics teachers as well as the experiences in terms of their professional development.

1.4 RATIONALE

In my five years as a Mathematics teacher, I have seen that Mathematics teachers are not given adequate support in the teaching of their subject by their line managers or HoDs. I have observed that participation and performance of learners in Mathematics is, generally, poor - especially in previously disadvantaged schools. In township schools and in the rural areas of South Africa there are considerably fewer opportunities to excel in Science and Mathematics, largely because teachers in those school lack knowledge and skills in the subjects and the schools are under-resourced. Professional teacher development and in-service training workshops are important pre-requisites for progress in teaching Mathematics. However, new Mathematics curriculums and teaching standards are not matched with qualified and competent Mathematics teachers to address problems in township schools where there is a need for high-quality Mathematics teaching (Hammond, 2000).

My assumptions in this study are that if good teachers are to be retained, there should be support and development for them to do their best work with learners and that the workplace should encourage the professional development of teachers. I further believe that school-based TPD may have a positive impact on the teaching of Mathematics, however not much is known about the professional development of mathematics teachers but little is known about how HoDs support the professional development of Mathematics teachers. Therefore, the focus of this study is on exploring how HoDs manage the TPD in Mathematics.

1.5 RESEARCH QUESTION AND SUB-QUESTIONS

1.5.1 Main Question

The main question of the study is: *How do HoDs support the TPD of Mathematics teachers in public secondary schools?*

1.5.2 Sub-questions

The sub-questions are the following:

1. *What is the HoDs' and the Mathematics teachers' understanding of the concept, professional development?*
2. *How do HoDs and Mathematics teachers experience the process of professional development?*
3. *What are the challenges experienced by HoDs and the Mathematics teachers in professional development?*
4. *What are the strategies used by HoDs to develop Mathematics teachers?*




1.6 THEORETICAL FRAMEWORK

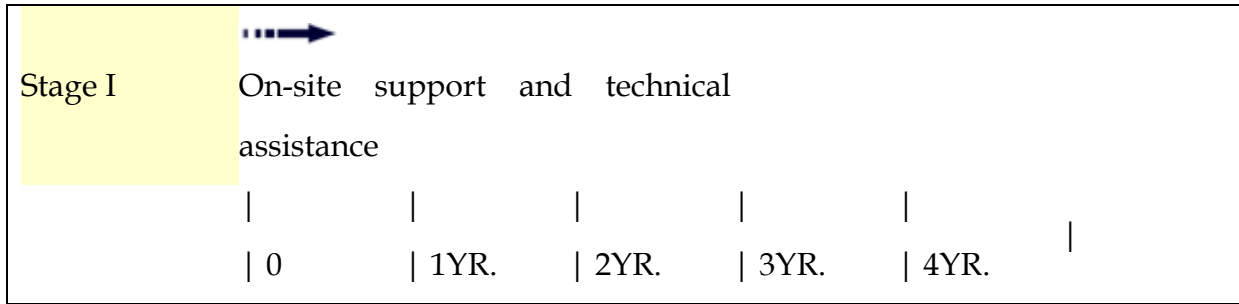
Talis (2009) defines the professional development of teachers as “activities that develop teachers “holistically” in their profession i.e their (knowledge, skills and expertise as well as their characteristics) as teachers an individual’s skills, knowledge, expertise and other characteristics as a teacher.” Further descriptions of professional development indicate that it can be achieved by means of formal structures, like courses and workshops and/or the informal internal collaboration of teachers at the same school in the form of coaching and mentoring or external networking between difference schools. Teacher development means growth and advancement in the teaching profession. Such growth can take place through the activities conducted in workshops, short courses, full degrees or seminars (Katz, 1975). The concept also means a natural progress during the career of a teacher. This study focus on how Mathematics teachers advance in their careers which is described in the different stages of Katz’s theory.

1.6.1 Katz's Theory of Teacher/Educator Development

The theory that was used for Mathematics teachers' professional development is the educator development theory by Katz (1975). Although Katz's study of educator development was on pre-school teachers, she suggests that it could be applied to different categories of teachers at different stages of their teaching career (Katz, 1975). Katz theory is about the different development needs of teachers as they progress through the different stages of their career (1975). She identified four *developmental stages* in which teachers experience personal and professional growth. The time taken to progress through the stages differs from one teacher to another. In each of the stages the teacher experiences growth in knowledge acquisition and practical teaching skills. The theory suggests that support and training have to be matched with the developmental stage of the educator.

Table 1.1: Katz's Theory of Educator Development

Developmental Stages	Training Needs
Stage IV	 Seminars, institutes, courses, degree programs, books, journals, conferences
Stage III	 Conferences, professional associations, journals, magazines, films, visits to demonstration projects
Stage II	 On-site assistance, access to specialists, colleague advice, consultants



Katz’s theory of educator development has four stages. The first stage is called the stage of *survival* where the educator is new to the field of teaching and needs hands on assistance in combating the challenges of the classroom and the realities of the school. The second stage is the *consolidation* stage where the educator is able to survive daily crises, but is now concerned with how to best impart knowledge to the learners according to their changing learning styles. The third stage is the *renewal* stage where the teacher’s concerns lie with what new materials, techniques and approaches are adequate and appropriate to yield the best results. The fourth stage is the stage of *maturity* where the educator shows confidence and competence and asks more philosophical questions, like what is the nature of growth and learning.

Table 1.2: Four Stages of Katz’s Theory of Teacher Development

Year	Stage	Realisation
1	Survival	<ul style="list-style-type: none"> Feels lost, preoccupied, inadequately prepared and wishes for survival.
2-3	Consolidation	<ul style="list-style-type: none"> Recognises specific goals for learners and organises specific tasks and skills for learners to work on.
	Renewal	<ul style="list-style-type: none"> Desires to learn new teaching styles, materials, techniques, approaches, and ideas.
3-5	Maturity	<ul style="list-style-type: none"> Feels secure and begins to ask deeper and more abstract, philosophical questions.

This theory links well with my study on how HoDs manage the professional development of Mathematics teachers because Mathematics teachers in schools are at different levels of development. In this study I tried to identify whether HoDs

support for Mathematics teachers aligns with the development stages suggested by Katz (1975:50-53). The theory further acknowledges that teaching is a complex business and that educator preparation is rarely sufficient to provide all the knowledge and skills necessary for successful teaching.

1.7 RESEARCH APPROACH, DESIGN AND METHODOLOGY

The research approach, design and methodology are presented in this section.

1.7.1 *Research Approach*

This is a qualitative study which capitalizes on using interviews for becoming acquainted with the phenomenon being studied (Merriam, 2007). The qualitative approach attempts to uncover meaning *via* the analysis of non-numerical data that comes from multiple sources, such as interviews, observations, audio-visual materials and documents (O'Connor, 2002). Qualitative data does not include interpretive judgements about whether what has occurred was good or bad, appropriate or inappropriate; the data simply describes and explains what has occurred. Qualitative research is an umbrella term used to describe forms of enquiry which assist in understanding and interpreting the meaning of social phenomena with as little description of the natural setting as possible (Merriam, 2007).

The epistemological assumptions underpinning this qualitative study are that knowledge is constructed through participants' social interaction with their reality (Creswell, 2003). This implies that knowledge of professional development can be obtained by exploring the experiences of the participants who have lived through the phenomenon. The researcher also believes in the existence of multiple realities (Merriam, 2007). What the participants share with the researcher is the reality of the phenomenon; different participants may have different experiences of professional development. The HoDs and the teachers may be expected to have diverse realities of professional development depending on their experiences. The Mathematics

HoDs and the Mathematics teachers participating in this study may live in different social worlds, so the realities constructed by them may also differ (Merriam, 2007). This study is located within an interpretive paradigm which will enable me, as the researcher, to analyse data inductively and to use the results of the analysis to make recommendations for professional development and future research.

1.7.2 Research Design

This study uses a case study design. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Merriam, 2007; Creswell, 2009). In doing case study, the researcher collects in-depth a variety of data from a single case (Gay *et al.* (2009). Case studies provide unique examples of real people in real situations which enable readers to understand ideas more clearly than simply presenting them in terms of abstract theories or principles (Cohen, Manion & Morrison, 2000). In this study I have used a Multi-Site Case Study (Merriam, 2007). This type of study involves collecting and analysing data from several sites and participants. Instead of studying one high school, I have looked at four high schools in a township area in Gauteng Province. I compare data from the four schools to strengthen the credibility and trustworthiness of my study by cross-checking the findings. Given that this study was to investigate a small sample of Mathematics teachers and Mathematics heads of department in schools, it fits in with a bounded characteristic of a case study and nuanced interaction between participants which is typical of an interpretive case study.

1.7.3 Data Collection Methods

This study made use of purposive sampling to select Mathematics HoDs and Mathematics teachers from three secondary schools in the Tshwane South district of the Gauteng Province. Purposive sampling consists of elements that contain the most characteristic, representative or typical attributes of the population (De Vos, 2001). By using purposive sampling to select participants, the researcher may obtain

information that develops an argument which leads to a deeper understanding of how heads of department manage the professional development of Mathematics teachers in public secondary schools. The total sample was made up of eight participants (two Mathematics HoDs and six Mathematics teachers - two from each school). The selected teachers have undergone professional development in Mathematics in the last two years and include those with one years' teaching experience; two to three years' experience; three to five years' experience; and over ten years' teaching experience. This criterion was used to identify the unique development needs and support within the different professional development stages - as suggested by Katz's theory of the professional development of teachers. Teachers who have never been professionally developed were excluded from the sample because they may not have been able to provide rich data related to their experiences of professional development. The sampled participants were interviewed to gather meaningful data of the phenomena being investigated.

The researcher used semi-structured interviews to collect data from selected participants which allows for a specialized form of communication between people for a specific purpose associated with some agreed subject matter (Anderson & Arsenault, 2000). Structured or semi-structured interviews are regarded as purposive communication that goes beyond mere conversation. Anderson and Arsenault (2000) maintain that the strength of semi-structured interviews is that the researcher can use probing questions to clarify responses and elicit a depth of information during the interview sessions. It also allows participants to discuss their worlds and express their points of view about the research focus (Cohen *et al.*, 2000; Creswell, 2003). Apart from interviews, official documents, such as the Personnel Administrative Measurement which outlines the role of HoDs, were analysed to establish the role that the HoD is expected to fulfil in the professional development of teachers. Other documents from the school, such as staff development programmes and evaluation reports, were analysed to identify the training needs of the teachers and the strategies used by the HoDs to develop their teachers. The data from document review was, then, triangulated with the data from interviews.

1.7.4 *Data Analysis*

The process of data collection and data analysis was a back-and-forth process in which the researcher collected and analysed the data simultaneously. The research questions, research problem and the theoretical framework guided the process of analysis (Mcmillan and Schumacher, 2001; Neuman, 2006). Content analysis was done in analysing the interview data and documents. The process of data analysis involved coding the data and condensing the codes into themes which are presented as a table or discussions (Crewell, 2007; McMillan & Schumacher, 2001). I began by listening to the taped responses of the participants and then transcribing the audio recordings to have a written text to analyse. The transcribed data was read and re-read to get a sense of participants' varied understandings of the experiences of how HoDs manage the professional development of Mathematics teachers in secondary schools. The data was coded, using open-coding which is done word-by-word, phrase-by-phrase and sentence-by-sentence during the initial data reduction process (Strauss 1987). The codes were, then, grouped in categories and themes which were aligned with the research questions.

1.8 CREDIBILITY AND TRUSTWORTHINESS

The credibility of the data was enhanced through the triangulation of the data from the different collection methods and multiple participants (Schwandt, 2007). Data from the interactive interviews was compared and cross-checked to corroborate findings (Schwandt, 2007). This strategy of enhancing data credibility and reliability has been called "investigator triangulation" (Cohen, Manion & Morrison, 2010). Data from the teachers was cross-checked with the data from the HoDs and data from the individual teachers was also compared for similarities and differences. As the researcher, I tried to be as objective as possible, but I was also sensitive to my personal bias and how it could shape the study. For a researcher, it is practically unavoidable to filter data through a personal lens which is shaped by a specific Mathematics teaching background (Creswell, 2003: 182) and, therefore, I was aware

that being a Mathematics teacher, my personal experience may contribute to personal bias; in order to reduce bias in my interpretation of data, I did member-checking and peer reviews.

Member-checking was done by taking the interview scripts and my initial interpretation of data to the participants to verify the accuracy of the data. I shared my findings and interpretation with my peers and I asked them for their critical comments. I kept an audit trail of all the decisions made and present it in the annexures. Briggs (2007:115) emphasises the importance of retaining the records of conversations to check their veracity with participants. To provide readers with the possibility of assessing validity of the researcher's interpretation of data, some of the information collected is presented in direct quotes and also as vignettes. All the above listed strategies were continuously used during the data gathering and data analysis processes to ensure the credibility and trustworthiness of the findings.

1.9 DELIMITATIONS AND LIMITATION OF THE STUDY

This study was limited to four schools and the findings may not be generalized beyond the context of the study as it represents the perceptions of a small sample of HoDs and teachers involved in the teaching of Mathematics. Furthermore, the findings of this study cannot, possibly, be reproduced because the conditions under which the phenomenon was investigated may not be exactly the same for other groups studied in a similar inquiry. In other words, the findings are applicable only to those Mathematics HoDs and Mathematics teachers in the township secondary schools in the Tshwane South district of Gauteng Province where the study was undertaken.

1.10 ETHICAL CONSIDERATIONS

Ethical considerations are most importance when one is conducting research (Strydom in De Vos, 2001:23-35). In research ethical issues concern beliefs about

what is wrong and what is right from a moral perspective in conducting the research (McMillan and Schumacher, 2001) and, therefore, they imply compliance with acceptable research norms, morals, standards and principles. Ethical considerations, rules and behavioural expectations of the correct conduct when dealing with respondents, employers, sponsors, researchers and learners were observed in all instances as they are a set of widely accepted moral principles for individuals or groups (Creswell, 2007). Prior to conducting the study I applied for permission to conduct research from the Gauteng Department of Education. On receiving approval, I applied for ethic clearance from the Ethics Committee of the University of Pretoria. After obtaining ethic approval I started collecting data. In planning the study I contacted the participants and informed them of the general purpose of the study and discovered areas that needed to be respected.

Mathematics HoDs and Mathematics teachers within the township secondary schools were asked for their permission to use them and informed consent to participate letters were signed which also explained the purpose of the study (Strydom, 2001). During the data collecting stage leading questions were avoided and no sensitive information was ever disclosed to another party. All participants were reassured of their voluntary participation and the right to withdraw at any time should they wish to do so. Participant confidentiality and anonymity was assured by using pseudonyms and excluding any information that could reveal the identity of the participant from the findings and elsewhere in the study (Wiles *et al.*, 2008). The names of the schools involved in the study are not disclosed. The data is reported honestly and based on the experiences of the participants (Creswell, 2007: 202; Trochim, 2001; Ary, 2006). Therefore, to ensure confidentiality, names of the participants and schools will not be disclosed, and participants will remain anonymous.

1.11 SIGNIFICANCE OF THE STUDY

The findings of this study may contribute to the knowledge base of professional development, particularly in terms of issues related to empowering Mathematics teachers. The findings of this study may provide insights that add to the knowledge base on the management of the professional development of teachers and the challenges experienced by HoDs and teachers in the process of professional growth. Recommendations made in this study may inform school-based professional development and policy-makers, like the Department of Education, on the possible strategies that could be used in developing Mathematics teachers in school contexts similar to the ones used in this study.

1.12 SUMMARY

In this chapter, I have presented my research purpose and explained the rationale for the study and the research questions. I have also briefly described my research design and the measures that I took to ensure the trustworthiness and credibility of the study. I have acknowledged the limitations of the study and indicated the possible significance of the study. The next chapter provides a literature review of the professional development of Mathematics teachers and the role of HoDs in their professional growth.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter is based on a review of the relevant literature which focuses on studies done concerning the professional development of teachers, in general, and Mathematics teachers, in particular. The types of programmes used to develop teachers are examined and the context in which the development takes place is explored. This study also reviews the role of HoDs in guiding teachers to construct new and improved practices in the process of professional development.

In South Africa the performance of learners in Mathematics in most schools is, generally, poor compared to other countries in the world (Reddy, 2006, cited in (Bergman, Bergman & Gravett, 2011). Performance in Mathematics in standardised tests, such as the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), the Third International Maths and Science Study (TIMSS) and the Annual National Assessment (ANA), as well as the matriculation results all indicated the poor performance of learners in Mathematics (DoE, 2011). Mogari, Kriek, Stols and Iheanachor (2009) believe that quality qualifications and deep subject content knowledge are important for teacher effectiveness. Where such attributes are lacking, professional development programmes of teachers may bridge the gap. In situations where there is an ineffective management of the professional development programmes of Mathematics teachers in schools, teachers may not improve or develop the necessary skills and knowledge for teaching Mathematics which leads to poor learner performance in the subject.

Mathematics teachers should be empowered by professional development programmes in order to have a teacher workforce with training and skills needed to deliver high-quality Mathematics teaching and learning (Asia Society, 2013). If the education policies related to teacher professional development practices remain

unchanged, then the school goals and standards aspired to will simply continue as a legacy of unfulfilled reform (Policy Brief, 2011). To achieve improved performance in schools and to help learners achieve set goals, the very culture of how teachers are developed should change. Schools should also have incentives and structures to attract, develop and retain the best Mathematics teachers who are competent and teach Mathematics effectively (Policy Brief, 2011).

Castetter (1996) suggests that teacher professional development is one way schools can support teachers in order to have fewer problems in the successful operation of the schools. A professional development system is made up of key elements, including teacher professional development programmes; teachers who are the learners in the system; facilitators/HoDs who guide teachers as they construct new knowledge; practices; and context in which the professional development is managed. In the process of developing Mathematics teachers, subject content and teaching skills are important for effective teaching. Mathematics teachers can be developed by means of induction in their early days of teaching to improve their teaching skills and practices that were not learnt during their original educator training (Dowding, 1998; San, 1999). While HoDs are expected to focus on the management of teachers under their care and create a caring learning environment, a new focus is their responsibility of supporting the teachers.

Research by Ingersoll (2004) indicates that inadequate professional development by school administration is one of the most often reported causes of poor performance in Mathematics. Teachers can collaborate with their colleagues in exchanging subject knowledge within the context of their school. Through the sharing of subject knowledge, teachers may develop better thinking skills that they can use in teaching difficult Mathematical concepts (Franke & Kazemi, 2001). The lesson presentations done by more skilled teachers in the workshops may be recorded for other teachers to as a point of reference for their own teaching.. Such recording may also be used in subsequent workshops for discussion in addition to learners' marked assignments (Borko, 2004). Changes in patterns of participation and connections between

teachers' experiences in the workshops may become evident over time as well as changes in their understanding of Mathematics and their teaching practices.

2.2 THE PROFESSIONAL DEVELOPMENT PROGRAMME FOR TEACHERS TEACHING MATHEMATICS

Intensive professional development programmes can help teachers increase their knowledge and change their instructional practices by focusing on subject content knowledge, critical thinking skills and instruction (Garet, Porter, Desimone, Birman, & Yoon, 2001). The assumption is that an appropriate qualification can provide teachers with the relevant mathematical content knowledge and classroom practice knowledge and skills (Mogari, *et al.*, 2009). In planning professional development, HoDs should identify initial Mathematics teachers' needs (Rodrigues, 2004: 31). A supportive orientation of the Mathematics teachers of the school environment for professional development reduces anxiety and feelings of isolation and allows the teachers to experience a coherent, supportive, comprehensive and sustained professional development process. Efforts of improving professional development programmes need to be based on the understanding of Mathematical concepts and involving learners in active learning through encouraging them to participate in class (Higher Education Quality Committee, 2007a). Once the staff development process is in place, Mathematics teachers should be able to adjust to the school culture and be part of the professional learning community.

In a study by Little (2002), the relationship among teachers which is based on collaborative interaction and trust has high possibility of strengthening the learning community and instructional practices that lead to school improvement. A further consideration is the diverse background and experiences of the teachers that could be used within a group of teachers to further develop their knowledge and skills (Park City Mathematics Institute (PCMI), 2013).

2.3 THE TEACHERS WHO ARE THE LEARNERS IN THE SYSTEM

Teacher often develops Mathematical knowledge and skills during workshops. To make the workshop more effective, diverse training needs should be part of the development programme. Such needs can be identified if teachers are involved in planning for the training with their own needs and the needs of their learners in mind. The training process of teachers should be done in a continuous manner for the teacher to remain interested and think more about the teaching of Mathematics (PCMI, 2013). The main reason for the continuous development of teachers is to improve teacher competency in terms of subject knowledge and teaching skills. Developing learners to be critical thinkers is part of professional development activities. Workshop activities should provide intense mathematical experiences geared to the needs of Mathematics teachers (PCMI, 2013). The experience of interaction among all participants may result in a greatly increased understanding and awareness of the issues confronting Mathematics teaching today.

Teachers who undergo professional development and attend workshops may first select a mathematical goal for a “study lesson”; then spend an extended period of time collaboratively creating a detailed lesson plan; observe a participant teaching the lesson to learners; as part of a group reflect on how the lesson affected learning; and revise and refine the lesson to share it with others (PCMI, 2013). A learner interaction skill that involves problem solving and decision making has the potential of developing the learners’ critical thinking skills that could help them in solving Mathematical problems (Levi & Fennema, 2001). The understanding of Mathematics, for example, requires teachers to be equipped to teach problem-solving more than a general understanding of concepts. Research indicates that meaningful learning, although a slow and uncertain process for teachers and learners brings about an improvement in some teachers and learners as a result of the Mathematics teachers’ participation in professional development programmes (Franke, 2008). During the professional development of teachers, there are some skills that are straightforward

to acquire and practice such as listening to what learners' think then include their concerns when teaching them (Franke *et al.*, 2001; Franke & Kazemi, 2004).

When teachers work together as a team they are better able to improve the teaching of Mathematics through shared goals and understanding. It becomes much easier to identify common problems and develop strategies of addressing them. The learners should also be encouraged to develop and use Mathematical problem solving strategies.

2.4 THE FACILITATOR GUIDING TEACHERS TO CONSTRUCT NEW KNOWLEDGE AND PRACTICES

Walshaw and Anthony (2008) suggest that in order to improve the teaching of Mathematics, teacher development programmes should be structured to include discussion related to purposeful questions as well as listening carefully to what Mathematics teachers say to guide the instructional conversation to a deeper understanding of issues. Mathematical discourse involving explanation, argumentation and a defence of mathematical ideas becomes a defining feature of a quality classroom experience (Walshaw & Anthony, 2008). By managing the dialogue in large and small group discussions, HoDs can learn where Mathematics teachers are in their understanding of the subject and they can provide timely assistance by means of questions, clarification, and follow-up activities based on what was learned. Dialogue is managed for an academic purpose—for assisting intellectual and cognitive mathematical growth. It also means a real exchange takes place and is to do with what someone has said. During group dialogue, HoDs are able to identify Mathematics teachers' understanding and they can make an in-input with the kinds of responses and questions that will move the teachers to greater clarity, deeper analysis and more rigorous thinking. This approach for developing Mathematics teachers is in line with Vygotsky's theory of learning which suggests that knowledge is constructed in the midst of interaction with others and is shaped by the skills and abilities valued in a particular culture.

2.5 THE CONTEXT IN WHICH PROFESSIONAL DEVELOPMENT IS PRACTISED

The way in which Mathematics teachers teach learners is influenced by their understanding of the concepts and the learners also influence how the teachers impart the subject content (Nye, Konstantanopoulos & Hedges, 2004). Teaching does not take place in isolation. The context in which the teacher works may influence the teaching and learning process. Contextual factors such as school culture and the community in which the school operates may have impact on the relationship between the teacher and the learner in the classroom. Professional development needs to be structured in such a way that it changes what a teacher does in class and learner outcome on the subject being taught. Research done by Timperley and Alton-Lee (2008) show that through professional development, teachers can become motivated as they acquire new subject knowledge and teaching skills on a continuous basis. The researchers further assert that teachers become more responsible as they advance in their teaching career especially when the growth comes as a result of training done in workshops. Due to contextual differences, the professional development programmes should be tailor made to suit the changes of different school environments. One-size-fit all may not be effective in some school environments.

2.6 PROFESSIONAL DEVELOPMENT

Mestry, Hendricks and Bisschoff (2009) maintain that professional development and training is essential for school improvement but that some teachers may not achieve their full professional potential from it or be committed to attend workshops if the training is not coherent, integrated and well planned. In their study they show that teachers consider continuous professional development workshops valuable if they benefit from them by acquiring knowledge that improves their teaching skills; develops their competence; and improves their critical thinking skills. They further argue that for professional development to be effective, teachers need to be aware

and dedicated to their personal growth in subject knowledge, teaching skills and the relationship they develop with their learners (Mestry, Hendricks & Bisschoff, 2009).

Teacher professional development is a school's initiative to support Mathematics teachers to reduce problems in the successful operation of the school and in improving learner performance (Cattet 1996). Commitment to profession development should also come from the school's administration. Research by Ingersoll (2004) indicates that inadequate professional development by school administration is one of the most often reported causes of poor Mathematics performance in schools.

Mathematics is a complex subject that needs competent and confident teachers. One way of developing Mathematics teachers is through induction in their early days of teaching to improve their teaching skills and practices that were not learnt during their original educator training (Dowding, 1998; San, 1999). While HoDs are expected to focus on the management of teachers under their care, a new focus of responsibility is staff support. HoDs are expected to create a caring and learning environment focused on learner success. They are supposed to be knowledgeable in terms of Mathematics and research by Ingersoll (2004) indicates that inadequate professional development by school administrators is one of the most often reported causes of poor Mathematics performance in schools. The commitment of teachers to their own professional growth should make a significant difference in the kind of support they give their learners. Mathematics teachers could - under the HoDs' guidance - do a needs analysis to identify more relevant areas to be addressed during professional development.

A supportive orientation of the Mathematics teachers of the school environment for professional development reduces anxiety and feelings of isolation and allows Mathematics teachers to experience a coherent, supportive, comprehensive and sustained professional development process (Little, 2002). In planning for professional development, HoDs should identify Mathematics teacher needs

(Rodrigues, 2004). Once the staff development process has taken place, Mathematics teachers should be able to adjust into the school culture and be part of the professional learning community.

School reform through professional development should be geared in fixed programmes designed to develop particular Mathematics knowledge and skills Timperley, Wilson, Barrar and Fung (2007), Timperley and Alton-Lee (2008) argue that school improvement strategies that focuses of teacher development should pay more attention to developing Mathematics teachers. The teachers past knowledge and experience of curriculum and assessment methods should be taken into consideration by the HoDs when designing professional development programme Prior knowledge of the teachers Mathematical skills and subject content maybe a strong background for further professional development (Darling-Hammond, Bransford, 2005). Teachers may be competent in one aspect of the subject and weak on another. Such issues can inform the programme designers to ensure that the training addresses the needs of the teachers and not too generic in nature. The needs of the learners may also determine the kind of professional development need by the teacher (Darling-Hammond *et. al.*, 2005; Timperley *et al.*, 2007). According to Guskey (2002), goal oriented professional development has more potential of improving learner outcomes.

Good professional development evaluation should be planned so that all critical levels of development needs are assessed. Guskey (2002) identified five critical levels of evaluation: participants' reactions to development programmes or activities; participants' learning experiences in terms of skills and knowledge gained; organizational support related to policies and practices; available resources; and future initiatives. Another two levels of evaluating professional development are assessing how the participants use new knowledge and skills gained during the development process and learner achievement (Guskey, 2002).

2.7 PROFESSIONAL LEARNING NEEDS AND MATHEMATICS TEACHING SKILLS

Poor Mathematics achievement is a concern in its own right and it is the focus of most current school improvement initiatives. A number of research studies question whether, and under what conditions, teacher development will help or hinder Mathematics academic achievement. A study by De Wet, Babinski and Jones (2003) suggest that school environment to some extent influences the professional development of teachers in general and Mathematics teachers ability to develop Mathematical skills.

Some school context is more enabling than others. For instance schools in socio-economic disadvantaged communities and rural areas are less likely to emphasize teacher development due to the general low teacher morale and lack of strong culture for teaching and learning (Schaps, Battistich, & Solomon, 2004). The characteristics of such schools do not often support professional development of teachers due to lack of financial abilities. The attitude of teachers in the disadvantaged schools further inhibits their professional because they mostly lack interest in self-development and improving the standards of teaching and learning. In addition, these schools have fewer incentives than surrounding suburban schools and they offer poorer working conditions. Research shows that the social environment in which the school operates influences the teachers' on learners' social, emotional, and ethical development which impact the kind of teaching and learning that takes place in the school (Schaps, et al, 2004).

Professional development opportunities should occur in an environment where teachers experience trust and respect in order to acquire new information and understand its implications for practice. The Mathematics educator who experiences a relationship of trust will never feel socially isolated. Before teachers can feel free to interact with their HoDs they need to trust that their honest efforts will be supported and not be belittled (Bryk & Schneider, 2002; Phillips, 2003). A friendly and warm

school environment reduces feelings of disillusionment, anxiety, uncertainty and disorientation (DeWert, Babinski & Jones, 2003).

Schools in socio-economic disadvantages environments need continuous professional development of teachers. The kind of professional development programmes in such schools should aim at the achievement of Mathematics related outcomes (Bryk & Schneider, 2002). The knowledge that may lead to the achievement of such goals should be shared through active interaction between and among Mathematical teachers and between the teachers and the learners. Vygotsky's theory of learning suggests that knowledge is constructed in the midst of interaction with others and is shaped by skills and abilities valued in a particular culture.

2.8 THE ROLE OF HODS/MIDDLE MANAGEMENT

HoD is the abbreviation for head of department that is use in this study, although other countries use the terms, middle managers, department chairs and administrators (in the United States) and middle leaders, subject leaders and curriculum coordinators (in the United Kingdom). The No Child Left Behind (NCLB) Act of 2001 of the United States (US) stipulates that states should ensure the availability of "high-quality" professional development for all teachers. Although this policy emphasizes the need to provide quality education to all learners it is silent on how teachers can be trained to acquire the knowledge and skills that may enable them to help and address the needs of different learners. Furthermore, Teaching Commission of the United States of America (2004), emphasizes the important of Mathematics to the nation and the value it adds to the teaching profession and potential future human capital (TTC, 2004:11). South Africa's perspective on the professional development of Mathematics teachers is important, based on the fact that teachers are accountable for the learner performance in their subjects (Joseph & Rigeluth, 2010). The South African government expects schools to have measures in place to support teachers and help them improve teaching and learning in schools.

One of the more common misconceptions about the HoDs' role in a socially interactive classroom is that they should back away or stand on the side-lines and allow the Mathematics teachers to discover for themselves in an almost unplanned fashion (Woods, 2001). Expert HoDs plan extensively; they gather and arrange resources; and they diligently watch to identify where their help is needed. They engage in a complex balancing act of knowing when to take centre stage – when to act as an expert – and when to give up control and step back as a facilitator so that Mathematics teachers can learn by teaching themselves and each other (Brown & Campione, 1996). Team learning and collective participation in acquiring more knowledge and pedagogical skills helps in improving the teaching style of teachers and how they interact with the learners in their classrooms that takes place in (Putnam & Borko, 2000). Professional development should therefore include a variety of teaching and learning activities which can be easily adopted in a classroom situation. The model lessons observed and discussed during professional development workshops can be dissimilated to other teachers as a guide to improve their own practice (Little, Gearhart, Curry & Kafka, 2003).

The HoDs' role is, therefore, multifaceted in that they not only have to create and design a professional learning environment that offers opportunities for teacher interaction, but they also have to act as an experts, models, guides, and facilitators of the social interaction (Goos, 2004; Wood, 2001). They are expected to design the tasks, develop resources and establish a culture and norms for interaction which includes identifying roles and appropriate behaviour for teachers as they interact with one another; fostering discussion between them; and managing the complexities of multiple on-going tasks and activities (Goos, 2004; Wood, 2001). HoDs in South African secondary schools are responsible for developing teachers in their particular areas of expertise. They are in charge of teachers of a specific subject or a phase; for example, a Mathematics HoD is responsible for coordinating, guiding and developing Mathematics teachers in terms of the latest ideas or approaches to Mathematics; for the strategies and methods to use; as well as for the techniques for

assessing and evaluating learners. HoDs are also subject teachers and engage in teaching - but to a lesser extent. They are expected to lead Developmental Support Groups (DSGs) during the appraisal process (DoE, 2005) and as leaders in staff development, they are responsible for mentoring; giving support to teachers; assisting teachers in the development of their Personal Growth Plans (PGPs); conducting diagnostic assessments of teachers for development purposes; and doing summative evaluations at the end of the year for performance measurement (DoE, 2005). HoDs are required to provide feedback to teachers after the evaluation and mentoring processes in order to set targets for professional development (Monyatsi, 2006).

The Employment of Teachers Act, No. 64 (1998) states that HoDs' jobs depend on the approaches and the needs of a particular school. The school's areas of need may include administration, teaching, personnel, extra and co-curricular activities and communication as well as core duties related to teaching and learning (DoE, 2000). HoDs have to develop teachers in order to improve teaching standards and the progress of learners. They are also expected to participate in agreed school/teacher appraisal processes in order to regularly review professional practice with the aim of improving teaching, learning and management. HoDs are expected to lead Developmental Support Groups (DSGs) during the appraisal process (DoE, 2005). The roles and responsibilities of DSGs include mentoring; giving support to teachers; assisting teachers in the development of their Personal Growth Plans (PGPs); conducting the diagnostic assessment of teachers for development purposes; and the summative evaluation at the end of the year for performance measurement. It is expected that HoDs should provide teachers with feedback from which targets for development are identified and agreed upon (Monyatsi, 2006). HoDs who have a good knowledge of Mathematics should be proactive in supporting teachers and be committed to making a significant difference in their professional growth. Mathematics teachers can - under the HoDs' guidance - do a need analysis to identify more relevant areas that should be addressed during professional development in the school.

2.9 MANAGING THE TEACHING AND LEARNING OF MATHEMATICS

Compared to other countries in the world South African Mathematics performance is poor (Reddy, 2006, cited in Bergman, Bergman & Gravett, 2011). Performance in the standardised tests, such as the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), the Systemic Evaluation, the Third International Mathematics and Science Study (TIMSS), the Annual National Assessment (ANA) of South Africa and the Matriculation results are equally poor (Department of Basic Education (DBE), 2011). Mogari, Kriek, Stols and Iheanachor (2009) are of the opinion that quality qualifications and deep subject content knowledge are important for teacher effectiveness. If there is no effective management of the professional development programmes of Mathematics teachers in schools, teachers will not improve or develop and ineffective Mathematics teaching and student performance will be the result.

One way to assist and assess teacher development is by structuring programme classroom discussions with purposeful questions and listening carefully to what Mathematics teachers say to guide the instructional conversation to a deeper understanding of the issues (Walshaw & Anthony, 2008). Mathematical discourse involving explanation, argumentation and the defence of mathematical ideas becomes a defining feature of a quality classroom experience (Walshaw & Anthony, 2008). By managing the dialogue in large - and small - group discussions HoDs can learn where Mathematics teachers are in their understanding of the subject and can provide timely assistance by means of questions, clarification and follow-up activities based on what was learned. Dialogue is managed for an academic purpose - for assisting intellectual and cognitive growth in Mathematics. It also means a real exchange of ideas takes place and involves what someone else has said. During group dialogue, HoDs are able to hear what the Mathematics teachers understand; they can, then, respond in a relevant way and pose questions that will move the teachers forward to deeper analysis, greater clarity and more rigorous thinking.

2.10 PRACTICES AS TOOLS FOR IMPROVING THE TEACHING OF MATHEMATICS

Teacher professional development suggests certain roles for HoDs and Mathematics teachers. The HoDs' role is multifaceted in that they not only have to create and design a professional learning environment that offers opportunities for teacher interaction, but they also have to act as experts, models, guides, and facilitators of the social interaction. The HoDs should take the lead in designing tasks, developing resources and establishing a culture and norms for interaction (Goos, 2004; Wood, 2001) which includes identifying roles and appropriate behaviour for teachers as they interact with one another; fostering discussion between them; and managing the complexities of multiple on-going tasks and activities.

A common misconception about the HoDs' role in socially interactive classrooms is that they should back away from interfering - or stand on the side-lines - and allow the Mathematics teachers to discover things for themselves in an almost unplanned fashion (Woods, 2001). Expert HoDs plan extensively, gather and arrange resources and watch diligently to determine where and when their help is needed. They engage in a complex balancing act of knowing when to take centre stage – when to act as an expert – and when to surrender control and step back as a facilitator so that the teachers can learn by teaching themselves and each other (Brown & Campione, 1996).

2.11 DEVELOPING THE WORK-GROUP COMMUNITIES

Teacher development programmes in SA require teachers to be learning mediators; interpreters and designers of learning programmes and materials; leaders, administrators and managers; scholars, researchers and life-long learners; role models and moral beings; assessors; and subject specialists (Department of Education, 2000:13-14). It is suggested that if teachers can display all seven competencies, they will be in a position to teach effectively and, thus, facilitate

meaningful learning. Mathematics teachers should be inducted and empowered through TPD in order to have a trained and skilled teacher workforce that is able to deliver high-quality Mathematics teaching and learning (Asia Society, 2013). If the education policies on teacher professional development practice remain unchanged, then school goals and standards aspired to will simply continue along a legacy of unfulfilled reform (Policy Brief, 2011). To achieve improved performance in schools and to help learners reach set goals, the very culture of how teachers are developed should change. Schools should have incentives and structures to attract, develop, and retain the best teachers who are competent and effective in teaching Mathematics (Policy Brief, 2011).

2.12 SUMMARY

In this chapter I have provided a literature review related to the role of HoDs and how they manage the professional development of Mathematics teachers as well as the challenges they face during this process. I have indicated possible implications of developing Mathematics teachers professionally in public secondary schools and in justifying my claims, I referred to similar studies done on Mathematics educator professional development programmes in other countries and the effect they have had on the teaching of Mathematics. In the next chapter, Chapter 3, the research design, methodology, ethical considerations and credibility and trustworthiness issues are presented

CHAPTER 3

RESEARCH APPROACH, DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter attempts to provide a blueprint which guided the various steps taken in collecting and analysing data in this study. It presents the research approach, design and how the research participants were identifying as well as a detailed description of the sample and sampling techniques used in this study. Data collection methods are discussed, including the strengths and weakness of the methods used. Ethical issues and the strategies used to ensure credibility and trustworthiness of the research are also examined. The researcher used the methodology discussed in this chapter to achieve the following aims:

- To establish how HoDs and the Mathematics teachers understand the concept, professional development.
- To explore the HoDs' and Mathematics teachers' experiences of the process of professional development
- To identify the challenges experienced by HoDs and the Mathematics teachers in professional development
- To describe the strategies used by HoDs to develop Mathematics teachers.

3.2 RESEARCH PARADIGM

This research paradigm is defined by Johnson and Christenson (2009:33) as “a perspective about research held by a community of scholars or researchers that is based on a set of shared assumptions, concepts, values and practices.” According to Myers (2009:23), “every research study is based on some philosophical assumptions about the nature of the world and how knowledge about the world can be obtained.” Myers (2009:23) further asserts that “these assumptions must be made

explicit” even before the study unfolds for the researcher’s position or point of departure be known to the readers, supervisors and other scholars. These assumptions provide the foundation for everything that follows in any research process.

The philosophical assumptions guiding a study can be discussed in terms of the ontological, epistemological and methodological assumptions of the study (Creswell 2009; Whitehead & McNiff, 2009). The stance taken on the philosophical assumptions guide the research by shaping the questions asked and how these are answered (Grix, 2001). Ontological assumptions are concerned with what it is believed constitutes reality; the nature of social reality; and how what exists is described (Grix, 2001). According to Denzin and Lincoln (2000:157), “ontology raises basic questions about the nature of reality and the nature of the human being in the world.” My ontological position affects the manner in which this research was undertaken. As a qualitative researcher, I assume that there are multiple and dynamic realities that are content-dependent and embrace an ontology that denies the existence of an external reality. In the study the data collected from the participants regarding their lived experiences of professional development presents the multiple realities of the phenomenon being studied.

The other philosophical assumption is epistemology. Epistemology is a core branch of philosophy and is concerned with the theory of knowledge, especially with regard to its methods and the possible ways of gaining knowledge of social reality or whatever it is understood to be (Grix, 2001). According to Whitehead and McNiff (2009:22), “epistemology refers to a theory of knowledge which involves two parts ... a theory of knowledge (what is known) and ... a theory of knowledge acquisition (how it comes to be known).” Denzin and Lincoln (2000) believe that epistemology asks: “How do I know the world?” and “What is the relationship between the inquirer and the known?” Every epistemology, therefore, implies an ethical-moral stance towards the world and the self of the researcher. In research it has to be acknowledged that researchers’ epistemological stance is influenced by their

ontological position. Therefore, how researchers understand the nature of reality influences what they regard as knowledge (Clark & Creswell, 2009).

In terms of this study I believe that knowledge of the professional development of Mathematics teachers could be generated by interpreting the experiences of the participants who have experienced the phenomenon. This research was carried out in line with the principles of an interpretive paradigm which includes inductive reasoning (Devetak, Glazar & Vogrinc, 2010). Inductive qualitative research focuses on examining the subjective experiences of individuals and recognizing the importance that they attach to occurrences and their responses to specific events. The interpretive view assumes that access to reality - given or socially constructed - is only through social construction. Interpretivism is about giving meaning to the data collected within the context of the phenomena; it is what defines the situation and prescribes the meaning the participants attach to their experiences. Epistemological assumptions of an interpretivist paradigm are that data is not detachable from theory; what counts as data is determined in the light of some theoretical interpretation; and facts, themselves, have to be reconstructed in the light of interpretation (Bernstein in Myers, 2009). Theories are reconstructions of facts and the criterion of a good theory is an understanding of meaning and intention rather than a deductive explanation. Generalisations derived from experience are dependent upon the researcher, his/her methods and interaction with the subject of the study (Myers, 2009).

3.3 RESEARCH APPROACH

A qualitative research approach was used in this study. Qualitative research is subjective, personal and socially constructed and so the data generated, mostly, conforms to the experiences of the participants in the research; generalizability is not its chief concern. Merriam (2009:5) maintains that “qualitative researchers are interested in understanding how people interpret their experiences, how they construct their worlds and what meaning they attribute to their experiences.”

Spencer, Ritchie, Lewis and Dillon (2003) agree with Merriam by suggesting that qualitative research's intention is to provide an in-depth understanding of people's experiences, perspectives or circumstances or settings. The collection of qualitative data is non-numerical (Creswell, 2008; Fraenkel & Wallen, 2008; Johnson & Christenson, 2009) and seeks to explore, discover, construct and describe a phenomenon.

In qualitative research, data is collected mainly by means of interviews, observations and documents and the generated qualitative data is presented in the form of the printed word, images and audio-visual data (Denzin & Lincoln, 2000). The phenomenon of how heads of department manage the professional development of Mathematics teachers in public secondary schools was explored by visiting schools to gather data from these natural environments. In undertaking research data is normally analysed inductively rather than deductively. The process is analytic and aims at developing explanations that provide an insight into the phenomenon. By means of all the characteristics of qualitative research, the researcher gives a detailed account of how heads of department manage professional development of Mathematics teachers in public secondary schools.

Another reason for choosing qualitative research as opposed to other methodologies is that through the use of qualitative research I aimed to study the world of the participants in a natural setting without manipulating it. This is in line with what Bogdan and Biklen (2007:4) believe - that qualitative research is naturalistic and, therefore, "the natural setting in which a phenomenon is experienced is the direct source of data whilst the researcher is considered the key instrument throughout the research process."

As the researcher, I decided to do qualitative research because it allows the subjects being studied to give much richer responses to questions put to them as well as provide greater value and insights into the phenomenon being scrutinized and being investigated (Marshall & Rossman, 2011; Creswell, 2007). Qualitative research is

viewed as a flexible method that can be used to complement quantitative research by using it as a prelude to quantitative research. Qualitative research was the research method of choice for this dissertation because, according to Klenke (2008), it produces a wealth of detailed and descriptive data about a small number of people and cases; in addition, depth and detailed is achieved by using quotations and careful descriptions of situations. Data is presented in the form of words which may contain quotations that illustrate and substantiate the authenticity of the findings (Bogdan & Biklen, 2007). Thus, the product of qualitative research, which is usually a narrative report, is used to generate rich, thick descriptions that are vivid and detailed rather than a statistical report that is produced by doing research by means of quantitative research. In a qualitative study the researcher often engages in inductive reasoning which opens up new ways for understanding a phenomenon (Marshall & Rossman, 2011).

Although, as the researcher, I used a qualitative approach to data collection I am aware of its limitations. The sample for qualitative research is usually small and, therefore, cannot be generalized beyond the case being studied. The only generalization that may be made is within the context of the study and among the participants involved in the study. Some research methods in qualitative research, such as interviews are time consuming to conduct, transcribe and analyse.

3.4 RESEARCH DESIGN

For this study the research design provided a set of guidelines, instructions and prescriptions to follow in addressing the research problem. It served as a blueprint or a plan on how the research would be conducted by describing the research sites; how the subjects were selected; and data collection procedures with the purpose of anticipating the decisions to be made to maximize reliability and credibility of the findings (Marshall & Rossman, 2011). This study used a case study design which is an empirical inquiry that investigates a phenomenon, such as teacher development within a real-life context like the school (Yin, 2009). I decided to do a multi-site case

study to obtain a deeper understanding of the experiences of HoDs and teachers regarding professional development in the teaching of Mathematics. The three main characteristics of a case study are: it is limited to a specific phenomenon on which the researcher seeks an in-depth understanding; it has the ability of producing a thick description of the phenomenon; and it gives the reader a clear picture of the context of the study (Merriam, 2009). The weakness of the design is the inability of the researcher to generalise findings beyond the context of the study, although Stake (2005) argues that the purpose of a case study is to represent a case and not to generalise findings.

3.5 RESEARCH SAMPLE

A research sample is part of a population which is described by Creswell (2007) as a group of individuals who have the same characteristics under the same context of the study. In qualitative research only a few individuals are involved in the study which aims at the collection of in-depth data (Creswell, 2007; Mayan, 2009). This study utilised a purposive sampling method. According to Johnson and Christensen (2008), purposive sampling - sometimes called judgemental sampling - specifies the characteristics of a population of interest and then tries to locate individuals who have those characteristics. It is a technique common to qualitative research whereby the researcher uses information-rich participants to select a sample (Saumure & Given, 2008). The purposive sampling technique refers to a process where participants are selected because they meet criteria predetermined by the researcher as relevant in addressing the research question (Creswell 2008; Saumure & Given, 2008). Even though purposive sampling has strengths, its major weakness is that, just like any other non-random sampling methods, the data generated from such samples cannot be generalised to a population on the basis of a single research study (Creswell,2007). When carrying out qualitative studies, the size of the sample is not very important; what is important is the depth of the data gathered through such a process. Because qualitative researchers are more interested in unearthing data through the lens of the participants, this study attempted to study the phenomena of

how heads of department manage the professional development of Mathematics teachers in three public secondary schools. The sample consisted of eight participants: two Mathematics teachers from each of the three schools and two HoDs. The third HoD from the third school could not be interviewed due to health reasons.

3.6 DATA COLLECTION

Data for this research was collected by means of in-depth, semi-structured interviews and document analysis and then triangulated to increase its credibility and trustworthiness. Access to the research sites was important because the data for this research was collected through interacting with participants by talking to them and recording their responses on audio tapes.

3.6.1 *In-depth interviews*

In-depth interviews were used as the main data source to investigate individual experiences, beliefs and behaviour related to how heads of department manage the professional development of Mathematics teachers in public secondary schools. The data from in-depth interviews was analysed to identify themes and higher order patterns in the phenomenon being investigated (Schensul, 2008). Participants' responses were not restricted and a few open-ended questions were posed (Creswell, 2008). Knowledge is, at the very least, reconstructed rather than facts simply being reported in interview settings (Mason, 2002). Qualitative research interviews involve a two way conversation in which the interviewer asks the participant questions to collect data and to learn about their ideas beliefs, views, opinions and behaviour. According to Maree (2007), the main aim of qualitative interviews is to see the world through the eyes of the participants; to obtain rich descriptive data that helps understand the social reality of the participants' experiences.

Maree (2007:88) suggests that for any interview to be successful the following have to be observed: find the right persons who are best qualified in terms of your research questions to provide the information required; tell the person being interviewed what the aim of the study is and what information you want to garner from them; and verify that participants are willing to be interviewed as the aim is to collect rich and detailed descriptive data on the phenomenon being studied.

The advantages of using interviews are that they generate a large amount of data, especially in semi-structure interviews. They allow the researcher to enter the world of the participants in the process of trying to gain understanding of their experiences (Robson, 2011) and the researcher is also able to probe for clarity and depth during the interview. The disadvantages of interviews are that transcribing interview data is time consuming and the information gathered maybe biased as it is the perspective of the participants; therefore, another methodology should also be used to cross-check the data (Cohen, 2011).

3.6.2 *Document analysis*

The researcher engaged with documents as a data source because of their scientific valuable and for the detailed information can be elicited from them (Yin, 2011). The use and analysis of documents as sources information is a major method of social research and one which many qualitative researchers see as meaningful and appropriate in the context of their research strategy. Documents include newspapers clippings, minutes of meeting, personal journals and letters, policies and other text recordings of an organisation (Creswell, 2008). The disadvantages of document analysis are that relevant documents maybe difficult to find and the selection of the documents may be biased. In this study a document analysis of government publications relating to the introduction of performance management in education, policy guidelines and statutory instruments (S.I), was used and incorporated the literature study. It is referred to later in the analysis section for clarity of interpretation concerning the performance management implementation process.

3.7 DATA ANALYSIS

The analysis of data in this study was done inductively. This approach was chosen for its comprehensiveness and its ability to create thick descriptions from data which is a key characteristic of qualitative research (Burnard *et al.*, 2008). Although collecting data by means of interviews is time-consuming, it was the most suitable method for a case study. As a researcher, I used the data sets to identify underlying themes present in the data. After transcribing the taped interviews, I reduced the bulk of the data by coding it into smaller, more meaningful parts (Yin, 2009). The data was coded and merged into categories. A code book assisted in identifying themes (Kodish & Gittelsohn, 2011). A constant comparison was made inductively - with codes emerging from the data - which was categorized in themes in readiness for interpretation through contextual description and direct quotations from the research participants (Leech & Onwuegbuzie, 2007). The colour-coded data, in the form of phrases and statements, was collated *verbatim* as evidence of the phenomenon. Examples of themes are grouped together to make sense of data using colour themes for interpretation to provide descriptive accounts and to provide explanations.

The data is presented qualitatively as narratives in the form of words developed around themes that emerge from the data that have been collected through various methods.

3.8 CREDIBILITY AND TRUSTWORTHINESS

The aim of trustworthiness in a qualitative inquiry is to support the argument that the research findings are “worth paying attention to” (Lincoln and Guba, 1985:290). Silverman (2000), Fenton and Mazulewicz (2008) have shown how qualitative researchers can incorporate measures to deal with these issues. Lincoln and Guba

(1981; 1985) assert that trustworthiness involves establishing constructs that correspond to the criteria employed by the positivist investigator and these are:

- Credibility (in preference to internal validity);
- Transferability (in preference to external validity/ generalizability);
- Dependability (in preference to reliability); and
- Conformability (in preference to objectivity) of the research.

Credibility is a terminology used in qualitative research. It deals with the integrity of the research process. For research findings to be credible it must be believable from the meaning given by the participants and the researcher (Lincoln & Guba, 1985; Trochim, 2006). Qualitative research seeks understanding of a phenomenon from the perspective of the participants. It is the participants that talk about their experiences and the researcher deduce meaning from it.

I have provided an audit trail of all the decisions taken during data collection, analysis and interpretation. The process of member-checking was also done at different stages of this study; the interview transcripts were given to the participants to confirm the accuracy of the data capturing process and the interpretation of findings was also shared with the participant and with peers to confirm them and to reduce possible bias (Merriam, 2009). Another strategy of limiting researcher bias is flexibility which is when the researcher constantly indulges in self-reflection on potential bias. The researcher kept a memo pad which contained all the results of the reflection done during data collection and data analysis.

From the standpoint of the qualitative research perspective, Trochim (2006) maintains that the transferability perspective is the primary responsibility of the one doing the generalizing – in other words, the one reading the research document. Therefore, an explicit description of the context of the research and the assumptions that are central to the research are important so that the person who wishes to “transfer” the results to a different context may be responsible for making a

judgement on how sensible the transfer is. In this study, I provide detailed background information of the schools and the participants to enable readers to decide how the findings may fit their own settings. The transferability of this study is enhanced by the thick description of responses provided by the participants.

Dependability has to do with showing that the findings are consistent and could be repeated. Trochim (2006) argues that the idea of dependability emphasizes the need for the researcher to account for the ever-changing contexts within which the research occurs. The researcher is responsible for describing the changes that occur in the setting and how these affected the research approached in the study. The dependability of this study was achieved through triangulation whereby an attempt was made to get a true fix on a situation or phenomena by combining different ways of looking at it. The researcher is able to triangulate by using and comparing findings from different data collection methods and different participants (Silverman, 2010:277). The triangulation of different methods in this study was done by using semi-structured individual interviews and document analysis. Data was obtained from different participants, such as Mathematics educators at different levels of development and with different years of experience of professional development and HoDs. The purpose of data “triangulation” is to produce authentic, trustworthy findings, (Barbour, 2009:46; Silverman, 2010:133) and it is achieved by examining where the different data intersects. In this research triangulation was used to corroborate and confirm results that were produced by using different methods. Qualitative research thrives analytically on these differences and discrepancies to authenticate data, (Barbour, 2009).

3.9 ETHICAL ISSUES

The researcher adhered to all specified ethical requirements when people are involved. The ethical expectations were met by obtaining permission to conduct research from the Department of Basic Education and an ethical clearance letter from

the University of Pretoria's Ethics Committee before seeking permission from the Governing Bodies of Public schools in the Gauteng Province to undertake the research. I was honest with the informants and did not trick them into participating in the research by means of unethical behaviour (Myers 2009; Creswell, 2007). The participants' names remained anonymous and the information obtained from them was treated as confidential (Myers 2009:47). The researcher gave participants detailed information about the study to enable them to make informed decision on whether they wanted to participant in the study. Informed consent procedures were upheld by briefing the participant on the nature, focus, purpose, procedures and confidentiality of the study. Code names were used instead of real names to protect the privacy of the participants. Written consent was obtained from the participants prior to their involvement in the study and they retained the right to withdraw from the study if they felt that they did not want to continue with the interviews (Creswell, 2007).

The participants were the first people to be informed about the findings of the study. I took draft copies of my dissertation to the participants for feedback (member-checking). I also gave the participants final copies of the research report and a summary of the key research findings and recommendations. The findings are presented and discussed in Chapters 4 and 5 of the dissertation and are available on request. All the data has been kept by the researcher and her supervisor as hard copy on paper as well as electronically. The transcriptions were made on the researcher's own computer and were made available to her supervisor. All documents and data are kept in a safe place - a locked cupboard - in the in the office of the supervisor at the University of Pretoria and can be made available in case of any queries and disputes. After the completion of the dissertation, all research material will be stored in the SMTE Department. The University of Pretoria's policy of at least 15 years' data storage will be ensured. The dissertation will also be available in the library at the University of Pretoria.

3.10 LIMITATIONS OF THE STUDY

This section outlines the limitations of the study, carried out in terms of a qualitative research methodology. There is no research method that is completely fool-proof or that has only strengths and no weaknesses. Despite the chronicled strengths of qualitative research, Creswell (2008:107) suggests that “researchers also advance limitations or weaknesses of their study that may affect their results.” According to Creswell (2008:107), the weaknesses or problems are often related to inadequate measures of credibility and trustworthiness and loss or a lack of participants, small sample size and other factors that, typically, relate to data collection and analysis.

However, limitations are useful for other potential researchers who may choose to conduct similar or replicate the study (Creswell, 2008: 107). It is important to note that the purpose of qualitative research is not to produce data that can be generalized to other situations; it is used to get thick and rich descriptions of phenomena obtained in specific situations according to the sample studied in a particular environment. Findings from this research are not be generalised to other populations or samples that are in situations and environments different to the one in which this particular study was done.

3.11 DELIMITATION OF THE STUDY

This study is delimited to three selected township schools in Tshwane South in Gauteng Province. The focus of the study was on the professional development of Mathematics teachers only. The research participants were teachers and HoDs only. Other stake-holders, like learners, parents and other subject teachers were not part of this study.

3.12 SUMMARY

The research methodology used in this study has been discussed in this chapter. The reason for doing qualitative research approach was highlighted; some justification for the research design and sample selection was given; and data collection methods were discussed. Measures to be taken in enhancing credibility and trustworthiness of the study and ethical considerations were also described. The research findings and analysis are presented in the next chapter, Chapter 4.

CHAPTER 4

RESEARCH FINDINGS AND ANALYSIS

4.1 INTRODUCTION

In Chapter 3, the research design and methodologies used were discussed and the choices made with regard to research instruments and strategies in terms of the research topic as well as the research purpose, questions and objectives were justified. This chapter presents the data gathered during the semi-structured interviews with Mathematics teachers and the Mathematics heads of department. The data from the document analysis is triangulated with the interview data. The findings are discussed in terms of the aims of the study and the research questions. The gap which was identified in literature is the lack of structure in the professional development of Mathematics teachers. The aim of this study was to explore how HoDs support the professional development of Mathematics teachers to improve learner performance in the subject.

The main question was: *How do HoDs support Mathematics TPD in public secondary schools?*

The sub-questions were the following:

- *What is the HoDs' and the Mathematics teachers' **understanding** of the concept, professional development?*
- *How do HoDs and Mathematics teachers **experience** the process of professional development?*
- *What are the **challenges** experienced by HoDs and the Mathematics teachers in professional development?*
- *What are the **strategies** used by HoDs to develop the Mathematics teachers?*

4.2 BIOGRAPHICAL INFORMATION

Table 4.1: The Biographical Information of the Participants Involved in the Study

Participant	Gender	Grade	Teaching Experience
Teacher 1 (School A)	Male	9 & 10	1 years
Teacher 2 (School A)	Male	8&9	3 years
Teacher 3 (School B)	Male	10,11 &12	7 years
Teacher 4 School B)	male	10,11 &12	5 years
Teacher 5 (School C)	female	10,11 &12	6 years
Teacher 6 (School C)	female	10,11, &12	10 years
HoD 1 (School A)	male	11&12	5 years
HoD 2 (School B)	male	10,11 &12	6 years

4.3 RESEARCH QUESTIONS AND THEMES

The research questions and the themes reflected in the following table are followed by a detailed explanation.

Table 4.2: Research Questions and Themes

RESEARCH QUESTION	THEMES
1. What is the HoDs' and the Mathematics teachers' understanding of the concept, professional development?	<ul style="list-style-type: none"> • HoDs' understanding of professional development • Teachers' understanding of professional development • Comparison of teachers' and HODs' understanding of professional development • Integrating the teachers' and HODs' understanding of professional development with information from the literature.

2. How do HoDs and Mathematics teachers experiences of professional development?	<ul style="list-style-type: none"> • HoDs' experiences of professional development – planning for professional development, • Teachers' experiences of professional development – planning for professional development; how are activities organised and evaluated • Support needed for further development of Mathematics teachers.
3. What are the challenges experienced by HoDs and Mathematics teachers in professional development?	<ul style="list-style-type: none"> • Challenges experienced by HoDs • Challenges experienced by teachers • Comparison of the challenges experienced by the teachers and the HODs.
4. What are the strategies used by HoDs to develop Mathematics teachers?	<ul style="list-style-type: none"> • Internal school strategies • External school strategies

4.3.1 Theme 1: HoDs' and the Mathematics teachers' understanding of the concept, professional development

In this study two HoDs were interviewed. One of the HoDs perceived professional development to be an advancement of teaching skills which builds confidence in the teachers. He saw it as a way of improving the standard of Mathematics teaching; for this HOD professional development was an opportunity for him to improve teachers' understanding of content and concepts in teaching Mathematics - in partnership with the department.

“My opinion is that professional development is an opportunity for teacher development, that ensures that people keep on upgrading themselves through in service training by the department” (HoD 1).

The second HOD, however, perceived professional development as a continuous and on-going process that incorporated curriculum changes in the teaching of Mathematics.

“Professional development is on-going teacher development, ensuring that people keep on upgrading themselves, keep on knowing what is happening around them through in service training” (HoD 2).

Five of the six teachers interviewed in this study defined professional development as growth that takes place during in-service training, such as workshops and seminars. Most of the teachers felt that professional development was a continuous growth process in terms of improvement of content delivery which included teacher discipline and time management.

“My opinion of professional development is that it is a process of enabling or equipping a teacher or educator with respect to his area of teaching by use of either seminars or some spot checks” (Teacher 3).

“I have grown very much in terms of development. The way I handle things is different now. I manage my time very well. I am a much disciplined person and by so doing I am able to discipline my learners. So I can say I am developed” (Teacher 2).

The majority of the teachers understand development as being a continuous improvement of the self through peer support. They spoke about enhancing their skills as part of professional development. One teacher commented:

“Upgrading yourself, attending some courses, which will let him improve in his way of teaching” (Teacher 1).

Another teacher alluded to the fact that professional development was an all-round development that included being able to identify the kinds of problems that learners had and assisting them accordingly. The teacher said:

“TPD is trying to diagnose learner problems and using your spare time to solve those problems. What I mean is like interrogating your ways of teaching them (the learners), and taking the blame when they fail. Assuming that maybe there is something that you are not doing right” (Teacher 4).

The findings of this study show that HoDs’ and teachers’ understanding of TPD is similar in that they all see it as an opportunity for on-going teacher development that ensures improvement through continuous lifelong learning. Professional development is associated with peer learning, seminars, in-service training and workshops organised by the Department of Education. The understanding of the term, professional development, in this study is in line with Rogan and Grayson’s (2004) and Teclé’s (2006) concept of teacher professional development being a process that entails all activities, both formal or informal, that enhance professional career growth. The process of professional development described by the participants also agrees within Katz’s (1975) description of teacher development as a process that involves activities, such as workshops and graduate coursework which is meant to develop teachers’ professional abilities as well as encourage the natural process of development teachers undergo during their careers in terms of a personal process.

The participants perceive teacher professional development as a process that leads to self-reflection on their own methods of teaching and the ability to identify and address learner problems.

4.3.2 Theme 2: HoDs' and Mathematics teachers' experiences of professional development

The two HoDs in this study related how they encountered resistance to change from educators in terms of professional development. They were satisfied that the department assisted their teachers by sending facilitators to address them on specific topics which they believed needed addressing. They experienced a smoother developmental process when they received co-operation from their teachers. One of the HoDs said:

"I have experienced all this by simply attending all the courses that were organized by the Department where experts were sent in to come and workshop us in different topics" (HoD 1).

The other HOD added:

"In the former Model C schools, that is where one develops the most, by simply exchanging ideas and adopting their (Model C) strategies of teaching Mathematics. That formed the basis of development in as far as I know" (HoD 2).

HoD 2 also experienced challenges as a result of a shortage of personnel in the form of subject advisors and a large number of peer teachers who were reluctant to take up the opportunities provided by the department in the form of bursaries to study further.

"Whilst the department is busy developing us, we know that it takes two to tango. Now when these opportunities are provided for in Mathematics because of the perception that underlies the subject, Mathematics, there are those that pass these opportunities by and don't make these applications" (HoD 2).

The teachers, on the other hand, had different experiences to those of the HoDs. They experienced professional development from education workshops organised

by the Department of Education. All the teachers in this study had attended and participated in training opportunities provided by the department, such as CAPS - Continuous Assessment and Policy Systems - and the ANA-Annual National Assessment.

Four of the teachers obtained their development from peer support and seminars where they developed teaching strategies and problem-solving skills by sharing teaching resources. It was evident that no direct professional development was forthcoming from their HoDs. They commented:

“Unfortunately to be honest, I haven’t had any professional development from my HoD. The only thing that I can say that we have is the workshops” (Teacher 1).

“Even though I have not been fully developed by the HoD, I have progressed in terms of self-development” (Teacher 2).

“We have actually gone for seminars where educators actually meet and share some teaching methodologies in different sections of Mathematics, either trigonometry or statistics or whatever sections learners experience problems in. We meet and we teach each other like when we teach content. And we observe different methods” (Teacher 4).

The lack of HoD support in professional development experienced by some teachers confirms Wood’s (2001) finding concerning a common misconception - that HoDs should back away or stand on the side-line and allows the Mathematics teachers to discover for themselves in an almost unplanned fashion. Documents in some of the schools, such as minutes of departmental meeting, did not show evidence of professional development by the HoD.

Two other teachers referred positively to experiences of support from their HoDs. The support included the development of teaching skills and a better understanding of mathematical concepts which was done on a regular basis. The teachers said:

*“I have a really good HOD; my HOD helped me a lot and guided me a lot”
(Teacher 6).*

“Yah, I can say that I have been professionally developed if I can compare myself now and when I started teaching. I have grown very much in terms of development” (Teacher 5).

From the interviews, it seems that most of the HoDs do not plan for, or take full responsibility for, the management of professional development. They only mentioned implementing the professional development plans of the Department of Education. The plans were carried out in organised seminars by Mathematics experts. The HoDs and the teachers saw these seminars and workshops as an external development.

“Through the school improvement plan we have a contribution that we make by doing the departmental school improvement plan where we come up with strategies of how to handle the new developments since the curriculum is always changing and so we do it through the improvement plans; we communicate them to our educators” (HoD 1).

One HoDs planned meetings with junior staff members to discuss issues, such as subject matter and learner performance. It was deemed progressive when the learners performed well in tests and examinations.

“We hold meetings with the staff or the junior staff and try to show them the critical areas that need attention and we always monitor that through assessment processes like giving tests and exams and checking the performance and whether we are on the right track” (HoD 1).

The other HoD experienced a challenge in being overwhelmed by the staff establishment and sometimes having to manage two learning areas. Usually, those two areas are paired in a school that has a low staff establishment. He managed this by delegating part of the workload to subject committees and subject heads. Meetings held were platforms to address these challenges.

“I also manage the other subjects. What happens is that we normally have a year programme, where in the year programme we would have different types of meetings and what we also do in terms of managing; I also ensure that I call the subject committees and the subject heads meetings where we go through the year programme in our regular meetings” (HoD 2).

The teachers were not aware of planned professional development - apart from occasional cluster meetings. In the meetings they discussed learner activities and assessed and compared learner performance. The agenda and the minutes of the cluster meetings showed that teachers would be invited for training and reflected the content of the sessions during the meetings. In most cases there was no evidence of any pre-planning of the training. They were also developed by more experienced teachers from other schools. It was thought that it was the responsibility of the teachers to ask for help. It seems that the teachers receive *ad hoc* training when the need arises.

“There is nothing. Really from my perspective ... if you don't stand up on your own to get teachers that are in other schools to assist you, or go to the workshops that are organized, then you are going to struggle” (Teacher 5).

“In my opinion there is no development that takes place. If I personally have a problem, I will approach another teacher that I think can help me. That is how we work” (Teacher 6).

The continuous professional development of teachers needs to be well planned and carried out according to policy to ensure that they attend and show a positive

attitude to workshops (Lessing & de Witt, 2007). If the education policies concerning teacher professional development practices remain unchanged, then the goals and standards that school aspire to will simply continue as a legacy of unfulfilled reform (Policy Brief, 2011). The participants' responses suggest that most teachers have no experience of planned developmental activities.

The Asia Society (2013) believes that Mathematics teachers should be inducted and empowered through TPD in order to have a teacher workforce with training and the skills needed to deliver high-quality Mathematics teaching and learning to learners. It seems that the HoDs in this study do staff development when it is requested by the teachers which mean that there are no class visits or monitoring to identify problem areas to develop teachers. This means that teachers are required to identify their own problems and ask for the needed help. The problem with this developmental approach is that some teachers may not be interested in attending developmental sessions and, therefore, do not share their developmental needs with their HoDs and this could lead to inadequate professional development. Research by Ingersoll (2004) indicates that inadequate professional development by school administration is one of the most often reported causes of poor performance in Mathematics.

Only one teacher in this study spoke of a planned professional development in terms of regular meetings once or twice a month. The teacher was developed by means of regular classroom visits and the HoD ensuring that the planned professional development activities were implemented.

"There is some planning done. We also meet, especially with the HOD, to see that the implementation of the things planned is happening. The way it is disseminated to the kids is the way that we actually agreed upon" (Teacher 3).

Most of the teachers perceived the organisation of professional development as an activity that had no structure or procedures that could be followed. They felt that the topics that were discussed were randomly suggested by the teachers during the

workshops. There was no formal structure of planned activities and evaluation of the set objectives of training. More experienced and competent teachers took ownership of the workshops and shared their knowledge and skills in the teaching of Mathematics with other teachers. They advised one another on resources to use and how best to deliver the content. They relied on teamwork to reach the desired outcomes.

“The person who is knowledgeable is the one in front and he actually teaches us, if we have any questions that we want to ask and then clarification is done but we haven’t discussed or written any tests. The resources that we use are textbooks and research on the internet. Those are the activities that we do” (Teacher 3).

According to Meador (n.d.), the process of TPD includes conducting meaningful evaluation by means of class visits to identify areas of need and weakness and to create an individual plan for specific teachers to help improve the quality of teaching. These evaluations should drive plans for resources, suggestions and professional development to improve identified areas of need. Brookfield (2005) asserts that teacher professional development should focus on keeping abreast with new knowledge and skills in subject areas by attending in-service training, such as workshops or short term courses. Champion (2003) supports this notion by proposing that there should be regular opportunities for systematic professional growth and development.

Walshaw and Anthony (2008) suggest that in order to improve the teaching of Mathematics and teacher development, programmes should be structured to include discussions with purposeful questions and that facilitators should carefully listen to what Mathematics teachers say in order to guide the instructional conversation to a deeper understanding of identified issues. School plans and documents from the different departments in the schools lacked a shared vision for professional development; the purpose of professional development; and operation guidelines.

Although it seems that professional development is mostly unplanned and has no structure, there was some evidence of staff evaluation. The technique used to evaluate teachers on their development is one that also entails evaluating the performance of learners. The learners' performance serves as a measure of the teachers' teaching skills and development. Unfortunately, this creates some sort of competition among the teachers.

"And the other way is - we normally look at the term tests. We have our own diagnostic analysis where we see the test failed and the particular area, we sit down and try to diagnose what could be the cause to that" (Teacher 4).

Another way in which the professional development of teachers is evaluated is by allowing the teachers to progress with their grades up to Grade 12 where learners are assessed in the national examination.

"But I think the continuity in the learners that you teach evaluates you as a teacher. Teachers use Grade 11 as a marker of what they will get as a pass percentage in Grade 12" (Teacher 4).

The roles and responsibilities of Developmental Support Groups (DSGs) include assessing the professional development of the teachers and identifying their needs (DoE, 2005). HoDs are expected to provide teachers with feedback from which targets for development are identified and agreed upon (Monyatsi, 2006). According to Guskey (2002), the purpose of evaluating the professional development of teachers is to determine whether the programmes or activities are achieving the intended results. Evaluation should further assess if the programmes and activities are better than before and if it is worth the cost. Guskey (2002) further recommends that professional development evaluation should focus on five critical levels of development, namely: participants' reactions to the professional development experience; the knowledge and skills gained by the participants; organisational support in staff development; how the participants use the new knowledge gained

through the process; and learner performance or achievement. In this study the findings suggest that profession evaluation seems to be based on the last evaluation criterion, learner performance or achievement. The HoDs and the teachers referred to reflection on the outcomes of the knowledge gained by the assessment of learners' performance in the Grade 12 national examination. The other levels of professional development are not evaluated.

Inviting other teachers to speak about various topics serves as a good motivation as teachers get support from other teachers. A teacher teaches a topic on another teacher's behalf and that teacher remains in the class to observe how to improve on teaching the topic.

"From time to time we keep on inviting other people and try to find different ways on how to do it better" (Teacher 4).

"We meet and we teach each other like when we teach content. And we observe different methods" (Teacher 2).

Wong (2004) argues that learner achievement depends on the teacher's knowledge, skills and classroom practice which imply that new teachers should observe more experienced teachers as they teach and also allow experienced teachers to observe them as part of sharing and growing together. Wong (2004) further maintains that structured and sustained professional development programmes allow new teachers opportunities to grow and learn from each other and to respect each other's work. In this study the concept is presented as co-teaching or paired-teaching and it is not only a development for new teachers, but also for veteran teachers who need to learn new skills. With reference to Katz's theory, co-teaching and other forms of peer support takes place, mostly, in stages one and two of educator development and the teachers' needs could be classified as consolidation or renewal in which the teacher desires to learn and use new teaching styles, materials and ideas (Katz, 1975).

In another study Putnam and Borko (2000) also suggest that teachers learn through participation in professional development communities, mostly in terms of classroom activities that facilitate the teaching of Mathematics. Professional development activities that include instructional plans, assignments, videotapes of lessons and samples of student work enable teachers to learn from one another (Curry & Kafka, 2003).

Both HoDs maintained that what is successful in professional development is the work schedules provided by the department that serve as a guide to the pace and work content to cover during a workshop. They emphasised that positive teachers' attitudes pave the way for smooth change as they often encounter resistance from them. Teachers often resist change because it is new and selling new ideas to teachers is not always an easy task. The HoDs found that teachers accept change when they are involved in the decision making process.

"Most of the time, we look at the attitude and try to make them understand the importance of developing as people" (HoD 1).

"You see teachers appreciate engagement, when teachers own up a particular decision they automatically like that decision because it is theirs and this results in them being properly developed" (HoD2).

What the teachers found to work well in professional development was the individual commitment that teachers made. They felt that when the school takes responsibility for development, there are greater chances for development. They found the technique of swapping teachers a good idea that learners appreciated. The teachers witnessed the progress achieved through teacher forums. Professional development also worked really well when training addressed the needs of the teachers.

“At the end of the day, this goes back to individual commitment. The schools themselves need to work on their people (educators) they mustn’t take the teachers” (Teacher 1).

“Teacher’s forum that works well because if you need a situation where you deal with a certain topic” (Teacher 5).

4.3.3 Theme 3: challenges experienced by HoDs and the Mathematics teachers in professional development

The main challenge that the HoDs face is a resistance to professional development. The resistance comes, mostly, from teachers who are close to retirement. The teachers they work with are rather reluctant to study further. They also consider the support that they receive from the district to be insufficient and that the department provides workshops that are too short. They complained of constantly having to defend a changing curriculum.

“There is a lot of resistance by the older teachers’ (HoD 2).

“The commitment by the department of education is one of the biggest challenges. It’s like they don’t take it seriously. The department takes us to workshops for three days, two days or in an afternoon” (HoD 1).

Teachers also face many challenges in terms of workshop attendance as they are expected to attend many workshops which pose a challenge when informing colleagues who were unable to attend the workshops of the proceedings. Some teachers are not interested in professional development and just attend workshops to comply with the circulars from the education department. A study done by Raj, Hendricks and Bisschoff (2009) on teacher development for an Integrated Quality Management System (IQMS) noted that the teachers’ attitudes towards their schools influence how they receive training and how they perform afterwards. In their study teachers who attended school regularly are more positive towards professional development than those whose attendance is irregular. They argue that teachers

with irregular attendance lack interest in training and find the workshops time-consuming. They also identify a lack of resources as a limiting factor and feel that because the Department of Education and the schools have other demanding expenses it may be the reason for a reduced budget when financing teacher development.

Other challenges identified in this study are: teachers come to workshops just to comply with department circulars; they do not participate in the workshops; and they attend workshops just to sign the register. A concern was expressed that workshops attended over weekends and after school conflict with teachers' personal time. A South African study by Lessing and de Witt (2007) found that teachers are reluctant to attend workshops during school holidays because the need to rest after all the work they are expected to do during school term.

4.3.4. Theme 4: Strategies used by HoDs to develop Mathematics teachers

A major strategy that HoDs use is one of team work as teachers are willing to work but they experience resistance from learners. They encourage parents to be more involved in their children's studies and they apply strategies stipulated by the department in implementing CAPS. Teachers are included in initiating workable solutions to classroom problems. The strategy is to close the gap between what the HoD knows and what the teacher does not know and completed tasks are well documented.

"We normally rely on the strategies by the department. They do organize the CAPS trainings and things like that, the NCS. We only rely on those methods by the department" (Teacher 4).

"The little that I am trying is just meeting them and closing the gap between what I know and what they do not know. That's the little that we are trying to do to engage them" (Teacher 3).

The teachers use informal strategies to develop skills; they learn by observing and listening to what others do. Teachers use their holidays and weekends to attend workshops and they take what support they can from HODs and the district.

“I have had a few informal strategies, so for me, I learnt the strategies informally by just listening to the guy and then looking and saying oh that I can do. I apply it” (Teacher 1).

The HoDs referred to the need to support teachers in building their confidence and changing their mind set. HoDs need support from the department in terms of policy implementation and also in terms of capacity building in terms of management skills. They need financial support for attending training courses concerned with skills they require to develop others.

“I believe it could be support from the department. Especially in terms of for me to support the other educators I must be knowledgeable, now if the department can have programmes where management teams we are not only capacitated in terms of management but also subject specific” (HoD 2).

Teachers are, apparently, keener to receive support from other teachers rather than help from the district. They need some commitment from the department in terms of development of teacher skills and not for compliance. Teachers need short term goals and long term goals in working towards outcomes.

“So the support that I think is needed is to draw out short term and long term goals. But the short term which I think is the most important one is the commitment from all stake holders, then once the team is on board its then we can look outside for getting more resources, ideas and more strategies” (Teacher 1).

Teachers need to keep abreast of the technological age and they need regular practice with advanced gadgets that learners are using. They need to discuss, observe and evaluate their practice in order to keep improving.

“We really need different types of technology like overhead projectors, like the use of tablets. You know that kind of thing. You know kids these days have that technology mindset where things are done on the tablets etc. so we also need some knowledge when it comes to the use of technology” (Teacher 3).

Intensive professional development programmes can help teachers increase their knowledge and change their instructional practices by focusing on three teacher characteristics, namely: subject matter knowledge for teaching; understanding student thinking; and advanced instructional practices (Garet, Porter, Desimone, Birman, & Yoon, 2001). All teachers should be involved in continuous learning and the practise of Mathematics; analysing and refining their classroom practice; and becoming resources for colleagues and the profession (PCMI, 2013).

4.4 SUMMARY

In chapter 4, a data analysis and the research findings in terms of themes support by *verbatim* quotations. In the analysis it has also been shown how HoDs support the professional development of Mathematics teachers in secondary schools in Gauteng Province. The findings of this study were related to the relevant literature. In the final next chapter, Chapter 5, a summary of the findings is given; conclusions are reached; recommendations are made; and suggestions are made for future research.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The purpose of this study was to explore how HoDs support the professional development of Mathematics teachers in order to improve learner performance in the subject. TPD is central to the study and plays a key role in serving as a basis for subject expertise and learner achievement in Mathematics (Sowder, 2007; Lerman, 2001). The rationale for the study was that Mathematics teachers are not given adequate supports by their line managers or HoDs and, hence, the poor participation and achievement in Mathematics by learners from previously disadvantaged schools. Not only are Mathematics teachers under-developed, but Mathematics teaching is under-resourced; TPD is poorly managed; and the new Mathematics curriculum and teaching standards are not matched with qualified and competent Mathematics teachers to address the Mathematics problems in township schools where there is a need for high-quality teaching (Hammond, 2000). The assumptions in this study were that support will result in good Mathematics teachers which will then improve learner performance.

5.2 SUMMARY OF CHAPTERS

In chapter 1, the research purpose was presented; the rationale for the study was explained; and the research questions were given. The research design and the measures taken to ensure trustworthiness and credibility of the study were also briefly described. The limitations of the study were acknowledged and an indication was given of the possible significance of the study to the greater research community.

Chapter 2, provided a review of the relevant literature concerning the role of HoDs and how they support the professional development of Mathematics teachers as well as what challenges they face during the TPD process. Possible implications for developing Mathematics teachers professionally in public secondary schools were cited. In justification of her claims, the researcher referred to similar studies done on Mathematics educator professional development programmes in other countries and the effect they have had on the teaching of Mathematics.

In Chapter 3 the research design and methodologies used were discussed and the choices made with regard to research instruments and strategies in terms of the research topic as well as the research purpose, questions and objectives were justified. The data gathered during the semi-structured interviews with Mathematics teachers and Mathematics heads of department was presented and discussed in terms of the aims of the study and the research questions. The gap identified in literature was unstructured TPD and HoD incompetency. The aim of this study was to explore how HoDs support professional development of teachers teaching Mathematics to improve learner performance.

Chapter 4 included a data analysis and research findings in terms of themes supported by *verbatim* quotations and an analysis of how Mathematics HoDs support or not support the professional development of Mathematics teachers in secondary schools in the Gauteng Province. The findings of this study were compared to the relevant literature.

The final chapter, Chapter 5, presents a summary of the research findings, makes recommendations and draws conclusions.

5.3 SUMMARY OF RESEARCH FINDINGS

A summary of the research findings is given in terms of the questions originally asked.

5.3.1 The HoDs' and the Mathematics teachers' understanding of the concept, professional development

The findings of this study show different ways in which the teachers and HoDs conceptualise professional development. One understanding of professional development is an advancement of teaching skills which builds confidence in teachers and uplifts their standard of teaching. Teachers in this study, on the other hand, see professional development as growth that takes place during in-service training, such as workshops and seminars. A common understanding of the concept professional development is that it is a continuous growth process in terms of the improvement of content delivery, teacher discipline and time management. There were different opinions on how teachers advance and grow in the process of professional development. The teachers view professional growth as self-improvement and empowerment that occurs through peer support while the HoDs consider the professional growth to be a result of training organised by the Department of Education to improve the competency of the teachers. The way in which the HoDs and the teachers explained their understanding of the concept professional development does not suggest that HoDs should play a major role in the professional development of teacher - as suggested in literature. There is a great dependency on the Department of Education to organise and facilitate professional developments training and programmes.

5.3.2 HoDs' and Mathematics teachers' experiences of professional development

The two HoDs do not regard profession development as their responsibility. Professional development is perceived as external (out of school) training organized by the department. The possible reasons for this perception could be due to the lack

of policy and structures that define and enable HoDs to take a leading role in the professional development of teachers. The HoDs seem not to have a clear outline or guide on how to develop their teachers. Each HoD has to initiate his/her own strategy to develop the teachers which has resulted in many teachers not being developed by their HoDs. There was also no mention of the experiences of HoD training for leadership in the professional development of teachers. Other possible barriers to HoDs' effective leadership roles in professional development are their heavy workload, lack of sufficient time and lack of competency to allow them to plan and implement professional development.

When HoDs were asked how they planned the professional development of their teachers, they spoke about the general school development plan that was devised and guided by the Department of Education and then communicated to the schools by means of circulars. This external professional development often does not cater for the individual and the contextual needs of the teachers. There is no school-based professional development plan or programme to ensure that the professional needs of the teachers and the desired outcomes are achieved.

The HoDs did not discuss their role in the professional development of teachers. Of the eight teachers in this study only two cited experiences of support from their HoDs. The other six teachers referred to their experience of workshop-based professional development which some studies report to be an ineffective way of developing teachers (Darling-Hammond *et al.*, 2009). Despite the prevalence of workshops that were attended by most of the teachers in this study, their record for changing teacher practice and learner achievement remains questionable. Short courses in the form of workshops do not often change teachers' attitudes and practices and have little effect on improving student achievement. Due to the fact that courses are conducted as workshops that are general, the needs of individual teachers who could be at different stages of development - as state in Katz's theory (1975) - may not get the necessary support that they need to develop.

Although in this study the HoDs and the teachers depended on the Department of Education to develop teachers, Lessing and de Witt (2007) believe that the school management team has a responsibility to motivate teachers to attend development programmes to enhance their knowledge, skills, values, and attitudes to improve their competency. The experiences of the teachers confirm that HoDs have minimum support and responsibility for their professional development. The teachers had different experiences to those of the HoDs; they experienced professional development only through education workshops. All teachers, apparently, attend training opportunity provided by the Department of Education, such as ones on Continuous Assessment and Policy systems (CAPS) and Annual National Assessment (ANA). Four of the teachers obtained their development from peer support seminars where they learnt about teaching strategies, problem solving and the sharing of teaching resources.

It was evident that there was no professional development being received from their HoDs. Only two teachers mentioned that their HoD was directly involved in supporting their development. It seems as if there is a gap in encouraging and developing HoDs to take the leading role in ensuring that teachers are developed on a continuous basis. Many HoDs depend on the Department of Education to design and implement training for teacher development. The kinds of workshops organized by the department seem to focus on the implementation of new policies and not, necessarily, to address the individual needs of the teachers which may be different depending on the development stage of the teachers - survival, consolidation, renewal and maturity as suggested in Katz's theory (1975). The training is, mostly, generic in nature to address the changes in the curriculum which aligns with the renewal maturity stage in Katz's theory and may have little influence in enhancing the subject competency of individual teachers who could still be in the survival or consolidation stage.

In this study the HoDs encountered resistance to change from some of the teachers and one HoD had a negative experience in the form of a shortage of personnel in subject advisors; he was also a bit disheartened by the large number of peers who

did not take up opportunities provided by the department in the form of bursaries to study further. The reason for the negative attitude of teachers to professional development could be that their individual needs are not being addressed. There was little evidence of evaluation of the development process. HoDs assess teacher development through the progress of the learners; it is deemed to have progressed when the learners performed well in tests and examinations. Guskey (2002) suggests different critical levels of professional evaluation: participants' reactions, participants' learning, organizational support and change, participants' use of new knowledge and skills and learning outcomes. The findings of this study show evaluation of professional development as learner outcomes and the other levels which could help in identifying needs and that the competencies of the teachers are not evaluated. Evaluating the reactions of the teachers would be useful in determining their interest and motivation for professional development.

5.3.3 Challenges experienced by HoDs and the Mathematics teachers in professional development

The challenges that the HoDs face are resistance from, mostly, veteran teachers who are close to retirement and teachers who are reluctant to enrol for further studies. The HoDs felt that support from the district was insufficient as the department provided workshops that were too short and did not address individual needs and they complained of constantly having to defend the changing curriculum. From the challenges mentioned by the HoDs, it seems that there is an urgent need to increase progress in developing HoDs to establish positive working relationships with their teachers in order to lead in their professional growth. There should be some incentives and recognition of the professional growth of teachers. As for the veteran teachers, their negative attitudes could be that the generic training organized by the department lacked value and did not meet their individual needs.

The teachers also face many challenges: workshop training is too short and does not adequately prepare them to implement the changes in the curriculum and new assessment policies, like ANA and CAPS. After attending the workshops, the

teachers are supposed to share the knowledge and skills gained at the workshop with their colleagues at school. Some of the teachers find it challenging to train their colleagues because the training they received was inadequate and they are still struggling to grasp the new knowledge and skills. Other teachers are not really interested in the training and only attend the workshops to comply with instructions from the department communicated by means of circulars. Teachers attend workshops just to sign the register and do not participate in the workshops as required. The teachers spoke of passive resistance by not participating during the training sessions and of, at times, being absent from training. This form of resistance should be investigated by the Department of Education and addressed in terms of a needs analysis to make the training purposeful and valuable and also to motivate teachers to have some self-drive for professional development. There is doubt about the effectiveness of the workshops if the attitudes of the teachers are that they should just comply with the expectations of the department. It is in such cases that HoDs who work closely with the teachers can help identify the needs and concerns of the teachers and explore ways of supporting them.

It is evident in the findings of the research that the teachers need support, especially in the teaching of Mathematics. In the classroom situation all teachers may lack confidence in teaching the subject. There is also the need to keep abreast of the fast changing technology and expectations to incorporate the use of technology in teaching. Resources are inadequate and there are frequent curriculum changes. The new CAPS curriculum is a challenge because certain topics are still problematic to comprehend and to teach. Because some teachers' needs are not met in workshops, teachers consult with, and seek assistance from, their peers and not their HoDs. This finding suggests a lack of teacher awareness of the professional development responsibility of the HoD or of their competence to support the teachers in the teaching of Mathematics. This leaves the teachers with one option which is to attend the workshops which are often schedule during after school hours or on Saturdays to avoid interfering with teaching time. All the teachers in this study maintain that

after school and Saturday training is inconvenient and conflicts with their personal time.

5.3.4 Strategies used by HoDs to support and develop Mathematics teachers

The strategies that are, generally, used by the two HoDs are those adopted from former Model C schools, including team work. The team initiative is a strategy used to close the gap between what the HoD knows and what the teacher does not know. The HoDs did not present themselves as subject specialist and they were willing to learn from their teachers and teachers from other schools. The team work strategy also encourages positive teaching and learning environment. Some teachers experience resistance from their learners and need parental support and involvement in their children's studies.

With regard to the implementation of CAPS, although there are strategies stipulated by the Department of Education, the teachers suggested some workable solutions to solve the problems of teaching Mathematics in the classroom; they use informal strategies to develop skills, such as learning by observing and listening to their colleagues. To create extra time for professional development, some teachers devote holidays and weekends to attending workshops. It seems that the teachers contradicted themselves when talking about resisting attendance of workshops over weekends and after school hours because it conflicted with their personal time as they also suggested the use of the same personal time as a strategy for professional development.

Another strategy identified by the HoDs that seems to work in their schools is the technique of swapping teachers around. The teachers exchange classes in order to let other Mathematics teachers teach a topic they are struggling with and they observe the strategies the other teacher uses in teaching the particular topic. There are also teacher forums which provide an opportunity for teachers to discuss the subject-based problems. The teachers spoke about being more open to discussing their

concerns in such forums as opposed to during the workshops organised by the department.

Involving teachers in active participation in identifying development needs and decision-making is a strategy used by one of the HoDs to change the teachers' negative attitude to professional development. This finding is in line with an earlier study by Putnam and Borko (2000) which suggests that teachers learn through interaction with other teaching during professional development sessions, mostly in classroom activities aimed at improving the teaching of Mathematics. Involving teachers in making decision on the content and structure of professional development activities may create a sense of ownership and, thus, reduce resistance to training for professional development.

5.4 CONCLUSIONS

This study explored how heads of department support the professional development of Mathematics teachers in public secondary schools. The results highlight the need to affirm the leadership role of the HoDs in the professional development of the teachers and to allow HoDs to acquire knowledge and skills that will enable them to perform this role effectively. The professional development workshops designed and implemented by the department seem to be the main source of professional development for the teachers involved in this study. It seems that teachers regard these workshops as inadequate and that they do not fully address their needs. The teachers attend the workshops in order to comply with department circulars. To address this problem, instructional designers need to develop flexible teacher professional development programmes for teaching and learning Mathematics based on factors, such as teacher competence levels and awareness of learners' experience and background, subject matter and instructional communications and technology.

From the findings, it may be further concluded that there is either insufficient, or a lack of, professional development of Mathematics teachers in public secondary schools. Ultimately, this is reflected in the poor results of Mathematics learners which are caused by incompetence and an insufficient understanding of mathematical concepts. HoDs and teachers have positive experiences of teamwork and peer support which should be further explored as a strategy for improving the competency of Mathematic teachers. Assessment of different levels of professional development may help in monitoring the professional growth of the teachers and also motivate them as they become aware of their own professional progress.

5.5 RECOMMENDATIONS

The following recommendations are made concerning the professional development of Mathematics teachers:

- A policy on staff development should be instituted in line with the roles of the Department of Education, the school principals, the HoDs and the teachers.
- The Department of Education and the principals should support HODs in planning, organising, supervising and implementing professional development to better equip Mathematics teachers with the required knowledge and skills.
- Comprehensive training should be introduced for HoDs to give them confidence and make them competent in supporting the professional growth of the teachers.
- HoDs should be able to identify the different developmental stages of the teachers and recommend appropriate training needs.
- Professional development workshops and seminars should be purposeful and meaningful. The goals to be achieved should be incorporated in the assessment to help identify further strategies for improvement in the teaching of Mathematics.

- The HoDs and teachers should continue to use workshops and seminars as platforms for sharing best practices as well as peer support to encourage, organise and evaluate effective professional development.
- Conflict management should be part of the training for HoDs to enable them to address relationship challenges, such as the teachers' reluctance and resistance to professional development training.
- Formulating school-based policy on professional development should be encouraged. The policy should include professional development needs assessment of individuals and the assessment of professional growth at different critical levels which are: participants' reaction, participants' learning, organizational support and change, participants' use of new knowledge and skills and learning outcomes.
- Schools should identify and award incentives that could motivate teachers and encourage them to participate more effectively in professional development programmes

5.6 DELIMITATIONS

This study was limited to Mathematics HoDs and Mathematics teachers in secondary schools in the Gauteng Province only because the purpose of the study was to explore selected HoDs' support for the professional development of Mathematics teachers in improving learner performance in the subject. The professional development of Mathematics teachers for school improvement occupies a central role as Mathematics plays a key role in future innovation and also serves as a basic subject for many other disciplines (Sowder, 2007; Lerman, 2001). The sample used was small but the focus of the study was to obtain an in-depth understanding of the participants' views rather than for the purpose of generalisation. The findings of this study apply only to the designated area and may, therefore, not apply to other areas that were not researched.

As a Mathematics teacher, my bias and subjectivity may have been responsible for overlooking other options that could have been explored in terms of instances where the professional development of teachers has resulted in poor performance of Mathematics learners despite the attention and money that the department was spending on Mathematics departments.

5.7 LIMITATIONS

Limitations to this study are the subjective bias of the researcher; the theoretical objectives adopted; and the sample chosen as targets which directed the study and resulted in the study being based on a few case studies only. My interest in the topic and my passion to improve standards of teacher professional development may have influence my interpretation of the findings of this study, but my supervisor acted as a critical reader in checking this possible bias. The practicality of the limited time I had to complete and submit my dissertation for examination my master's degree did not allow me restricted a deeper probe of the topic.

5.8 FUTURE RESEARCH

This qualitative case study has attempted to provide some insight into how HoDs support Mathematics in teachers in selected schools in Gauteng Province. A larger quantitative study could be undertaken to enable a generalisation of findings to a larger population. Issues that emerged from this study, such as teacher reluctance and resistance to professional development initiatives organised by the Department of Education, could be explored further to identify possible solutions to the problems as well as another interesting finding which was the appreciation of teachers of team work during professional development workshop. It is suggested that a study to explore and formulate further strategies that could be used to

increase teacher participation in, and the development of knowledge and skills for, teaching Mathematics should be undertaken.

5.9 CONCLUDING REMARKS

In this chapter, a summary of the research findings and conclusions have been presented. Recommendations, based on the findings of the study, have been made and areas of study for future research on professional development of Mathematics teachers were suggested.

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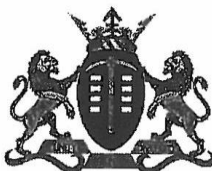
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ANNEXURE A

PERMISSION LETTER FROM DEPARTMENT OF EDUCATION



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no: D2014/357

GDE RESEARCH APPROVAL LETTER

Date:	14 February 2014
Validity of Research Approval:	14 February to 3 October 2014
Name of Researcher:	Mampane T.J.
Address of Researcher:	1877 Tshama Hansi Street
	Mamelodi Gardens
	Pretoria
	0122
Telephone Number:	012 801 7515 / 084 888 0737
Email address:	tjmampane@gmail.com
Research Topic:	Exploration of how Heads of Department manage professional development of maths teachers in public secondary schools
Number and type of schools:	TWO Secondary Schools
District/s/HO	Tshwane South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

Makhado
2014/02/17

1

Making education a societal priority

Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



Dr David Makhado
Director: Education Research and Knowledge Management

DATE: 2014/02/17

2

Making education a societal priority

Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
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Email: David.Makhado@gauteng.gov.za
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ANNEXURE B

LETTERS OF INFORMED CONSENT



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

CONSENT LETTER TO MATHEMATICS HoDS

DEAR PARTICIPANT

My name is Ms Tebogo J. Mampane. I am a Master's student at the University of Pretoria, Faculty of Education, Department of Education Management and Policy Studies. The title of my study is "How School Management Teams support mathematics teachers in public secondary schools in Gauteng province." The study aims at exploring how HoDs manage the professional development of teachers teaching mathematics in order to improve learner performance in the subject. The second aim of the study is to establish the strategies used by HoDs to develop mathematics teachers. The knowledge and information obtained from this study may be relevant and valuable to the HoDs, mathematics teachers and policy makers in terms of school-based continuous professional development.

Participation in this study is voluntary and you have the right to withdraw from the study at any stage. If you consent to be a participant in this study, you will be interviewed by the researcher. The researcher will ask you ten questions about how you manage the professional development of your teachers. The interviews will last for about 45 minutes. The interviews will be done after school hours. The venue will be at school or an alternative place of your choice. The information obtained from the interviews will be treated as confidential and your identity will be concealed. Anonymity is guaranteed as no names will be required from you as a participant. The name of your school and any other personal details that could identify you or your school will be excluded from the study. I do not anticipate putting you as a participant at any risk by participating in this study. The information gathered will be used for research purpose only.

I hereby request for your consent to be interviewed.

A handwritten signature in black ink, appearing to read 'Tebogo J. Mampane'.

Yours sincerely,

Ms T. J. Mampane, Student number: 04304853

PARTICIPANT CONSENT

I hereby *give consent/decline to give consent* to Ms T. J. Mampane to be involved as a participant in her research on “How School Management Teams support mathematics teachers in public secondary schools in Gauteng province.” I understand that participation in this study is voluntary and that I have the right to withdraw at any stage of the study. The nature, purpose and objectives of the study, the title of the study as well the details of the researcher were explained to me. My confidentiality and anonymity is guaranteed as I will not be required to provide my name, the name of my school or to give any personal details that could identify me or be traced back to me.

PARTICIPANT SIGNATURE

RESEARCHER'S SIGNATURE 

SUPERVISOR'S SIGNATURE: 



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

CONSENT LETTER TO MATHEMATICS TEACHERS

DEAR PARTICIPANT

My name is Ms Tebogo J. Mampane. I am a Master's student at the University of Pretoria, Faculty of Education, Department of Education Management and Policy Studies. The title of my study is "How School Management Teams support mathematics teachers in public secondary schools in Gauteng province." The study aims at exploring how HoDs manage the professional development of teachers teaching mathematics in order to improve learner performance in the subject. The second aim of the study is to establish the strategies used by HoDs to develop mathematics teachers. The knowledge and information obtained from this study may be relevant and valuable to the HoDs, mathematics teachers and policy makers in terms of school-based continuous professional development.

Participation in this study is voluntary and you have the right to withdraw from the study at any stage. If you consent to be a participant in this study, you will be interviewed by the researcher. The researcher will ask you ten questions about your experiences of professional development as a mathematics teacher. The interviews will last for about 45 minutes. The interviews will be done after school hours. The venue will be at school or an alternative place of your choice. The information obtained from the interviews will be treated as confidential and your identity will be concealed. Anonymity is guaranteed as no names will be required from you as a participant. The name of your school and any other personal details that could identify you or your school will be excluded from the study. I do not anticipate putting you as a participant at any risk by participating in this study. The information gathered will be used for research purpose only.

I hereby request for your consent to be interviewed.

A handwritten signature in black ink, appearing to read 'T. J. Mampane'.

Yours sincerely,

Ms T. J. Mampane

Student number: 04304853

PARTICIPANT CONSENT

I hereby *give consent/decline to give consent* to Ms T. J. Mampane to be involved as a participant in her research on “How School Management Teams support mathematics teachers in public secondary schools in Gauteng province.” I understand that participation in this study is voluntary and that I have the right to withdraw at any stage of the study. The nature, purpose and objectives of the study, the title of the study as well the details of the researcher were explained to me. My confidentiality and anonymity is guaranteed as I will not be required to provide my name, the name of my school or to give any personal details that could identify me or be traced back to me.

PARTICIPANT SIGNATURE

RESEARCHER'S SIGNATURE 

SUPERVISOR'S SIGNATURE: 

ANNEXURE C

INTERVIEW PROTOCOLS



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

INTERVIEW PROTOCOL: MATHEMATICS HoDs

PURPOSE OF THE STUDY

The purpose of this interview is to elicit your responses regarding how heads of Departments manage professional development of Mathematics educators in public secondary schools. Your participation in this study is completely voluntary and you are free to withdraw at any stage of the study. Any information provided by you will be kept anonymous.

INTERVIEW QUESTIONS

Please tell me something about yourself as a Mathematics HoD?

What is the HoDs' and the teachers' understanding of the concept professional development?

How do you manage the professional development of the teachers in terms of:

- Planning
- Organising
- Leading the development programme
- Evaluating the development

What works well in terms of professional development of your teachers?

What does not work well?

What strategies do you use to professionally develop your teachers?

What kind of support do you need to further develop your teachers?

What challenges do you experienced in doing professional development?

Is there anything else that you would like to tell me regarding professional development of your teachers?



INTERVIEW PROTOCOL: MATHEMATICS TEACHERS

The purpose of this interview is to elicit your responses regarding how heads of Departments manage professional development of Mathematics educators in public secondary schools. Your participation in this study is completely voluntary and you are free to withdraw at any stage of the study. Any information provided by you will be kept anonymous.

INTERVIEW QUESTIONS

1. Please tell me something about yourself as a Mathematics teacher?
2. In your opinion, what is professional development?
3. Tell me about your experiences of professional development?
4. What are your views in terms of:
 - The planning of professional development of Mathematics teachers in your school?
 - How are the developmental activities organised?
 - How are the activities executed?
 - How is the professional development processes evaluated?
5. What works well in terms of professional development of Mathematics teachers?
6. What does not work well?
7. What strategies are being used in your school to develop you as Mathematics teachers? What kind of support do you need to further development in your profession?
8. What challenges do you experience during professional development?
9. Is there anything else that you would like to tell me regarding professional development?

Thank you for your consent and time to be interviewed

ANNEXURE D

INTERVIEW TRANSCRIPTS

Transcription of T.J. MAMPANE interviews

School 1/ teacher 1(D4 TOWNSHIP SCHOOL)male (27)

Interviewer: The purpose of this interview is to elicit our responses regarding your experiences of professional development as a Mathematics teacher. Your participation in this study is voluntary and you have the right to withdraw at any stage of the study. Your identity will be protected by using pseudonyms.

Question 1: Please tell me something about yourself as a mathematics teacher?

Teacher 1: Alright I have been teaching mathematics for about three years now. I teach grade 10 pure maths and also grade 9. Me I am passionate about maths because maths is an easy subject you can teach to anybody and to understand it. Basically what I do is I try to understand each and everything first as far as I can before I can teach it, so jah.

Interviewer question 2: In your opinion what is professional development?

Teacher 1 :(before answering the teacher shows me a face that says: hmm what?) For me professional development is basically developing the profession itself in the sense that. I don't believe that if you have a degree which can be a paper it means that you are complete. Each and every person needs development each and every day, so when anybody gets developed professionally it's when they are still being taught. For example I went to (certain university) with one module we were taught that as teachers we are always learners, we are always researchers so, when you get developed professionally it simply means you still need to learn. You still need to find other methods. You can't be thinking that there is something that you learnt 5 years ago is going to apply to the people you are teaching currently. You need to keep on improving on whatever that you know.

Interviewer question 3: Tell me about your experiences of professional development.

Teacher 1: For me personally unfortunately to be honest, I haven't had any professional development. The only thing that I can say that we have is the workshops, of which I feel that they are not enough, but in terms of the profession itself I haven't had any.

Interviewer question 4: What are your views in terms of the planning for professional development of teachers in schools.

Teacher 1: No, don't think there is anything like that. The only thing that they focus on is the content, which I don't really think that it adds up to professional development which I'll say its not

even being spoken about. It's the first time actually I hear people telling me about professional development in my life. (he laughs).

Interviewer question: how are professional development activities organized?

Teacher 1: (laughs again)

No again. Nothing like that is being organized. We never hear or get memorandums sent to us that say: we are going to develop your profession as an educator. All that we get is :Lets teach you about algebra, something that I have done, not that I am perfect, but something that can be ignored and take that time to do other serious things like professional development.

Interviewer: how is professional development process evaluated?

Teacher 1: I think this question for now does not make sense for now because, (giggle) like I said. We are not being developed professionally as educators. So it does not relate If I was being developed then I could say something about that. But unfortunately there is nothing I can talk about because I am not being professionally developed.

Interviewer: the next question would have been: What works well in terms of professional development

Teacher 1: irrelevant

Interviewer: what does not work well in professional development?

Teacher 1: I don't understand the question.

Interviewer: In the beginning of the interview you said something about what was being done like workshops you said it's a one day thing and it doesn't work. So what wouldn't work wont well?

Teacher1: I don't understand the question. Can you try explain it more.

Interviewer: if they were going to develop us (teachers) what wouldn't work? In terms of professional development. Example if they hold a stick to our heads and say if you are late then they do something to me. (Short laugh)

Teacher 1: At the end of the day, this goes back to individual commitment. I mean as much as you can try to develop people professionally, if there is a lack of commitment among the schools nothing can be developed as such. Like I said earlier everything starts from the inside. You can develop them (teachers) as much as you can, but if the inside part doesn't want to be developed unfortunately this (professional development) is going to be useless. The schools need to work on the people (teachers) firstly . They need to prepare them for the development. Ya ya ya. This is what I think will work best. The schools themselves need to work on their people (educators) they mustn't take the teachers and throw them into the development. It must be the responsibility of the principal, the school management team that makes them aware why they need to develop

Interviewer: have you experienced or seen any strategies that are being used to develop you as a maths teacher?

Teacher1: Are you talking about formal or informal strategies?

Interviewer: any.

Teacher 1:

Teacher 1: I have had a few informal strategies. I am not speaking about strategies where we have sat down and strategized. It was pass by informal strategies whereby in terms of the marking, in terms of doing small things that helped me out to be enjoying what I do now. I think that what is lacking is the formal part. I think people are not the same. Some people might learn from an informal strategy while some people learn through formal strategies. So for the strategies to work it's better if the HOD'S and they present those strategies to everybody. So for me, I learnt the strategies informally by just listening to the guy and then looking and saying oh that I can do. I apply it and I eventually love the whole thing.

Interviewer: What kind of support do you need to further develop in terms of professional development?

Teacher 1: I think that the support that I need is not from the outside. I believe as a school, for example let me be specific as a maths department, the support that I need are from the teachers that are already in the school. I don't really think that we need support from anywhere else. That we can find after. I think the main support we need as a school is the commitment from the teachers, the fullest commitment. Because if everyone can be committed and live under the same vision, I am telling you things can change but if you are trying to drive a bus and unfortunately people are not supporting you unfortunately your vision might not last. So the support that I think is needed, or maybe draw them(support) out as in short term and long term. But the short term which I think is the most important one is the commitment then once the team is on board its then we can look outside like getting more resources, ideas and more strategies we can get from other schools which help ours. But I think that main thing that is needed in most schools is the commitment from the teachers.

Interviewer: Is there anything else you would like to tell me about professional development?

Teacher 1: I really think that its one thing that we need within our own self to be developed and as much as it's been neglected we unfortunately working in a rat face. Where everything seems to be the same. Year after year. We get the same results. We get the same results because we don't know what we are doing but simply because we don't plan and we neglect a lot of stuff for example neglecting professional development and this limits us to be the best that we can. I wish maybe we can have workshops where teachers are being taught professional development not just the content. The algebras and the financial mathematics. Be taught how to be an effective teacher. I think this would be great. Maybe I will steal the idea.

Interviewer: ok thank you for your participation and your consent as well as giving me your time to be interviewed

ANNEXURE E

DATA ANALYSIS TABLE

QUESTION	REPOSENSE/SUMMARY	CODING	CATEGORY	THEME
<p>Biography:</p> <p>1 Please tell me something about yourself as a mathematics teacher?</p> <p>Biography:</p>	<p><u>Teacher 1</u> Alright I have been teaching mathematics for about three years now. I teach grade 10 pure maths and also grade 9. I am passionate about maths because maths is an easy subject you can teach to anybody and to understand it. Basically what I do is I try to understand each and everything first as far as I can before I can teach it. So jah.</p> <p><u>Teacher 2</u> I have been a maths teacher for four years now, I have taught grade 8 and 9, in my four years of teaching. I have experienced that in order for you to be a successful maths teacher; you must be a committed person, very dedicated to the work - as you know maths needs a lot of time.</p> <p>Biography:</p> <p><u>Teacher 3</u> Alright I actually started teaching mathematics in 1996. Ever since, I have been in the mathematic</p>	<p>3 years' experience as a knowledgeable grade 9 and 10 maths teacher</p> <p>4 years' experience as a committed maths teacher</p> <p>18 years' experience as a passionate maths teacher</p>	<p>Different years of Experience as a mathematics teacher</p>	<p>Teacher experience</p>

	<p>mathematical literacy. At first it's obviously kind of difficult being in a classroom with the learners alone. You have to know what you are doing. I had to always prepare to make sure that I am ready for class, it was kind of challenging when I started teaching but as time goes by with hard work it became much better.</p> <p><u>Teacher 6</u> Well I taught several years mathematics. When my children were small, I gave extra lessons in mathematics and then I returned back to school. It was mathematics literacy that I taught for four years. Then I was appointed as a teacher facilitator and I trained teachers in CAPS and yes I am teacher moderator now. I have a GDE position at high school. I am involved in training teachers during holidays and Saturdays in rural areas in Middleburg.</p>	<p>maths teacher and a CAPS facilitator</p>		
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<p>2. In your opinion what is <u>professional development</u>?</p>	<p>Teacher 1 For me professional development is basically developing in the profession itself in the sense that. I don't believe that if you have a degree which can be a paper it means that you are complete. Each and every person needs development each and every day, so when anybody gets developed professionally it's when they are still being taught. For example I went to (certain university)with one module we were taught that as teachers we are always learners, we are always researchers so, when you get developed professionally it simply means you still need to learn. You still need to find other methods. You can't be thinking that there is something that you learnt 5 years ago is going to apply to the people you are teaching currently. You need to keep on improving on whatever you know.</p>	<p>Professional and self-development through support mechanisms</p> <p>Growth process</p> <p>In service training</p> <p>Development is subject content and management of content delivery - discipline,</p> <p>Move with the changes in times</p> <p>Continuous improvement</p> <p>Self-reflection, self-empowerment and peer support.</p> <p>All round development(e.g time management,</p>	<p>Support mechanisms</p> <p>Time allocation to support</p>	
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	<p>Teacher 2 Professional development simply means that you grow in terms of your way of doing things. For example it involves things like disciplining, time management, and punctuality. If you need to develop you need to follow those things that I have just mentioned.</p> <p>Teacher 3 <i>My opinion of professional development is that process of enabling or equipping a teacher or educator with respect to his area of teaching by use of either seminars or some spot checks. Upgrade yourself attending some courses, which will let him improve in his way of teaching. That is how I view professional development.</i></p> <p>Teacher 4 Interactions with your kids in your spare time. Trying to diagnose their problems and using your spare time to solve those problems. What I mean is like interrogating your ways of teaching them and take the blame when they fail. Assume that maybe there is something that you are not doing right. Get other colleagues from different institutions to come and present to those kids and you learn from them and you go</p>	<p>and discipline)</p> <p>Organisational and HoD support through courses</p> <p>Problem identification skills. – improving teaching skills</p> <p>Taking responsibility</p> <p>Getting help</p> <p>People empowerment</p> <p>Volunteer time to assist</p> <p>Departmental and HOD support</p> <p>Empowerment through skills development</p>	<p>Support structures</p> <p>Problem solving techniques</p> <p>Skills development</p>	
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	<p>through different materials and you will do better. Use your spare time to prepare for your lessons and you will be fine.</p> <p>Teacher 5 <i>Professional development is any development that you can get from your HOD or from any other organization that is a development and that development can help you in a classroom situation.</i></p> <p>Teacher 6 <i>To equip people to do their job and empower them to do their utmost in their education set up.</i></p>			
<p>3: <u>Tell me about your experiences of professional development</u></p>	<p>Teacher 1 For me personally unfortunately to be honest, I haven't had any professional development. The only thing that I can say that we have is the workshops, of which I feel that they are not enough, but in terms of the profession itself I haven't had any.</p> <p>Teacher 2 Yah, I can say that I have been professionally</p>	<p>Peer support and learning in seminars, teaching strategies, problem solving, sharing teaching resources</p>	<p>Workshops</p> <p>Professional development, time and self-management and self-discipline</p>	

	<p>developed if I can compare myself now and when I started teaching. <i>I have grown very much in terms of development. The way I handle things is different now. I manage my time very well. I am a very disciplined person and by so doing I am able to discipline my learners. So I can say I am developed.</i></p> <p>Even though I am not fully developed but I have progressed in terms of development.</p> <p>Teacher 3 We have actually gone for seminars, where educators can actually meet and they share some teaching methodologies in different sections of mathematics either trigonometry or statistics or whatever sections that we'll be finding students experiencing some problems and we teachers will meet and we share like each teacher teaching us the way he teaches that content. And we observe different methods. So</p>	<p>Development through seminars</p> <p>Peer development through peer training.</p> <p>Sharing of different teaching strategies</p> <p>Onus on the teacher Positioning of oneself towards development</p> <p>Attending the training opportunity provided</p> <p>CAPS(Continuous Assessment and Policy systems)</p> <p>ANA(Annual National Assessment)</p> <p>Be involved in activities that surround your field</p>	<p>Seminars</p> <p>Peer training</p> <p>Sharing strategies</p> <p>Teacher ownership of problems</p> <p>Training</p> <p>CAPS</p> <p>ANA</p> <p>Involvement in planned activities</p>	
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	<p>seminars and collecting other material from the internet and that what we do.</p> <p>Teacher 4 I think on my side I started volunteering certain positions at district level and as a result I was a forum leader for maths senior phase. And through that period, <i>I went through different training. CAPS training. I would also be invited to content training for different topics. I also managed to discuss question papers and memos for my cluster as well as nationally for ANA.</i> But it doesn't go everyone, only those people that are in that position at that time. That is how I received development.</p> <p>Teacher 5 Well number one I attended a lot of workshops provided for by the district. I have been a teacher moderator for the district grade 12 as well. I have been a marker. I had the opportunity to be part of a programme</p>	<p>e.g. marking, discussions on papers etc</p> <p>Workshop attendance</p> <p>Marker, district moderator</p> <p>Training from higher institution led to preparation for training of peer educators</p> <p>CAPS trainer</p> <p>HOD support on regular basis</p> <p>Roadshow attendance, exam paper feedback discussion attendance</p>	<p>Workshops</p> <p>Higher institution training</p> <p>CAPS trainer</p> <p>HOD support</p> <p>Roadshow</p>	
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	<p>in the United States this year. It was very good development for me professionally because learnt a lot about what the US system is doing with their education which is different from our education system.</p> <p><u>Teacher 6</u> I attended the TURFONTEIN training there at tuks. I really thought that it was well organized and executed. It equipped me to do to the CAPS training for the teachers. It was well prepared, the handout was available to everybody. And one can use it in the classroom. I have a really good HOD, my HOD helped me a lot and guided me a lot. I attended the roadshows feedback from the exams. It was sufficient for me to apply it in my job.</p>			
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ANNEXURE F

DECLARATION OF LANGUAGE EDITING

14 Sep 02 10:05

Walter

0117826174

p.2

DECLARATION OF LANGUAGE EDITING

02 September 2014

TO WHOM IT MAY CONCERN

This is to confirm that I have language edited and proof-read the dissertation by Ms Tebogo Jillian Mampane entitled: **How School Management Teams Support Mathematics Teachers in Public Secondary Schools in Gauteng Province.**

The language editing/proof-reading process included the checking of spelling, punctuation, syntax and expression. An attempt was made to simplify complex sentences and, where necessary, combine short sentences to clarify meaning. Attention was given to the use of various language elements, such as prepositions, consistency in language usage and formatting as well as tenses and capital letters.



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ANNEXURE G

ETHICAL CLEARANCE CERTIFICATE



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE

DEGREE AND PROJECT

INVESTIGATOR(S)

DEPARTMENT

DATE CONSIDERED

DECISION OF THE COMMITTEE

CLEARANCE NUMBER :

EM 14/03/02

MEd

How School Management Teams support mathematics teachers in public secondary schools in Gauteng province

Tebogo Jillian Mampane

Educational Management and Policy Studies

27 August 2014

APPROVED

Please note:

For Masters applications, ethical clearance is valid for 2 years

For PhD applications, ethical clearance is valid for 3 years.

**CHAIRPERSON OF ETHICS
COMMITTEE**

Prof Liesel Ebersöhn

DATE

27 August 2014

CC

Jeannie Beukes
Liesel Ebersöhn
Dr TA Ogina

This ethical clearance certificate is issued subject to the following condition:

1. It remains the students' responsibility to ensure that all the necessary forms for informed consent are kept for future queries.

Please quote the clearance number in all enquiries.

ANNEXURE H

DECLARATION OF ORIGINALITY

UNIVERSITY OF PRETORIA

DECLARATION OF ORIGINALITY

This document must be signed and submitted with every
essay, report, project, assignment, dissertation and/or thesis.

Full names of student: TEBOGO JILLIAN MAMPANE

Student number: 04304853

Declaration

1. I understand what plagiarism is and am aware of the University's policy in this regard.
2. I declare that this dissertation (eg essay, report, project, assignment, dissertation, thesis, etc) is my own original work. Where other people's work has been used (either from a printed source, internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.
3. I have not used work previously produced by another student or any other person to hand in as my own.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

SIGNATURE OF STUDENT: 

SIGNATURE OF SUPERVISOR: 

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