

MENTORING AS A PROFESSIONAL DEVELOPMENT  
FOR MATHEMATICAL LITERACY TEACHERS IN THE  
GREATER TAUNG AREA

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by

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## **ABSTRACT**

The study seeks to examine the role of mentoring and how it could be used in the process of professional development of mathematical literacy teachers in the Greater Taung area. The study attempts to flag the importance of mentoring in professional development, especially for mathematical literacy teachers. To obtain data for the study sixteen mathematical literacy teachers from Taung area (within Ruth Mompati District) were purposively selected. Questionnaires and interviews were used to collect relevant data. Literature review, based on previous studies on mentoring also provided data for the study. The following findings emerged from the study: a) that mentoring has over the years has been an effective process for developing early-career teachers' practices b) that there are no formal mentoring programmes to assist mathematical literacy teachers in the Greater Taung area c) there is a need for effective communication between the mentor and the mentee, since the learning that takes place in a mentoring relationship is usually through regular interaction. From the findings, a collaborative form of mentoring is recommended. Both parties in this relationship are considered as a source of knowledge that can contribute to the learning that occurs within the context of mentoring.

**Key terms:** Mathematical literacy, mentoring, professional development, content and pedagogical knowledge.

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**DECLARATION**

“I declare that “MENTORING AS A PROFESSIONAL DEVELOPMENT FOR MATHEMATICAL LITERACY TEACHERS IN THE GREATER TAUNGA AREA is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE

(Mr J. Owusu-Mensah)

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DATE

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# CHAPTER 1

## INTRODUCTION

### 1.1. Background

The educational system in South Africa during the apartheid era did not encourage black learners to study subjects that would enable them to pursue careers in accounting, engineering, actuarial science and so forth. Education at that time (i.e. during the apartheid era) was a privilege enjoyed by the few and used by the minority government to divide the nation. Under the apartheid system, the aim of education was to forge white superiority, favouring whites and putting blacks at a disadvantage (Clark & Worger 2004:49).

There are black teachers (i.e. teachers of African origin) who are the product of the so-called Bantu education system, which was of an inferior standard. The Bantu Education Act of 1953 was a piece of apartheid legislation, intended to separate black South Africans from the main, and by comparison, well-resourced education system for whites (Clark & Worger 2004:49). The Bantu education system was a system designed explicitly and without reservation to keep blacks in South Africa subservient to whites, and to provide them with a vastly inferior education (Byrnes 1996). The policy of Bantu (African) education was aimed at directing black, or non-white youth, to the unskilled labour market (Byrnes 1996). It is on record that the then Minister of Education stated: “What is the use of teaching black children mathematics when they cannot use it in practice?” (Clark & Worger 2004:50). This indicates that, during the apartheid era, black learners (i.e. learners of African origin) were not given equal opportunity to study mathematics, and this may have contributed to the current shortage of suitably qualified mathematics teachers in South Africa.

Under the Bantu education system, teaching was largely teacher dominated in the sense that teachers were perceived as source of knowledge that had to be transmitted to learners who, in turn, were required to store this knowledge in their heads and merely regurgitate it when the need arose. Mathematics was taught as a dry and

abstract subject with no relation to real life. Learners memorised without understanding what they were being taught. Some teachers developed the belief that mathematics was a difficult subject and therefore discouraged learners from considering it for further studies. However, according to the National Council of Teachers of Mathematics (NCTM)(2000:14), “there are well documented examples demonstrating that all children, including those who have been traditionally underserved, can learn mathematics when they have access to a high-quality instructional program that support their learning”.

With the transformation of the South African education system after 1994, the emphasis shifted from rote learning and the mere acquisition of knowledge, to the application of knowledge and skills. Laridon (1993:46) noted that the significant reforms that occurred in mathematics education, with mathematics instruction being geared towards the teaching of mathematics for understanding. The author concurs with Laridon that learners need to understand what they learn in mathematics rather than memorising. For instance, in terms of the National Curriculum Statement (NCS) for mathematical literacy, learners are required to properly understand mathematical terminology and to make sense of numerical information. Learners are also required to develop the use of basic mathematical skills in order to critically analyse situations and solve everyday problems in financial matters, such as hire-purchase contracts, mortgage bonds and investments (South Africa Department of Education, 2003).

With regards to mathematics, the focus is now on relevance and use, particularly in the modern technological society. This focus has necessitated the acquisition of some form of mathematical background by all learners. All learners, regardless of their background or physical challenges, must have the opportunity to study mathematics, and also must be given the necessary support to learn mathematics. It is for this reason that the new curriculum provides the opportunity for every learner to be exposed to some form of mathematics, which can either be the normal mathematics or mathematical literacy (South Africa Department of Education, 2003).

In view of the historical reality, there have not been a sufficient number of adequately qualified teachers in the field of mathematics, and this problem has been aggravated

by the introduction of mathematical literacy programmes in the school curriculum. Mathematical literacy (another form of mathematics (see section 1.2)), is compulsory for learners not taking normal mathematics. The inclusion of mathematical literacy in the school curriculum is to ensure that learners develop fundamental mathematical skills (South Africa Department of Education, 2003). This will enable learners to analyse situations critically and to solve everyday socio-economic problems creatively. One would expect mathematics teachers to teach mathematical literacy, but the current teaching load makes it difficult for teachers to do so. In order to address the problem, the South Africa Department of Education appealed to other non-mathematics teachers to consider teaching mathematical literacy.

Even though current mathematical literacy teachers had previously been trained as professional teachers, they never specialised in mathematics, and many of them only did mathematics up to standard 8 (currently grade 10). These are predominantly teachers who run the risk of becoming redundant given the persistent low enrolments in the subjects they are teaching. It should be noted that most of these teachers had not been properly instructed in mathematics at school and were themselves the products of the very inadequate Bantu education system.

The limited mathematical knowledge of these teachers necessitated a rigorous in-service training programme that would focus on exposing them to both mathematical contents and the necessary pedagogical knowledge. These in-service training programmes, which took place during school holidays in the form of workshops, were facilitated by mathematics subject specialists<sup>1</sup>.

As a high school mathematics teacher with fifteen years of experience in one of the high schools in the Greater Taung area, the author noted that these newly trained mathematical literacy teachers seem to experience problems with basic mathematical concepts and were therefore unable to adequately explain these concepts to their learners. This situation did not give them the confidence required to teach the subject.

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<sup>1</sup> Subject specialists are office-based educators who supervise and monitor teachers in their respective subjects within an educational district.

Given these teachers' initial inadequate mathematics background, and the general problems associated with the teaching and learning of mathematics, it is highly unlikely that they could have acquired the much needed mathematical content, as well as the necessary pedagogical knowledge, through these in-service training programmes. Johnson (2002) also highlighted the fact that traditional in-service courses are often ineffective. As a result, these teachers would not have acquired the expected level of competency to be effective in the teaching of mathematical literacy for effective realisation of the learning outcomes.

## **1.2. What is mathematical literacy?**

The South Africa Department of Education (2003:9) defines mathematical literacy as follows:

Mathematical literacy is a subject driven by life-related applications of mathematics. It provides learners with an awareness and understanding of the role that mathematics plays in the modern world. It enables learners to develop the ability and confidence to think numerically and spatially in order to interpret and critically analyse everyday situations to solve problems.

Mathematics literacy is an aspect of the subject mathematics and in schools learners who are weak in mathematics are encouraged to learn in order to acquire basic numerical skills. The relation between mathematical literacy and mathematics has been described by the Association of Mathematics Educators of South Africa (AMESA) (2003:1) as follows:

Although mathematical literacy and mathematics are quite clearly related, they are also different. In the conceptualisation of mathematical literacy as presented in the subject statement it remains too much of a watered down version of mathematics. The outcomes are essentially the same as those of mathematics. It may be that this is done intentionally, to address matters of portability and mobility between mathematics and mathematical literacy, but we argue that the two subjects are so dissimilar in

philosophy and purpose that such portability and mobility should not be a consideration.

Mathematical literacy is generally associated with numbers and computations, and to be mathematically literate means that one has acquired the ability to manipulate numbers. Mathematical literacy, in a broader sense, could be seen an aggregate of skills, knowledge, beliefs, disposition, habits of mind, communication abilities and problem-solving skills that provide peoples' need to engage effectively in quantitative situations arising in life and work.

Different terms such as quantitative literacy, numeracy, mathematical literacy, quantitative reasoning, or sometimes just simply as mathematics have been used by different authors to describe the capacity to deal effectively with the quantitative aspects of life. However different terms convey different nuances and connotations that are not necessarily interpreted in the same way by all.

The Program for International Student Assessment (PISA, 2000), defines mathematical literacy as an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded mathematical judgements and to engage in mathematics in ways that meet the needs of that individual's current and future life as a constructive, concerned and reflective citizen.

From the definitions cited above, significant differences emerge. Some of the definitions focus on an individual's ability to use quantitative tools, while others emphasise the ability to understand and appreciate the use of mathematical and quantitative methods in day-to-day matters. Furthermore some definitions emphasise basic skills (arithmetic operations), while yet others refer to higher order thinking (or, well-founded judgement).

Drawing from all these definitions, mathematical literacy can be thought of as the ability to use mathematics to understand everyday situations and to solve real-life problems. The notion that mathematical literacy is primarily concerned with mathematics use in context is fundamental to all the definitions of mathematical

literacy reviewed above. Therefore mathematical literacy refers to the ability to use mathematics in context, and being numerate refers to the capacity to use mathematics effectively in context.

### **1.3. Purpose of mathematical literacy**

The inclusion of mathematical literacy in the South African school curriculum is based on the principle of social transformation. The imperative to transform the South African society by making use of various transformative tools stems from a need to address the legacy of apartheid in all areas of human activity, and in education in particular (South Africa Department of Education, 2003:8). Mathematical literacy is part of a progressive agenda by the democratic government of South Africa, to transform the society towards increased democracy and social justice. Social transformation in education is aimed at ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sectors of the population. Mathematical literacy is therefore a means of levelling the educational playing field, thus affording all learners an equal opportunity of learning some form of mathematics.

Mathematical literacy provides learners with an awareness and understanding of the role of mathematics in normal daily affairs. It is a subject driven by a wide variety of life-related applications of mathematics. Learners should appreciate the importance of mathematical literacy for all people and in all areas of life. They should therefore, be exposed to mathematical literacy in a way that would pique their interest and allow them to “own” the knowledge. This will enable learners to develop the ability and confidence to think numerically and spatially, in order to interpret and critically analyse everyday situations and solve problems.

The inclusion of mathematical literacy as a fundamental learning area in the school curriculum, according to the National Curriculum Statement (NCS) (South Africa Department of Education, 2003:9), will ensure that learners acquire the necessary skills to enable them to live and work effectively in today’s world. The teaching of mathematical literacy will provide learners with the skills necessary to engage with

real life problems in different contexts. They will have increased opportunity to work in problem-solving contexts and to discover relationships and meanings themselves. It will also help them to consolidate and practice their basic mathematics skills. Mathematical literacy should enable the learner to become a self-managing person, a contributing worker, and a participating citizen in a developing economy. The above statements however seem to be the expectation of the NCS and have not been proven through any research.

Despite the above expectations arising from the inclusion of mathematical literacy as a compulsory school subject for all learners in the Further Education and Training (FET) band in South Africa, this has nevertheless created several challenges for teachers. Teachers of mathematical literacy still struggle with a variety of issues ranging from a lack of adequate training, diverse textbook interpretations, differing philosophical views on the importance of content versus context, negative parent and learner perceptions, non-standardised assessments, diverse multilingual and multicultural settings, and lack of resources, to name but a few. The major issue, and one that is of primary concern to this study, is the non-availability of qualified teachers to teach the subject. This concern was confirmed by a submission, by AMESA, to the Department of Education in 2003, in which it was mentioned that there were not enough well-qualified or trained teachers in South Africa to teach the subject of mathematical literacy (AMESA, 2003).

Mathematical literacy as a subject is designed for learners who do not intend to pursue further studies in mathematical sciences. The aim of mathematical literacy is to enable learners to use mathematics for making informed decisions, and for planning actions in real life situations. In order to do this, it introduces into the curriculum a range of mathematical skills which are relevant and useful in everyday life. These skills are spanned by four learning outcomes as stated in the DoE (South Africa 2003:10). These are:

- numbers and operations in context
- patterns and relationships
- space and shapes (which includes both geometry and measurement)
- data handling



#### **1.4. The problem statement for the study**

Judging from what has transpired in the schools ever since the introduction of mathematical literacy, perhaps it is justified to suggest that teaching and learning the subject has not been devoid of problems. There have been several instances of concern that the author, as a mathematics teacher with extensive teaching experience, has observed in one particular school, and presumably these problems are in evidence at other schools elsewhere. These concerns pertain directly to the teaching and learning of mathematical literacy. There are numerous mathematical literacy teachers who seem to have problems with basic mathematical concepts themselves, and therefore find it difficult to explain such concepts satisfactorily to their learners. This might be the consequence of not having had adequate exposure to mathematics themselves while at school (see section 1.1). Furthermore, this situation seems to have impacted negatively on their confidence to teach the subject. In view of this state of affairs, I am of the view that these ‘newly trained’ mathematical literacy teachers could be developed further, through a process of mentoring, in terms of their mathematical content knowledge and pedagogical approaches. The problem of the study is therefore stated as:

*How can mentoring be used to support mathematical literacy teachers in Taung area, in both content and methodology for effective realisation of learning outcomes?*

#### **1.5. Research questions**

The study will address the following questions:

1. What form of assistance/support do the ‘newly trained’ mathematical literacy teachers receive from their experienced colleagues?
2. What are the challenges faced by the mentors and mentees within the school system?

3. How can mentoring of newly trained mathematical literacy teachers be improved?

In the process of seeking answers to the research questions, the questions below were also addressed. Hence, the questions have been posed as the study's research sub-questions as follows:

- i. What is the value of mentoring newly trained mathematical literacy teachers in the school system?
- ii. What is the role of the mentor in the process of professional development?

### **1.6. Significance of the study**

The study is an attempt to flag and highlight the importance of mentoring in the process of professional development, especially for newly trained mathematical literacy teachers. From the literature study, it became evident that early-career teachers could improve their content knowledge and instructional skills, and enhance their teaching strategies and classroom management capabilities through mentoring. Teachers who performed the role of mentors would also be able to identify their key functions in the process. The study could help schools, as well as teachers and authorities in the education system, to develop a deeper understanding of the value of mentoring programmes, not only in mathematical literacy, but also in all other learning areas.

Having taught high schools in South Africa for the past fifteen years, the author has observed that the use of mentoring to develop early-career teachers has not been adequately addressed. The author is of the opinion that in-service training and workshops alone will not suffice in bringing current mathematical literacy teachers up to the required standard. Mentoring is therefore strongly advocated as a means to reinforce the knowledge and skills gained through these in-service training programmes and workshops. Johnson (2002), however, describes these workshops as ineffective because teachers usually attend the sessions after a full day's work, only to listen to an expert describe an approach or a methodology that often does not relate to their classroom situation or align with their teaching styles in mathematics.

Whereas in-service training and workshops provide teachers with theoretical knowledge, mentoring will focus on both the content knowledge and the practical aspects (that is, how such knowledge and skills are applied in the classroom).

The study also focused on mathematical literacy as a new learning area in South African schools. Consequently, the areas that were covered included the problems associated with teaching and learning the subject. Since the strength of an education system depends largely on the quality of the teachers, this study focused primarily on the professional development of mathematical literacy teachers through the process of mentoring. This focus on mathematical literacy was initiated by the fact teachers who “volunteered” to teach mathematical literacy, were initially not trained as mathematical literacy teachers, and therefore lacked sufficient content and pedagogical knowledge.

Although practical knowledge cannot be ‘passed on’ literally, it does not, however, negate the role of the mentor. Mentors are in a unique position to support trainees as these ones begin to conceptualise the requirements of their practical work. They are also uniquely placed to expose trainees to various pedagogical concepts and to help them see the implications of different ways of thinking.

## **1.7. Definition of terms**

This section provides working definitions of key terms used in the study. They include mentoring, professional development and mathematical literacy.

### **1.7.1. Mentoring**

Mentoring is a process through which an experienced mathematics teacher guides, supports and helps a newly trained mathematical literacy teacher (on a one-to-one basis) to acquire the content knowledge and skills required to teach mathematical literacy. This process may include both formal and informal activities such as conversations, discussions and observations (see also section 2.2).

### **1.7.2. Professional development**

Professional development refers to all activities, whether structured or unstructured, formal or informal, which are intended to develop an individual's skills, knowledge, expertise and other characteristics as a teacher. Development can be provided in many ways, ranging from formal to informal.

### **1.7.3. Mathematical literacy**

Mathematical literacy is one of the core subjects in the National Curriculum Statement introduced in the South African schooling system in 2006. It affords learners who could not cope with pure mathematics, the opportunity to be exposed to some alternative form of mathematics. Thus the inclusion of mathematical literacy as a core learning area in the school curriculum aims at giving all learners the opportunity to become mathematically literate (see section 1.2).

## **1.8. Organisation of the thesis**

The thesis is structured into seven chapters as follows:

### **Chapter 1**

Chapter 1 presents the introduction and background to the problem. It goes on to discuss the importance of the study and defines the problem statement. The research questions of the study are stated in this chapter.

### **Chapter 2**

In this chapter the rationale for mentoring is discussed. The chapter continues with the discussion of the theoretical framework. Mentoring and professional development are also discussed. Some of the aspects of mentoring that are discussed include: definitions of mentoring, historical perspectives of mentoring, and the selection and roles of mentors.

### **Chapter 3**

In this chapter the formal and informal of mentoring is discussed. The chapter continues with the concept of mentoring, where the apprenticeship model and collaborative partnership have been discussed. Other aspects covered in the chapter include functions of mentoring and the characteristics of effective mentors.

### **Chapter 4**

This chapter reports on various studies on mentoring globally.

### **Chapter 5**

This chapter presents a discussion of the research design. The sampling technique for the study has been discussed. The process for data collection and analysis has also been discussed.

### **Chapter 6**

This chapter presents data collected. It also includes the analysis and discussion of the data.

### **Chapter 7**

This chapter presents the summary of the study, highlights its implications and makes some recommendations.

## CHAPTER 2

### MENTORING AND PROFESSIONAL DEVELOPMENT

#### 2.1. Introduction

In view of the importance of mentoring as the core of this study, the literature study spans three chapters, i.e. chapters 2, 3 and 4. This was done deliberately to ensure that the most salient aspects of the literature on mentoring could be discussed sufficiently. The previous chapter provided the background to the study and highlighted the need for the further professional development of mathematical literacy teachers using mentoring. This chapter discusses mentoring and continuous professional development with reference to mathematical literacy teachers. The discussion covers essentially the following areas: the theoretical framework, mentoring and its history and challenges in mentoring relationships. Other aspects covered in this chapter include the mentoring model and mentoring and continuous professional development.

#### 2.2 Rationale for mentoring

Currently, from the experience of the author, there are no formal mentoring programmes for the mathematical literacy teachers in the schools in the Taung area. In each school there is at least one experienced mathematics teacher. These mathematics teachers can assist in improving the mathematical content knowledge of these mathematical literacy teachers through mentoring. Through the process of mentoring, each of the mathematical literacy teachers would have regular interactions with the experienced mathematics teachers. Such regular interactions would allow them to learn the required mathematics and the necessary pedagogical knowledge needed for teaching mathematical literacy.

Through mentoring, each mathematical literacy teacher would be assisted based on his or her own weaknesses. Mentoring could create a relationship based on mutual respect and trust between the mentor and the mentee. This relationship will allow the

mathematical literacy teachers to be open and not feel ashamed to disclose their weaknesses as far as the teaching of the subject is concerned.

Mentoring, in this context, may be described as the establishment of a personal relationship for the purpose of professional growth and guidance. There is a general acceptance that most people achieve better levels of professional proficiency if they have the guidance and help of a mentor (that is, someone with whom they can discuss their career paths and evaluate options and achievements). According to Kram (1985), mentors typically perform both career and psychosocial functions. The career functions include sponsoring, exposure and preparation for advancement. On the other hand, the psychosocial functions provided by the mentor serve to enrich the mentee's sense of competence and effectiveness. The importance of mentoring for an individual's educational success and continuing career progression is becoming more and more widely recognised. According to Kochran and Pascarelli (2003), a wide range of organisations have established formal internal mentoring schemes.

The basis for pursuing a study on mentoring as a form of support and professional development for mathematical literacy teachers is the fact that teachers play a key role in the successful implementation of any reform process in education. Their success, in terms of teaching the subject effectively, is a key to learners' meaningful acquisition of the subject. As noted earlier, the objective with the inclusion of mathematical literacy as a core learning area in the school curriculum is to give learners the opportunity to become mathematically literate. This can only be possible if the teachers themselves have the necessary content knowledge and skills to teach the subject. Mathematical literacy therefore, makes the following two core demands on teachers:

- i) to organise a learning programme that enables learners to develop all the skills, subject knowledge, values and attitudes relevant to the subject
- ii) to have a sound, up-to-date knowledge of the subject content and the method of teaching the subject, and a clear understanding of its social

relevance so that they may act as a guides, facilitators and subject experts in the classroom (South Africa 2003:5)

According to Mthethwa (2007), teachers view mathematical literacy as that kind of mathematics that finds application in peoples' lives, and view it as a simplified or easier version of the mathematics that learners do at school. This perception of mathematical literacy confirms that mathematical literacy teachers need a sound knowledge of mathematics in order to be effective. Considering the average mathematical literacy teacher's poor background in mathematics, generally speaking, it is obvious that they would need a programme that would expose them on a regular basis to mathematical content, as well as to pedagogical knowledge. It is for this reason that a proper mentoring programme is required.

In view of the above, and since mathematical literacy teachers mostly seem to lack the pedagogical and content knowledge of the subject they are required to teach, it is recommended that mathematics teachers in schools be designated to serve as mentors of mathematical literacy teachers. Having to deal with an area of study which is essentially foreign to them, mathematical literacy teachers would require support and guidance in the way the subject is to be taught.

### **2.3. Theoretical framework**

This study is grounded in situated learning theory because it seeks to use mentoring, which is an essential element of situated learning, in the professional development of new teachers (Brown, Collins & Duguid 1989:33). The study therefore aims to examine the use of mentoring in the professional development of new teachers. The current research also seeks to examine how such a relationship (mentoring) could be used to improve the instructional skills, the teaching strategies and the content knowledge of mathematical literacy teachers.



### 2.3.1. Situated learning theory

Situated learning was first proposed by [Jean Lave](#) and [Etienne Wenger](#) as a model of [learning](#) in a [community of practice](#). Mentoring is assumed to be rooted in the principles of situated learning theory. Lave and Wenger (1991) indicate that learning should not be viewed simply as the transmission of abstract and decontextualized knowledge from one individual to another, but as a social process in which knowledge is co-constructed. They also suggest that such learning is situated in a specific context and embedded within a particular social and physical environment. Hence, situated learning becomes highly relevant in a study on mentoring. At its simplest, situated learning is learning that takes place in the same context in which it is applied (Merriam & Caffarella 1991:134). It should also be noted that situated learning is a broader term that covers social learning theories. The focus of the current study is mentoring, which can be described as a learning activity that takes place within a given social context. In contrast to formal classroom settings which often involve abstract concepts and a discussion of dry facts presented out of context, situated learning theory proposes that it is through ‘doing’ knowledge in its relevant performance situation, that it is best acquired (Lave 1988).

Thus, situated learning theory is a general theory of knowledge acquisition that recognises the critical importance of the social setting to knowledge construction (Brown, Collins & Duguid 1989:33). The theory represents a major shift in learning theory from psychological views of learning as mechanistic and individualistic, to perspectives of learning as emergent and social (Brill 2001). Lave and Wenger (1991) concur that situated learning is primarily social rather than psychological, and similarly the learning that takes place through mentoring is primarily social rather than psychological. Rather than viewing learning as the acquisition of certain forms of knowledge, these authors have tried to position learning within the context of social relationships and situations of participation. Social learning theory is based on two key principles (Lave, 1988:3):

1. that knowledge needs to be presented in authentic context,
2. that learning requires social interaction and collaboration.

Social learning theorists posit that people learn from observing and interacting with other people (Merriam & Caffarella 1991:134). By definition then, such observations take place in a social setting. The theory emphasises that learning is situated in particular physical and social contexts, and is therefore disseminated to the individual and to other persons within communities of practice. The following are the primary components of Wenger's social theory of learning (Wenger 1998:12):

- (1) Meaning (learning as experience)
- (2) Practice (learning as doing)
- (3) Community (learning as belonging)
- (4) Identity (learning as becoming).

The choice of the situated learning theory for the study is based mostly on the "communities of practice" component. The communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact (Wenger, 2006). In this study, communities of practice are groups formed between mentors and mentees. Between the mentor and mentee there is arguably concern or passion to transfer knowledge and skills. The mentor transfers and the mentee acquires/receives what is transferred. Thus, the theory is consistent with the process of mentoring.

A critical reading of the theory of situated learning reveals a number of important characteristics which contributed to its evolution. Authors on the theory of situated learning, such as Kirshner and Whitson (1997:39) and Greeno (1997:8), believe that usable knowledge is best gained in learning environments that provide the following characteristics:

- authentic contexts that reflect the way the knowledge will be used in real life
- authentic activities
- access to expert performances and the modelling of processes
- opportunities for the collaborative construction of knowledge
- opportunities for reflection to enable abstractions to be formed

- the necessary articulation to enable tacit knowledge to be made explicit.

Some of the above characteristics (such as opportunities for the collaborative construction of knowledge) may be similar to Lerman's (2001:92) sociocultural approach to the teaching and learning of mathematics. Lerman states that class, gender, ethnicity, race and other dimensions of identity seem to disappear given the appropriate social environment. He further argues that an integrated representation is needed of all the factors required to examine how social factors (such as liberal-progressive positioning) affect the development of particular forms of mathematical thinking. The author would therefore suggest that both social learning theory and the sociocultural approach have important implications for the current study on mentoring as a vital tool to provide for the professional development of mathematical literacy teachers.

The author is then with the opinion that through the process of mentoring mathematical literacy teachers could improve their content knowledge as well as their instructional strategies as they interact with their experienced colleagues. These colleagues, who are experienced mathematics teachers, are in a position to help foster the further development of mathematical literacy teachers. In addition to helping mathematical literacy teachers with the acquisition of content knowledge, the experienced mathematics teachers could also demonstrate teaching techniques, observe (and be observed) and provide constructive feedback (Elliot & Calderhead 1993).

Social interaction is very critical as far as the process of mentoring is concerned. Hence Torres-Guzman and Godwin (1995) describe mentoring as an intense dyadic relationship between the mentor and the mentee. The mentoring relationship is largely based on trust. Such trust enables mathematical literacy teachers to open up and honestly disclose areas where they need assistance with regards to the teaching of mathematical literacy. The author is therefore with the opinion that without trust and openness, the mentor-mentee relationship would not achieve its desired objectives.

Hence, the process of mentoring could be described as a form of professional development where mentees learn the skills required to be effective in their profession, through interaction with experienced colleagues. Mentoring is therefore rooted in the principles of situated learning theory.

### **2.3.2. Implications of Situated Learning Theory for Mentoring**

Through the process of mentoring, mathematical literacy teachers are expected to acquire the necessary knowledge and skills in various social settings. Each mentee is assigned a mentor and they regularly interact, by arrangement and punctually. It means that each interaction becomes a unique event and creates a specific setting or context. In this context the mentee actively interacts with his/her mentor so as to acquire the necessary knowledge and skills to teach mathematical literacy. Wenger (1998) points out that, for learning to be effective, the mentee and mentor must interact in a mutually beneficial and meaningful fashion. It is through such a learning process that mentees would become more effective in their teaching. Accordingly, mentees would become more effective to the extent that their mathematical literacy content knowledge and instructional strategies are improved. Thus, I argue that *identity* (learning as becoming), as one of the components of Wenger's social theory of learning, could be realised through mentoring.

According to Lave and Wenger, in Graven (2004:188), learning is not merely based on the acquisition of structure, or simply located in the heads of individuals. Rather, learning takes place in the process of cooperation and in the increased access of learners to participation. Through the process of mentoring, mathematical literacy teachers interact with their experienced colleagues so as to improve their abilities to teach the subject. Learning by way of interaction makes mentoring different from formal education contexts where teachers have a central role in ensuring that successful learning occurs, and where they are also accountable for such learning. Sparks (2002) and Stoll, Earl and Fink (2003) affirm that theoretical and conceptual visions of professional development have, over the last several decades, shifted in emphasis from teaching to teacher learning. Through the process of mentoring, mentees acquire the necessary knowledge and skills primarily through learning rather

than through teaching. However, one cannot completely do away with teaching in the mentoring process since it remains one of the key functions of the mentor. Through teaching and learning, mathematical literacy teachers could become significantly more effective in the teaching of mathematical literacy, and hence of identity as one of the components of Wenger's (1998) theory.

The most salient feature of Wenger's (1998) theory, in terms of identity, is his description of three modes of belonging and the accompanying sources of identity formation. These are engagement, imagination and alignment. Engagement is all about mutual participation in meaningful activities and the interactions between the mentor and the mentee. In the process of mentoring, mathematical literacy teachers are also expected to learn from their mentors through observation and participation in whatever is being done. This form of interaction helps the mentees to learn from mentors, as indicated by Lankau and Scandura (2002).

The other mode of identity formation is *imagination*. This is described as an open-minded disposition that requires a willingness to explore, to take risks and to make connections in order to create new images of the world and of ourselves (Wenger 1998). This suggests that, for a mentoring process to be effective, mathematical literacy teachers must first admit that they need help to improve their mathematical content knowledge, and then demonstrate the desire to learn. In order for the mentoring relationship to be effective, mentees need to demonstrate the desire to learn, display an interest in the role of their mentors and be able to communicate effectively with them. In addition to these requirements, the mentee must also demonstrate initiative and follow through on learning activities (Healy & Welchart 1990:19). All these elements are essential ingredients for successful learning to take place. Given that all these factors depend on the mentee, it can be argued that it is the mentee who, in a certain sense, determines the success of the mentoring process.

The third mode of the identity formation process, namely *alignment*, describes a process of coordinating perspectives and actions, and of finding common ground from which to act. Mentoring provides a platform for both mentors and mentees to

engage in constructive discussions with the aim of settling on how best the mentees (and possibly the mentors) can improve on their classroom practices (Wenger 1998).

The next section discusses the implications of situational learning theory for mathematical literacy teachers.

### **2.3.3. Implications of situated learning theory for mathematics literacy teachers**

In harmony with the principles of situated learning theory, I believe that mathematical literacy teachers learn better from practical situations through mentoring. Above all, mathematical literacy teachers, as mentees, need to be informed of the conditions for applying knowledge while working within the context of their relationship. They are also more likely to engage in the discovery of solutions to real-context problems, and even to more general matters requiring problem-solving skills, as a consequence of their interactions with their mentors. It is through the situated learning environment that mathematical literacy teachers can see the implications of acquired knowledge in a real context. A situated learning environment also supports learners to structure knowledge in ways appropriate to later use, by gaining and working with such knowledge in context (Brill, 2001).

Mathematical literacy teachers would learn a variety of mathematical skills from their experienced colleagues when they interact with one another. Furthermore, through mentoring, mathematical literacy teachers' learning is more likely to take place in the immediate context in which the knowledge thus gained, would be applied. Mentoring will therefore serve as means for mathematical literacy teachers to learn from practical situations. Again, learning through mentoring is all embracing. Mathematical literacy teachers thus do not merely acquire content knowledge, but they also learn how to impart such knowledge to learners effectively. Learning through mentoring provides a non-intimidating environment that supports the collaborative construction of knowledge (Feiman-Nemser 2001:20).

Mentoring as a professional development programme thus creates learning structures that allow newly trained mathematical literacy teachers to align their experiences with

the styles and discourses of the settings in which they are expected to function. Through the use of mentoring the various components of Wenger's social theory of learning could be realised and, in particular, these elements could assist mentees to become more effective mathematical literacy teachers. Mathematical literacy teachers would also become more effective in teaching the subject as a result of their improved content knowledge, and that, in turn, should enhance their confidence.

In a study by Graven (2004:201) on Wenger's (1998) social practice perspective to teacher learning, Graven argues that confidence is pivotal in understanding and explaining the learning process experienced by mathematics teachers. The study explored the concept of confidence in relation to teacher learning in being both a product and a process of learning. Graven (2004:201) argues further that confidence is a primary condition for on-going learning in a profession like mathematics teaching. The current study is concerned with mathematical literacy teachers who have very little knowledge in mathematics. The author therefore believes that regular interaction with experienced mathematics teachers could help them improve their content knowledge as well as their instructional skills in mathematical literacy. The experienced mathematics teachers and the mathematical literacy teachers should therefore schedule regular supportive meetings. Mathematical literacy teachers' confidence in teaching this new subject would also be enhanced through such regular social interaction.

Social interaction is critical as far as the process of mentoring is concerned. Social interaction builds trust between the mathematical literacy teachers and their respective mentors. As a consequence they are likely to be more open with one another. This openness will allow mathematical literacy teachers to disclose their individual weaknesses as far as the teaching and learning of mathematical literacy is concerned. Hence, Torres-Guzman and Godwin (1995) describe mentoring as an intense dyadic relationship between the mentor and the mentee.

Therefore through the process of mentoring, mathematical literacy teachers could interact with their experienced colleagues so as to improve their abilities to teach the subject. This makes mentoring different from formal education contexts. In the

process of mentoring, mentees acquire the necessary knowledge and skills primarily through learning rather than through teaching. However, one cannot completely do away with teaching in mentoring since it is one of the key functions of the mentor.

#### **2.4. The history of mentoring**

For as long as the human race has been in existence, there have always been some members of communities who possessed specialised knowledge or skills gained through experience. Sometimes these individuals took others under their wings so as to share with them the wisdom of their experience. Such individuals, according to Chamberlain (2001:18), are referred to as mentors. Mentoring may be one of the oldest forms of knowledge transfer in human development, dating back to the Palaeolithic era when those with specialised talents or skills, such as healing, instructed younger people in these arts (Shea 2002). However, according to Kerry and Mayers (1995) mentoring has its professional origins in the world of business, and over the past three decades it has evolved to become a prominent feature of many professions, including teaching.

The concept of mentoring also has ancient roots. Consider, for example, Homer's legendary figure Odysseus, who left his son and household under the care and tutelage of Mentor. Over time, the term mentor came to refer to individuals who are experienced, trusted advisors or counsellors, and thus mentoring can take many forms. In education, mentoring sometimes serves as a sort of shorthand for induction programmes, most of which involve significant mentoring.

The modern study of mentoring and other supportive relationships and their roles in adult development started in the 1970s, as stated by Chamberlain (2001:20). Chamberlain also alluded to the fact that mentoring relationships became a hot topic in business literature starting in the 1970s, when several seminal articles trumpeted the benefits of and, according to some articles, the necessity of having, or of being a mentor. Since the 1970s, literature on mentoring increased significantly (Nankivel&Shoolbred 1997:95), and more recently there apparently has been a comparable interest in mentoring in education. In fact, this is the reason for the



current study on mentoring as a form of professional development with reference to mathematical literacy teachers in Greater Taung area.

## 2.5. What is mentoring?

The majority of the authors who have written on mentoring, describe the roots of mentoring as originating with Homer's epic poem, *The Odyssey* (e.g. Kerry and Mayers 1995; Wojnowski, Bellamy & Cooke 2003 and Chamberlain (2001:17). According to this myth, Odysseus, a great royal warrior, went off to fight in the Trojan War and had his son Telemachus entrusted to his friend and advisor, Mentor.

A review of the literature on mentoring, however, reveals that there is no single agreed upon definition, either of what constitutes a mentor, or of what is meant by "mentoring". The National Academy of Science (NAS) (1997) suggests that a mentor is someone who has experience in the challenges faced by the mentees, the ability to communicate that experience and, more importantly, the willingness to do so. A mentor therefore takes a special interest in helping another person develop into a successful and professional employee.

Anderson and Shannon (1988:39) define mentoring on the basis of the classical version of the mentor found in *The Odyssey*. According to Anderson and Shannon, the essential attributes of any mentoring process should include the processes of:

- **Nurturing:** The mentor encourages the growth and development of the mentee.
- **Intentional:** The mentor intentionally engages in the responsibilities of caring for and educating his or her mentee.
- **Insightful:** The mentor shares his or her insights with the mentee who learns from the wisdom of the mentor.
- **Supportive and protective:** Mentors do their best to support mentees and shield them until they reach maturity.

Collinson, Vivienne and Kozina (2009:4) also trace the concept of mentoring to Homer's legend. They point out, however, that over the course of time, mentors have come to signify experienced and trusted advisors or counsellors, and that mentoring can take many forms. Collinson et al believe that, in education, mentoring sometimes serves as a sort of shorthand for induction programmes, most of which involve a significant amount of mentoring.

Torres-Guzman and Godwin (1995) define mentoring as an intense, dyadic relationship in which the mentor furthers the professional and personal development of the mentee by providing information, assistance, support and guidance. Kochran and Trinbe (2000) define mentoring as a relationship that provides opportunities to develop dispositions and abilities that are invaluable to strengthening capacities for personal and professional growth. Murray (1991) defines mentoring as a process whereby a more experienced person helps a less experienced person develop in some specified capacity.

In mentoring there is usually an intimate relationship between the mentor and the mentee. This relationship creates a favourable atmosphere for the mentee to learn from the mentor. In this study it is also expected that an intimate relationship exists between mathematical literacy teachers and their experienced colleagues.

According to Donaldson, Ensher and Grant-Vallone (2000:235), mentoring is a term generally used to describe a relationship between a less-experienced individual called a mentee or protégé, and a more experienced individual known as a mentor. Donaldson, Ensher and Grant-Vallone also acknowledge that the term "mentor" was borrowed from the male guide, Mentor, in Greek mythology. In the traditional sense, mentoring is therefore viewed as a dyadic, face-to-face, long-term relationship between a supervisory adult and a novice student. Such a relationship, they believe, should foster the mentee's professional, academic and/or personal development.

Yalow (2003) describes a mentor as someone who has experience with the challenges faced by the trainees, has the ability to communicate that experience and the willingness to do so. According to Yalow, a mentor takes special interest in helping

another person develop into a successful professional, and he therefore maintains that the role of a mentor is different from that of a supervisor or adviser. These roles, however, can lead to a mentoring relationship.

According to Shea (2002), mentoring has been defined traditionally as a process whereby the young and the inexperienced are shepherded by older and more experienced adults. Kochran and Pascarelli (2003) view the process of mentoring as a way of enabling the youth to acquire the skills and attitudes necessary to participate fully in society and, more specifically, in the workplace. Huling and Resta (2001) also do agree with the view that mentoring is a process whereby new employees are assimilated into an organisation, and assisted in their personal and professional development.

Philip-Jones (in Kerry & Mayers 1995) defines mentors as influential people who assist mentees in some significant way to reach their life-goals, whereas McIntyre and Hagger (1996) maintain that a mentor is a person of higher rank or level of expertise, and who teaches, counsels, guides and develops a novice in an organisation or profession.

The definitions of mentoring may range in focus from the tasks performed by the mentor and the mentee respectively, to the processes taking place within the relationship. Murray (1991) thus defines mentoring as a process whereby a more experienced person helps a less experienced person to develop in a specified capacity. For example, a newly trained mathematical literacy teacher could be paired with a veteran mathematics teacher, and regular meetings between them could elicit discussions and practices that will support the new teacher's instructional skills.

Anderson and Shannon (1988:28) describe some of the definitions of mentoring as being "vague or ambiguous", stating that such definitions do not provide enough specific direction on what mentors are supposed to do or how they do it. According to Anderson et al, any definition of mentoring need to highlight the fact that mentoring is fundamentally a nurturing process, and that the mentor must serve as a

role model for the protégé. They therefore believe that mentoring can best be defined as:

*a nurturing process in which a more skilled or more experienced person, serving as a role model, teaches, sponsors, encourages, counsels and befriends a less skilled or less experienced person for the purpose of promoting the latter's professional and or personal development (Anderson & Shannon 1988:28).*

Anderson and Shannon (1988:29) promote a conceptualisation of the mentoring process that is rooted in historical reference and serves as a model for use by those who design and implement teacher mentor programmes. They also examine the problems inherent in current concepts of mentoring and propose what they believe to be the essential characteristics of mentoring. These are:

- effecting the process of nurturing
- serving as a role model
- focusing on professional and/or personal development
- engaging in the five mentoring functions (teaching, sponsoring, encouraging, counselling and befriending)

The above statement seems to suggest that mentoring processes could, in fact, occur naturally. However, some authors believe that mentors require some training and that the process needs proper planning. Carter and Francis (2000) believe that, although some mentoring relationship can emerge naturally, educators must ensure that mentoring is not left to chance. It is therefore necessary to plan mentoring in order to enhance the novice teachers' learning experiences.

Mentors may need explicit training in the stimulation of novice teachers to help them reflect on their actions so as to move them to higher levels of professional thinking. Griebelhaus and Bowman (2000:246) agree that mentors need to be trained, and claim that those who received training in effective mentoring practices had a greater impact on the mentees' development than those who did not.

Hudson (2007:209) adds that, since curricula continually change, teachers are required to develop their skills to advance their teaching practices. Similarly, mentors need to ensure that their understanding and skills are aligned with current mentoring practices and mentoring models.

From the above definitions, the author concludes that a mentor is a person who has advanced knowledge and skills in a particular field, and who therefore is able to guide young colleagues in their personal and professional development. Therefore, the operational definition of mentoring proposed in this study is formulated as follows:

Mentoring is a one-to-one relationship between a newly trained mathematical literacy teacher (a mentee) and a more experienced mathematics teacher (a mentor) which is aimed primarily at assisting in the professional development of the mathematical literacy teacher.

## **2.6. Roles and responsibilities of mentor and mentee**

Just as there are various definitions of mentoring, so there are many views concerning the roles and responsibilities of both the mentor and the mentee in a mentor-mentee relationship. Both the mentor and the mentee have specific responsibilities to ensure the success of the mentoring process. These responsibilities, if fulfilled, will optimise the effectiveness of the relationship between the mentor and the mentee.

According to Kram (1985), mentors perform both career and psychosocial functions. The career functions include sponsorship, exposure and preparation for advancement. These functions of the mentor are shown to correlate directly with the career advancement of the mentee. The psychosocial functions provided by the mentor enrich the mentees' sense of competence and effectiveness. Kram believes that the career-related functions emerge first in the relationship, followed by the psychosocial functions, which become important in the later phases of the relationship.

The National Academy of Science (NAS) (1997) describes the roles of a mentor as an advisor, a teacher, a role model, a friend and an advocator. The National Education

Association (1999:3) identifies thirteen (13) key roles of a mentor in an academic setting. These roles include that of a counsellor, a teacher, a challenger, a coach, an observer, a facilitator, a trainer, a master, a tour guide, an advocate, a role model, a reporter and an equal. Each of these roles has a slightly different function within the educational context.

Various aspects of each of the above-mentioned roles may be needed in a variety of combinations to guide mentees toward their desired goals. It is therefore important to note that no single role description can be used as an interchangeable term with mentoring. Rather, mentoring is the ability of the mentor to carry out a variety of roles depending on the needs of the mentee.

One crucial role of the mentor is to assist the mentee in understanding and adhering to the standards of conduct within his or her profession. Responsible conduct is more than the desire to do the right thing, or the reading of relevant regulations and publications. It is also important that mentees recognise the wide range of acceptable practices, and that some of these practices may be more preferable than others. Furthermore, mentees need to understand that acting responsibly depends on an appreciation of the fact that standards may vary between and within disciplines, may change over time, and in some cases are not even clearly defined.

According to Healy and Welchert (1990:19), the primary responsibilities of the mentor are:

1. to make an investment of quality time in the mentoring relationship,
2. to make a commitment to take the time necessary to allow for in-depth discussion of the needs and goals of the mentee and the progress towards those goals, and
3. to maintain supportive interaction.

In addition to the above, Healy and Welchert (1990:19) identify the following as major responsibilities of the mentor: sharing resources, providing feedback in non-

judgemental language, challenging mentees to work towards their own goals, assisting with the development of a vision, assurance of learning and facilitating reflective practices.

Although some authors such as Jipson and Pauley (2000), and Costa and Kallick (1993:49), believe that the mentee is an equal partner in the mentoring relationship, their roles are nevertheless different. Healy and Welchert (1990:20) believe that a key role of mentees is to identify their weaknesses and to articulate a vision so as to ensure that interaction with the mentor remains focused on the mentee's goals.

In order for the mentoring relationship to be effective, mentees need to carry out certain responsibilities. First of all, mentees must demonstrate the desire to learn. They must also have an interest in people and be able to communicate effectively. Healy and Welchert (1990:20) suggest that, understanding how to formulate questions and listen attentively, are two further and important responsibilities of the mentee. They add that the mentee must demonstrate initiative and follow through on assignments, an essential element in the achievement of goals. Since it is the mentee who ultimately decides what can be achieved, the degree to which these responsibilities are carried out will significantly impact on the productivity of the relationship.

The discussion above suggests that, with reference to the present study, newly trained mathematical literacy teachers must first admit that they need to improve their mathematical content knowledge and pedagogical abilities. Additionally, they need to demonstrate the desire to learn. Where teachers tend to withdraw or display signs of an inferiority complex, assistance should be provided by the mentor to help mentees overcome these obstacles.

Mathematical literacy teachers should therefore do some self-evaluation to identify their own shortcomings. They need to identify the topics (or the assessment standards) which they do not fully understand and may find problematic to teach. Furthermore, they must demonstrate a willingness to learn.

Mathematics teachers, who assume the role of a mentor, need to be committed to thorough discussions of the needs and expectations of the mathematical literacy teacher. They need to spend productive time with them. It is also worth mentioning that the mathematics teachers should encourage and support the career advancement of the mathematical literacy teachers, for instance, by assisting them to enrol in further studies in mathematical literacy or mathematics.

## **2.7. Challenges in mentoring relationship**

The mentor-mentee relationship is not without challenges, particularly when these relationships are not properly managed based on a well-developed plan to ensure the success of the mentee. There are also questions that may arise in this relationship and these issues should be addressed in the proper manner to make the mentor-mentee relationship effective for both parties. Such questions may be related to the communication skills of both the mentor and the mentee. Mentoring is a two-way conversation that can benefit both the mentor and the mentee, particularly when both understand how to make it work.

Wojnowski, Bellamy and Cooke (2003) state that, although mentoring has become widespread in recent years, there are significant barriers to its effectiveness that often prevent such programmes from being as successful as they should be. Smagorinsky, Cook, Moore, Jackson and Fry (2004:12) believe that the relationships and experiences that occur between the mentor and the mentee during the mentoring period will influence the development of the mentees either positively or negatively. During this period there is a close interaction between mentor and mentee such that the mentor can influence the beliefs and future teaching practices of the mentee.

However, one cannot assume that such relationships are without complexities or tensions. Bradbury and Koballa (2008:823) describe these tensions between mentors and mentees as “borders” that need to be crossed in order to develop a working relationship. A vital component of mentoring relationships is the nature of the communication that develops between mentors and mentees. The most frequent type of communication is conversation, which is the vehicle that allows mentors and



mentees to make sense of their experiences in the classroom (Orland-Barak 2005:358).

Mentoring is a relationship of trust that ensures that a mentor and a mentee can talk confidentially about important problems and areas that may require attention. Without trust, the mentoring conversation may not deliver the expected benefits of discovery, deep analysis and self-assessment, inquiry into practice and learning and improvement. Furthermore, without trust, the expected results of adjusted thinking and practices may not be attained. According to Stanulis and Russel (2000:69), in several studies of mentoring relationships, participants emphasised the importance of developing a level of trust that would allow for productive conversations leading to greater learning on the part of the mentee. Where there is a level of trust in a relationship, both parties will be more open with one another.

One barrier to developing open communication between mentors and mentees is the culture of isolation that exists in the case of many would-be mentors (Stanulis 1995:334). Wojnowski et al (2003) state that mentoring is currently making significant inroads in many areas of education because of the need to reduce teacher isolation and to retain new teachers. According to Gratch (1998:223) experienced teachers often have very little opportunity to discuss their teaching methods with other teachers. Because teachers work mostly in the privacy of their own classrooms, they have little opportunity to engage with others in discussions about the details of their work. For this reason, the practical knowledge that experienced teachers use to direct their day-to-day teaching functions, may remain hidden from the mentee. Moreover, according to Zanting, Verloop, Vermunt and Van Driel (1998) some mentors feel that it is disrespectful to give mentees direct advice; in contrast, mentors prefer to have the mentee's ideas at the centre of their discussions. On the other hand, mentees, particularly new teachers, may be reluctant to admit that they need help for fear of giving the impression that they are not competent (Wilman, Magliaro, Niles & Niles 1992:211).

An additional barrier that may hinder open communication is the desire of mentors and mentees to avoid conflict in the relationship (Borko & Mayfield 1995:515). In

most mentoring relationships, both mentors and mentees are reluctant to disagree or challenge each other's ideas because they are unwilling to jeopardise the relationship. While communication is fundamental to developing successful mentoring relationships, tensions can arise as a result of the interactions that occur between the two parties. Hobson (2002:15) and Maynard (2000:20) observed that in some instances, mentees become frustrated because they feel that their mentors are not communicating helpful advice or providing adequate feedback. Norman and Feiman-Nemser (2005:688) also add that in most cases, new teachers may be reluctant to incorporate the mentor's advice because it does not resonate with their own beliefs about teaching, thus leading to frustration on the part of the mentor.

The respective beliefs about teaching that mentors and mentees bring to the partnership can influence the development of their relationship. Stanulis and Russel (2000:72) found that difficulties in communication could emerge when mentors and mentees hold different opinions about teaching and mentoring. It is therefore important for mentees to be cognisant of their mentor teacher's beliefs and values about teaching in order to develop a proper understanding of their mentor's teaching and mentoring practices. Other barriers that may have a negative effect on mentoring are lack of time and inadequate funding.

Effective communication between mathematics teachers is vital for the success of the mentoring relationship. Where there is effective communication and trust, newly trained mathematical literacy teachers will be prepared to admit that they need help without fear of being labelled as incompetent.

## **2.8. Mentoring model**

According to Norman et al (2005:680), mentoring has been viewed as a valuable construct in fostering novice teachers' personal and professional development. Norman et al believe that novice teachers require experienced guidance in the school setting. Mentors can therefore develop strong connections with mentees and engender a sense of esteem and satisfaction that come from their mutual efforts.

Hudson (2007:203) proposed a five-factor model for mentoring. The model identified five primary factors which include personal attributes; systems requirements; pedagogical knowledge; modelling and feedback. These factors are not isolated but closely inter-related, as indicated by the double-headed arrows in figure 1 below. This model is relevant to the current study because, in the process of mentoring, mentors are supposed to focus on these factors, not in isolation, but holistically.

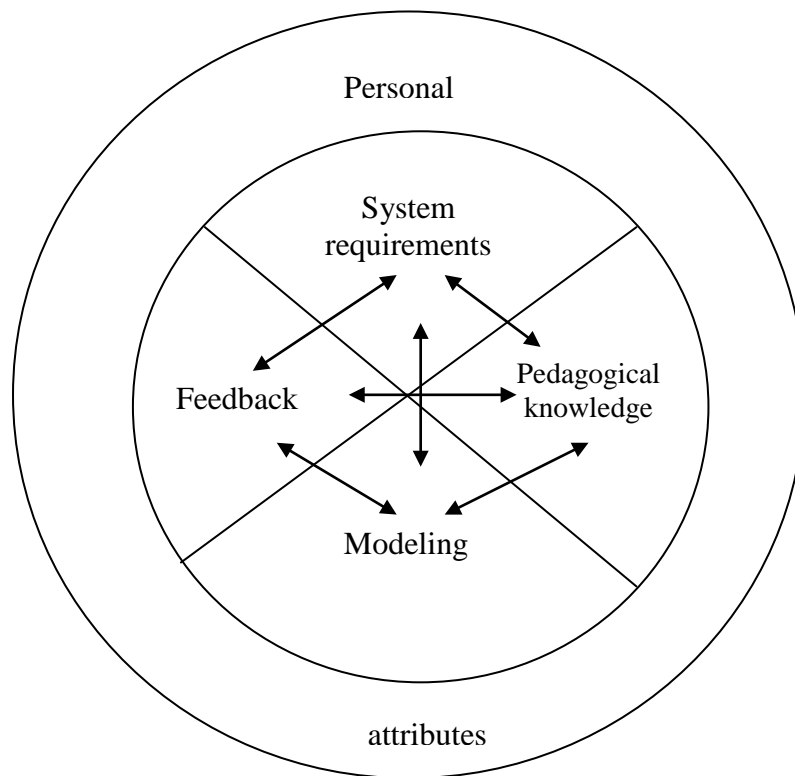


Figure 1. Five-factor model for mentoring

Adapted from Hudson (2007:203)

### 2.8.1 Personal attributes

In relation to the five-factor model, Hudson (2007:204) alludes to the fact that learning to teach requires social interaction, which, in this study occurs between mentor and mentee. Such social interaction can have an important impact on the mentee's development as a teacher. This interaction will be possible only when

mentors display personal attributes that facilitate a supportive learning environment. Beck, Czermaik and Lumpe (2000:331) contend that the mentor's personal attributes can instil positive attitudes and confidence in the mentee. Furthermore, it can also help to promote an environment conducive to the mentee's reflecting constructively on teaching practices. Harrison, Dymoke and Pell (2006:1059) reveal that desirable mentor attributes include being a good listener, being flexible and displaying the ability to focus on issues. It needs to be emphasised that a good social relationship between mathematics teachers and mathematical literacy teachers in a school setting can promote an environment conducive to learning for both teachers and learners.

### **2.8.2 System requirements**

In addition to instilling a positive attitude and confidence in the mentee, the mentors also need to articulate the departmental requirements in teaching mathematical literacy. The educational system within which teachers work, operates as a regulatory environment. It is therefore necessary for the mathematical literacy teachers to know and understand these requirements. A vital requirement would be the continued personal and professional growth and development of mathematical literacy teachers. According to Griffins (1979:27), one of the requirements of a profession is that its members continue to learn, to grow and to improve their knowledge. Lenton and Turner (1999:69) assert that the mentors' articulation of system's requirements provide mentees with departmental directions for teaching.

### **2.8.3 Pedagogical knowledge**

Mentors need to have adequate pedagogical knowledge in order to facilitate effective mentoring programmes. A competent and experienced mentor can enhance the pedagogical knowledge of the mentee. Allsop and Benson (1996) postulate that the mentee's development of pedagogical knowledge can be enhanced in the school setting, particularly when guided by a competent and experienced mentor. In this study it is assumed that the experienced mathematics teachers do, in fact, possess an adequate degree of pedagogical knowledge in order to enhance the development of the mathematical literacy teachers.

#### **2.8.4 Modelling**

Generally, mentees view their mentors as experts who model good practices that could be emulated. For example, Van Ast (2002:9) asserts that pedagogical knowledge can be further enhanced by the mentor's modelling of teaching practices. The experienced colleagues therefore need to exhibit good practices in teaching and learning for mathematical literacy teachers to emulate. They need to be role models.

#### **2.8.5 Feedback**

Providing feedback is one of the key functions of a mentor. Zachary (2001:28) emphasises that the mentor requires specific outcomes as focus areas to provide useful feedback. Feedback will be more useful if it addresses the mentee's needs in relation to the outcomes required for effective teaching. Outcomes that are linked to indicators of effective practices may provide clearer directions to both mentor and mentee (Hudson, 2004:140). Feedback in the form of open discussions may contribute to improving the knowledge and skills of the mentee.

Earlier in the current study, mentors were described as experienced and knowledgeable teachers who guide and support novice teachers in their personal and professional development. It is for this reason that Zanting, Verloop and Vermunt (2003) insist that teacher-mentors need to have adequate pedagogical knowledge to facilitate effective mentoring programmes. In fact, according to Shulman (1987:4), the framework for any teacher development programme should include three major domains. These are content knowledge, pedagogical knowledge and pedagogical content knowledge.

- **Content knowledge.** This involves the mastery of specific content being taught.
- **Pedagogical knowledge.** This involves understanding the theories and principles of teaching and learning, understanding the learner, and understanding the theories and principles of classroom behaviour and management.

- **Pedagogical content knowledge.** This involves the ability to blend technique and content, including how the given topics are related to one another and how they are most effectively organised and presented in the classroom (Shulman 1987:4).

## 2.9. Types of educational mentoring

According to Wojnowski et al (2003) there are three types of educational mentoring, namely traditional mentoring, collegial mentoring and professional development mentoring.

Traditionally, mentoring is not a new idea and evolved from *The Odyssey* (see section 2.3). Currently, mentoring is becoming very relevant in many areas of the educational environment. Darling (1989:43) believes that many institutions have initiated formal planned mentoring programmes because they have come to realise that we need mentors throughout our lifelong journey. When mentoring programmes are well planned, the activities are usually targeted to address the needs and concerns of the participants. Furthermore, it will encourage collaboration of teachers and reduce teacher isolation. According to Ganser (1996:37), mentor relationships can emerge naturally, but teacher isolation makes this unlikely for many new teachers. Ganser describes teacher isolation as the complete absence of collaboration between teachers.

Collegial mentoring, often referred to as peer coaching, consists of pairs of teachers who work together towards a common goal, namely that of improving their educational and teaching practices. Anderson and Pratt (1996) describe collegial mentoring as being different from other forms of mentoring in that it takes place between equals. The different parties to the relationship have the benefit of colleagues to provide reflective feedback on their progress and to offer positive support for their efforts. Furthermore, opportunities provided for professional teacher growth by

means of collegial support tend to minimise classroom isolation, which, in turn, enhances teacher satisfaction and development (Taylor 1987:28).

According to Mullen (2000:5), the concept of collaborative mentoring has also emerged within academia. Mullen goes on to say that collaborative mentoring replaces the traditional hierarchical model with one that focuses on mutual empowerment and learning. It also gives an opportunity for professionals to become directly involved in each other's learning and to provide feedback while developing towards a mutually agreed set of goals. Mullen describes this form of collaboration as co-mentoring, and defines this relationship as synergistic. Mullen views mentoring as providing opportunities to be involved in each other's learning processes by sharing a common purpose and being commitment to projects. The ability to collaborate and share is seen as providing opportunities to strengthen personal and professional skills.

Collaborative mentoring is described as a practice that engenders a creative, democratic relationship which promotes the development of insights and understanding between peers (Jipson & Pauley 2000). Costa and Kallick (1993:50) refer to collaborative mentoring as a "critical friend" and they describe such a critical friend as a trusted person who asks provocative questions and provides data to be examined through another lens.

McCann and Radford (1993) highlight the importance of collaboration, teamwork and mentoring among school staff and between staff and administrators. They also promote the involvement of educational leaders. Such educational leaders must genuinely support and encourage collaboration in order to foster a positive learning environment for teachers. 'Educational leaders should share with teachers a disciplined curiosity about teaching, and join them in mastering and advancing this complex human activity', say McCann et al (1993:43). They acknowledge that time is important and that schools should not always expect the quality of work to remain constant given an increase in the quantity of work. The focus should rather be on enhancing the quality of teaching in order to encourage reciprocal learning.

Training for academic mentoring usually takes the form of professional development. To be effective, professional development activities must be targeted towards the needs and concerns of the participants. According to Guskey (2000), the mentoring model of professional development typically involves pairing an experienced and highly successful educator with a less experienced colleague. Guskey further states that professional development activities must support the sharing of teacher expertise by preparing and using mentors to provide professional development opportunities.

It is the author's belief that all three types of educational mentoring discussed above should be evident in the professional development of mathematical literacy teachers, and that they cannot be easily separated from one another.

## **2.10. Continuous Professional Development**

Continuous Professional Development (CPD) in education goes by many names, such as professional growth, on-the-job training, continuing education, in-service education and training, human resource development and staff development (Webb, Montello & Norton 1994). Sparks and Loucks-Horsely (1990:24) state that "staff knowledge and skills and attitudes of school employees" are vital aspects of professional development. According to them, the most important objective of professional development is to enhance student learning, and the individuals most responsible for this are the teachers.

According to the Organisation for Economic Cooperation and Development (OECD) (1998), professional development signifies any activity that develops an individual's skills, knowledge, expertise and other characteristics. These may include mentoring, personal study and reflection, as well as formal courses. On the other hand, professional development is about planning and implementing activities to enhance the professional career growth of employees. Such activities may include individual development, continuing education and in-service education, as well as curriculum writing, peer collaboration, study groups and peer coaching or mentoring. Fullan (1991:21) expands the definition to include the sum total of formal and informal



learning experiences throughout one's career, from pre-service teacher education to retirement.

The purpose of continuous professional development, according to Sparks et al (1990), is to enhance the quality of students' learning by improving the quality of teaching. Consequently, professional development programmes are intended to improve the professional knowledge, skills and attitudes of teachers in order that they, in turn, may educate students more effectively.

Kriek (2005) agrees with Sparks et al on the purpose of professional development when she says that continuous professional development relates to a life-long development that focuses on a wide range of knowledge, skills and attitudes in order to educate students more effectively. Kriek also perceives CPD as a formal, systematic programme designed to promote personal and professional growth.

With transformation in the South African education system, which evidently necessitated changes in the mathematical curriculum, teachers are required to teach certain topics which they may not have learned during their pre-service training. Cohen (1995:14) affirms that the expectations of effective teaching and meaningful learning in mathematics require teachers to have the necessary knowledge and skills to enable them to cope with changes in the curriculum. Professional development therefore plays a crucial role in helping teachers to acquire such knowledge and skills.

For professional development to be handy and helpful, as Hea-Jin (2001) contends, it has to be structured in such a way that it includes activities such as study groups, networking, coaching and mentoring. This is in addition to activities such as workshops, seminars and conferences that Hea-Jin regards as the more traditional forms of professional development. It is on this basis that the current study advocates the process of mentoring as a form of professional development for newly trained mathematical literacy teachers, and to serve as a means to facilitate learning through direct interaction between the mentor and the mentee.

Desimone, Porter, Garet, Yoon and Birman (2002:86) agree with Hea-Jin (2001) that reformed professional activities such as mentoring need to be structured. They further identify some advantages of the reformed type of professional development programmes. Firstly, such programmes allow teachers to make connections with classroom teaching that are easier to sustain over time. Secondly, the programmes may be more responsive to how teachers learn, have greater influence on changing teaching practice, and be more responsive to teachers' needs and goals.

The author asserts that, in order for mentoring to achieve the intended objectives, it should be well planned and properly implemented. Desimone et al (2002:88) state that an effective mentoring programme will depend largely on the nature and quality of such programmes, and they identify two broad areas of a high-quality professional development programme, namely the *structure* and the *core features* of the programme. With regards to the structure of the programme, Desimone et al focus on the following areas:

- the need to establish an organised structure to facilitate the professional development activity (for example, a study group, a teacher network, or systematic coaching or mentoring)
- the duration of the activity, that is, the total number of contact hours to be spent by participants
- the degree of collective participation (for example, a group of teachers from the same school, department or grade level).

In addition to these structural features, Desimone et al also mention three dimensions or core features of the professional development programme. These three core features include the content focus (i.e. the degree to which the activity is focused on improving and deepening teachers' content knowledge in mathematics), the extent to which the activity offers opportunities for active learning, and the degree to which the activity promotes coherence in teachers' professional development by incorporating experiences that are consistent with teachers' goals.

The content focus of a professional development programme may vary in scope. However, Desimone et al (2002:101), like many other educators, claim that professional development should focus on both content knowledge and an understanding of how students learn specific content.

The professional development of mathematical literacy teachers has recently received increased attention, and the main driving force behind this is the need to improve the quality of teaching in the subject concerned. According to Even (1999:521-545), research indicates that, while content knowledge, pedagogical content knowledge and knowledge of the curriculum are all critical elements required for the effective teaching of any learning area, the dynamics of the classroom situation is much more complicated. Even continues to say that effective mathematics (or mathematical literacy) teaching entails detailed preparation, linking various curriculum materials to a specific mathematics context and pacing the instructions to the range of learners' abilities. Adler (2004) asserts that teachers need sophisticated knowledge about the complexities of mathematics instruction, and have the disposition to apply the knowledge gained in practice. It is for this reason that the author is of the opinion that training experienced mathematics teachers to become mentors of mathematical literacy teachers can enhance their conceptual understanding.

Given all of the above, we may conclude that mentoring is a vital form of professional development, and in harmony with this conclusion we will now proceed to explore the relationship between mentoring and professional development in more detail.

### **2.11. Mentoring and Continuous Professional Development**

Continuous Professional Development (CPD), quite simply, is a means of supporting people in the workplace to understand more about the environment in which they work, the job they do and how to do it better (OECD 1998). Currently, changes occur at such a rate that teachers need to adapt rapidly in order to meet the demands and challenges brought about by such changes. Some of these changes are the result of the fast-changing needs of the society, which in turn, impacts on the school curriculum.

CPD also helps practicing teachers to keep abreast of changes taking place in the education system. Through CPD teachers can upgrade and update their knowledge and skills in order to become more effective teachers. Such upgrading of knowledge and skills necessitates a professional development programme that will ensure that teachers will cope with the current rate of change. Hea-Jin puts it as follows:

Professional development is a critical ingredient of mathematics education reform, and effective professional development experiences are designed to help teachers build new understandings of teaching and learning through direct experiences with strategies that help students learn new ways (Hea-Jin 2001:12).

The purpose of professional development is to enhance the quality of pupils' learning by improving the quality of the teaching they receive (Bolam, 1988:3). Professional development programmes are therefore intended to improve the professional knowledge, skills and attitudes of teachers so that they will be capable of educating learners more effectively.

It needs to be emphasised that assessment cannot be separated from teaching and learning in mathematics education. If experienced mathematics teachers are involved in the professional development of mathematical literacy teachers by means of mentoring, they should explain to them both the importance and the various forms of assessment in mathematics education.

Kerry and Mayers (1995:25) identified some of the challenges and issues relative to the roles of mentors, their institutions and the various teacher education programmes within which they work. They consider mentoring as pivotal to institution-based professional development.

Both Barneth (1995) and Crowther and Cannon (1998) assert that mentoring can develop teaching practices as it provides opportunities for mentors and mentees to engage in pedagogical discourse and reflective thinking. In support of this assertion, Sinclair (1997:311) adds that, in recent times, mentoring has become even more prominent in teacher education than before.

Maynard and Furlong (1993:51) also allude to the fact that learning to teach is a complex, bewildering and sometimes painful task, which involves developing a practical knowledge base, changes in cognitive abilities and the development of interpersonal skills. Maynard et al examine the ways in which teachers, acting as mentors, can most effectively help mentees in this difficult process. They believe that in these times of rapid change in teacher education, it is necessary to have a clear and principled understanding of the rationale behind each aspect of training and how it relates to other dimensions of education.

Elliot and Calderhead (1993) are mainly concerned with fostering growth in teaching through mentoring. In the context of teaching, mentors need to demonstrate a range of teaching techniques. Elliot et al assert that mentors need to observe the mentees' classroom teaching abilities and provide constructive feedback. Mentors should schedule support meetings with their mentees. In school-based mentoring such meetings between mathematical literacy teachers and the experienced mathematics teacher could be informal, taking the form of a conversation.

Wojnowski et al (2003:11) stress the fact that student learning will improve only when efforts are focused on improving teaching. They use the term 'teacher isolation', which they describe as a lack of opportunity for collaborative interaction with peers. In view of the foregoing, they emphasise the importance of effective mentoring and induction programmes for beginning teachers as a way of improving teacher-teacher interaction, thereby minimising isolation, especially among teachers with minimal career experience. They strongly promote the idea that the teachers should interact with their experienced colleagues on a regular basis. Such interaction would allow them to obtain the necessary support to improve their skills and abilities in the teaching. In line with the above statements, it is expected that mathematical literacy teachers could obtain the necessary support that may help in improving their knowledge and skills as they interact with their experienced colleagues. By minimising 'teacher isolation', mathematical literacy teachers will be encouraged to observe lessons taught by their experienced colleagues.

## **2.12. The importance of mentoring to the educational system**

As an interactive system, mentoring benefits all the stakeholders: the mentor, the mentee and the school system. As mentor teachers assist their mentees in improving their teaching, they also improve their own professional competencies. Gordon and Maxey (2000) claim that several studies have documented the positive effects of mentoring on the mentors themselves. Mentors benefit by applying cognitive coaching skills such as listening, asking inquisitive questions, providing non-judgemental feedback, and by reassessing their own classroom management strategies (Clinard&Ariav 1998:93).

It is not only the mentor who benefits from mentoring, but the mentee as well. According to Evenson (1982:11), one of the most recognised uses of mentoring is the conveyance of operating procedures to the mentee. The benefit derived by the mentee in a mentoring relation can be put in three major ways:

- fast assimilation into the school,
- establishment of professional competence,
- introduction to teaching as a continually developing, lifelong career.

Schools also benefit both directly and indirectly, from mentoring programmes. Involving experienced teachers in the mentoring programme and providing them with the opportunity to pass on their expertise to novice teachers, will expose novice teachers to opportunities to acquire the skills and attitudes necessary to participate fully in society, and more importantly, in the workplace. Mentoring may also provide an environment conducive to lifelong professional careers. Moreover, it helps new employees to be assimilated into an organisation.

## **2.13. Mentoring versus coaching**

Both mentoring and coaching are learning relationships which help people to take charge of their own development to release their potential and to achieve results which they value. Parsole (1999:8) states that most people use the two terms,

mentoring and coaching, interchangeably. However, Parsole believes that there is a distinction, at least in the meaning of the words if not in the way that they are used. He describes coaches as transactional leaders, while mentors are transformational leaders. As transactional leaders, coaches are mostly interested in helping people or groups of people to acquire the knowledge and skills necessary to complete a task or fulfil a role. They adapt their leadership style to the most appropriate style required to facilitate a particular task or organisational accomplishment. On the other hand, mentors, as transformational leaders, are more interested in helping people or organisations to acquire the awareness and confidence necessary to fulfil their potential. Mentors adapt their leadership style to the most appropriate style required to facilitate personal or organisational growth. Thus, whereas coaches want people to ‘do’ something, mentors want to help people to ‘become’ something. In a nutshell, the coach is job-focused whereas the mentor is person-focused.

Both coaching and mentoring are processes that enable individuals and organisations to achieve their full potential. However, in this study the emphasis is on the professional as well as the personal development of the mathematical literacy teachers. That being the case, we are of the opinion that mentoring will be more appropriate than coaching in the educational environment. Thus, through the process of mentoring, mentees are expected to acquire the skills necessary to enable them to adapt to various conditions within the organisation in which they are required to function. Mentoring seeks to develop the potential and capabilities within an individual, and as such, it is not task-centred but focused more on the holistic development of the mentee.

The difference between mentoring and coaching is presented in the table below.

Table 1. Difference between mentoring and coaching

	MENTOR	COACH
Focus	Individual	Performance
Role	Facilitator with no agenda	Specific agenda
Relationship	Self-selecting	Comes with the job

Source of influence	Perceived value	Position
Personal returns	Affirmation learning	Teamwork/performance
Arena	Life	Task-related

Source: Starcevich (2009:2)

From the above table, it may be seen that the coach seeks to build someone's confidence or teach them the skills or knowledge so that they can achieve something. On the other hand, the mentor provides job or carrier advice and support, based on the wisdom they have gained through experience. Furthermore, the coach has a professional commitment to the relationship whereas the mentor makes a personal and professional commitment to a learner's success.

## **2.14. Conditions for an effective mentoring programme**

Hobson, Ashby, Malderez and Tomlinson (2009:412) state that, while certain conditions may be more likely to facilitate the achievement of some mentoring aims than others, a number of common findings have emerged from research regarding factors which impact on the success or otherwise of different kinds of mentoring programmes across a variety of contexts. Hobson et al identify four factors that may contribute to effective mentoring programmes: these include contextual support for mentoring; mentor selection and pairing; mentoring strategies; and mentor preparation.

### **2.14.1. Contextual support for mentoring**

According to Lee and Feng (2007:257), the success of mentoring programmes and mentoring relationships is influenced by a range of contextual factors. They indicate that the most consistent findings in this area suggest that, all other things being equal, mentoring is more likely to be effective where teacher-mentors are given additional free time or non-contact time to enable them prepare for and undertake the mentoring role. The role of the mentor requires quality time with the mentee. Evans and Abbott (1997:140) add that mentoring is more likely to lead to positive outcomes where



mentors receive financial rewards and/or some other form of incentive or recognition for their work.

In addition to the above, the environment, or the school setting, within which mentoring takes place also contributes to its success. This is drawn from Lee and Feng's (2007:257) belief that mentoring of novice teachers is more likely to be successful where it takes place within schools characterised by collegial and learning cultures, and where both mentors and mentees have access to support outside of the mentoring relationship. In this study, it is assumed that the school setting within which the mentoring of the mathematical literacy teachers take place, represents a culture of learning and of genuine support of one another.

#### **2.14.2. Mentor selection and pairing**

Hobson et al (2009:428) suggest that the success of teacher mentoring programmes is, at least in part, a function of the ways mentors are selected and paired with mentees. According to Roehring, Bohn, Turner and Pressley (2008:686), mentors should be effective practitioners who are able to model good professional practice, and it is also important that mentees have 'professional respect' for their mentors. That is, at least as far as the mentees' are concerned, their mentors possess sufficient knowledge and teaching experience in their respective specialist subjects. However, being an experienced and effective teacher, and being recognised as such, is a necessary but not sufficient condition for being an effective mentor.

Effective mentors, according to Yusko and Feiman-Nemser (2008:5), must be willing and able to 'make their work public' and to make explicit the factors underlying their classroom practices. Furthermore, they must be supportive, approachable, non-judgemental and trustworthy, have a positive demeanour, possess good listening skills and the ability to clearly articulate what they wish to convey, as well as the willingness and ability to take an interest in novice teachers' work and lives.

Mentors must not be chosen simply on the basis of rank or position (for example, a senior teacher, a deputy principal or the head of a department) if they do not have the

necessary qualities to understand the novice teacher. Hobson et al (2009) indicate that there is clear evidence that mentoring is more likely to be successful where decisions about mentor-mentee pairings take into account the mentees' strengths and limitations, and where the mentor and mentee get along well, both personally and professionally.

### **2.14.3. Mentoring strategies, approaches and tactics**

Like all forms of teaching, mentoring is most effective where it is 'fit for purpose' and addresses the needs of the mentee. Valencic, Zuljan and Vogrinc (2007:379) mention that mentors need to take account of individual learning styles and ensure that the strategies employed to support the mentees' learning process, are responsive to their concerns and appropriate to their current stage of development. Mentoring may also be more effective where mentors teach the same subject as their mentees (Johnson 2004).

While it is important for mentors to address the individual needs of mentees, there are a number of approaches, strategies and tactics which have been found to be effective across different contexts. Feiman-Nemser (2001) and Maynard (2000) agree that effective mentors need to provide their mentees with emotional and psychological support, and make them feel more welcome, accepted and included. Secondly, effective mentors make time for their mentees: they have regular meetings with them and are available for informal discussions at other times (Harrison, Dymoke & Pell 2006). Lastly, effective mentors allow their mentees an appropriate degree of autonomy to make decisions and to develop their own teaching styles (Feiman-Nemser 2001; Harrison et al 2006).

According to Hobson (2002:15), numerous studies have found that one of the most valued aspects of the work undertaken by mentors is that of lesson observation (both of and by the mentee), with subsequent analysis of the processes involved. Mentors' observations of the lessons of mentees tend to be more valued where its objectives are agreed during a pre-observation meeting, and where the post-observation meeting is conducted in a sensitive and non-threatening way.

#### **2.14.4. Mentor preparation and support**

In support of mentor training, ValencicZuljan and Vogrinc (2007:377) believe that mentors are more likely to employ effective mentoring strategies when they have undertaken an appropriate programme of mentor preparation. Bullough (2005:151) concluded from his study on 'being and becoming a mentor', that mentor preparation should go beyond the kind of training that has traditionally been perceived as 'behavioural inculcation without insight', and should include planned strategies to assist individuals in developing their identities as mentors. Evans and Abbott (1997:139) emphasise the importance of directing mentors towards appropriate research that will help them in their mentoring activities, as well as to understand the value and potential benefits of discussing pedagogical issues with novice teacher mentees.

The conditions of an effective mentoring programme as described in section 2.13 are important for all early-career teachers, particularly for mathematical literacy teachers as they start their teaching career in a transformed educational system in South Africa. A properly designed mentoring programme will serve as a powerful and cost-effective tool to support and retain mathematical literacy teachers. Lloyd, Wood and Moreno (2000:38-42) agree that novice teachers who have the support of their mentor-teachers, are more likely to remain in the profession. Training programmes for these mentors to ensure that they will live up to expectations are therefore vital. Desimone et al (2002:101) mention that training programmes for teacher mentors should consist of the following critical elements:

- 1) the role of the teacher mentor,
- 2) tactics for working with adult peers,
- 3) ways to establish rapport and trust with teachers (mentees),
- 4) strategies to provide feedback that is both positive and constructive.

#### **2.15. Learning as an aspect of mentoring**

The concept of mentoring has been defined in various ways by different authors. For example, Torres-Guzman et al (1995) describe mentoring as an intense dyadic relationship in which the mentor furthers the professional and personal development of the protégé, while Murray (1991:7) defines it as a process whereby a more experienced person helps a less experienced person develop in some specific way. But generally speaking, modern mentors are viewed as influential and more experienced people who can assist less experienced individuals in the attainment of their work and career goals in an organisation (Starcevich 2005:3-5). In terms of the present study, newly trained mathematical literacy teachers are expected to learn from the experienced and more influential mathematics teachers through the process of mentoring. These mathematics teachers are required to assist mathematical literacy teachers both in content and in the techniques of teaching and of assessing learners. Additionally, these newly trained teachers should also be encouraged to take their personal development seriously.

During the process of mentoring, learning and experimentation occur through analysis, examination, re-examination and reflection on practical situations, problems, mistakes and successes (of both mentors and mentees) in order to identify learning opportunities and gaps. Mentoring can also be viewed as a process of helping the learner or mentee to grow in self-confidence and to develop independence, autonomy and maturity.

At this point, it is clear that learning is one of the most important aspects of the mentoring process. With reference to the current study, mentees (i.e. mathematical literacy teachers) are required to learn from their experienced colleagues. It is therefore important that both mentor and mentee understand the learning processes in which they find themselves. Most of the learning that occurs within the mentoring relationship would be compatible with the principles of social learning theory.

Lankau and Scandura (2002) add that individuals learn a great deal through their interactions with others, especially from those with different backgrounds, expertise, and seniority in their organisations. One can therefore conclude that mentoring could

serve as a forum for personal learning. However, according to Lankau and Scandura (2002), it is somewhat surprising that personal learning has not been the subject of empirical studies in the current literature on mentoring. This study will therefore investigate this issue in more detail.

During the process of mentoring, most of the learning take place through conversation, observation and imitation. Consequently, in the present study, it is assumed that mentees will learn from their mentors through observation, imitation and conversation. People can learn by observing the behaviour of others and the outcome of those behaviours. The observer is more likely to imitate the model's behaviour if the model possesses characteristics that the observer finds attractive or desirable (such as talent, intelligence, power).

At this stage, learning is seen to be at the core of any mentoring process. It is therefore important that both mentee and mentor understand the learning process. The process of learning within the mentoring relationship is largely based on the principles of social learning theory. Since, in this study, the parties involved in the mentoring relationship are adults, it is not only necessary but also important to look at some issues pertaining to adult learning, especially with reference to professional development activities.

## **2.16. Adult learning**

In any mentor-mentee relationship, it is expected of mentees to learn from their mentors. Hence it is important to understand how effective learning can take place within the process of mentoring. In this study the focus is on the mentoring of mathematical literacy teachers. Since these teachers are adults, it is necessary to distinguish between the ways adults learn, and that of children. Consequently there is a need to refer to certain important aspects of adult learning theory. Billington (1996) cautions that, since we are living in a world where knowledge and technology are changing rapidly, adults (who, in this case, are the teachers of mathematical literacy) continue to learn throughout their lives in order to cope with changes taking place.

The failure to do so would result in their skills and knowledge becoming obsolete quite rapidly.

In his contribution to adult learning, Specks (1996:33-41) suggests that the following important principles of adult learning should be considered when professional development activities are designed for teachers:

- Adults will commit to learning when the goals and objectives are considered to be realistic and important to them. Application to the 'real' world is important and relevant to the adult learners' personal and professional development.
- Adult learners need to see that the professional development learning process is directly related and relevant to their day-to-day activities.
- Adult learners want to be the initiators of their own learning and will therefore resist learning activities they believe to be an attack on their competence.
- Adult learners need direct, concrete experiences in which they are able to apply what they are learning in the real world.
- Adult learning has ego involved. Professional development must therefore be structured to provide support from peers and to reduce the fear of judgement during learning.
- Adults need to receive feedback on how they are doing and the results of their efforts. Opportunities must therefore be built into professional development activities that allow the learner to practice the learning and receive structured, helpful feedback.
- Adults need to participate in small-group activities during the learning process to move them beyond understanding to application, analysis, synthesis and evaluation. Small-group activities provide an opportunity to share, reflect, and generalise learning experiences.
- Adult learners come to the learning process with a wide range of previous experiences, knowledge, self-direction, interests, and competencies. This diversity must be accommodated in the planning of professional development programmes.

The process of mentoring as a process to further the professional development of mathematical literacy teachers, involves adult learning. It is therefore imperative to consider some of the aspects of adult behaviour and the conditions under which adults learn best. We believe the observations on adult learning by Specks are relevant to the present study.

Billington (1996:58) claims that learning and personal growth are inseparable. However, Billington also believes that more is required in terms of the type of environment that will help adults grow and develop best. In view of this, Billington identifies the following factors in learning programmes that will stimulate adult development and make it more effective:

1. An environment where the adult learner feels safe and supported, where individual needs and uniqueness are recognised, and where abilities and achievements are acknowledged and respected.
2. An environment that promotes intellectual freedom and encourages experimentation and creativity.
3. An environment where adult learners are treated as peers. Adult learners are accepted and respected as intelligent experienced adults whose opinions are listened to, honoured and appreciated.
4. An environment where self-directed learning is encouraged. This results in people taking responsibility for their own learning. Individual learning programmes which address what each person needs and wants to learn in order to function optimally in their profession must be provided for.
5. An environment that is conducive to active involvement in learning, as opposed to passively listening to lectures, must be encouraged.
6. The programme needs to provide mechanisms for regular feedback (Billington 1996:58).

In a mentoring relationship where mentees feel unsafe and threatened, where they are viewed as underlings and where achievements are not recognised, mentees tend to

regress developmentally, especially in terms of their self-esteem and self-confidence (Hayashi & O'Donnell, 2010). In the present study, mathematical literacy teachers are therefore to be viewed as adults in the mentoring process. We agree with the conditions described above as being necessary for any effective adult learning programme and consider them as relevant to this study.

## **2.17. Summary of chapter**

In this chapter the theoretical framework for the study has been identified. The study is grounded in situated learning theory by Lave and Wenger. It is a general theory of knowledge acquisition that recognises the critical importance of the social setting to knowledge construction. The chapter continues with a historical background of the term “mentoring”. The literature traced the history of mentoring and examined to what extent this concept has changed over time. Various definitions of mentoring have been given and there appears to be no single and comprehensive definition for mentoring. The roles and responsibilities of mentor and mentee which will ensure that the objectives of the mentoring relationship are realised are discussed. Some of the challenges in mentoring relationship have been identified in the chapter.

The five-factor mentoring model proposed by Hudson has been identified as personal attributes; systems requirements; pedagogical knowledge; modelling and feedback. Each of these factors has been discussed. The close association between mentoring and continuous professional development has also been discussed in the chapter. This is followed by a discussion on the importance of mentoring to the education system. Conditions for effective mentoring have also been discussed. Mentor selection and pairing are very important. Support for mentors could increase their commitment to their mentees. The chapter has also discussed learning as an aspect of mentoring. In this study the focus is on mentoring of mathematical literacy teachers. Since these teachers are adults it then becomes necessary to discuss adult learning. Some important principles of adult learning have been identified in the chapter.

The next chapter will discuss the mentoring processes.



## CHAPTER 3

### MENTORING PROCESSES

#### 3.1. Introduction

The previous chapter discussed mentoring and professional development. In this chapter the various processes of mentoring will be discussed. Elements which will be covered in this chapter include the concepts of mentoring, formal and informal functions of mentoring and the characteristics of effective mentors.

#### 3.2. Formal and informal mentoring

In most organisations, including educational institutions, professionals are willing to offer assistance to their colleagues when they realise that there is an obvious need for help. There are situations where managers will ask a more experienced employee to serve as a 'mentor' to a less experienced colleague. In these situations, experienced employees are typically left to decide for themselves on the best way to provide the necessary assistance. In most instances the mentor's experience and common sense may be sufficient to address the needs of the mentee. Sweeny (2001) describes such assistance as informal mentoring. Teachers in most schools have always worked together, helping one another through the exchange of ideas on problems related to teaching and learning. This system of informal exchange will always be part of the professional culture. In advocating informal mentoring, Sweeny (2001) states that part of our job as professionals, is to help each other.

The Treasury Board of Canada (TBC 2001) describes formal mentoring as a relationship facilitated and supported by the organisation so that more participants may benefit. Even though the degree of the structured intervention may vary from one organisation to the other, the organisation provides the necessary tools for participants to facilitate the creation and the maintenance of the relationship.

However, according to the Missouri Department of Elementary and Secondary Education (MDESE) (2005:4-8), since professional development is crucial in retaining good teachers, the importance of a formal process of professional development must be recognised to ensure that learners have quality teachers in every classroom. In a formal mentoring relationship, mentors have an on-going commitment to help their mentees reach their goals in a planned manner and over a predetermined period of time. However, research by Ragins (1999:531) indicates that there are some doubts as to the effectiveness of formal mentoring. According to Ragins, formal mentoring yields fewer positive outcomes for mentees than informal mentoring. He further indicates that formal mentoring does not appear to yield significantly more positive outcomes than no mentoring at all. Where fewer positive outcomes are obtained may be due, at least in part, to the fact that most formal mentoring relationships never really get going to any significant degree. This is confirmed by Arnold and Johnson (1997:61-70) in their research into formal and informal mentoring in the UK, which indicates that informal mentoring can help mentees realise most of their needs. Furthermore, Blackwell and McLean (1996:80-85), in discussing various issues related to mentoring, argue for informal peer-mentoring rather than hierarchical mentoring arrangements.

Mentoring relationships may therefore be viewed as a continuum, ranging from informal or spontaneous mentoring to highly structured and planned mentoring. According to Sweeny (2008), the degree of formality in mentoring should not be based on personal opinion alone, but also on the objectives that the mentor programme aims to achieve. Sweeny states further that some mentoring objectives will require a very formal set of mentoring rules, whereas, in other cases, these objectives may be achieved without formalised structures.

Although informal mentoring practices can be effective in professional development, the author tends to agree that the importance of formalised processes in professional development need to be recognised. The current study examines the support given to mathematical literacy teachers through mentoring. Spencer (1996) asserts that an important aspect of a structured mentoring programme is the evaluation and measurement of outcomes. According to Sweeny (2008), if the purpose of mentoring

is to provide teachers with the support they need until they have gained the necessary confidence to become proficient in their teaching practices, or to be able to provide in-depth assistance in curriculum, then a more formal approach in mentoring will be necessary. Sweeny further states that there is substantial evidence proving that the needs of novice teachers' are not being met through "traditional" informal mentoring. Based on Sweeny's assertion, the author agrees that formal mentoring for mathematical literacy teachers could be the most appropriate approach. Mentors would be able to evaluate the proficiency of mathematical literacy teachers through classroom observations.

In fact, Adele (1998:1-2) affirms that formal mentoring will be more productive if the organisation has specific objectives in mind in terms of their mentoring programmes. However, Adele cautions that, if these expectations are not clearly explained to both the mentor and the mentee, it might give rise to the feeling by the end of the mentoring cycle that the process was a waste of time. This study therefore subscribes fully to the idea that newly trained mathematical literacy teachers should be provided with the necessary support, through the process of mentoring, in order for them to gain confidence in teaching the subject.

### **3.3. The concept of mentoring**

Most authors define the process of mentoring from a historical perspective (see section 2.1). Such definitions usually describe the mentor as someone older than the mentee. For example, Shea (2002) describes mentoring as a process whereby the young are shepherded by older adults. Kochran and Pascarelli (2003) also view mentoring as a way of enabling the youth to acquire the required skills and attitudes to participate fully in society and more specifically, in the work place. These descriptions seem to suggest that mentors are always older than their mentees.

Typically, mentoring is seen as a one-to-one relationship between a more experienced and a less experienced employee. However, this is not always the case since over time the concept of collaborative mentoring has emerged in academic circles. According to Goodyear (2006), earlier researchers have found that most career

professionals have a developmental network of individuals who provide mentoring functions. Goodyear continues to explain that these networks consist, not only senior staffs in the profession, but also of peers and even of junior professionals who often help veterans learn a new skill.

Successful mentoring relationships require that both the mentor and the mentee possess certain sets of skills, qualities and attributes. For example, good mentees are characterised by their commitment to learning and their independent efforts to develop their own solutions. In discussing the roles and responsibilities of mentees, Healy and Welchert (1990:19) mention that mentees must take the initiative for achieving their own goals, This statement is in line with the modern concept of mentoring which places the responsibility for mentoring squarely on the mentee (Goodyear, 2006). This allows mentees to develop their own developmental networks in relation to their particular needs. They then have to reach out to individuals around them to seek assistance in the functional areas where they need help. Thus there is a need for collaboration between the mentees and their more experienced colleagues.

Mullen (2000:4-11) affirms that collaboration provides an opportunity to strengthen personal and professional skills. Spencer (1996) also believes that mentoring is a relationship that gives people the opportunity to share their professional and personal skills and experiences, and to grow and develop in the process. However, in most mentoring relationships, the professional development of the mentee usually takes centre stage, thus focusing more on content knowledge, especially in academic mentoring. This is affirmed by Mathias (2005:98) who states that many of the mentoring programmes make use of a subject-based mentor, primarily in the role of a critical friend. In most schools, the Head of the Department (HOD), who acts as supervisor, also serves as mentor to most of the mathematical literacy teachers. This situation may create a potential conflict in the role of the mentor as a guide and assessor. For example, Biggs (2003) argued that the role of the critical friend in the context of a supporting and reflective practice, should be someone who is not involved in making judgements about the individual's performance, thus allowing the process of mentoring to focus on its formative role.

The concept of mentoring is not new to the teaching profession. This statement is confirmed by Huling and Resta (2001:4) who assert that teacher mentoring programmes have increased dramatically since the 1980s as a vehicle to support and retain novice teachers. Wojnowski et al (2003) also affirm that mentoring is currently making a significant entry in many other areas of education. However, the author believes that there are numerous areas where this concept is not being put into practice effectively (particularly in the rural schools). Hence the aim of the current study is to examine the extent to which mentoring is being used at present to develop mathematical literacy teachers, particularly in Greater Taung, which is one of the rural areas in the North West Province of South Africa.

The concept of mentoring is viewed differently by different authors. Three different views of the concept of mentoring were identified from the literature, namely apprentice; moral supporter; and collaborative partner.

### **3.3.1. Apprentice**

The most commonly held view of mentoring is that of a master and an apprentice. In this view the mentor acts as a guide or leader who knows best and attempts to share practical knowledge with the mentee. In this approach the mentor often demonstrates certain concepts to the mentee, or gives specific advice about what to do in a particular situation, and the mentee tries to imitate the mentor or implement the advice given (Franke & Dahlgren 1996:627-641). The mentee usually approaches the mentor with a particular problem (Norman & Feiman-Nemser 2005:682). In a study by Harrison, Dymoke and Pell (2006:1055-1067), it was found that new teachers believed that the best mentoring practice was based on conversations that were subject-specific in nature.

### **3.3.2. Moral supporter**

Another common conception held by many people is that of the mentor as a moral supporter. In this role, the mentor acts as an advocate who provides counsel, support and encouragement (Zanting et al; 1998). In this type of relationship a tight bond may

form between the mentor and the mentee, and this may lead to a close personal relationship (Bullough, 2005). The emphasis in this understanding of mentoring is on the personal needs of the mentee and on building a trusting friendship, rather than focusing on the mentee's teaching practices (Elliot & Calderhead 1993). Conversation in this relationship can be therapeutic in nature with a great deal of time spent focusing on the mentee's experiences (Orland-Barak & Klein, 2005:387).

### **3.3.3. Collaborative partnership**

The third view is that of a relationship which is conceived by both the mentor and mentee as a collaborative partnership. This view is more egalitarian in nature, with mentors and mentees considering themselves as partners rather than the mentor holding a more authoritative position (Feiman-Nemser 2001:21). In this relationship both members are regarded as sources of knowledge that can contribute to the learning that occurs within the context of the relationship. Each partner proposes ideas that are discussed, with both parties making important contributions and sharing the workload (Abell, Dillon, Hopkins, McInerney & O'Brien 1995:175). Feiman-Nemser (2001:17-30) believes that this conception is closely aligned with the notion of educative mentoring in which mentors and new teachers help to address day-to-day problems, but that it also focuses on the broader notion of continued professional growth and meeting student learning needs.

While the above sections (3.3.1, 3.3.2 and 3.3.3) have highlighted the various conceptions about mentoring relationships, there are criticisms as to whether or not some of these perceived relationships really do help the mentees. One major concern, according to Evertson and Smithey (2000:301) and Sundli (2007:211), is that, by providing support that focuses only on "teaching tips" and survival techniques, novices will be encouraged to replicate existing models of teaching rather than to implement more reformed-based philosophies. In a more recent study, Sundli (2007:201-214) reports that mentees even mimicked the exact body language and vocabulary of their mentor teachers. Carter and Francis (2000:4) remark that if mentees are encouraged to accept advice without actively reflecting on their own teaching, it will only lead to continued implementation of current routines and the stifling of professional growth.

### **3.4. Functions of mentoring**

From the literature on mentoring it becomes clear that most authors describe a mentor as a teacher, adviser, a friend, a counsellor, guide and a role model (Collinson, Vivienne & Kozina 2009:3-19; National Education Association 1999). Spencer (1996) adds that mentoring is also an act of leadership and that leaders need to identify, develop and nurture future leaders. According to Murray (1991), mentoring should develop the less-experienced person in a specific capacity, but other authors like Donaldson and Ensher et al (2000:236), believe that mentoring should further the mentees' academic and professional development. It should help the mentee to grow in all aspects of life. Sweeny (2002:2-4) affirms this by defining mentoring as a process of assisting youths to acquire knowledge, skills and attitudes that will help them to participate fully in society and work, and most importantly, in the workplace.

Kram (1985) categorised the functions that emerged from the mentoring relationship into a career function, a psychosocial function and an educative function, whereas Goodyear (2006) mentions career assistance, psychological support and role modelling. Within the concept of mentoring, three variables can be identified; they are the mentor, the mentee and the process of mentoring. Thus in a mentoring process the mentor assists, guides and provides support to the mentee in both professional and personal development.

Self-development is rarely successful without the support of other people. Therefore, in all spheres of life (including the working environment), people need someone whom they can rely on for support and encouragement. Kelly, Beck and Thomas (1992) believe that mentoring offers that support by providing individuals with someone who can give feedback, question, discuss, challenge, comfort and guide them through the learning cycle. Such a person is always described as a mentor.

Murray (1991) describes mentors as experienced colleagues, but Sweeney (2001:3) goes further to describe effective mentors as those willing to serve and who are approachable. In addition to being willing to serve, Yalow (2003) also describes

effective mentors as those who have the ability to communicate their experiences. In this sense, willingness may mean that one is prepared to help without necessarily considering the sacrifices attached to it. According to Goodyear (2006), such mentors experience satisfaction, pride and a feeling of rejuvenation accompanied by positive thoughts as they observe the benefits their experiences bring to another person.

Effective communication is often regarded as fundamental to developing a successful mentoring relationship, because mentors usually engage with their mentees through conversation. A conversation with one's mentor then, should be uplifting because it helps bring clarity and a sense of new possibilities to the mentee. Hence it is important that the mentor's communication skills be improved. This is affirmed by Stanulis (1995:341) when he mentions that there is a need for open communication between the mentor and the mentee.

One way of improving the communication skills of mentors is through training. The concept of mentor training is supported by various authors, even though their reasons for such training may differ. For instance, Griebelhaus and Bowman (2000:247) think that mentors need training so that they can stimulate and help their mentees to reflect on their actions. Hudson (2007:201-217) also believes that the training of mentors will ensure that their understanding and skills are aligned with current mentoring practices and mentoring models.

Most literature on mentoring seems to suggest that it is only the mentee who benefits from the mentoring relationship (Torres-Guzman & Godwin, 1995; Murray, 1991). However, according to Huling and Resta (2001), the idea that mentors also derive some benefit from the mentoring process is not completely new. Gordon and Maxey (2000) affirm that several studies have documented the positive effects of mentoring on the mentors themselves (see section 2.9). For instance, as mentor teachers assist their mentees in improving their teaching abilities, they also improve their own professional competence (Huling & Resta 2001), as well as the quality of their teaching (Yosha 1991).



Mentoring has forced mentors to be reflective about their own beliefs about teaching, about their students, about the learning processes, and about teaching as a career. Huling and Resta (2001) and Ganser (1996:36-39) add that it provides them with the opportunity to validate the experience they have gained over the years.

It is therefore important for school principals to understand that creating a structure that allows experienced teachers to work with novice teachers, will ultimately benefit the learners of both novices and mentors; and the overall organisation will be stronger as a result of the increased capacity and the quality of teachers. Having quality teachers available to teach mathematical literacy in schools will minimise learners' problems in the subject. It is with this in view that the author decided to pursue this study on mentoring as a means of professional development for mathematical literacy teachers with reference to Greater Taung area.

### **3.5. Characteristics of effective mentors**

Mentors fulfil successful roles in a wide range of professional learning environments, whether these are in University programmes or within a school environment. The characteristics of an effective mentor may incorporate personal attitude and character, communication abilities and interpersonal skills, as well as professional competence and experience.

The literature on mentoring identifies certain predominant characteristics of effective mentors. According to Mathias (2005:101) one should always expect a measure of variation in the levels of commitment, capability, confidence and support that mentors provide in the mentoring programme. The characteristics that have been described here are by no means exhaustive. Different authors have proposed different characteristics depending on what they expect to see in a mentoring relationship. As Sweeny (2002:1-4) puts it, the effectiveness of a mentoring programme is a function of the objectives of the programme. A particular mentoring programme may target mentoring purely as a means to orientate new employees, while another may provide mentoring to support the professional development of all employees. In this study the purpose of the mentoring process is to support and develop the mathematical

knowledge and skills of mathematical literacy teachers. Hence this section discusses the characteristics of effective mentors with the objective of stimulating professional growth and improved performance.

To be a good developmental mentor, certain prerequisites must be met. Starcevich (2005) points out that mentors should possess the following two key competencies: well-developed communication skills, and self-awareness and a genuine belief in the mentee's potential. Starcevich adds that for many mentoring relationships it is also important that the mentor possesses a substantial base of knowledge and experience in the area he or she is mentoring in. This is the rationale behind my recommendation in this study that mathematical literacy teachers be mentored by experienced mathematics teachers.

In addition to Starcevich's prerequisites, Sweeny (2001:3-5) identifies the following characteristics of an effective mentor:

- a willingness to serve as a mentor and to be approachable,
- being foresighted, anticipating problems and preparing solutions in advance,
- being an excellent role model as a professional educator,
- being sensitive to the evolving developmental needs, feelings, and skills of others,
- be candid, but also positive, patient, encouraging, and helpful,
- be committed to the success of their protégé,
- be knowledgeable about the organisation and its culture, mission and values,
- be an effective listener and communicator,
- be a continual learner, open to the views and feedback of others,
- be nurturing, caring and accepting.

The above characteristics imply that, for a mentoring process to be effective, the mentor must have the appropriate content knowledge and be committed to the success of the mentee. In addition to being knowledgeable, an effective mentor also needs to be approachable and have good listening and communication skills. Above all,

mentors should be able to uphold confidentiality and maintain respect for their mentees.

The process of mentoring is not always clearly understood in education. Researchers are becoming increasingly aware of its complexity. Lee and Feng (2007:355) write that the “heart and soul” of mentoring grows out of belief in the value and worth of people and an attitude towards education that focuses upon passing on the torch to the next generation of teachers. The mentoring process extends far beyond supporting the induction of new teachers into the school system through professional guidance and encouragement. Shea (2002) believes that the heart of mentorship comes from a commitment to education, a belief in its future, and a respect for those who enter into the educational community.

### **3.6. Summary of chapter**

This chapter discussed both formal and informal mentoring processes, and observed that the mentoring relationship is viewed by various authors as ranging from informal to a highly structured and well-planned mentoring process. Three different views of the mentoring relationship were discussed; this included apprenticeship, being a moral supporter and having a collaborative partnership. The views on the various functions of mentoring, as proposed by different authors were also discussed. The chapter concludes with a discussion on characteristics of effective mentors. Among other things mentors should be people who are willingness to serve as a mentor and is approachable.

The next chapter will review the current literature on mentoring.

## **CHAPTER 4**

### **MENTORING: THE GLOBAL PERSPECTIVE**

#### **4.1. Introduction**

This chapter reviews previous studies on mentoring as seen from the global perspective. All over the world, mentoring is used as part of the professional development of teachers. There could be many reasons for establishing mentorships at the school level. One reason may be to retain qualified beginning teachers and to assist them to become effective practitioners as soon as possible (Andrews & Quinn 2005:110-116). Feiman-Nemser offers an additional reason in saying: “providing support to beginning teachers is a humane response to the trials and tribulations associated with the first year of teaching” (Feiman-Nemser 1999:12). Hudson and Gencer (2009) describe early-career teachers as including pre-service teachers and beginning teachers in their first year of practice.

#### **4.2. Previous studies on mentoring**

##### **4.2.1. Hobson, Ashby, Malderez and Tomlinson (2009)**

In an attempt to evaluate the effectiveness of mentoring for early-career teachers, Hobson et al (2009) conducted research on an international scale. This research evaluated the effectiveness of mentoring from the perspectives of mentors, mentees and key professionals within schools. Appropriate questionnaires were administered to collect data for the research. The findings showed that early-career teachers generally appeared to receive sufficient help from their mentors in order to improve their instructional skills and teaching strategies. Furthermore, from the perspective of the early-career teachers, effective mentoring contributed to reduced feelings of isolation, enhanced confidence and self-esteem, and improved professional development, self-reflection and problem-solving capacity. According to Hobson, Ashby, Malderez and Tomlinson (2009:410), over the past two decades, mentoring has emerged as an effective process for developing early-career teachers’ practices.

The current study will investigate how mentoring can be used to develop mathematical literacy teachers who initially were non-mathematics teachers.

#### **4.2.2. Hudson, Usak and Gencer (2010)**

This study focused on 304 final-year pre-service teachers. This was a qualitative study that employed an empirically-based survey instrument to measure mentees' perceptions of their mentoring. The survey was linked to a five-factor mentoring model (i.e. personal attributes, system requirements, pedagogical knowledge, modelling and feedback). The mentees observed their mentors' (teachers) professional behaviour for a period of twenty eight days. During this period they observed their mentors' professional behaviour in class, their relationship with their students, their classroom management techniques and their behaviour management. They also observed their teaching methods, strategies and assessment practices.

The findings of the study were reported on each of the five factors mentioned above. The study found that between 71% and 87% of mentees perceived that their mentors exhibited the desired *personal attributes* for mentoring. In terms of *system requirements*, the majority of mentees claimed that their mentors did, in fact, discuss the aims and policies for teaching science. The study also found that the majority of mentees agreed that mentors displayed sound *pedagogical knowledge*. However, a quarter or more of these pre-service teachers indicated that the necessary pedagogical knowledge around planning, timetabling or scheduling lessons, implementation of the lessons and questioning skills for teaching science, was lacking in their mentor's teaching approach. The study also reported that a significant percentage of mentees perceived that they did not observe their mentors engaging in *model teaching* or *classroom management*. On the issue of *feedback*, it was reported that more than 70% of the mentees claimed that their mentors did provide evaluations about their teaching and that they also provided feedback. By comparison, the present study will examine the value of the mentoring functions of teaching, guiding, encouraging and counselling.

#### **4.2.3. Hudson (2007)**

In Australia a study was undertaken by Hudson (2007) to explore and describe final-year pre-service teachers' perceptions of the mentoring received in primary science and primary mathematics education. A total of 446 pre-service teachers from Australian Universities were involved in the study (i.e. 331 for teaching science and 115 for teaching mathematics). The mentees' perceptions of their mentoring were based on the five-factor mentoring model referred to previously (i.e. *personal attributes, systems requirements, pedagogical knowledge, modelling and feedback*). Questionnaires were used to collect data. The data-collection instrument was in a form of a five-point Likert scale (strongly disagree = 1, disagree = 2, uncertain = 3, agree = 4, strongly agree = 5). The five factors were analysed through confirmatory factor analysis on mentoring practices for developing pre-service teachers in science and mathematics teaching.

An analysis of this study's findings showed that, in terms of the mentees' responses relative to their mentors' *personal attributes*, the majority of mentors (64%) were regarded as being supportive of their mentees' with regard to primary science teaching. Mentees' assessment of the mentoring received in mathematics teaching was considerably higher than that for science in terms of personal attributes. The study also found that the assessments for both primary science mentoring practices and primary mathematics mentoring practices associated with *system requirements* were below 50%. Mentees perceived that they received minimal mentoring exposure in terms of planning for their mathematics and science teaching experiences. The study further found that a little more than a third of the mentors (37%) provided necessary *pedagogical knowledge* for effective primary science teaching.

#### **4.2.4. Foote and Solem (2009)**

Foote and Solem (2009) from the University of Colorado, in Boulder, conducted a study to explore both the structural factors that promote effective mentoring, as well as the topics that new academics wished to have addressed in their mentoring

relationships. For this study 46 students were selected from a total of 158 graduate geography students. The participants were asked to describe the mentoring they had received during the programmes. The interviews were audio-taped and later transcribed, verified and prepared for analysis.

The results emphasise the importance of two different aspects of the mentoring process: (1) the structure of the mentoring relationship, and (2) the contents of the mentoring engagements. In terms of the structure of the mentoring relationship, the findings emphasised the value of employing regular proactive meetings, engaging diverse groups of individuals within and outside of a department, and establishing broad support, leadership and resources for mentoring at the department and at institutional levels. It is against this background that the current study is being pursued.

#### **4.2.5. Wolf (2003)**

Wolf (2003) presents a case study of a student-teacher learning project aimed at improving learners' comprehension of mathematics with the help of mentors. The study was conducted using an elementary student-teacher as subject, and was aimed at assessing how mentoring contributed to her learning experience. Three different mentors with unique sets of knowledge and skills contributed to the student-teacher's learning experience. The study offers a detailed description of the substance of a novice teacher's learning experiences and the opportunities that had an effect on her thinking processes and classroom practices. The student-teacher's learning revolved around mathematics content, pupils' thinking processes and lesson construction based on her pupils' mathematical concepts.

The findings from the case study revealed that novices need many and varied opportunities to learn. These opportunities included observation of skilful practices, participation (with support) in teaching-related activities such as planning for instruction and the instruction itself, as well as instructional conversations with individuals or small groups of pupils in the classroom. It also emerged from the case study that novices need discussions with more experienced practitioners in order to

make sense of the learning opportunities available to them. Mentors should assist novices to learn from what they experience. This involves helping novices to “see” and “hear” what there is to be seen and heard, as well as to assist them with teaching activities. In the current study, mentees are experienced teachers who have been redeployed as mathematical literacy teachers.

#### **4.2.6. Bradbury and Koballa (2008)**

Bradbury and Koballa (2008) undertook a study to explore the tensions that developed between two pairs of mentor-interns in high schools in America. The study investigates the relationships of the two pairs of mentor-interns over the course of a year to develop in-depth case studies based on their experiences. The two mentors, who taught at different schools in close proximity to each other, were chosen because they had previous successful experience working with novice teachers and were accredited as certified mentors.

Data collection included interviews, field notes and archival data in the form of lesson plans and mentor observation notes. The findings of the study revealed three obstacles arising from the mentors’ and interns’ words and actions. These are: differences in conceptions of mentoring, communications and relationship development, and beliefs about teaching.

Bradbury and Koballa describe the tensions between the mentor and the mentee as borders that need to be crossed in order to develop a working relationship. Though the tensions varied in how they were manifested in each relationship, the themes of the borders were consistent between the pairs. The present study intends examine the challenges faced by mentors and mentees in the school system.

#### **4.2.7. Hayashi and O’Donnell (2010)**

Hayashi and O’Donnell (2010) presented a report termed “A review of mentoring studies and websites” to the Melissa Institute for the Prevention and Treatment of Violence. The report was a review of the various studies and websites on mentoring,



and was aimed at assessing the effectiveness of mentoring on youth, the variables that can contribute to successful programmes, and the issues that need to be addressed. In preparing the report, published studies and well over 300 websites were reviewed. The websites were categorised into four sections, namely national mentoring organisations and programmes, mentoring programmes, mentoring for youth in the justice system and training manual websites for mentoring. The findings of the studies, as indicated in the report, showed that overall, there is evidence that mentoring can be effective. The report added that, crucial to the effectiveness of mentoring, is a strong relationship between mentors and youth. Furthermore, the report identified some important issues that may need to be addressed in mentoring. These issues are: (1) the importance of demographic characteristics, such as ethnicity, race, gender, marital status, income and age, in matching youths with suitable mentors, and (2) the role of focusing on specific behaviours for improvement. Accordingly, my study aims to examine how mentoring can be used to develop newly-trained mathematical literacy teachers.

#### **4.2.8. Moss (2010)**

In a research article on induction and mentoring, Moss (2010) focused on the induction and mentoring of early career teachers. The research was the outcome of a school-University partnership with local schools that commenced in 2002. The study was set in an Australian primary school and was a small scale, school-based research design that utilised “the discipline of noticing” as the primary research approach. The data collection included open-ended survey questions distributed to the staff of the school, and field notes of discussions that were recorded when school visits were undertaken. It was found from the study that moral commitment to critical professional activism and a partnership priority can untangle factors that characterise how the profession constructs induction and mentoring.

#### **4.2.9. Stanulis and Floden (2009)**

Stanulis and Floden (2009:112-122) conducted a study on intensive mentoring as a way of helping beginning teachers to develop balanced instruction methods. The

study examined the impact of intensive mentoring as a vital component of an induction programme aimed at improving teacher quality in ways that link teaching to student engagement. In the study, 24 beginning teachers were randomly divided into two groups of 12, an experimental group and a comparison group. The experimental group received intensive mentoring in addition to the regular district induction, while the comparison group only received the regular district induction programme. Assigned mentors observed each teacher in the experimental group between 29 and 31 times during the school year. During these sessions the mentors co-planned, observed and provided feedback, taught demonstration lessons and observed other teachers together.

All the participants from both groups had graduated from a traditional teacher preparation programme. The findings of the study showed that the experimental group which was exposed to intensive mentoring, scored higher on AIMS (Atmosphere, Instruction/Content, Management and Student Engagement). AIMS is the instrument used to evaluate teachers after an induction programme.

By comparison, this study will examine the use of mentoring to 're-tool' and 're-skill' qualified teachers to teach a completely different subject.

#### **4.2.10. Luneta (2006)**

In South Africa a study was conducted by Luneta (2006) to investigate mentoring and its relevance to continuous professional development for teachers of mathematics. Four teachers were involved in the study. These teachers went through a mentorship training programme aimed at improving their abilities to supervise and guide the teaching practices of student teachers of mathematics. The training was both theoretical and practical. The teachers were exposed to the various aspects of mentorship in class, and then experimented with these concepts during teaching practice with student teachers. After the training in mentorship, they supervised, supported and guided student teachers of mathematics. They were then interviewed about their experiences during the programme.

The mentor teachers reported that supervising student teachers was a useful source of professional development for them as mentors as well. In supervising the student teachers they, in most cases, reviewed their own teaching skills and practices. They also reported that their interaction with their mentees in the classroom, gave them the opportunity to rediscover or renew their own pedagogical skills. The mentor-teachers further mentioned that supervising the student teachers motivated them to take time to reflect on and evaluate their own instructional approaches and perspectives. They also developed a feeling of satisfaction from the sense that they were contributing to the training of beginning teachers. The study appeared to focus mainly on the professional development of teachers who were trained as mentors to supervise and support student teachers of mathematics. In the current study, however, the focus is on the professional development of newly trained mathematical literacy teachers.

#### **4.2.11. Other studies**

There have been other studies, for example, in Turkey to evaluate the effectiveness of mentoring. A study conducted by Ekiz (2006) focused on student teachers and their mentors. In this study it was found that most of the emerging issues in mentoring programmes are the result of either a lack of mentor-mentee communication, or of a lack of mentor support. The current study intends to examine how mentoring can be used as a form of professional development for mathematical literacy teachers.

In another study by Okan and Yildirim (2004:603-616), pre-service teachers and their mentors were interviewed to evaluate their experiences on mentoring. In this study it was concluded that there was very little evidence of the effectiveness of the mentoring programme. In a qualitative research study by Isikoglu, Ivrendi and Sahin (2007) involving pre-service teachers, it was found that pre-service teachers had difficulties establishing their presence in the classroom and entering into professional relationships with their mentor teachers. In terms of my study, mentees will have had some teaching experience, but what is lacking is an adequate level of content knowledge since the majority of them have not had sufficient instruction in mathematics at school (see section 1.1).

Chamberlain (2001) also did a study on the mentoring of graduate students at the School of Information and Library Science (SILS) at the University of North Carolina. The aim of the study was to determine the degree of mentoring experienced by the students prior to earning their professional degrees. The study describes the results of a survey administered to graduate students at the School. The survey instrument focused on students who had completed a year and a half of course work at SILS, and inquired about their experiences with mentors in other supportive relationships, if any, during the period of their enrolment.

It emerged from the study that most of the students surveyed believed that they did receive mentoring while enrolled, with the majority having had more than one mentor. It was also found that relationships tended to develop naturally over time rather than being assigned or sought out by either partner. It was further reported in the study that nearly all the students regarded the mentoring experience as beneficial and most wanted to mentor others in the future. This provides the essential background to the current study. However, the focus of my study is on previously qualified teachers who are interested in teaching mathematical literacy.

With the exception of one, all of the above studies were done outside of Africa. The current study, however, was undertaken in one of the rural areas in South Africa. The study is therefore situated in a rural context.

#### **4.3. Reflection on other mentoring studies carried out**

Most of the studies appeared to focus either on evaluating the effectiveness of mentoring (Hodson et al 2009; Ekiz 2006), or on measuring mentors' and mentees' perceptions of mentoring (Hudson, Usak and Gencer, 2010; Clinard&Ariav, 1998). There is also a report on a study to investigate mentoring and its relevance to continuous professional development of mathematics teachers. Stanulis and Floden (2009:112-122) provide an instrument, referred to as AIMS, that could be used to evaluate teacher quality as it links teaching to student engagement. It is evident from these studies that little or no research has been done to examine the use of mentoring to develop mathematical literacy teachers. One reason might be that mathematical

literacy is a new learning area in South African schools. Teachers, who “volunteered” to teach mathematical literacy, had not received sufficient instruction in mathematics at school themselves. The current study therefore, focuses on using mentoring as a form of on-going professional development for mathematical literacy teachers.

#### **4.4. Reflection on the chapter**

The chapter discussed various studies on mentoring with a view to establishing how extensively the subject has been researched, and to examine the findings from these studies. The following themes on the benefits derived from the mentoring process, emerged from these:

- improved instructional skills and teaching strategies
- enhanced confidence and self esteem
- improved content knowledge and classroom management skills
- more effective mentor-mentee communication
- positive changes in mentees’ perceptions of their mentoring

In the literature review, not much was said on the challenges of mentoring when used as a form of professional development. Similarly, in the current study the focus will be on how mentoring could be used to help mathematical literacy teachers in Greater Taung become more effective in the teaching of the subject (mathematical literacy).

From the literature it further appears that there is a need to pursue studies on mentoring involving practicing teachers who have been retrained to teach a newly introduced subject (i.e. mathematical literacy) in schools. The research questions (see section 1.5) for the current study were thus influenced by the relevant literature. The choice of research methodology and the data collection processes were also influenced by the relevant literature. For example, the questionnaire (see Appendix A) was developed based primarily on the five-factor mentoring model.

Having reviewed some literature on mentoring in this chapter, the next chapter will discuss the methodology underlying the present study.

## CHAPTER 5

### RESEARCH METHODOLOGY

#### 5.1. Introduction

In the previous chapter some of the studies done globally were presented. This chapter describes the methodology used for the present study under the following subheadings: research design, geographical area of the study, population, sampling techniques and process of instrumentation, data collection and analysis procedures and ethical issues pertaining to the study.

#### 5.2. Research Design

The study seeks to examine how mentoring can be used to support mathematical literacy teachers. The theoretical framework is located within a situated learning theory. The research is therefore designed so that qualitative data could be collected and analysed to determine how mentoring could be used to support mathematical literacy teachers.

Qualitative research is defined as a formal, objective and systematic process of obtaining information about a particular phenomenon (Stubbs 2005). This research employs a qualitative research approach that follows a symbolic interaction. The choice of a symbolic interaction design coheres with the various philosophical and epistemological assumptions inherent in mentoring and the chosen theoretical framework. The study seeks to examine how mentor-mentee interaction leads to the development of a mentee into a better teacher. The choice of the symbolic interaction design is further informed by the following statement taken from De Vos (2002:272):

*The qualitative research strategy differs inherently from a quantitative research design in that it does not usually provide the researcher with a step-by-step plan or a fixed recipe to follow. In quantitative research the design determines the researcher's*

*choice and actions, while in qualitative research the researcher's choices and actions will determine the strategy.*

The author considers this quotation relevant because mentors and mentee continually interact and it is this interaction that underpins a symbolic interaction design. Weaver and Olson (2006:463) further argue that qualitative researchers are more concerned about uncovering knowledge about how people feel and think in circumstances in which they find themselves, than making judgements about whether those thoughts and feelings are valid. In this study mathematical literacy teachers are given the opportunity to express their feelings about the support they receive from their experienced colleagues.

### **5.2.1 Research paradigm**

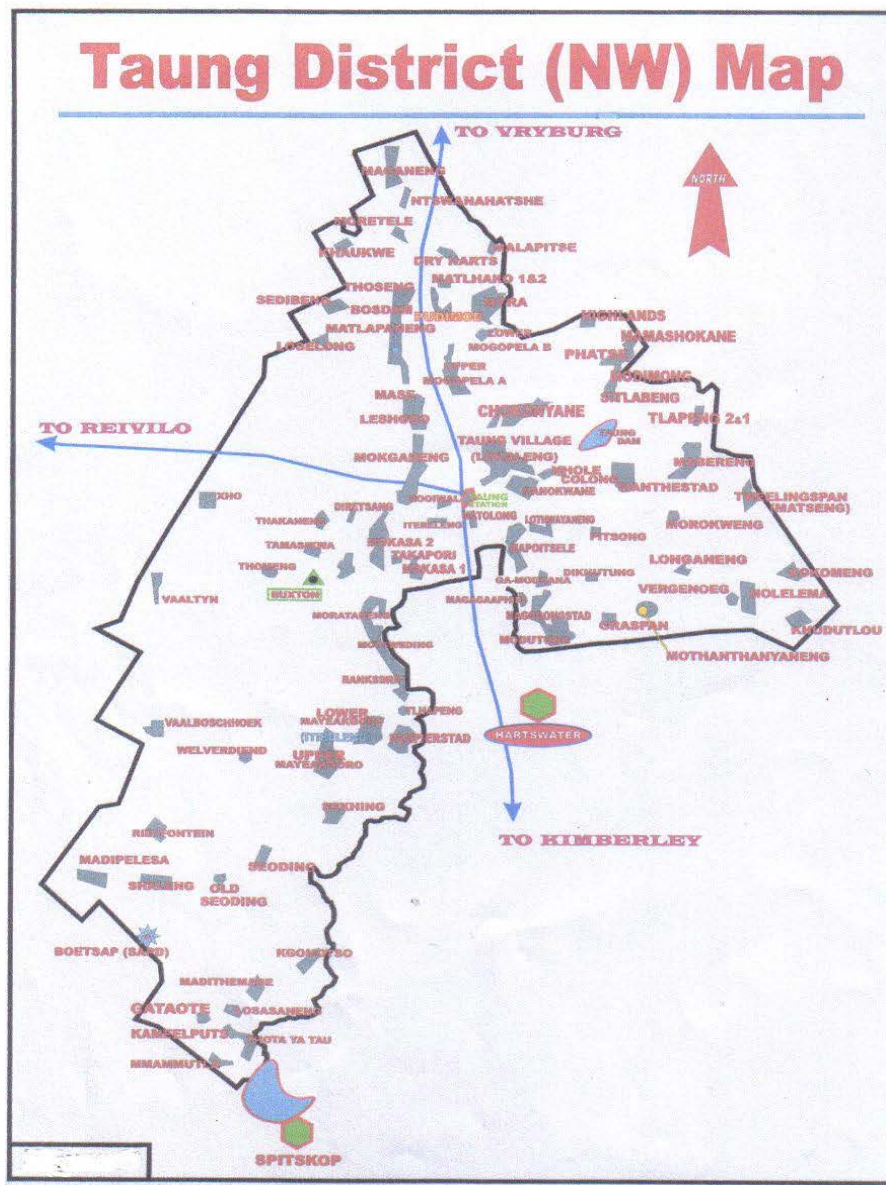
A paradigm is “a broad view or perspective of something” (Taylor, Kermode and Roberts, 2007:5). Additionally Weaver and Olson's (2006:460) definition of paradigm reveals how research could be effected and guided by a certain paradigm by stating, “paradigms are patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which the investigation is accomplished”.

The qualitative methodology shares its philosophical foundation with the interpretive paradigm which supports the view that there are many truths and multiple realities. The interpretive paradigm is associated more with methodological approaches that provide an opportunity for the voice, concerns and practices of research participants to be heard (Weaver and Olson 2006). In this study, the opportunity is given to the mathematical literacy teachers, who are the participants, to voice their feelings and concerns about the support they receive from their experienced colleagues. The study therefore adopted the interpretive approach whereby the involvement of the researcher in data collection is high. Furthermore in presenting the results it is the narrative of the participants that speak.

### 5.3 Geographical area of the study

This study was conducted in the Taung district. Taung is one of the rural communities in the North West Province of South Africa. It is located about 225 kilometres south-west of Mafikeng (the provincial capital of the North West) and lies between Vryburg and Kimberly. Since the area is largely rural, it does not attract many qualified mathematics teachers. The Taung District Map is provided in figure 1.

Figure 1: Taung District Map





#### **5.4. Population of the study**

The population of the study comprises teachers who are currently teaching mathematical literacy in their various schools in the Taung district and do not have a pass in grade 12 mathematics. However, they have all done mathematics up to standard 8 (currently grade 10) since mathematics is compulsory up to grade 10. Moreover, they are all practicing teachers who used to teach subjects such as Afrikaans, Setswana, Geography or Guidance and Counselling. They have taught these subjects on average between eight and twelve years. They all registered for, and successfully completed the ACE (Advanced Certificate in Education) in mathematical literacy, and attended short courses for two years (from 2006 to 2007). A combination of a South African three-year teacher training diploma and the ACE programme is considered as being the equivalent of a professional degree in the South African context.

#### **5.5. Sampling**

A purposive sampling technique was used to select the sample for this study. Purposive sampling is described as follows by Leedy et al: “Purposive sampling starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suit the purpose” (Leedy&Ormrod 2005:207). To obtain data for the study, purposive sampling was used because random sampling was not possible due to the nature of the study. Purposive sampling involved the researcher making a conscious decision about which individuals would best provide the desired information (De Vaus, 2002).

This type of non-probability sampling was chosen in order to provide the researcher with the most useful data for the study. Such a sampling technique was appropriate and advantageous for this study because the researcher required mathematical literacy teachers who were previously teaching subjects such as Setswana, Afrikaans, Geography, etc. Furthermore, the schools where these mathematical teachers are selected from also need to have at least one experienced mathematics teacher.

There are a total of twenty-five high schools in the Greater Taung area. Of these, ten schools were purposively selected. The rationale for selecting these schools was the number of mathematical literacy teachers in the school who previously taught subjects like Setswana, Afrikaans, and Geography. Since the author has lived and worked in the Greater Taung area for the past fifteen years as a mathematics teacher, he is quite familiar with these schools and the mathematical literacy teachers in the area. The schools that were selected therefore displayed the characteristics or typical attributes of the target population to the largest degree. These characteristics are (i) these schools have grades 10 to 12, (ii) they have some experienced mathematics teachers on their staff, (iii) the mathematical literacy teachers in these schools were previously teaching non-mathematical subjects such as Setswana, Afrikaans, Geography, etc. and (iv) these mathematical literacy teachers (based on the experience of the author) have a weak mathematics background. There were a total of sixteen mathematical literacy teachers in the sample. The relatively small sample size of sixteen was not a major concern given the nature of the study and what it sought to investigate.

## **5.6. Techniques for collecting data**

In this research, interviews and questionnaires were employed to collect the data required for the study. These methods of data collection cohered with Wenger's (1998) theoretical framework of social practice theory. The interviews gave me the opportunity to interact with the teachers and to get their views first-hand. It also gave the mathematical literacy teachers the opportunity to voice their feelings about the support they received from their colleagues.

### **5.6.1. Questionnaire**

The questionnaire was developed based on the five-factor mentoring model proposed by Hudson (2007:203), which is presented in section 2.5, and on Lave and Wenger's (1991) situated learning theory. The questionnaire was then sent to four experts in the field of research for their comments. This was done to ensure the validity of the data collection instrument. The following suggestions from three of them were given:

- some of the questions were not necessary
- a few of the questions needed to be expanded in scope
- the questionnaire should be designed to determine the kind of mentoring support provided, and the depth and quality of such support
- the questionnaire should give teachers the opportunity to provide additional mentoring functions

All of these suggestions were considered in the design of the final questionnaire (see Appendix A).

The questionnaire for this study comprised three sections. Section A related to the level and quality of support in the teaching of mathematical literacy. Questions in this section were based on the principles of Lave and Wenger's situated theory of learning. This section was aimed at determining how mathematical literacy teachers interact with their experienced colleagues. Additionally, the questionnaire was designed to establish whether such social interaction benefitted mentees as far as the teaching and learning of mathematical literacy was concerned. Section B related to the mentoring function and section C was based on the five-factor mentoring model. For these sections respondents were requested to indicate their responses on the following five-point Likert type scale:

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Uncertain
- 4 = Agree
- 5 = Strongly agree

The five-point Likert scale allows respondents to opt for indecision or neutrality. Participants were asked to evaluate a statement according to any kind of subjective or objective criteria and determine the level of agreement or disagreement. Upon receiving the completed questionnaires, each item will be analysed by first summing up the number of responses who agree or disagree to that statement. A table will be used to represent the responses. The questionnaires were sent to twenty mathematical

literacy teachers. Respondents were requested to express their opinion on given statements by indicating their level of agreement or disagreement. Four of the twenty respondents failed to complete their questionnaires, leaving sixteen respondents for the study.

### **5.6.2. Interviews**

Six of the teachers who completed the questionnaire were interviewed. Generally, the responses by the participants were largely similar. As a consequence the author ended up interviewing only six teachers. The questions were asked in English and the respondents also answered in English. The questions were sometimes repeated or rephrased to help respondents understand what was meant. The responses were captured in writing since some of the teachers objected to the idea of using a tape-recorder. The author had to respect their rights as it is one of the ethical issues to be taken into consideration when in conducting research. Therefore, in order to ensure that the responses were recorded correctly, the researcher had to read back to the respondents what had been recorded to confirm the accuracy of the statements, before moving on to the next question. This process made the interview sessions longer. Each interview session took more than two hours and only two teachers could be interviewed per day.

The questions asked during the interview were based on the principles of situated learning theory. This theory posits that learning requires social interaction and collaboration. Accordingly, the interview sought to find out how these mathematical literacy teachers have benefitted (professionally) from the social interaction with their experienced colleagues.

Some of the basic questions in the interview included the following:

- When you started teaching mathematical literacy, was there any person (family members excluded) who provided you with information or assistance to enhance your professional development?

- If not, why not?
- If yes, how did the relationship start?
- Could you please explain how you benefited from this relationship, both personally and professionally? (see Appendix B).

### **5.6.3. Reliability**

For research conclusions to be credible and acceptable, it is important that the data-collection instruments display both validity and reliability. In order to ensure reliability, first the author made sure the sample is representative. Even though the participants were purposively selected, they formed a better representation of the target population. Again during the interview, follow-up questions were asked in order to get more clarity from the responses. The author found that the responses from the participants were consistent. This consistency was found throughout the study. This therefore demonstrates a high level of reliability of the study.

### **5.6.4. Validity**

In general, instruments have validity when they measure what they are supposed to measure. To ensure the validity of the questionnaire, a draft was first sent to four experts in the field of research for their inputs. Three of them responded while one did not. Appropriate changes were made based on the suggestions of those experts who did respond. A pilot study was then conducted to pre-test the questionnaire.

In addition to using the questionnaire in the pilot and main studies to verify consistency, Cronbach's alpha coefficient was also calculated to determine the internal consistency (reliability) of the questionnaire. This was necessary since the items on the questionnaire consisted of Likert-scale type of questions. According to Gliem and Gliem (2003:2), when using a Likert-type scale, it is imperative to calculate and report Cronbach's alpha coefficient for any scales that may be used. The calculated alpha coefficient was 0.75633. This indicates that the internal reliability of the questionnaire was within the acceptable range. The data collection

techniques were then tested on a small number of mathematical literacy teachers in the Greater Taung area who were not part of the main study.

#### **5.6.5. Pilot study**

Piloting is used by researchers to test the validity and reliability of their interviewing design on a small number of participants. Lauer (2006) is of the opinion that, because of the number of variables typically encountered in a research study, a pilot test can serve to increase the probability that the measures used are appropriate and that the conclusions drawn will be valid.

In qualitative research, the pilot study is usually informal, and a small number of respondents possessing the same predominant characteristics as those of the main sample, can be involved in the study. This is done to determine certain trends and also to establish whether the relevant data can be obtained from the respondents. In brief therefore, a pilot study is a small study conducted prior to a more significant research project to determine whether the methodology, the sample size, the data collection instrument and the methods of analysis are adequate and appropriate.

In order to evaluate the interview schedule for the study, a pilot study was conducted involving 6 mathematical literacy teachers. These teachers previously taught subjects like Afrikaans, Setswana or Geography, but have since received some training in mathematical literacy.

Teachers who were involved in the pilot study were excluded from the main study. In fact, those teachers who took part in the pilot study were drawn from two schools which had not been selected for the main research. This also accounts for the use of non-probability sampling (see section 5.3). Teachers who were involved in the pilot study had no interaction with the teachers participating in the main study to prevent compromising the nature and purpose of this study.

### **5.6.6. Triangulation**

Triangulation is a method by which a researcher seeks out different types of sources that may provide insight into a particular field of study. It is a validity confirmation procedure in which researchers look for convergence among multiple and different sources of information to form themes or categories (Creswell & Miller, 2000). Triangulation therefore maximises the validity and reliability of a study.

In this study, the data collected came from questionnaire and from interviews with mathematical literacy teachers, who are the main focus of the research. Data emerging from these sources had to be similar and consistent; otherwise the sources would be neither valid nor reliable. Thus reliability, validity and triangulation, especially in a qualitative research approach, reflect multiple ways of establishing the trustworthiness of the study.

### **5.7. Data Collection**

In gathering data for the study, the author first administered the questionnaire and then conducted semi-structured interviews with individual respondents. The purpose of the interview was to explore the views, experiences and beliefs of the mathematical literacy teachers on the support they received from their colleagues. The questionnaires were distributed to twenty mathematical literacy teachers in the Taung district through personal contact. The teachers were given one week to complete the questionnaire. Four of the teachers failed to complete the questionnaires, which left sixteen completed questionnaires. This number represents an eighty percent (80%) return rate. In this study the author opted for the Likert-type questionnaire since he wanted to find out how strongly the participants agreed or disagreed with the statements regarding mentoring. Six of these participants were later interviewed on individual basis. The interview process has been described in section 5.6.2 above.

## 5.8. Analysis of Data

After the process of data collection, the researcher immersed himself in the data by reading through the many times. This was done in order to be familiar with the data and to look for patterns and themes so as to group the data accordingly. The volume of data collected was therefore organised in some manageable form and then interpreted.

The two sets of data collected (a questionnaire and personal interviews) were analysed as follows: the data from the questionnaire was organised in frequency tables, while the data from interviews was grouped under common themes (McMillan & Schumacher 1997:28).

In the current research, qualitative data was collected through the use of a questionnaire and interviews in order to determine how mentoring is used to support mathematical literacy teachers. In order to systemise the data collected, the author carefully studied the recorded data immediately after the interview to identify ideas which were relevant to the study. These ideas then became the main themes on which respondents' views were sought. The themes include:

- The use of mentoring in teacher development,
- Functions of mentoring,
- The role of the mentor in professional development, and
- Upgrading knowledge and skills

Lave and Wenger's (1991) situated learning theory played a key role in the selection of main themes. For instance, the study identified particular aspects of professional support received through social interaction with experienced colleagues. The data analysis was then based on these particular aspects of professional assistance, as well as on how such assistance contributed to improve their knowledge and skills in teaching mathematical literacy.

The details of the data analysis are given in chapter 6.



## 5.9. My role as the researcher

The author assumed the following roles in terms of the research project:

Firstly, he wrote a letter to the Area Manager of schools in the Greater Taung area to obtain permission to conduct research in the selected schools. The letter briefly specified the following:

- the names of school sites to be visited
- the objectives of the study
- the participants
- the duration of the data collection process
- the institution I represented (see appendix C).

He then paid personal visits to the schools that were chosen to inform the respective principals that their schools had been selected for the research. Letters asking for permission to conduct research in these schools were delivered to the principals. The letters also requested permission to release the mathematical literacy teachers from certain other duties in order to participate in the research.

In conducting the interviews, the author at all times attempted to adhere to the following principles:

- **Establishing rapport.** Establishing good rapport between myself and the participants improved the likelihood of getting more detailed answers to the questions.
- **Being non-directive** A non-directive approach was adopted to ensure that participants would express their views and beliefs in a non-biased manner.
- **Assuming a naïve stance.** The author tried as much as possible to set aside personal assumptions and to assume the role of a learner. The objective was to let participants enjoy the satisfaction of being interviewed.

- **Exhibiting patience.** He deliberately restrained myself from interrupting participants and allowed them sufficient time to express themselves fully.

### **5.10. Ethical considerations**

In formal research it is important to adhere to a strict code of ethics with regard to the rights of others, and to display an appropriate level of respect for the privacy, views and beliefs of participants. In harmony with a generally acceptable code of ethics, the author initiated the research activities by firstly obtaining permission to conduct the research in the selected schools from the Area Project Office (APO), formerly known as the District Education Office. A copy of the letter of requesting the necessary approval is attached as Appendix B. Although the APO manager gave his consent verbally, no approval letter was issued. He then met with the Principals of the selected schools to inform them of my intentions to obtain the approval of the APO to conduct research in their schools. He also:

- met with the participants to obtain their voluntary consent,
- informed them about the research objectives and the method of recording their responses,
- informed the participants of their right to withdraw from the research at any time without any negative consequences,
- informed the participants of the confidential nature of the research and assured them that their privacy would be respected at all times.

### **5.11. Summary of Chapter**

In this chapter the research methodology has been described. The concept of research was briefly defined. The research method employed in this research was identified as a qualitative approach. The rationale for the choice of this approach was explained in this chapter. The role of the researcher in a qualitative research approach was highlighted. The research design, which involves a logical approach to the gathering of data for the research, was detailed in the chapter. The process of maximising the

credibility of the study by ensuring the validity and reliability of the study was highlighted, as well as the additional process of triangulation to confirm the validity and reliability of conclusions arrived at. The instruments used in the data collection were described as being a questionnaire and interviews, and the method applied in the selection of the sample was explained.

The next chapter will present the data collected and the method of analysis.

## CHAPTER 6

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

#### 6.1. Introduction

The previous chapter focused on the research methodology. This chapter presents the data collected, together with the analysis and discussions. Data analysis is the process of bringing order, structure and meaning to the mass of collected data (De Vos, 2002). In this chapter data collected from the questionnaires and the interview sessions will be presented, analysed and then discussed.

#### 6.2 Data from questionnaire

Data collected from questionnaires are presented here in the form of tables. The tables indicate how the participants responded to a particular statement.

The table below shows the responses of the participants and indicates whether or not they received any assistance or support from their colleagues.

Table 2: Assistance and support from colleagues

	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	0	0	0	9	7	16
Percentage	0	0	0	56	44	100

All the participants indicated in the questionnaire that they have, in fact, received or are currently receiving some form of professional support from their colleagues at their workplaces. This can be seen from the table above.

**Discussion:** From the responses of the participants it appears that they all have someone to assist them in the execution of their professional duties as mathematical literacy teachers. However, these teachers usually sought help from those they found approachable and could trust. This confirms what Norman et al (2005:679-697) found in their study, namely that mentees usually approached their mentors with a particular problem to which they expected to receive a solution (see section 3.3.1).

The key areas where assistance and support were received included content areas to be taught, developing learner assessments, classroom management and teaching strategies to meet learner needs. These areas are supposed to help in the development of the mathematical literacy teachers in terms of content and methodology. They include key content areas, developing learner assessment, classroom management and teaching strategies.

### 6.2.1. Assistance on key content areas to be taught

The table below shows how the participants rated the assistance received on content areas to be taught in mathematical literacy.

Table 3: Assistance received on content areas to be taught in mathematical literacy.

Response	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	0	1	3	5	7	16
Percentage	0	6	19	31	44	100

Twelve of the sixteen participants indicated that they received regular assistance on key content areas to be taught as far as the teaching and learning of mathematical literacy is concerned. This number represents about 75% of the participants. Three of the participants, however, indicated that they were not certain about having received any assistance on key content areas, and none of them claimed not to have received any form of assistance on the key content areas to be taught in mathematical literacy.

**Discussion:** The content areas mentioned here, refer to the mathematical literacy topics to be taught as indicated in the assessment standards. The assessment standards reflect the key areas which are supposed to be taught under a given topic. Table 3 shows that 12 out of the 16 respondents (that is, 75%) claimed to have received assistance on the mathematical content areas which they are supposed to teach. This confirms the claim by Desimone et al (2002:101) that professional development should focus on content knowledge as well as on how students learn specific content (see section 2.10).

The mathematical literacy teachers' problems with mathematical content knowledge seemed to be varied and may have a negative effect on their confidence in teaching the subject. In the literature review Hobson et al (2009) reported that early-career teachers stated that effective mentoring enhanced their confidence, self-esteem and actually improved their instructional skills and teaching strategies (section 4.2). The author agrees with the suggestion that, if the mathematical literacy teachers are effectively mentored, they could improve their knowledge and the skills required to teach the subject.

### **6.2.2. Assistance in developing learner assessments**

Mathematical Literacy teachers were asked to rate the assistance they received from colleagues in developing learner assessments.

Table 4: Assistance received in developing learner assessments.

Response	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	0	6	4	4	2	16
Percentage	0	37.5	25	25	12.5	100

The response indicates that many of the participants do not appear receive assistance in learner assessment. Of the sixteen participants, six claimed to have received assistance in developing learner assessment, and only two of them rated the assistance received as being given on a regular basis and with a high degree of success. This represents only 12,5% of the total number of respondents. The table above shows how other respondents rated the assistance received from colleagues in developing learner assessments.

**Discussion:** Those teachers who claimed to have received some assistance in developing learner assessment were probably referring to the learner assessment at the end of each quarter. This situation seems to suggest that many of the teachers do not assess their students during the lesson in order to determine whether the lesson objectives were achieved. The responses by the participants seem to suggest that currently, there are no formal mentoring programmes for these mathematical literacy teachers. A formal mentoring programme, according to Sparks and Loucks-Horsely (1990) would address not only the issue of content knowledge, but other aspects of professional development as well (see section 2.10).

### 6.2.3. Assistance received in classroom management skills

Participants were asked to rate the training received in classroom management skills modelled by experienced colleagues.

The table below shows how the participants rated the assistance received in classroom management skills.

Table 5: Assistance received in classroom management skills.

Response	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	2	2	4	8	0	16
Percentage	12.5	12.5	25	50	0	100

The responses indicated that training in classroom management does not occur regularly. However, 50% of the participants claimed that they have, in fact, received some training in classroom management skills from experienced colleagues. Only 25% of them indicated that no such activity occurred and the other 25% were indifferent.

**Discussion:** It was not very clear what was the nature of the assistance provided in classroom management, but those teachers explained that their close association with the experienced teachers helped them to learn more about classroom management skills. Hence it could be said that such skills were probably learned or acquired informally. This affirms Sweeny's (2001) view that the system of informal exchange of ideas will always be a part of the professional culture (see section 3.2).



#### 6.2.4. Assistance in teaching strategies to meet learner needs

The table below shows how the participants responded to assistance received in teaching strategies to meet learner needs.

Table 6: Assistance received in teaching strategies.

Response	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	4	4	6	2	0	16
Percentage	25	25	37.5	12.5	0	100

Of the sixteen participants who completed the questionnaire, only two indicated that they had received some assistance in modifying their teaching strategies to meet learner needs. Half of the participants said that they had not received any assistance on how to modify their teaching strategies to meet the needs of the learners, and the rest (37.5%) were indifferent.

**Discussion:** Table 6 shows that many of the participants received very little or no assistance at all in modifying teaching strategies to meet the needs of learners. Most of the mathematical literacy teachers believed that, as trained teachers they were actually familiar with the various strategies in teaching. However, since they were now required to teach a completely different subject from that in which they had been trained, many of them experienced problems with regard to teaching strategies. It would therefore be important for them to develop new teaching strategies for the teaching and learning of mathematical literacy. This confirms what (Desimone et al 2002:101) found, namely that professional development for teachers should focus on content knowledge as well as understanding how students learn specific content (see section 2.10). At this stage it is clear that the assistance that mathematical literacy

teachers receive cannot be equated to mentoring, because in a mentoring programme the focus is not only on the content knowledge of the mentee.

### 6.3. Observation by experienced colleagues

The table below shows the responses of the participants.

Table 7: Observation by experienced colleagues

Response	Level 1 Strongly disagree	Level 2 Disagree	Level 3 Uncertain	Level 4 Agree	Level 5 Strongly agree	Total
No. of respondents	8	0	6	2	0	16
Percentage	50	0	37.5	12.5	0	100

Of the 16 participants, only six indicated that they have occasionally been observed by their experienced colleagues in the classroom setting. On the other hand, they have not had the opportunity to visit the classrooms of their experienced colleagues. Fifty percent of the participants indicated that they have neither visited the classroom of an experienced colleague, nor have they had any of their colleagues visiting their classrooms.

The responses show that classroom observation is not very popular with many of the teachers, and it appears that most of them do not feel comfortable when being observed by their colleagues. This situation strongly supports the statement by Gratch (1998:223) that teachers work mostly in the privacy of their classrooms and that they have little opportunity to engage with others (see section 2.7).

**Discussion:** In the process of mentoring, mentors need to demonstrate teaching techniques in addition to observing the mentees. They also need to have support

meetings with mentees to provide feedback on their observations. Lesson observation has been found to be one of the most valued aspects of the work undertaken by mentors. For example, in a study on intensive mentoring by Stanulis and Floden(2009:112-122), mentors taught demonstration lessons and also observed their mentees in their classrooms (see section 4.2).

In the mentoring process, it is expected that mentors and mentees would visit each other’s classrooms and then meet to discuss whatever was observed. Since this process appears to be lacking, it would suggest that currently there are no formal mentoring programmes for mathematical literacy teachers.

#### **6.4. Evaluating support and assistance received**

In this part of the questionnaire, participants were asked to evaluate the assistance and support received since they started to teach mathematical literacy.

The responses of the participants are presented in a table below.

Table 8: Evaluating the support and assistance received

Evaluation Items	Respondents	Percentage
Useful technical skills in teaching mathematical literacy	10	62.5
Encouragement and emotional support	8	50
Political dynamics of the workplace	12	75
Influenced career decision	12	75

In terms of useful technical skills in teaching mathematical literacy, ten respondents indicated that they had received some support and assistance in this aspect, while

eight indicated that those people, who assisted them, also provided some encouragement and moral support. Twelve of the participants indicated that they learned much about the political dynamics of the workplace and/or the profession from their more experienced colleagues.

**Discussion:** The responses indicate that all the participants were in agreement that their relationship with those individuals mentioned earlier had been beneficial to them both professionally and personally. The responses by the participants clearly suggest that the assistance they received had been very valuable. This is in line with the findings of Hobson et al (2009) that early-career teachers generally appear to receive sufficient help from their mentors in improving their instructional skills and teaching strategies (section 4.4).

### **6.5. Data on Interviews**

Six of the mathematical literacy teachers were interviewed to discuss their perceptions of the assistance and support received when they started to teach the subject.

Teachers' comments appear below in *italics*. The six teachers are identified simply as Participant A, B, C, D, E and F.

During the interviews, these teachers were asked how they normally went about solving problems when encountering difficulties in the teaching of mathematical literacy.

All six teachers who were interviewed indicated that they approached their colleagues for help whenever they encountered any difficulties. All of the participants also said that whenever they needed help, their colleagues were prepared to help them. This confirms what Norman et al (2005:682) found, that mentees usually approached the mentor with a particular problem to which they expected to receive a solution (see section 3.3.1).

Teachers generally sought assistance from their colleagues on topics they found challenging. They usually required assistance with financial calculations, particularly with calculations of compounded interest and percentages, as well as with shapes and measurements.

Participant B said that:

*My colleague, who also teaches mathematical literacy, has been helping me whenever I have difficulties in solving some of the problems in mathematical literacy, especially financial mathematics and percentages.*

The mathematical literacy teachers unanimously agreed that their colleagues, who teach mathematics, were prepared to help them, especially with content knowledge. The support and assistance that the teachers say they received and the way they learned from their colleagues is consistent with the situated learning theory. Here the ‘apprenticeship model’, as discussed in section 3.3.1, is applicable.

Participant A observed that:

*Whenever I approach Mr X (real name withheld) who teaches mathematics, he is always ready to help me even if I repeatedly approach him with the same problem because he knows that I am not good at mathematics and am a slow learner.*

Four of them, however, expressed the concern that some of the mathematics teachers, who usually helped them, often had too much school work, such as attending to their classes, and marking students’ assignments and tests. The participants complained that the workload of these mathematics teachers did not allow them enough time to attend to some of their problems. This situation impacts on the frequency at which they asked for assistance from their colleagues.

Participant B said, for example:

*Our experienced mathematics teachers should be given fewer teaching periods so that they would have enough time to help us.*

The above statement is consistent with the suggestion by Lee and Feng (2007:247) that teacher-mentors could be given additional free time or non-contact time so that they can prepare for and undertake the mentoring role (see section 2.14.1).

The teachers, who were interviewed, however, mentioned that they were quite satisfied with the assistance they had been receiving on some of the topics in mathematical literacy. Some of the topics which came up as being particularly challenging were financial mathematics and shapes and measurements.

This was what Participant D had to say in this regard:

*I had problems with financial mathematics, especially with compounded interest. But now I think I am getting better with it, due to the help received from my colleague teaching mathematics.*

The above statement supports what Evenson (1982) claimed, namely that one of the benefits derived from a mentoring relationship is enhanced professional competence (see section 2.12).

Three of the six teachers who were interviewed said that they received very little assistance from their colleagues as far as developing learner assessments were concerned. The other three could not say whether they had received any assistance with learner assessments.

Participant E who claimed to have received little assistance on learner assessment, said:

*My HOD only moderates my question paper, and in most cases he makes very few changes.*

During the interview, some of the teachers (four of them) seemed to agree that they had acquired at least some classroom management skills through interaction with their experienced colleagues.

Participant A said:

*I learned a lot from some of the informal discussions with my colleagues in teaching and managing a class effectively. I have been using some of their ideas in teaching mathematical literacy, especially with regard to assessing learners during and after the lesson.*

The above statement suggests that mentees learn from the mentor in many ways. This is consistent with the statement by Stanulis and Floden (2009:112-122) that mentees need assistance and support from their mentors in various ways (see section 4.2), including informal discussions. This form of learning is consistent with the situated learning theory where knowledge is acquired through social interaction.

During the interviews, only one of the six teachers mentioned that he had received some assistance in strategies relating to the teaching of mathematical literacy. He (Participant E) said that:

*I now understand some of the topics (e.g. percentages and compounded interest) and can confidently teach them. I have also learned specific ways of teaching some of these topics.*

Three of the mathematical literacy teachers who were interviewed, indicated that they have never been observed by any colleague in order to improve their teaching. The other three claimed that they had, in fact, been observed by some of their colleagues and did receive feedback on these class observations. Two of them also remarked that classroom observation has contributed to improving their lesson preparation and presentation abilities.

One of them (Participant A) said:

*The discussions we have after the class observation has helped me a lot and I now understand why it is important to prepare for my lesson.*

The three mathematical literacy teachers who claimed that they have had experienced colleagues visiting them in their classrooms, were actually referring to the routine visits from their respective subject specialists. These subject specialists are experienced office-based teachers who have been assigned to offer curriculum support to teachers in their respective subjects within the district. It was quite clear that there were no frequent classroom observations of these mathematical literacy teachers by their experienced colleagues. Furthermore, these mathematical literacy teachers did not have the opportunity to observe their experienced colleagues in their classrooms. At this stage it was evident that most experienced teachers have little opportunity to engage with others about the details of their classroom practices as alluded to by Gratch (1998) (see section 2.7).

All six teachers who were interviewed also mentioned that some of the informal conversations that often took place among staff members during breaks were very helpful.

This is what Participant F had to say:

*Whenever I listen to some of my colleagues sharing their experiences in teaching, I try to emulate some the 'good' things and practice them in my mathematical literacy class.*

Some of the teachers also used such informal conversations to reflect on their classroom practices.

This is what Participant C had to say:

*Some of the informal conversations or discussions have helped me to reflect on my teaching practices. I really learnt a lot from them.*



During the interview session, two of the six teachers mentioned that they had also received some professional assistance through workshops. Even though these workshop sessions were intended to help the mathematical literacy teachers, some of them had a different view. Whereas two of the interviewees claimed to have received some assistance from workshops, the others felt that these workshop sessions were not helping them as much as they had expected. In fact, one of the teachers (Participant F) made the following remark:

*During the workshops some of the presenters move through the concepts very fast and you don't understand what is going on. Those of us who are slow don't benefit much from these workshops.*

From the above remark, it may be concluded that not all the teachers who attend workshops, actually benefit from them. Others may not want to expose their weaknesses in public and therefore would not ask questions during these sessions, even though they may have problems. This confirms what Johnson (2002) says, namely that workshops are ineffective because they often do not relate to teachers' situation or align with their teaching styles (see section 1.6).

During the interview, all the teachers mentioned that they appreciated the assistance and support that they received from their colleagues who are teaching mathematics. They also indicated that they failed to grasp many of the topics discussed during their short courses. However, as a result of the assistance given by their colleagues, they now have a much better grasp of these topics.

One of the teachers (Participant C) mentioned that:

*I can say that I have gained so much from my colleague who is teaching mathematics. For example, I now understand how to apply the "BODMAS" rule and understand the Pythagoras theorem very well. I now feel confident in teaching mathematical literacy.*

The teachers who were interviewed focused mainly on evaluating the assistance they received on content knowledge. This seems to confirm what was said in section 1.1 that the short courses that were organised for the mathematical literacy teachers, could not have prepared them adequately to teach mathematical literacy.

The teachers were also asked what they thought their colleagues who taught mathematics could do to help them improve in the teaching of mathematical literacy.

Participant A said:

*I think the mathematics teachers should assist us in the topics that are quite challenging and they should also invite us to visit them when they are teaching.*

The other teachers agreed with the above opinion and added that they would also want the mathematics teachers to visit their classes and observe what they were doing.

The mathematical literacy teachers were asked if they considered those who have been assisting them as mentors.

There were various responses to this question as the teachers were not sure what being a mentor actually entailed. These were some of the responses from the teachers:

*I think so, because I do learn a lot from him (the mathematics teacher) as far as the teaching of mathematical literacy is concerned (Participant C).*

*I don't know, but since he (the mathematics teacher) is helping me with mathematical literacy and I have learned some things from him. I could therefore say that he is my mentor (Participant D).*

*I could say yes, because whenever I have problems, I consult with him (the experienced mathematics teacher). Apart from being taught, I also get some advice and encouragement from the experienced colleagues (Participant E).*

The teachers were asked about some of the challenges they faced in getting assistance and support from their experienced colleagues.

The teachers highlighted time factor, heavy workload and commitment as some of the major challenges.

Participant B, for example, said:

*Sometimes these experienced colleagues do not have enough time to attend to our problems because of their own workload. They usually make the excuse that they are too busy.*

Participant D added:

*It appears that some of the experienced colleagues are not committed to helping us, because they will sometimes ask you to come later if you need help. Others may not take you very serious.*

The teachers were asked to suggest how they thought the assistance they received could be improved.

The responses from the teachers suggested that they wanted such assistance and support from their experienced colleagues to be recognised by the school authorities so that their workloads could be reduced. What these teachers are saying confirms what Lee and Feng (2007:243-263) noted, that mentoring is likely to be effective only if mentors are provided with additional free time or non-contact time (see section 2.14.1).

For example, participant B said:

*If the School Management Team (SMT) could reduce the workload of our experienced colleagues by giving them fewer classes or by taking away some of their responsibilities, they would have enough time to spend with us.*

## **6.6. Summary of key findings**

Having analysed the data from both the questionnaire and the interviews, the author found them to be consistent. Thus most of the information from the interviews were found to coincide with that obtained from the questionnaire. This is consistent with section 5.7.5 where the issue of triangulation was discussed, and confirms the validity of these findings.

The key findings of the research are stated below:

- There are currently no formal mentoring programmes in place to assist newly trained mathematical literacy teachers in Greater Taung area. These teachers do, however, receive some assistance and support from their experienced colleagues and friends.
- The assistance/support received by the mathematical literacy teachers were mostly on mathematical content.
- Over the years mentoring has emerged as an effective process for developing early-career teachers' practices. Thus mentoring can be used with benefit to assist newly trained mathematical literacy teachers to become effective in the teaching of the subject.
- Both mentor and mentee have to assume responsibility for their respective roles if the mentoring objectives are to be realised. However, the mentors' role in the process of professional development is quite crucial. Among others, the mentors' role includes that of being an advisor, a facilitator and a role model.

- Some of the challenges faced by the mentor and the mentee within the school environment include inadequate time for mentors to attend to their mentees and lack of commitment on the part of both mentors and mentees.
- Mentoring of newly trained mathematical literacy teachers could be improved by formalising the mentoring process and by providing some training in mentoring to the experienced colleagues.

## **6.7. Discussions**

The purpose of the study was to determine how mentoring could be used as a form of professional development for mathematical literacy teachers. Accordingly, the following research questions were asked:

1. What form of assistance/support do the ‘newly trained’ mathematical literacy teachers receive from their experienced colleagues?
2. What are the challenges faced by mentors and mentees in the school?
3. How can mentoring for the newly trained mathematical literacy teachers be improved?

The following sub-questions were also addressed:

- i) What is the value of mentoring newly trained mathematical literacy teachers in the school system?
- ii) What is the role of the mentor in the process of professional development?

### **6.7.1. Use of mentoring in teacher development**

In a research conducted on mentoring by Hobson et al (2009:407-433), it was found that early career teachers appeared to receive sufficient assistance from their mentors

in improving their instructional skills (see section 4.2). Clinard and Ariav (1997:91-108) explored the perceptions of mentor teachers on the impact of mentoring (see section 4.3). According to this study, mentor teachers generally believed that mentoring assisted novice teachers to improve their instructional skills. Luneta (2006:17-25) investigated mentoring and its relevance to continuous professional development. Luneta established that mentoring of teachers is equivalent to continuous professional growth and development (see section 4.2). Mentoring as a means of professional development, however, requires regular interaction between the mentor and the mentee.

The social interaction between the mentor and the mentee contributes significantly to the professional development of the mentee. In the study it was established that mathematical literacy teachers generally do engage with their experienced colleagues. Through such engagement, they also learn from their colleagues. During the interview, some of the participants expressed how they have benefitted from their interactions with their experienced colleagues.

Participant B stated:

*I learned a lot from some of the informal discussions with my colleagues on teaching and managing a class effectively. I have been using some of their ideas in teaching mathematical literacy, especially that of assessing learners during and after the lesson (Participant B).*

The findings of the current study, however, show that there are no formal mentoring programmes for newly trained mathematical literacy teachers in the Greater Taung area. Instead, novice teachers will typically identify one or two experienced mathematical literacy teachers to ‘mentor’ them. This was indicated in the responses from the questionnaire. It was later confirmed during the interview process.

For example, Participant B explained:

*I have been getting some assistance from my experienced colleague in solving problems on percentages and compounded interest (Participant B).*

Case in point: The current study noted that experienced teachers provided considerable assistance and support to their newly trained colleagues who were also required to teach mathematical literacy. These included solving mathematical problems, explaining how some topics could be taught and how to assess learners during and after a lesson.

During one of the interviews Participant F said:

*Whenever I listen to some of my colleagues sharing their experiences in teaching, I try to emulate some the 'good' things and apply them in my mathematical literacy class (Participant F).*

These findings affirm Wolf's (2003:87-106) assertion that the assistance and support offered to novice teachers may have to include teaching-related activities such as planning for instruction and assessment (see section 4.2). Similarly, a study by Hobson et al (2009:407-433) showed that the assistance received from mentors helped to improve the instructional skills and teaching strategies of early career teachers (see section 4.2).

The study further found that the mentoring functions of teaching, guiding, encouraging and counselling are vital to the process of the professional development of teachers. In addition to teaching, mentors offer professional guidance to their mentees. However, the type of guidance may range from lesson preparation to presentation and assessment. For example, in the study the mathematical literacy teachers reported that their experienced colleagues did provide some guidance in selecting tasks for assessments.

This is what Participant A said during the interview:

*I learned a lot from some of the informal discussions with my colleagues on teaching and managing a class effectively. I have been using some of their ideas in teaching mathematical literacy, especially that of assessing learners during and after the lesson (Participant A).*

The teachers noted that assessment cannot be separated from teaching and learning in mathematical literacy. Therefore, while improving both the content and pedagogical knowledge, it is also necessary for mathematical literacy teachers to be guided on lesson preparation and presentation. Moreover, they need to understand the importance of assessment in mathematical literacy. This affirms Hudson, Usak and Gencer's (2010:245-252) findings in a study on mentoring pre-service teachers. Hudson et al found that pre-service teachers needed to be assisted in lesson planning, implementation and questioning skills (see section 4.2).

The current study is based on the principles of situated learning theory. The theory postulates that learning requires social interaction and collaboration. The author found this principle to be quite relevant to my study. Evidently from the study there were regular interactive sessions between mentor and mentee and the mentor and mentee tended to work collaboratively on various tasks (see section 6.2; 6.4 & 6.5). Thus, mathematical literacy teachers can be assisted and supported by their mentors through regular social interaction.

### **6.7.2. Functions of mentoring**

In assisting and supporting mentees, mentors provide one or more of the following functions, namely teaching, guiding, encouraging and counselling (Anderson and Shannon 1988). For example, during the interviews, one of the teachers mentioned that the experienced teachers not only teach, but also give advice and encouragement.

Participant D said:

*Apart from being taught, I also get some advice and encouragement from the experienced colleague as to how to manage my class effectively (Participant D).*



In the current study it was found that the experienced colleagues provided one or more of the following mentoring functions: guiding, encouraging and counselling. The National Education Association (1999) also identifies the functions of the mentor as including teaching, guiding, counselling and encouraging (see section 3.4). This supports the study by Hobson et al (2009:407-433) which found that early-career teachers appeared to receive sufficient help from their mentors in improving their instructional skills and teaching strategies (see section 4.2). The help received was in the form of teaching, guiding and encouraging.

### **6.7.3. Role of the mentor in the process of professional development**

The mentor plays a key role in a professional development of the mentee. The National Academy of Science (NAS, 1997) describes the roles of a mentor as that of an advisor, a teacher, a role model and a friend (see section 2.6). Some of these roles were evident in the current study. For example, during the interview, one of the participants (Participant C) confirmed that they viewed their experienced colleagues as friends and role models. This is how he expressed himself on this matter:

*Some of the informal conversations or discussions we sometimes have made it possible for me to reflect on my teaching practices. I really learnt a lot from our experienced colleagues (Participant C).*

This agrees with other studies on the mentoring of novice or early-career teachers. For example, Stanulis and Floden (2009:112-122) conducted a study on intensive mentoring as a way of helping beginning teachers to develop balanced instruction skills (see section 4.2). The expression “intensive mentoring” suggests that the beginning teachers had regular interaction with their mentors. Such regular interaction with their mentors helped them to improve their instructional skills. On the other hand, where tensions exist between the mentor and the mentee, the objectives of mentoring cannot be realised. For example, Ekiz (2006:924-934) conducted a study that focused on student-teachers and their mentors. In this study it was found that most of the emerging issues in mentoring programmes are as a result

of either lack of mentor-mentee communication, or lack of mentor support (see section 4.2).

Lave and Wenger's (1991) situated, or social learning theory is based largely on social interaction and collaboration. This means that the mathematical literacy teachers need to view their experienced colleagues as friends and advisors, and more importantly, as role models. This could facilitate their regular social interaction. Thus, the mathematical literacy teachers learned from their experienced colleagues as they interacted with them. Such interaction helped the mathematical literacy teachers to get advice on the topics they were required to teach.

#### **6.7.4. Impact of situational learning on mathematical literacy teachers' professional development**

Mathematical literacy teachers learn from their experienced colleagues through social interaction. In the present study it was found that these teachers learned basic mathematical literacy content as they interacted with their experienced colleagues. In addition to improved content knowledge, they also learned some instructional skills, and improved their instructional strategies.

This is what Participant E said:

*I now understand some of the topics (like percentages and compounded interest) and can confidently teach them. I have also learned specific ways of teaching some of the topics (Participant E).*

This evidence from the study is similar to some of the findings in previous studies on mentoring. For example, Brill (2001) affirms that a situated learning environment supports learners in structuring knowledge in ways that are appropriate for later use. Thus, based on the principles of situated learning, mathematical literacy teachers could be developed professionally through effective mentoring. The professional development of the mathematical literacy teachers could therefore be conducted based on the principles of situated learning.

Through situated learning, mathematical literacy teachers would acquire the necessary knowledge needed to make them effective teachers. This is affirmed by Brill (2001) who indicated that a situated learning environment supports learners in structuring knowledge in ways that are appropriate for later use by gaining knowledge in context and then applying it in the work environment.

#### **6.7.5. Applicability of Lave and Wenger's situated learning theory to the study**

The current study is on the use of mentoring as a means of professional development for mathematical literacy teachers. The study is underpinned by Lave and Wenger's situated learning theory. The basic principles of the theory are that knowledge must be presented in authentic context, and that learning requires social interaction and collaboration (Lave and Wenger, 1991). Situated learning theory promotes the notion that learning should take place in the immediate context in which it is to be applied.

This theory is applicable to the present study in the sense that learning that takes place through mentoring, requires social interaction. In this context the mentee actively interacts with the mentor on a regular basis in order to acquire the necessary knowledge and skills. Such knowledge and skills are therefore acquired within a social context. In the current study, the mathematical literacy teachers learned from their experienced colleagues as they interacted with one another. One of them (Participant C) said:

*Some of the informal conversations or discussions we sometimes have made it possible for me to reflect on my teaching practices. I really learnt a lot from them (Participant C).*

This evidence from the study affirms Lankau and Scandura's (2002) assertion that individuals learn a great deal through their interaction with others, especially from those with different backgrounds, expertise, and seniority in their organisations (see section 2.15). It is for this reason the author insists that the situated learning theory is relevant when studying mentoring as a professional development.

### **6.7.6 Mathematical literacy: Pedagogical and content knowledge**

According to Shulman (1987:7), the framework for any teacher development programme should include content knowledge and pedagogical knowledge. Content knowledge involves the mastery of specific content being taught. Pedagogical knowledge involves an understanding of the theories and principles of teaching and learning, understanding the learner, and the knowledge and principles of classroom behaviour and management (Shulman 1987:8). In the current study, a primary objective is for mathematical literacy teachers to improve their content as well as their pedagogical knowledge through mentoring. They should be assisted to master the fundamentals of basic mathematics and learn how to impart this knowledge to their learners.

Some of the participants in the present study acknowledged that they have learned some basic mathematics with the assistance of their experienced colleagues. They mentioned topics like percentages, simple and compounded interest, and shapes and measurements.

This is what Participant D had to say:

*I had problems with financial mathematics, especially that of compounded interest. But now I think I am getting better with it, with the help of my colleague teaching mathematics (Participant D).*

The above statement shows that, through mentoring, mathematical literacy teachers can improve their content knowledge and therefore their pedagogical strategies. This affirms what Barneth (1995) and Crowther and Cannon (1998) found, namely that mentoring can develop teaching practices as it provides the opportunity for mentors and mentees to engage in pedagogical discourse and reflective thinking (see section 2.11).

Lave and Wenger's situated learning theory acknowledges that knowledge is acquired in a social setting, which in this study is formed by mentor and mentee. The study found that teachers say that they obtained knowledge from their colleagues, and that point to the possibility of exploiting more formal mentoring programmes as a possible way forward. However, research would be required to see whether formal mentoring might improve on the current informal practices.

#### **6.7.7. Professional development: Upgrading of knowledge and skills**

The professional development of teachers aims at upgrading knowledge and skills so as to change teachers' teaching practices to ensure that all learners achieve higher learning standards (Sparks & Loucks-Horsely, 1990). Mathematical literacy teachers can be assisted through mentoring to upgrade their basic mathematics knowledge. This would enhance their confidence in the teaching and learning of mathematical literacy.

Participant E mentioned this during the interviews:

*I now understand some of the topics (e.g. percentages and compounded interest) and can confidently teach these concepts. I have also learned specific ways of teaching some of the topics (Participant E).*

Desimone et al (2002:81-112) alluded to that fact that there has been an increased attention to the professional development of teachers in recent times. This study sought to look at mentoring as a form of professional development for mathematical literacy teachers. Through the process of mentoring, highly experienced mathematics teachers could play a leadership role in guiding the activities of mathematical literacy teachers. Such guidance could improve the knowledge of the mathematical literacy teachers who generally lack in this respect. Based on the findings of the current study, I believe that the knowledge and skills of mathematical literacy teachers could be improved through regular interaction with their experienced colleagues. This supports

the principle of Lave and Wenger's learning theory that learning requires social interaction.

In conclusion, the use of mentoring as a form of teacher development cannot be overemphasised. Collinson et al (2009) affirm that in recent times, the education community has embraced formal mentoring as a necessary extension of learning and as a way to build habits of learning. The study has shown that the process of mentoring could be an effective form of professional development for mathematical literacy teachers.

### **6.8. Summary of chapter**

This chapter presented and analysed the data collected from mathematical literacy teachers in ten secondary/high schools in the Greater Taung area. A total of 16 mathematical literacy teachers responded to the questionnaires, while six of them were interviewed. The findings from the literature, as well as from the current study, were presented in this chapter. The information obtained from participants revealed that currently, there are no structured, formal mentoring programmes available for newly trained mathematical literacy teachers in the Greater Taung area. These teachers usually rely on their colleagues and friends to obtain assistance and support. From the literature study it was found that early-career teachers appeared to receive sufficient help from their mentors in improving their instructional skills and teaching strategies (see section 4.2). From the data collected, it was evident that:

- There are currently no formal mentoring programmes in place to assist newly trained mathematical literacy teachers in Greater Taung area.
- Over the years mentoring has emerged as an effective process for developing early-career teachers' practices, and the mentoring functions of teaching, guiding and encouraging play a critical role in mentoring.
- The assistance/support received by the mathematical literacy teachers were mostly on mathematical content.

- The mentors' role in the process of professional development is quite crucial. Among others, this may include being an advisor, a facilitator and a role model.
- Some of the challenges faced by the mentor and the mentee in the school environment included insufficient time available to mentors to attend to their mentees, and lack of commitment on the part of both mentors and mentees.
- Mentoring of newly trained mathematical literacy teachers could be improved by formalising the mentoring process and by providing some training in mentoring to the experienced colleagues.

The next chapter gives a summary of the research, the implications and recommendations.

## CHAPTER 7

### SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

#### 7.1. Summary of the study

In this study I set out to examine the role of mentoring and how it can be used in the process of the professional development of mathematical literacy teachers in the Greater Taung area. In order to establish a framework for the study, a literature study was conducted. Relevant literature on mentoring as well as on professional development was reviewed. Additionally, an empirical study was done. Sixteen mathematical literacy teachers were purposively selected from 10 high schools within the Greater Taung area. These teachers completed a set of questions aimed at eliciting their opinions on mentoring and professional development. A convenient sample of six of the 16 teachers was selected and these teachers were later interviewed at their various schools to determine the kinds of assistance and support they received from their experienced colleagues. The findings from the study are as follows:

- There are currently no formal mentoring programmes in place to assist newly trained mathematical literacy teachers in Greater Taung area.
- Over the years mentoring has emerged as an effective process for developing early-career teachers' practices, and the mentoring functions of teaching, guiding and encouraging play a critical role in mentoring.
- The assistance/support received by the mathematical literacy teachers were mostly on mathematical content.
- The mentors' role in the process of professional development is quite crucial. Among others, this may include being an advisor, a facilitator and a role model.
- Some of the challenges faced by the mentor and the mentee in the school environment included inadequate time available to mentors to attend to their mentees, and lack of commitment on the part of both mentors and mentees.



- Mentoring of newly trained mathematical literacy teachers could be improved by formalising the mentoring process and by providing some training in mentoring for the experienced colleagues.

## **7.2. Implications of the study**

One of the objectives of professional development is to improve the professional knowledge, skills and attitudes of teachers so that they will be able to educate learners more effectively. In order for professional development programmes to be effective, it is essential that they are well-planned. Even though the responsibility for development must always lie with the individual, the active support of an experienced colleague, playing the role of a mentor, can be extremely helpful. This is particularly necessary during the early stages of a career, or in times of change as in the case of newly trained mathematical literacy teachers. From this study, it clear professional development took place through mentoring. In order for mentoring to be successful the mentor and mentee had to plan, arrange and design a programme that guided their professional development activities. Thus, the study implies that for mentoring to be effective there has to proper plan and arrangements made so that a mentor and mentee can work harmoniously and effectively on professional development activities.

What the study has also presented is that, teachers with minimal mathematics/mathematics literacy background can be converted into effective mathematics literacy teachers through mentoring by developing and improving both their content knowledge and pedagogical approaches. Another factor to consider is that mentoring tends to be successful if there is a cordial relationship between a mentor and a mentee. Furthermore, in a mentoring relationship, mentors not only provide assistance for professional growth and development but they also provide for personal growth as well.

Generally, professional development programmes in the teaching profession mostly take the form of workshops which are attended by teachers for a specified period. During these workshop sessions, little or no attention is given to individual needs. By comparison, during mentoring, the professional needs of teachers are dealt with on individual basis. Teachers being mentored have direct and personal contact with their

mentors and can therefore obtain assistance, quite often in a situational context. This is another point that the study has presented. The study has also showed that mentoring, as a professional development programme, can be made effective by the fact that both mentors and mentees have the opportunity to observe each other in their classrooms with necessary feedback being provided thereafter. This allows both the mentor and the mentee to reflect on their teaching practices and to improve on them.

In sum, the study has showed that mentoring can be used as a professional development initiative and its success depends largely on the cordial relationship established between the mentor and mentee and also on how the mentoring process has been planned, designed and arranged.

### **7.3. Limitations of the study**

In the study, a sample of sixteen (16) mathematical literacy teachers was purposively selected from ten high schools in the Greater Taung area. Most of the high schools in the area are situated in very remote locations and are difficult to access. This sample may therefore not be a good representation of all the mathematical literacy teachers in the Taung area. Evidently this presents a significant limitation in terms of the objectives of the study. Another limitation is the fact that the study could not explore a number of related issues. The study only examined the professional development of mathematical literacy teachers through mentoring, and could not examine, for example, the relationship between teacher effectiveness and student performance. Another critical issue that the study could not address was the importance of demographic characteristics such as ethnicity, race, gender, marital status and age in mentoring relationships.

### **7.4. Recommendations**

Mentoring in the teaching profession has been effective, not only in giving early career teachers confidence in teaching abilities, but also in improving their content knowledge. The process of mentoring also gives experienced teachers who serve as mentors the opportunity to reflect on, and assess their own teaching practices. The

study, therefore, recommends a collaborative form of mentoring. This form of mentoring is also known as collaborative partnerships, where both mentors and mentees are considered as partners, rather than the mentor holding a more authoritative position. In this relationship both parties are regarded as sources of knowledge that can contribute to the learning that occurs within the context of the relationship.

A well-planned mentoring programme for newly trained mathematical literacy teachers will help them to improve their individual skills and competencies. A successful formal mentoring programme, however, should have the following characteristics:

- professional development that targets teacher competencies, with the aim of improving student achievement,
- professional development that is classroom-centred, focused on instructional development, and allows teachers to grow as professionals without leaving the classroom,
- professional development that is personalised, rather than consisting of common activities for all participants.

### **7.5. Possible further studies**

The ultimate objective of any teacher development programme (including mentoring) is to improve learner achievement. Further research is therefore needed to evaluate teachers' effectiveness following a mentoring programme.

Possible research is also needed to identify the challenges associated with mentoring relationships and how these can be minimised to ensure the effectiveness of the relationship as a form of professional development. Further research is also needed to ascertain whether teachers perceive formal mentoring to be more successful than informal support they currently receive.

## BIBLIOGRAPHY

Abell, SK, Dillon, DR, Hopkins, CJ, McInerney & WD, O'Brien, DG. 1995. Somebody to count on. Mentor/intern relationship in a beginning teacher internship program. *Teaching and Teacher Education* 11(2) 173-188.

Adele, BL. 1998. Mentoring programs: Is there a difference in formal vs. informal? The Adele Lynn Leadership Group. Available at: [www.lynnleadership.com](http://www.lynnleadership.com) (accessed on 12/10/2010).

Adler, J. 2004. Research inside teacher education: The QUANTUM project, its context, some results and implications. Paper presented at the AERA conference in San Diego, April.

Alexander, RJ. 1997. *Policy and practice in primary education*. London: Routledge.

Allsop, T & Benson, A. 1996. *Mentoring for science teachers*. Bristol, PA: Open University Press.

Anderson, RD & Pratt, H. 1996. *Local leadership for science education reform*. Dubuque, IA: Kendall/Hunt.

Anderson, EM & Shannon, AL. 1988. Towards a conceptualization of mentoring. *Journal of Teacher Education* 39(1):38-42.

Andrews, DB & Quinn, JR. 2005. The effects of mentoring on first-year teachers' perceptions of support received. *The Clearing House* 78(3):110-116.

Arkava, ML & Lane, TA. 1983. *Beginning social work research*. Boston: Allyn and Bacon.

Arnold, J & Johnson, K. 1997. Mentoring in any career: *Human Resource Management Journal* 7(4):61-70.

Association of Mathematics Educators of South Africa (AMESA). 2003. Submission to the Department of Education on the National Curriculum Statement Grades 10-12 and in particular on the Mathematics and Mathematical Literacy Statements. Available at: <http://academic.sun.ac.za/mathed/amesa/Hearing.htm> (accessed on 24/11/2011).

Barneth, BG. 1995. Developing reflection and expertise: Can mentors make the difference? *Journal of Educational Administration* 33(5):45-59.

Bandura, A. 1986. *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Beck, J, Czermaik, CM & Lumpe, AT. 2000. An exploratory study of teachers' beliefs regarding the implementation of constructivism in their classrooms. *Journal of Science Teacher Education* 11(4):323-343.

Biggs, J. 2003. *Teaching for quality in higher education*. Buckingham: Society for Research into Higher Education and Open University Press.

Billington, D.D. 1996. Seven characteristics of highly effective adult learning programs. *New Horizons for Learning*. Seattle. *New Horizons*. <http://www.newhorizon.org> retrieved on 08/10/2010.

Blackwell, R & McLean, M. 1996. Mentoring new university teachers. *International Journal for Academic Development* 1(2):80-85.

Bogdan, RC & Biklen, SK. 1992. *Qualitative research for education: an introduction to theory and methods*. 2<sup>nd</sup> edition. Boston: Allyn and Bacon.

Bolam, R. 1988. What is effective INSET? Professional development and INSET. Proceedings from the 1987 NFER member conference. NFER.

- Borko, H & Mayfield, V. 1995. The roles of the cooperating teacher and university supervisor in learning to teach. *Teaching and Teacher Education* 11(5):510-518.
- Bostwick, GJ & Kyle, NS. 1981. Measurement, in *Social work research and evaluation*, edited by RM Grinnel. Itasca II Peacock. Pages 14-20.
- Bradbury, L & Koballa, T. 2008. Mentor advice giving in an alternative certification program for secondary science teachers: opportunities and roadblocks in developing a knowledge base for teaching. *Journal of Science Teacher Education* 18(2):817-840.
- Brill, JM. 2001. Situated cognition, in *Emerging perspectives on learning, teaching and technology*, edited by M Orey. Available at: <http://projects.coe.uga.edu/epltt/index.php?title=SituatedCognition> (accessed on 5/10/2011).
- Brown, JS & Duguid, P. 1993. Stolen knowledge. *Educational Technology* 33(3):10-15.
- Brown, JS, Collins, A & Duguid, S. 1989. Situated cognition and the culture of learning. *Educational Research* 18(1):32-42.
- Bullough, RV. 2005. Being and becoming a mentor: school-based teacher educators and teacher educator identity. *Teacher and Teacher Education* 21:143-155.
- Byrnes, RM. 1996. *South Africa: a country study*. Washington: GPO for the Library of Congress.
- Carter, M & Francis, R. 2000. Mentoring and beginning teachers' workplace learning. Paper presented at the Australian Association of Research in Education (AARE) Conference, Sydney, Australia.
- Chamberlain, C. 2001. Mentoring of graduate students at the School of Information and Library Science at the University of North Carolina at Chapel Hill. An unpublished master's dissertation, University of North Carolina, Chapel Hill.

Clark, NL & Worger, WH. 2004. South Africa- the rise and fall of apartheid. *Seminar Studies in History*. Pearson Education Limited, 48-52.

Clark, M, Riley, J, Wilkie, T & Wood, S. 1998. *Researching and writing dissertations in hospitality and tourism*. London: International Thompson Business Press.

Clinard, LM & Ariav, T. 1998. What mentoring does for mentors: a cross-cultural perspective. *European Journal of Teacher Education* 21(1):91-108.

Cohen, DK. 1995. What is the system in system reform? *Educational Researcher* 24(9):11-17.

Collinson, J, Vivienne, G & Kozina, E. 2009. Professional development for teachers: a world of change. *European Journal of Teacher Education* 32(1):3-19.

Cooper, DR & Schindler, PS. 2003. *Business research methods*. English edition. New York: McGraw Hill.

Costa, A & Kallick, B. 1993. Through the lens of a critical friend. *Educational Leadership* 51(2):49-51.

Creswell, JW & Miller, DL. 2000. Determining validity in qualitative inquiry. *Theory into Practice* 39(3):124-131.

Crowther, DT & Cannon, JK. 1998. How much is enough? Preparing elementary science teachers through science practicum. Paper presented at the Annual Meeting of the Association for the Education of Teachers of Science, Minneapolis, MN.

Darling, LW. 1989. Mentor types and life cycles. *Journal of Nursing Administration* 14(11):43-44.

Darling-Hammond, L. 2000. Teacher quality and student achievement: a review of state policy evidence. Available at: <http://epaa.asu.edu/epaa/v8n1> (accessed on 4/9/2005).

De Vaus 2002. *Surveys in social research*, London, UCL Press.

De Vos, AS. 2002. *Research at grass roots for the social sciences and human science professions*. Pretoria: Van Schaik.

Denzin, NK & Lincoln, YS. 2000. *Handbook of qualitative research*. London: Sage.

Desimone, L, Porter, AC, Garet, M, Yoon, K & Birman, B. 2002. Does professional development change teachers' instructions? Results from a three-year study. *Educational Evaluation and Policy Analysis* 24(2):81-112.

Dimmock, C. 1990. Managing for quality and accountability in Australian education. *Education Review*: 42(2):197-208.

Donaldson, SL, Ensher, EA & Grant-Vallone, EJ. 2000. Longitudinal examination of mentoring relationships on organizational commitment and citizenship behavior. *Journal of Career Development* 26:233-249.

Duffy, ML & Forgan, J. 2005. *Mentoring new special education teachers. A guide for mentors and programme developers*. California: Corwin Press.

Ekiz, D. 2006. Mentoring primary school student teachers in Turkey: seeing it from the perspectives of student teachers and mentors. *International Education Journal* 7(7):924-934.

Elliot, B & Calderhead, J. 1993. Mentoring for Teacher Development: Possibilities and Caveats, in *Issues in mentoring*, edited by T Kerry & AS Mayers. London: Routledge.



Evans, L & Abbott, I. 1997. Developing as mentors in school-based teacher training. *Teacher development* 1(1):135-148.

Even, R. 1999. Subject knowledge for teaching and the case of functions. *Educational studies in mathematics* 21(6):521-545.

Evenson, J.S. 1982. Workplace mentoring. *Far West Laboratory for Educational Research and Development*. ED 246182. Information Science References, San Francisco, CA.

Evertson, CM & Smithy, MW. 2000. Mentoring effects on protégés' classroom practices. An experimental field study. *Journal of Educational Research* 93:294-304.

Feiman-Nemser, S. 1999. A conceptual review of literature on new teacher induction. Unpublished manuscript, East Lansing, MI, National Partnership for Excellence and Accountability in Teaching.

Feiman-Nemser, S. 2001. Helping novices learn to teach: lessons from an exemplary support teacher. *Journal of Teacher Education* 52(1):17-30.

Foote, KE & Solem, MN. 2009. Towards better mentoring for early career faculty: results of a study of US geographers. *International Journal for Academic Development* 14(1):47-58.

Franke, A & Dahlgren, LO. 1996. Conceptions of mentoring: an empirical study on the conceptions of mentoring during the school-based teacher education. *Teaching and Teacher Education* 12(6):627-641.

Fresco, B. 1999. Mentoring and tutoring as preparation for prospective teachers. Paper presented at the International Conference on Teacher Education, 27 June-1 July, Israel.

Fullan, M. 1991. *The new meaning of educational change*. 2<sup>nd</sup> edition. New York Teachers' College Press.

Ganser, T. 1996. What do mentors say about mentoring? *Journal of Staff Development* 17(3):36-39.

Gliem, AJ & Gliem, RR. 2003. Calculating, Interpreting and Reporting Cronbach's Alpha Reliability Coefficient for Likert-type scales. Paper presented at the Midwest Research-to-Practice Conference in Audit, Continuing and Community Education, 8-10 October, Ohio State University, Columbus.

Gold, Y. 1996. Beginning teacher support: attrition, mentoring and induction, in. *Handbook of research on teacher education*, edited by J Sikula. New York: Macmillan :548-595.

Goodlad, S (ed). 1998. *Mentoring and tutoring by students*. London. Routledge

Goodyear, M. 2006. Mentoring: A learning collaboration. *EDUCAUSE* 29(4): 51-53

Gordon, S & Maxey, S. 2000. How to help beginning teachers succeed. 2<sup>nd</sup> edition. Interim evaluation report on the national mentoring pilot project. Unpublished report, Association for Supervision and Curriculum Development Kogan Page, Warwick University Center for Education and Industry, Alexandria, VA.

Gratch, A. 1998. Beginning teacher and mentor relationships. *Journal of Teacher Education* 49(3):220-227.

Graven, M. 2004. Investigating mathematics teacher learning within an in-service community of practice: the centrality of confidence. *Educational Studies in Mathematics* 57:177-211.

Greeno, JG. 1997. On claims that answers the wrong questions. *Educational Researcher* 26(1):5-17.

Griebelhaus, CR & Bowman, CL. 2000. Teaching mentors: is it worth the effort? *Journal of Educational Research* 95(4):246-254.

Griffins, GA. 1979. Guidelines for the implementation of staff development programmes, in *Staff development: new demands, new realities, and new perspectives*, edited by A. Leiberman & L. Miller. Columbia University, New York: Teachers College Press, Teachers College.

Guskey, TR. 2000. *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.

Hannan, A & Anderson, J. 2007. *Questionnaires in education research*. Faculty of Education, University of Plymouth.

Harrison, J, Dymoke, S & Pell, T. 2006. Mentoring beginning teachers in secondary schools: an analysis of practice. *Teacher and Teacher Education* 22:1055-1067.

Hayashi, Y & O'Donnell, RC. 2010. A review of mentoring studies and websites: a report for the Melissa Institute for the Prevention and Treatment of Violence. Available at: [www.melissainstitute.org/documents/TMIMentoring](http://www.melissainstitute.org/documents/TMIMentoring) (accessed on 1/4/2011).

Hayward, LM. 2001. Curriculum-based electronic peer mentoring. An instructional strategy for integrative learning. *Journal of Physical Therapy Education* 15(4):14-25.

Hea-Jin, L. 2001. *Enriching the professional development of mathematics teachers*. Columbus, OH: ERIC. Clearinghouse for Science, Mathematics and Environmental Education.

Healy, CC &Welchert, AJ. 1990. Mentoring relations: a definition to advance research and practice. *Educational Researcher* 19:17-21.

Henning, E, Van Rensburg, W &Smit, B. 2004.*Finding your way in qualitative research*. Pretoria: Van Schaik.

Hobson, AJ. 2002. Student teachers' perception of school-based mentoring in initial teacher training. *Mentoring and Tutoring: Partnership in Learning* 10(1):5-20.

Hobson, AJ, Ashby, P.,Malderez, A & Tomlinson, PD. 2009. Student teachers' experiences of initial teacher preparation in England: core themes and variation. *Research papers in Education* 23(4):407-433.

Hudson, P. 2007. Examining mentors' practices for enhancing pre-service teachers' pedagogical development in mathematics and science.*Mentoring and Tutoring: Partnership in Learning* 15(2):201-217.

Hudson, P. 2004. Specific mentoring: a theory and model for developing primary science teaching practices. *European Journal of Teacher Education* 27(2):139-146.

Hudson, P. 2004a. Subject specific mentoring for developing primary teaching strategies. *International Journal of Practical Experience in Professional Education* 8(2):18-28.

Hudson, P &Gencer, S.A, 2009.Employing the five-factor mentoring instrument: analyzing mentoring practices for teaching primary science.*European Journal of Teacher Education* 22(1).

Hudson, P &Skamp, K. 2003.Mentoring pre-service teachers of primary science.*The Electronic Journal of science Education* 7(1).

Hudson, P., Usak, M. & Gencer, S.A. 2010. Benchmarking mentoring practices: a case study in Turkey. *Eurasia Journal of Mathematics, Science & Technology Education* 6(4):245-252.

Huling, L. & Resta, V. 2001. *Teacher mentoring as professional development*. ERIC Document Reproduction Service, No. ED460125.

Isikoglu, N., Ivrendi, A. & Sahin, A. 2007. *An in-depth look at the process of student teaching through the eyes of candidate teachers*. Educational Research, Vol 49, No.3 page 225

Jipson, J. & Pauley, N. 2000. *Questions of you and the struggle of collaborative life*. New York: Peter Lang.

Johnson, K.F. 2002. *Being an effective mentor: how to help beginning teachers succeed*. California: Corwin Press.

Johnson, S. 2004. *Finders and keepers*. San Francisco, CA: Willey.

Kelly, M., Beck, T. & Thomas, J. 1992. Mentoring as a staff development activity, in *Mentoring in schools*, edited by M Wilkin. London: Kogan Page.

Kerlinger, F.N. 1986. *Foundations of behavioural research*. 3<sup>rd</sup> edition. Port Worth, Harcourt.

Kerry, T. & Mayers, S.A. 1995. *Issues in mentoring*. London: Routledge.

Kirshner, D. & Whitson, J.A. 1997. *Situated cognition: social semiotic and psychological perspectives*. Mahwah, NJ: Lawrence Erlbaum.

Knowles MS 1990. *The adult learner: a neglected species*. 4<sup>th</sup> edition. Houston, TX: Gulf Publishing.

Kochran FK &Pascarelli JT, (eds). 2003. *Global Perspectives on mentoring: transforming contexts, communities and cultures*. Connecticut: Information Age Publishing.

Kochran, FK &Trinbe, SB. 2000.From mentoring to co-mentoring.Establishing collaborative relationships.*Theory in Practice* 39(1): 17-25

Kram, KE. 1985. *Mentoring and work: developmental relationships in organizational life*. Glenview, IL: Scott, Foresman.

Kriek, J. 2005. Construction and evaluation of a holistic model of professional development of physics teachers in distance education. Unpublished dissertation. Pretoria: University of South Africa.

Lam, Shur-fong, 1999. Educators' opinion on classroom observation as a practice of staff development and appraisal.*Teaching and Teacher Education* 17(2):161-173.

Lankau, MJ &Scandura, TA. 2002. An investigation of personal learning in mentoring relationships: content, antecedents and consequences. *The Academy of Management Journal* 45(4): 779-790

Laridon P. 1993.Towards transforming mathematics education in South Africa.*Pythagoras* 31(1):41-68.

Lauer, PA. 2006. *An education research primer: how to understand and evaluate it*. San Fransisco: Jossey-Bass.

Lave, J. 1988. *Cognition in practice: mind, mathematics and culture in everyday life*. Cambridge UK: Cambridge University Press.

Lave, J & Wenger, E. 1991. *Situated learning: legitimate peripheral participation*. New York: Cambridge University Press.

Lee, JC &Feng, S. 2007. Mentoring support and the professional development of beginning teachers: a Chinese perspective.*Mentoring and Tutoring: Partnership in Learning* 15(3):243- 263.

Leedy, PD. 1992. *Practical research, planning and design*. New York: Prentice Hall.

Leedy, PD &Ormorod, J.E. 2005.*Practical research: planning and design*. Upper Saddle River,NJ: Pearson Meril Prentice Hall.

Lenton, G & Turner, G. 1999.Student teachers' grasp of science concepts. *The Journal for Science Education* 81(295):67-72.

Lerman, S. 2001. Cultural, discursive psychology: a sociocultural approach to studying the teaching and learning of mathematics. *Educational Studies in Mathematics* 46:87-113.

Lloyd, SR, Wood, TA & Moreno, G. 2000. What's a mentor to do? *Teaching Exceptional Children* 33(1):38-42.

Luneta, K. 2003. Developing piloting and evaluating a mentor training programmes for primary school teachers in Swaziland. Unpublished doctoral thesis. Johannesburg, SA: University of Witwatersrand.

Luneta, K. 2006. Mentoring as professional development in Mathematics Education: A teaching practicum perspective.*Education as Change* 10(1):17-25.

Mathias, H. 2005. Mentoring on a programme for new university teachers: a partnership in revitalizing and empowering collegiality.*International Journal for Academic Development* 10(2), 95-106.

Maynard, T. 2000. Learning to teach or learning to manage mentors? Experiences of school-based teacher training.*Mentoring and Tutoring: Partnership in Learning* 8(1):17-30.

- Maynard, T & Furlong, J. 1993. Learning to teach and models in mentoring, in *Issues in mentoring*, edited by T Kerry & AS Mayers. London: Routledge.
- McCann, I & Radford, R. 1993. Mentoring for teachers: the collaborative approach, in *The return of the mentor: strategies for workplace learning*, edited by BJ Cadwell & EM Carter. Washington, DC: Falmer Press.
- McLellan, H. 1995. *Situated learning perspectives*. Englewood Cliffs, NJ: Educational Technology Publications.
- McLaughlin, C. 2002. Learning support in distance and networked learning environments: ten dimensions for successful design. *Distance Education* 23(2):149-162.
- McIntyre, D & Hagger, H. (eds). 1996. *Mentors in schools: developing the profession of teaching*. London: David Fulton Publishers Ltd.
- McMillan, JH & Schumacher, S. 1997. *Research in education: a conceptual introduction*. New York: Longman.
- Merriam, S & Caffarella, R.S. 1991. *Learning in adulthood. A comprehensive guide*. San Francisco: Jossey-Bass.
- Miller, A. 2002. *Mentoring students and young people*. London: Kogan Page.
- Missouri Department of Elementary and Secondary Education (MDESE). 2005. *Missouri professional development guidelines for student success*. [http://dese.mo.gov/divteachqual/leadership/pg\\_guidelines/index.html](http://dese.mo.gov/divteachqual/leadership/pg_guidelines/index.html), pages 4-8 (retrieved 12/09/2010).
- Moran, S. 1990. Schools and the beginning teacher. *Phi Delta Kappan* 72(3):210-213.



Moss, J. 2010. A partnership in induction and mentoring: noticing how we improve our practice. *Australian Journal of Teacher Education* 35(7):43-53.

Mouton, J. 2001. *How to succeed in your masters and doctoral studies: a South African guide and resources book*. Pretoria: Van Schaik.

Mthethwa TM. 2007. Teachers' views on the role of context in mathematical literacy. A research report submitted to the School of Science Education in the Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science.

Mullen, C. 2000. Constructing co-mentoring partnerships: walkways we must travel. *Theory into Practice* 39(1):4-11.

Murray, M. 1991. *Beyond the myths and the magic of mentoring: how to facilitate an effective mentor program*. San-Francisco: Jossey Bass.

Nankivel, C & Shoolbred, M. 1997. Mentoring in library and information science. A literature review and report on recent research. *New Review of Academic Librarianship* 5:91-114.

National Academy of Science (NAS), 1997. *Adviser, teacher, role model, friend. On being a mentor to students in science and engineering*. Washington DC: National Academy Press.

National Council of Teachers of Mathematics (NCTM), 2000. *Principles and standards for school mathematics*. Reston, VA: Author.

National Education Association, 1999. *A better beginning. Helping new teachers survive and thrive*. Washington DC: National Education Association.

Norman, PJ & Feiman-Nemser, S. 2005. Mind activity in teaching and mentoring. *Teaching and teacher Education* 21:679-697.

Okan, Z & Yildirim, R. 2004. Some reflections on learning from early school experience. *International Journal of Educational Development* 24(6):603-616.

Organisation of Economic Cooperation and Development (OECD), 1998. *Staying ahead: in-service training and professional development*. SAGE Publications, London.

Orland-Barak, L. 2005. Lost in transition: mentors learning to participate in competing discourses of practice. *Journal of Teacher Education* 56(4):355-366.

Orland-Barak, L & Klein, S. 2005. The expressed and the realized: mentors' representations of a mentoring conversation and its realization in practice. *Teaching and Teacher Education* 21:379- 402.

Ormond, JE. 1999. *Human Learning*, (3<sup>rd</sup> edition). Upper Saddle River, NJ: Prentice Hall.

Parsole, E. 1999. The manager as coach and mentor. *The Coaching and Mentoring Network*, Oxford, CIPD Publishing.

Programme for International Student Assessment (PISA). 2000. *Organisation for economic cooperation and development*. Paris, OCED.

Ragins, BR. 1999. Mentor functions and outcomes: a comparison of men and women in formal and informal mentoring relationships. *Journal of Applied Psychology* 84(4):529-550.

Roehring, AD, Bohn, CM, Turner, JE & Pressley, M. 2008. Mentoring beginning primary teachers for exemplary teaching practices. *Teacher and Teacher Education* 24:684-702.

Shea GF. 2002. *Mentoring: how to develop successful mentor behaviours*. Menlo Park, CA: Axzo Press.

Shulman, LS. 1987. Knowledge and teaching: foundations of the new reform. *Harvard Educational Review* 57:1-22.

Sinclair, C. 1997. Redefining the role of university lecturer in school-based teacher education. *Asia-Pacific Journal of Teacher Education*, 25(3), 309-324.

Slavin, RE. 2006. *Educational psychology: theory and practice*. New York: Pearson Publishing.

Smagorinsky, P, Cook, LS, Moore, C, Jackson, AY & Fry, PG. 2004. Tensions in learning to teach: accommodation and the development of teacher identity. *Journal of Teacher Education* 55(1):8-24.

South Africa. Department of Education 2003. *National curriculum statement, grades 10-12 (mathematical literacy)*. Pretoria: Government Printer.

Sparks, D. 2002. *Designing powerful professional development for teachers and principals*. Oxford, OH: National Staff Development Council.

Sparks, D & Loucks-Horsely, S. 1990. Models of staff development, in *Handbook of research on teacher education*, edited by WR Houston. New York: Macmillan.

Specks, M. 1996. Best practice in professional development for sustained educational change. *ERS Spectrum*. 33-41.

Spencer, C. 1996. *Mentoring made easy. A practical guide for managers*. Office of the Director of Equal Opportunity in Public Employment, NSW Government Publications. TFAFE NSW, 1995, Guide to mentored learning, Manufacturing Training Division.

Stanulis, RN, 1995. Classroom teachers as mentors: possibilities for participation in a professional development school context. *Teaching and Teacher Education* 11(4):331-344.

Stanulis, RN & Floden, ER. 2009. Intensive mentoring as a way to help beginning teachers develop balanced instruction. *Journal of Teacher Education* 60(2):112-122.

Stanulis, RN & Russel, D. 2000. "Jumping in": trust and communication in mentoring student teachers. *Teaching and Teacher Education* 16(1):65-80.

Starcevich, MM. 2005. Characteristics of the most effective mentors. *Post Residential Newsletter* 2(12).

Starcevich, MM. 2009. Coach, mentor, is there a difference? Resources for the coaching and mentoring process. Available at: [matt@coachingandmentoring.com](mailto:matt@coachingandmentoring.com) (accessed on 02/05/2010)

Stoll, L, Earl, L & Fink, D. 2003. *It's about learning (and it's about time): what's in it for schools?* London: RoutledgeFalmer.

Straus, A & Cobin, J. 1990. *Basics of qualitative research: grounded theory, procedures and techniques*. London, Routledge.

Stubbs, R. 2005. Report at the heart of business and public life. Available at: <http://www.mori.com/quantitativeindex.shtml> (accessed on 7/9/2011).

Sundli, L. 2007. Mentoring: a new mantra for education? *Teaching and Teacher Education* 23(2):201-214.

Sweeny, B. 2001. Is informal or formal mentoring needed? Available at: [www.mentoring-association.org](http://www.mentoring-association.org) (02/05/2010).

Sweeny, B. 2002. A re-vision of the characteristics of effective mentors. Available at: [www.mentoring-association.org](http://www.mentoring-association.org) (02/05/2010)

Sweeny, B. 2008. Formal or informal mentoring? Best practice resources. Available at: [www.teachermentors.com](http://www.teachermentors.com) (02/05/2010).

Taylor, B., Kermode, S., and Roberts, K. 2007. Research in Nursing and Health care: evidence for practice 3<sup>rd</sup> edition, South Melbourne, VIC, Thomson

Taylor, SE, 1987. The California mentor teacher program: a preliminary evaluation of one's district program. *International Journal of Mentoring* 1(1):27-30.

Torres-Guzman, ME & Godwin, A.L. 1995. Urban bilingual teachers and mentoring for the future. *Education and Urban Society* 28(1): 48-66

Treasury Board of Canada (TBC). 2001. Informal and formal mentoring. Available at: [www.eowa.gov.au](http://www.eowa.gov.au) (accessed on 02/08/2010).

ValencicZuljan, M & Vogrinc, J. 2007. A mentor's aid in developing the competencies of teacher trainees. *Educational Studies* 33(4):373-384.

Van Ast, J. 2000. *Community college mentoring program: mentor-mentee handbook*. Ames, IO: College of Education, Iowa State University of Science and Technology.

Weaver, Kand Olson, JK. 2006. Understanding paradigms used for nursing research: *Journal of Advanced Nursing* 53(4) 459-469

Webb, LP, Montello, PA & Norton, MS. 1994. *Personnel administration in education. New issues and needs in human resource management*. 2<sup>nd</sup> edition. Columbus, OH; Merrill.

Wenger, E. 1998. *Communities of practice: learning meaning and identity*. Cambridge, UK: Cambridge University Press.

Wertsch, JV, Del Rio, P & Alvarez, A. 1995. Sociocultural studies: history, action and mediation, in *Sociocultural studies of the mind*, edited by JV Wertsch, P del Rio & A Alvarez. Cambridge, UK: Cambridge University Press:1-34.

Wilman, TA, Magliaro, SG, Niles, RA & Niles, JA. 1992. Teacher mentoring and analysis of roles, activities and conditions. *Journal of Teacher Education* 43:205-213.

Wojnowski, BS, Bellamy, ML & Cooke, S. 2003. *A review of literature on the mentoring and induction of beginning teachers with an emphasis on the retention and renewal of science teachers*. Virginia: National Science Association Press.

Wolf, N. 2003. Learning to teach mathematics for understanding in the company of mentors. *Teachers and Teaching: Theory and Practice* 9(2):87-106.

Yalow, R. 2003. Banquet speech at the Nobel Banquet, December 1997, The Nobel Foundation, Stockholm.

Yosha, P. 1991. The benefits of an induction program: What do mentors and novices say? Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL ED 332 994.

Young, AM & Perrewé, PL. 2000. What did you expect? An examination of career-related support among mentors and protégés. *Journal of Management* 26(4):611-632.

Yusko, D & Feiman-Nemser, S. 2008. Embracing contraries: combining assistance and assessment in new teacher induction. *Teacher College Record*, 110(7):1-12.

Zachary, LJ. 2001. The role of a teacher as a mentor. *New Directions for Adults and Continuing Education* 93:27-38.

Zanting, A, Verloop, N & Vermunt, JD. 2003. How do students teachers elicit their mentor teachers' practical knowledge? *Teachers and Teaching: Theory and Practice* 9(3):197-211.

Zanting, A, Verloop, N, Vermunt, JD & Van Driel, JH. 1998. Explicating practical knowledge: an extension of mentor teachers' roles. *European Journal of Teacher Education* 21(1):11-28.

## Appendix A

### Questionnaire (To be answered by mathematical literacy teachers)

#### Section A

Indicate the level and quality of the support you received or have been receiving during your years of teaching mathematical literacy.

**KEY: A rating of 1 indicates that no such activity occurred. A rating of 5 indicates a regular occurrence and a high degree of success.**

1. A specific person from whom to obtain information on handling school procedures  
2      3      4      5  
1
2. Regular assistance on key objectives to be taught  
1    2    3    4    5
3. Assistance from colleagues in developing learner assessments  
2      3      4      5  
1
4. Training in classroom management skills with strategies modelled by experienced colleagues  
1    2    3    4    5
5. Regular meetings with experienced teachers who teach your grade level or content area  
2      3      4      5  
1
6. An experienced teacher observing in your classroom  
1    2    3    4    5
7. Assistance from colleagues in modifying teaching strategies to meet individual learner needs  
1    2    3    4    5
8. Assistance in accessing needed classroom resources  
1    2    3    4    5



**SECTION B: Mentoring roles and functions.**

Which of the following are functions of mentoring?

- (a) Teaching (b) Encouraging (c) Supporting (d) Counselling (e) Guiding (f) Providing feedback.

Are there any other functions of a mentor that you can think of?

i).....  
.....

ii).....  
.....

Please indicate the degree to which you agree with each statement below by circling the appropriate scale to the right of each statement

Key: 1= Strongly disagree 2= Disagree 3= Uncertain 4= Agree 5= Strongly agree

1. My mentor should be supportive in the teaching of mathematical literacy
 

					1				2
	3	4	5						
  
2. My mentor should feel comfortable in talking to me about mathematical literacy teaching
 

									1
	2	3	4	5					
  
3. My mentor should instil a positive attitude in me towards teaching mathematical literacy
 

									1
	2	3	4	5					
  
4. My mentor should assist me to reflect on improving my mathematical literacy teaching
 

									1
	2	3	4	5					
  
5. My mentor should make me feel more confident as a mathematical literacy teacher
 

									1      2
	3	4	5						

6. My mentor should listen to me attentively on mathematical literacy teaching matters
- 1 2
- 3 4 5

## SECTION C

Question 1:

- a. When you started as mathematical literacy teacher, was there any individual (other than a spouse or a family member) who took a personal interest in enhancing, enriching, or otherwise encouraging your development as professional teacher? Yes No
- b. If “no”, do you wish you had such a relationship?  
Yes No
- c. Was there more than one such person?  
Yes No
- d. If your answer to question 1(c) is “yes”, please decide which of these persons had the greatest influence on you, and use information about that person in answering any relevant questions that follow.

Question 2:

- a. How would you categorise that person? Please be sure your answers apply only to the person who had the greatest influence on you.
  - i. Peer /fellow teacher
  - ii. Immediate supervisor at place of employment
  - iii. Other superior at place of employment
  - iv. Other co-worker
  - v. Other (specify)

For questions 3- 14, please indicate your response by circling the appropriate number on the scale following each question, where 1= strongly disagree and 5= strongly agree.

3. This person teaches me useful technical skills

1 2 3 4 5

4. This person provides me with encouragement and praise

2 3 4 5

1

5. This person helps me to learn about the political dynamics of my workplace and/or profession
- 1 2 3 4 5
6. I often turn to this person for advice 1
- 2 3 4 5
7. This person provides me with emotional support 1
- 2 3 4 5
8. This person exemplifies and encourages me to follow professional standards
- 1 2 3 4 5
9. I view this person as a role model 1
- 2 3 4 5
10. My relationship with this person has been beneficial to me professionally 1
- 2 3 4 5
11. My relationship with this person has been beneficial to me on a personal level
- 1 2 3 4 5
12. I consider this person to be my mentor
- 1 2 3 4 5
13. My relationship with this person has influenced my career decisions
- 1 2 3 4 5
14. I am grateful for the relationship with this person 1
- 2 3 4 5
15. How did your relationship with this person develop?
- a. assigned as part of a formal mentoring program
  - b. I initiated the relationship
  - c. this person initiated the relationship
  - d. unable to determine: It just "happened"
  - e. other (please explain)
16. a) Did you have a relationship of this nature with another person prior to becoming a mathematical literacy teacher?
- b) If "yes", did that relationship influence your decision to become a mathematical literacy teacher?

## **Appendix B**

### **Interview schedule**

1. What do you do when you encounter difficulties in the teaching of mathematical literacy?
2. How often do you get help from your colleagues?
3. Are you satisfied with the assistance you receive?
4. What form of assistance do you normally receive from your colleagues?
5. How do you evaluate the teaching, guidance and counselling that you receive from your colleagues?
6. What do you think your colleagues, especially those teaching mathematics, should do in order to help you in your professional and personal development?
7. Can you say that those who assist you are your mentors?

## Appendix C

P.O. Box 9113

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12<sup>th</sup> February,

2010

The APO Manager

Taung

Dear Sir,

### **PERMISSION TO CONDUCT RESEARCH IN SELECTED SCHOOLS**

**JAMES OWUSU-MENSAH (Student no. 0851 233 7).**

I hereby apply for permission to conduct research in some selected schools in the APO. I am currently registered for the PhD degree in Mathematics Education at UNISA.

My research topic is “Mentoring as a professional development for Mathematical literacy teachers in Greater Taung area”.

A sample of ten schools in the APO will be involved in the research.

I intend to conduct interviews from the 16<sup>th</sup> March to the 4<sup>th</sup> April, 2010.

I would be thankful if you could grant this permission.

Yours truly,

J. Owusu-Mensah.





















