UNIVERSITY OF ZULULAND

EXPERIENCES OF TEACHERS IN TEACHING MATHEMATICAL LITERACY IN THE FURTHER EDUCATION AND TRAINING PHASE

by

Patience Nompumelelo Memela

A DISSERTATION SUBMITTED TO THE FACULTY OF EDUCATION IN FULFILMENT OF THE REQUIREMENTS FOR THE MASTER'S DEGREE IN THE DEPARTMENT OF EDUCATIONAL PSYCHOLOGY AND SPECIAL EDUCATION AT THE UNIVERSITY OF ZULULAND

Supervisor: Prof. D.C. Sibaya

February 2020

DECLARATION

I, Patience Nompumelelo Memela hereby declare that this study titled “Experiences of teachers in teaching mathematical literacy in the Further Education and Training” is my work and has not been submitted for any degree or examination at any University. All sources that I have used, have been indicated, cited and acknowledged by means of complete references.

P.N. Memela

ACKNOWLEDGEMENTS

To God be the Glory. My sincere gratitude goes to the Man above, The Almighty God who has provided me with strength, patience and facilitated my studies. It was not through my knowledge nor power that I have come this far, but through his amazing love and grace towards me. Thank you Father.

To my supervisor Prof D.C. Sibaya and the late Prof P.T. Sibaya who were my source of inspiration. Their support, encouragement and guidance is highly appreciated.

To the teachers of King Cetshwayo District for participating in my study and to mathematical literacy education specialist (Mrs Mdiniso) and principals of schools of King Cetshwayo District who gave me the opportunity and allow me to conduct my research. Thank you so much.

My sincere gratitude goes to my family, my parents and my siblings (Nokuthula and Nokulunga) for everything they have done in my life. You contributed a lot to my studies in different ways. Thank you boNgomane, Mqomboli.

My special appreciation goes to my husband (Sifiso) for his encouragement and support, love and affection, understanding, assistance, caring and encouragement throughout my hard work. Thank you so much Gambu, Msuthu. My children Anele, Mvelo, Zasesuthu and Abelo, thank you for understanding your busy mother and your cooperation by giving me time to study without disturbing me. *Ngiyabonga bantwana bami.*

DEDICATION

This work is dedicated to my family, my husband Sifiso, mom and dad, my siblings (Nokuthula and Nokulunga) and my children who are my source of inspiration and the reason why I live.

ABSTRACT

This study investigated the relationship between teachers' demographic data and their experiences in teaching Mathematical Literacy (ML) in the Further Education and Training (FET) Phase. It also investigated participants' experiences when teaching ML in the FET Phase and the strategies they used during this process.

The introduction of ML in 2006 in South African schools by the Department of Basic Education was largely aimed at capacitating South African citizens with knowledge and skills to contribute to a democratic society and economy. Despite curriculum developers' claim that they had streamlined the ML curricula, teachers lacked the experience to teach ML.

The study was conducted in the King Cetshwayo District in the KwaZulu Natal province. Purposive sampling was used to select a population of 301 teachers and a sample size of 150 teachers with first-hand experience of teaching mathematical literacy in the FET phase was used. The positivism paradigm framed this study when measuring participants' perceptions of experiences in teaching ML in the FET phase. The quantitative data was collected using a questionnaire and a descriptive research design was used.

The findings revealed that teachers must possess strong mathematical knowledge and that ML teachers must integrate ML with other subjects to put mathematics content into real-life contexts. Half of the study sample were under the age of 40 years and most of them were females; implying that young teachers were engaged in the teaching ML. The study showed that participants' experiences in teaching ML ranged between 0-13 years and most of them have a university degree; implying that they are highly educated. There were 141 respondents, out of 150, who were of the African race and 9 mixed-race respondents.

The study recommends that in-service teachers must be retrained to improve the facilitation and understanding of the subject content and the ability to select and implement effective ML teaching strategies. The Department of Education should conduct workshops regularly and provide adequate resources to support ML teachers.

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACE	: Advanced Certificates of Education
FET	: Further Education and Training
HEIs	: Higher Educational Institutions
DoE	: KwaZulu-Natal Department of Education
ML	: Mathematical Literacy
MCK	: Mathematical Content Knowledge
PCK	: Pedagogic Content Knowledge
PCF	: Principal Component Factor Analysis
KMO	: Kaiser-Meyer- Okin
EFA	: Eigenvalues of Factor Analysis

Table of Contents

CHAPTER 2

CHAPTER 3

CHAPTER 5

CHAPTER 1

Theoretical overview of the study

1.1 Introduction

The study investigated the relationship between teachers' demographic data and their experience in the teaching of mathematical literacy in the Further Education and Training (FET) phase. It is also concerned with finding teachers' experiences in the teaching of Mathematical Literacy (ML) in the Further Education and Training phase. Furthermore, it explored the methods used by teachers in the teaching of Mathematical Literacy. This chapter presents the background of the study, problem statement, the rationale for the study, research questions, and objectives of the study and the operational definition of terms. An outline of the chapters in the research study is also given at the end of the chapter.

1.2 Background of the study

The study focuses on teachers' understanding of the value of Mathematical Literacy (ML), not only as the concept, but also as the nature, of mathematics and its transformative purpose and possibilities.

The introduction of ML as a subject was intended to benchmark internationally in order to strengthen knowledge and skills that would be used in and contributed to a democratic society and economy of the country (Department of Education [DoE], 2003). Many people in South Africa showed a low level of mathematics competency which affected the employment and economic development due to lack of numerical skills (DoE, 2003). The government had to address the issue so that learners would be able to function, negotiate and become citizens who could contribute to the world's economy and be able to do mathematical calculations and problems (Bansilal, Webb & James, 2015).

Language plays a crucial role in mathematics and mathematical literacy. Without language, teachers and mathematicians would not be able to transfer new information, their understanding and the development of new ideas. Language usage is essential

in concept development, relationship and understanding the world around us (Adams, 2010).

1.3 Problem Statement

The research focused on Mathematical Literacy (ML) teachers' experiences when teaching ML in the Further Education and Training Phase, that is, in Grades 10-12. According to Kapacu and Yildirimi (2014), the curriculum developers claimed that they had prepared the new mathematics curricula by considering the needs of the society, the educational developments in the world and changes in science and technology.

Bansilal, Mkhwanazi and Mahlabela (2012) claimed that the purpose of ML in SA is specifically to improve the numeracy skills of citizens. The study conducted by Dede (2013) focused on the teaching experience of teachers. Jita and Akpo (2013) investigated the relationship between teachers' academic qualification and students' academic achievements. Literature on ML teachers' experiences of teaching in the FET Phase is rarely found. Hence this study is mainly concerned about that.

The research questions were posed as follows:

1.3.1 What is the relationship between teachers' demographic data and the experiences in teaching Mathematical Literacy in the FET Phase?

1.3.2 What are the teachers' experiences with regards to the teaching of Mathematical Literacy in the FET Phase?

1.3.3 What strategies do teachers use in handling Mathematical Literacy in the classroom?

1.4 The rationale for the study

In my teaching experience, I have observed that mathematical literacy teachers were not trained to teach ML in the FET Phase. Teachers were selected according to their high-school-level mathematical knowledge. Mathematics and Science teachers were among those selected. Because of shortage of ML teachers in the field, “non-mathematics teachers like Geography and History teachers had to be retrained when ML was implemented in 2006. This contributed to the complexity of ML teacher education (Fransman, 2010),

Several studies have been conducted on ML, but I could not trace any study that had explored the experiences of ML teachers in the FET phase. Therefore, I decided to employ a field or descriptive approach in order to fill this gap. I was inspired to conduct the study by the fact that one of the aims of education is to improve the quality of teaching and learning and to strengthen knowledge and skills that will be used in and contributed to a democratic society and economy of the country.

1.5 THE OBJECTIVES OF THE STUDY

Objectives of this study were:

1.5.1 To determine the relationship between teachers’ demographic data and their experiences in teaching Mathematical Literacy in the FET Phase.

1.5.2 To determine the teachers’ experiences in the teaching of Mathematical Literacy in the FET Phase, in terms of

(i) Pedagogic content knowledge

(ii) Curriculum Design

(iii) Resources

(iv) Policies related to mathematical literacy

1.5.3 To identify teaching strategies used by ML teachers in the classroom.

1.6 OPERATIONAL DEFINITION OF TERMS OR CONCEPTS

1.6.1 Mathematical Literacy

In this research, the term “Mathematical Literacy” (ML) shall mean a subject that is offered to grade 10-12 learners who are not studying mathematics (Vilakazi, 2010).

1.6.2 Teachers

Teachers are educators who are teaching ML in grades 10-12.

1.6.3 Further Education and Training Phase

Further Education and Training phase is grade 10-12 for learners who are studying ML.

1.7 LIMITATIONS OF THE STUDY

The researcher acknowledges that the study had certain limitations. A common limitation is when the respondents do not respond truthfully to items on an instrument like questions; their response reflects neither true perception nor the perception of the population from which they were drawn (Prince & Murnan, 2004). From this study, respondents could have listed any strategies even if they do not use them in class.

This study was conducted in the King Cetshwayo District in KZN. Some circuits were not represented since the district is too big. The sample consisted of 150 respondents; this means that not all teachers were represented in the study since the researcher could not reach those schools. A quantitative research method was used in the study. The study used mostly African public schools therefore not all the races were represented in the study; this could also hinder the actual results. In this study, the focus was only on teachers who are fully engaged with the teaching of ML in the classroom; subject education specialists were not part of the study. Other researchers can conduct research on the things that were not covered in this study.

1.8 Method of investigation

1.8.1 Research design

The researcher used a field study/ descriptive approach. This type of research is also referred to as ex-post facto research. The descriptive research design and ex post factor research design are both non- experimental research designs. The descriptive research design was used in this study because it incorporates the first research question on demographic data which best describes the sample.

In education, we conduct research with the aim of understanding the basis of successful school achievement. In this instance, we faced many possibilities - for example: intelligence, aptitude, learners' motivational levels, teachers' roles, and teaching methods. The most unpleasant fact is that we could not control these variables. In this type of research, variables were inherently not manipulable (Kerlinger, 1972 & Turney & Robb, 1971).

Descriptive studies are concerned with the following research questions: describing certain characteristics of populations, i.e., aims at providing accurate quantitative information about certain population characteristics, e.g., how many people in a community had certain problems or needs, to ascertain the existence of an association between variables, e.g., was there a correlation between examination fears and pupils' personality? Or to what extent does the level of education affect income? Many research problems in education do not lend themselves to experimental inquiry. Experimentation was impossible with research problems involving the following variables: intelligence, aptitude, home background, parental upbringing, teacher's personality, school atmosphere, etc. In this context, descriptive research was more important than experimental research.

Many research problems dealt with existing facts, prevailing conditions, the status of phenomena, processes that are ongoing, i.e., "what we want and how to get there." By identifying causes retrospectively, the research approach qualifies as a descriptive /field study.

1.8.2 Description and selection of participants

The researcher used a purposive sampling, where a group of individuals were identified from the population and subjects drawn from these groups (McMillan & Schumacher, 2014). Purposive sample is more common in qualitative research but can be used in quantitative research if the researcher has the predetermined knowledge that the participants are in the best position to provide the researcher with the information needed for the study (Kumar, 2014). In this study the ML teachers were the only ones who could provide information about their experiences and strategies they use in teaching ML

In this study, different high schools from the King Cetshwayo District were used. Senior, junior, male and female teachers were selected to take part in the research.

1. 8.3 Description of procedures

The researcher requested permission from the University of Zululand to conduct the research and submitted it to the Head of Department in the DoE District Office, so that they would be aware of the research that would be taking place. The researcher acquired permission to conduct research in schools by requesting permission from the principals of those schools.

1.8.4 Research instrument

The researcher used a questionnaire as a data-collection technique. Questionnaires consisted of closed-ended questions and open-ended questions. The researcher obtained information from respondents by using a questionnaire containing questions which were answered in writing.

1.8.5 Data analysis

A quantitative data analysis method was used in closed-ended questions with options to choose from and open-ended questions.

1.9 ETHICAL CONSIDERATIONS

The researcher took into consideration the individual's human rights when conducting the research, as stipulated in the South African constitution. The researcher explained the purpose and process of the research to the participants and that they were free to decide not to participate if they did not want to. The researcher made it clear to the participants that it was their choice and there would be no negative consequences if they decided not to participate. To protect their privacy, the researcher explained that their names would never be disclosed. The researcher used the language which would be most understandable to the participants. The process started at the schools where the researcher had applied to acquire permission from the principals in order to conduct the research in their schools. The researcher requested the principals to sign the letter and fill in the consent form if he or she agreed that the school would take part in the research. The teachers who took part in the research also signed the letter and the consent form to agree to take part in the research.

1.10 PLAN OF STUDY

The research is reported in five chapters as follows:

Chapter 1

This chapter introduced the topic and aims of the study, and its purpose and objectives. It outlined the motivation for the study to be undertaken.

Chapter 2

The existing literature of studies conducted in this field, relevant to this study, were reviewed in this chapter.

Chapter 3

This chapter presented the methodology - the research design, description and selection of participation, research instrument, data analysis, description of procedures and laws that guided the researcher.

Chapter 4

This chapter presented the data obtained and the analysis thereof.

Chapter 5

This chapter concluded the research report. It covered the discussion of findings, implications and contribution of the study, recommendations, limitations and conclusion.

1.11. Chapter conclusion

This chapter provided the background and outline of the research problem which investigated the experiences of teachers in the teaching of ML in the FET phase. The introduction focused on the background of ML as a subject and outlined the motivation for the study to be undertaken by the researcher. The existing literature of the study was reviewed. The purpose of the study was elucidated in line with the research questions and objectives of the study. Definition of terms, research methodology and plan of the thesis of this study were discussed and chapters to follow were outlined.

The next chapter provided a review of the related literature that informed the study. In particular, the experiences of teachers in the teaching of ML in the FET phase.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed literature which was pertinent to the experiences of Mathematical Literacy (ML) teachers. It is organised following the order of the objectives; firstly, the relationship between teachers' demographic data and their experiences in teaching ML in the FET Phase, secondly, the experiences of teachers when teaching ML in the Further Education and Training (FET) phase and, lastly, the identification of teaching strategies used by ML teachers in the classroom. This chapter included literature on curriculum design. It also included literature review on resources and policies related to ML. This chapter presented literature review on strategies used by teachers in handling ML in the classroom both internationally and locally. The chapter is concluded by presenting the theoretical framework of the study.

2.2 The relationship between teachers' demographic data and their experiences in teaching mathematical literacy

A clearer definition of mathematical literacy (ML) is provided by Stacey (2011) who regards it as an individual's capacity to identify and understand the role that mathematics plays in the world. Pillai, Galloway and Adu (2017) elucidated that teachers use different approaches in teaching ML. In this context, it is important to note that some teachers follow a mathematical approach while others follow the mathematical literacy approach (Pillai et al., 2017). Further, according to Pillai et al. (2017), mathematical literacy developed confidence in thinking mathematically. A study by Pillai et al. (2017) also recognised that mathematical literacy encourages teachers to use a leaner-centred and activity-based approach.

A study conducted by Umugirane, Bansilal and North (2017) explored the practices of teachers in teaching statistics and mathematics. It revealed that the choice of a variety of teaching and assessment methods is associated with teachers' demographic

factors such as gender, age, teaching experience, participation in professional development and further studies. Similarly, a study by Durodolu (2018) on teachers' perceptions of Information Literacy Skills found that teachers' demographic factors had a direct positive influence on teaching methods and also enhanced their teaching skills. It also revealed that there were more female teachers than male teachers teaching Information Literacy within the range of 36 and above.

Lazarus (2017) conducted a study on the influence of demographic variables on teachers' use of scaffolding strategies in teaching reading to pupils with reading disabilities. The study found that teachers' gender did not influence learners' learning and teaching experiences and it is also not a significant factor in teachers' usage of scaffolding strategies. The study further revealed that teachers' educational qualifications and teaching experience are significant factors that influence teachers' use of scaffolding strategies for reading instruction among learners with reading disabilities.

2.3 Experiences of teachers teaching mathematical literacy

2.3.1 Pedagogic Content Knowledge

A study conducted by Nel (2012) on the Advanced Certificate in Education Mathematical Literacy Programme found that before enrolment some of the teachers had little prior knowledge of the nature of ML as a learning area. Similarly, a study by Abidin, Mathrani, Parsons and Suriadi (2015) also found that a number of teachers lack the understanding of ML concepts. Teachers' lack of ML concepts was the reason for low participation in the ML workshops. In this context, teachers should be exposed to the curriculum document and readings related to ML.

Another research study conducted after teachers' completion of the Advanced Certificate in Education Mathematical Literacy Programme by Bansilal, Webb and James (2015) revealed that teachers had clear conceptions about mathematical literacy. The conceptions influenced the way of teaching ML in a manner that is aligned to the goals of the subject. Hence, Bansilal et al. (2015) maintained that these teachers

would convey a more informed view of mathematical literacy than a teacher who had not indicated in the same way about the subject potential value. North (2015) argued that it was problematic to perceive that the definition of mathematical literacy as excluding mathematical knowledge. Geldenhuys, Kruger and Moss (2013) agreed upon the definition of mathematical literacy as an individual capacity to distinguish the role that mathematics plays in the world.

A study conducted by Khaerunisak, Kartono, Hidayah and Fahmi (2017) showed that mathematical literacy is conventional learning. It is conjectured that conventional learning refers to teaching using chalk and a board by teachers. Another way to apply mathematical literacy and creating a compassionate environment is to choose realistic mathematical education learning with a scientific approach. From Khaerunisak et al.'s (2017) perspective, teachers had problems with learners who doubted their capabilities which led to difficulty in the ability to transform problems into mathematical language. The view of Mhakure and Mokoena (2011) showed that there were other problems associated with the teaching of ML. Some of the problems were known within the education system of South Africa. According to Mhakure and Mokoena (2011), the lack of qualified ML teachers was a problem in the teaching and learning of mathematical literacy. The teaching and learning of mathematical literacy were, therefore, genuine in the sense that it was based on the everyday experience of teachers. Mbonambi and Bansilal (2014) also reported that Further Education and Training phase teachers teaching ML needed knowledgeable use of mathematics. Tai and Lin (2015) also agreed with Mbonambi and Bansilal (2014) that systematic differences in ML teachers happened in individuals' processing of information in problem-solving situations. Tai and Lin (2015) noted that the knowledge of patterns in problem-solving could assist teachers in designing tailored interventions for learners.

Suharta and Suarjana's (2018) study finding was that understanding the problem was not enough; however, teachers should still be able to see and apply the relevant concepts and procedures. However, the low skills in mathematical literacy were caused by not knowing or forgetting the concept that should be used. Teachers feared that the implementation of ML was not meeting the aim of the subject and consequently its implementation was problematic (Graven & Buytenhuys, 2010). Vale

(2013) added that the problem could be attributed to unnecessary linguistic complexity in the implementation of mathematical literacy. In addition, ML teachers who were lacking the knowledge of mathematical content were not confident in teaching mathematical literacy (Owusu-Mensah, 2014). A study by Owusu-Mensah (2014) revealed that ML teachers engaging with experienced colleagues for guidance improved the knowledge of mathematical literacy.

The study indicated that teachers who did not like to use real-life contexts in ML were disinterested in the mathematical literacy context (Botha & van Putten, 2018). Botha and van Putten (2018) also reported that the demonstration process done by teacher educators at the workshops, during teaching, seemed unclear to teachers and the direction of the activity dealing with word problems was not necessarily understood. Similarly, the study conducted by Machaba and Mwakapenda (2017) showed that teachers experienced a problem about what counts as legitimate knowledge in mathematical literacy. Machaba and Mwakapenda (2017) acknowledged that there was no clear difference between mathematics and mathematical literacy tasks. In this respect, Machaba and Mwakapenda (2017) clearly suggested that the similarity of teachers' reactions could be assigned to ML teachers not knowing how to distinguish between mathematics and mathematical literacy theories. In a different view, according to Long, Bansilal and Debba (2014), some observers had noted that mathematical literacy differs from mathematics' objective and content. According to Long et al. (2014), there was lack of evidence in the description of mathematical literacy and mathematics. However, in mathematical literacy, the emphasis was specifically on the application of basic mathematics to understand situations in real life. Hence adequate training was needed for ML teachers to be trained in the content of mathematical literacy so that they know the difference between mathematical literacy and mathematics.

For Debba (2011), there was uncertainty as to whether making mathematics compulsory or mathematical literacy was a good idea or whether teachers were able to change from teaching mathematics to teaching mathematical literacy. Furthermore, according to Debba (2011), the introduction of mathematical literacy brought uncertainty when teaching mathematics and mathematical literacy to teachers. In the

same breath, mathematical literacy was welcomed with the hope that it would enable teachers to teach learners to become active participants in society. Kogar (2015) found out from the research that mathematical literacy was not an attribute that an individual either has or does not have; rather, it is a skill that could be developed over a lifetime. The study conducted by Kogar (2015) showed that gender, economic, social and cultural status variables had direct effects on an individual. It had been identified that mathematical literacy was influenced by variables for learning mathematics (Kogar, 2015). With a view to supporting the argument, Houston, Tenza, Hough, Singh and Booyse (2015) suggested that teachers' mathematical literacy was reflected in ways of engaging with problems.

The study conducted by Botha et al. (2013) suggested that the only requirement of the mathematical literacy curriculum was that teachers should have experience in the establishment of a productive and instructional practice. Thus, the ML teachers who lacked or had not been trained in the teaching of mathematics were disadvantaged. Teachers were unable to bring the real world to the mathematical literacy classroom so that learners could appreciate the value of mathematics (Botha et al., 2013). It appeared that, besides relevant knowledge having an influence on teachers' practices, teaching experience, as well as mathematics teacher training, may play an important role in the productivity of the instructional practices of the teachers (Botha et al., 2013). The study of Bansilal and Debba (2012) indicated that working with mathematical literacy tasks involves engagement with attaining the various attributes of the context. Therefore, there had been widespread confusion about the purpose of ML with many teachers seeing it as a watered-down version of real mathematics (Bansilal, Goba, Webb, James & Khuzwayo, 2012). Hechter (2011) reported that progression in the mathematics domain was dependent on the ability to engage with increasingly abstract mathematics rules, procedures and concepts. It was therefore necessary that mathematical literacy teachers understand the relationship between mathematics and mathematical literacy so that teachers do not propagate the misconception that mathematical literacy was simplified mathematics. Hence, there appeared to be an underlying tension between the aims within the ML curriculum with respect to the emphasis on mathematical content and the real-life contexts (Hechter, 2011).

Mathematical literacy curriculum specification had a focus on mathematical concepts and skills yet neglected the contextual focus.

2.3.2 Curriculum design

Gal (2009) commented that the grades 10-12 mathematical literacy curriculum represents a general assumption that studies would focus on preparing learners to deal with the demands of mathematics. A view held by Bansilal (2014) indicated that a life-preparation orientation is a prevalent feature of the mathematical literacy curriculum. It was a mandate of ML teachers to align life-preparation orientation goals that develop learners' skills in line with mathematical literacy curriculum at accessing numerical information used in real-life contexts. In contrast to the life-preparedness orientation of the curriculum, current practices afford a limiting education and life-preparedness experience (North, 2017). The consequence was that ML teachers who participated in the qualification were inadequately prepared for engagement in real-world practices into the domain of scientific mathematics. As such, current ML teachers learning in the mathematical literacy limit rather than afford access to future career and study opportunities and, in so doing, facilitate a degree of educational disadvantage within the curriculum framework. This had been accompanied by criticism and even rejection by some educationalists, tertiary institutions and employers of the value of the qualification (North, 2017). One might also consider Gal's (2009) commentary that grades 10-12 mathematical literacy curriculum represented a general assumption that studies would focus on preparing students to deal with the demands of mathematics. Yet, this vision appeared to have been weakened when teaching and assessing probability. Such emphasis rules out all numerous ways of the risks associated with processes and situations that express and represent an interest in public life. The general rhetoric related to everyday contexts and uses of probability, while the assessment standards were restricted primarily to classical probability. The mathematical literacy curriculum was assumed on the idea that the important goal of the education of learners after grade 12 should be preparing them for adult life (Gal, 2009).

Scholars such as Winter (2014) had noted that the mathematical literacy conception has not fundamentally changed although the curriculum has been reviewed further. A central argument in the mathematical literacy curriculum was primarily concerned with teachers preparing learners for the quantitative demands of everyday life. Again, the local contexts which might be relevant to the individual teachers' experiences were too many to be included within ML lessons given the time constraints. It seems unclear whether mathematical literacy should focus on extending understandings of mathematics content, developing contextual understandings or both. The introduction of mathematical literacy increased the need for qualified teachers to implement mathematical literacy in schools (Winter, 2014). Thomson et al. (2013) showed that mathematical literacy is structured into three broad components: situations and contexts, content areas and competencies or processes.

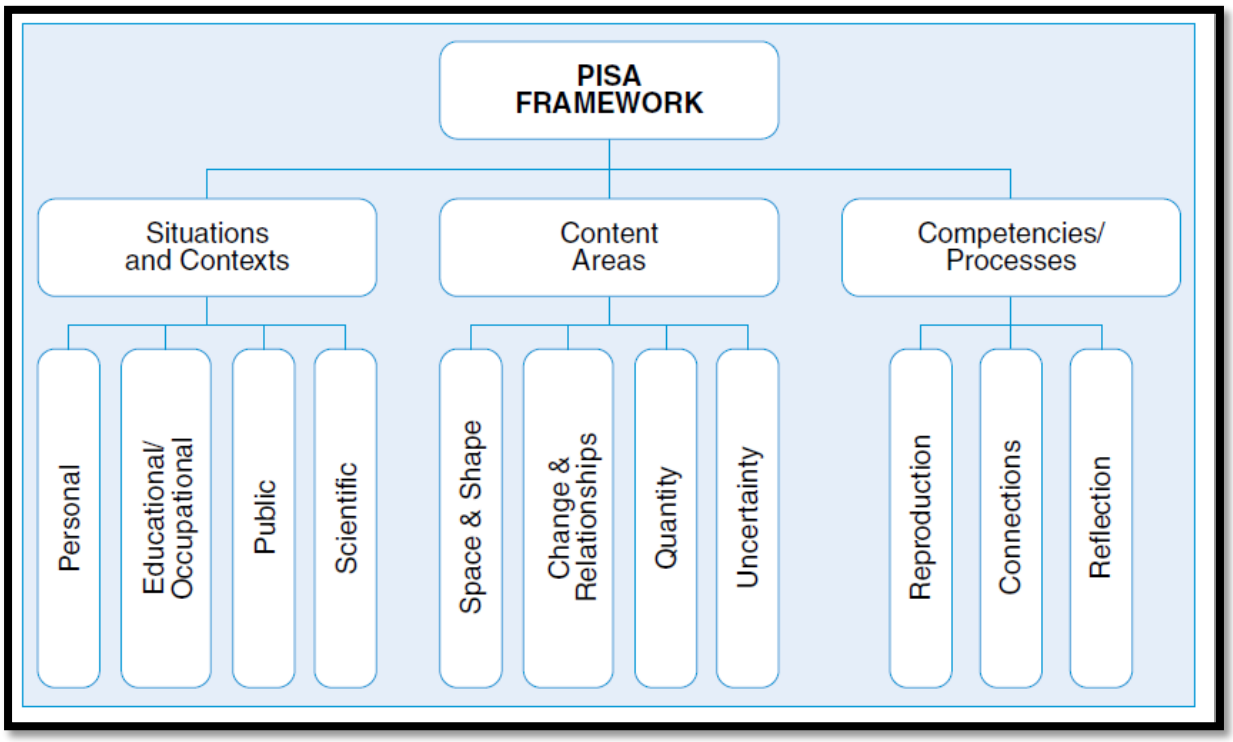


Figure 2.1: Components of the mathematical literacy framework

Source: Thomson et al. (2013)

Figure 2.1 presented the components of the mathematical literacy framework that were structured into three broad components, i.e., situations and context, content

areas and competence and processes. These components used in ML track down problems and use sources of stimulus material. They also connect the real world with problems generated with mathematics and solve those problems (Thomson et al., 2013).

The mathematical literacy organised into three broad components are the experiences of teachers teaching ML. In essence, mathematical literacy should differ significantly from the formal, abstract and symbolic competency associated with the mathematics of the classroom (Vale, 2013). It was also argued that mathematical literacy took the contexts in real life and applies mathematics to explore the meaning and implications of the information (Bansilal & Debba, 2012). The Department of Basic Education (2011) asserted that, in the mathematical literacy classroom, mathematical content should be taught together with its context. It was confirmed that the situations and contexts were used as sources of stimulus material (Thomson et al., 2013). The learning should be situated in a specific context (Owusu-Mensah, 2014). In the same light, Thomson et al. (2013) reported that the mathematical competencies should operate to connect the real world to solve problems. As pinpointed by Graven and Buytenhuys (2010), there was a concern regarding the implementation of the mathematical literacy curriculum.

Graven and Buytenhuys (2010) indicated that there are concerns related to contradictory messages within curriculum documents. It was claimed that national research was required to reflect on the extent to which mathematical literacy had met its stated aims (Graven & Buytenhuys, 2010). In view of this, Nel (2012) believes that teacher education is concerned with the recognition of ML in the curriculum and whether it matches those of teachers who were trained in ML. The dilemma of implementation could be of recognition, which could be avoided by establishing whether the Advanced Certificate of Education Programme helped the participants to change what was specified in the outcome of a programme as being a professional teacher. Mathematical literacy needs teachers to develop new beliefs, perform new roles and construct new identities in relation to other learning areas (Nel, 2012).

Furthermore, Bansilal, Goba and Webb (2012) were of the opinion that the opportunity to learn could be seen as the curriculum content that was taught and the amount of contact time devoted to teaching the subject area. The quality of a teacher's knowledge or training, however, could not make a difference to the learner if the teacher was not present in the classroom (Bansilal et al., 2012). Botha and van Putten's (2018) study revealed that the mathematical literacy curriculum aimed to close a gap between school and society. On the other hand, Machaba and Mwakapenda (2017) argued that the mathematical literacy curriculum was driven less by an everyday application. There was no clear response from teachers on whether they viewed the relationship between content and context in the way suggested by the mathematical literacy curriculum (Machaba & Mwakapenda, 2017). Based on the views of Debba (2011), mathematical literacy was included in the FET curriculum in 2006 as a basic subject to ensure that South African citizens were highly numerate consumers of mathematics in the future. The Department of Basic Education (2011) showed a clear description of expected progression in terms of content and contexts from grades 10 to grade 12.

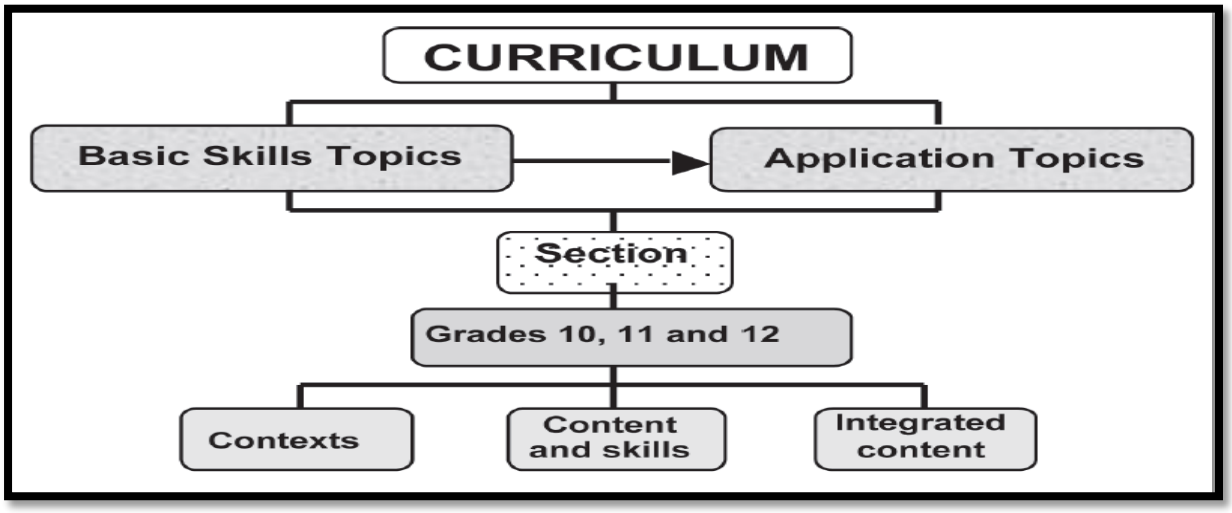


Figure 2.2: Structure of the mathematical literacy curriculum

Source: The Department of Basic Education (2011)

Figure 2.2 illustrated the structure of the mathematical literacy curriculum. However, the structure provided descriptions of mathematical literacy content from Grades 10 to 12 (DBE, 2011). It also indicated which description was related to which grade level in relation to the experiences of teachers teaching mathematical literacy. According to

North (2017), the ideological intentions of the mathematical literacy curriculum framework were underpinned by experiences which were both familiar and unfamiliar to the teachers' real-world experiences. However, a study conducted by Hechter (2011) showed that the ML curriculum was less driven by everyday applications. The curriculum was largely organised around mathematics which was often not of utility in everyday practices (Hechter, 2011). In addition, Bansilal (2014), made it clear that much discussion and interrogation was needed for the kinds of curricula that could equip mathematical literacy teachers. There are different interpretations that had arisen from a lack of a common understanding of mathematical literacy (Bansilal, 2014). The space and shape; change and relationships; and uncertainty form the contents of the mathematical literacy curriculum (Mhakure & Mokoena, 2011). Debba (2011) also advocated that mathematics plays a role in the modern world and ML teachers should understand it. The curriculum of the qualifications should be comprehensive enough to span the changes of the curriculum in the classroom (Bansilal et al., 2015). Bansilal et al.'s (2015) study also showed that mathematical literacy when properly taught results in the ability to make sense of numerical and spatial information communicated.

As indicated by Venkat (2010), one of the critiques of the mathematical literacy curriculum was that it could not produce mathematical working in coherent ways. A study by Venkat (2010) showed that content mathematical literacy was not organised around the structure of mathematics. Further evidence of mathematical literacy curriculum was lack of mathematical progression (Venkat, 2010). The concerns in this regard also were expressed by Botha et al. (2013) who regarded the mathematical literacy curriculum as full of misconceptions, exclusions and unjustified purpose. Teaching mathematics in a contextualised and de-compartmentalised manner where the content topics were integrated complicates the teaching of mathematical literacy. In the same vein, Botha et al. (2013) said that mathematical literacy was on the application of mathematics in everyday life situations. Frith (2009) also elucidated that mathematical literacy engages with well-defined problems that involve collecting or analysing data. In the same vein, Frith (2009) stated that the achievement of curriculum's idealistic goals was important to a mathematical literacy teacher. The curriculum statements for both mathematics and mathematical literacy were full of

really marvellous ideals and objectives (Frith, 2009). There were statements about teachers developing learners' communicative competence (Frith, 2009).

2.3.3 Resources

A resource is a competitive asset that is owned or controlled by the Further Education and Training (FET) to implement mathematical literacy (Thompson, Peteraf, Gamble & Strickland III, 2014). Bansilal (2014) stated that there had been a few higher education institutions that had designed and offered initial teacher education programmes with mathematical literacy human resources. There were no initial teacher education offerings for mathematical literacy human resources when the subject was introduced in 2006 and most universities opted to offer in-service programmes for practising teachers who wanted to retrain as mathematical literacy teachers. This implied the need for qualified teachers whose understanding of both mathematics content and contexts were developed (Winter, 2014). It appeared from Pillai et al.'s (2017) study that the Department of Education did not emphasise on the training of mathematical literacy teachers. Pillai et al. (2017) stated that effective mathematical literacy teaching depends on mathematical literacy applications. In addition, Nel (2012) argued that the contextualisation and newness of mathematical literacy required that teachers put the mathematical content into real-life context and become participants in the classroom rather than didactical leaders. In addition, Ngoepe and Kaino (2014) indicated that the challenge in teaching mathematical literacy was lack of teaching aids. Another important and discussed issue revolved around different resources available for teaching mathematical literacy (Pillai et al., 2017).

Some researchers claim that in order to facilitate understanding of mathematical literacy, teachers' professional development requires both cognitive and emotional commitment since it was complex in nature (Bansilal, Goba & Webb, 2012). However, in order to design mathematical literacy teachers' professional development programmes, it was necessary for designers to first be clear about the purpose and content of the mathematical literacy being targeted. Ngoepe and Kaino (2014) observed that few teachers have experience in teaching mathematical literacy

therefore there are insufficient teaching resources. The success of the implementation of mathematical literacy depends on the development of appropriate learning support materials (Ngoepe & Kaino, 2014). As articulated in Bansilal et al. (2015), there were no in-service programmes to reskill teachers in order to teach ML. Nobody was talking about the continuation of professional development of ML teachers who were retrained in the initial programmes. Considering that there were no pre-service mathematical literacy teacher training initiatives, the situation was serious. Higher Education Institutions and the Department of Education should work together and see that professional development programmes are offered for practising teachers as well as to expand pre-service teacher programmes in mathematical literacy (Bansilal et al., 2015).

Vilakazi (2010) provided evidence that there was an extended invitation to teach mathematical literacy for teachers who had studied mathematics up to grade 12. The unavailability of teachers to teach mathematical literacy led the education departments to find the alternative human resources in dealing with the mathematical literacy teacher's shortage (Vilakazi, 2010). This re-skilling and retraining enabled the implementation of the complex framework of agendas and statements for mathematical literacy (Vilakazi, 2010). However, before the implementation of ML at schools, one needs to understand the feasibility or the need to do so (Abidin et al., 2015). In a similar study, the focus, with regards to schools, had been educational resources (Guvendir, 2017). In a comparable study, Bansilal and Debba (2012) found that mathematical literacy is a subject that entails the use of mathematical tools and resources. Botha et al. (2013) show that the instructional practice of the teacher occurs in the classroom where teachers' goals, knowledge and beliefs serve as driving forces behind the instructional efforts. A study by Vale (2013) indicated that ML's emphasis was on the use of mathematical skills in applied contexts. This application of contexts increases in difficulty and complexity as the student progresses through the FET phase to demand higher levels of understanding and analysis from teachers (Vale, 2013).

In a related view, Owusu-Mensah (2014) argued that mathematical literacy courses were facilitated by mathematics specialists focusing on mathematics content. A study

by Owusu-Mensah (2014) also showed that existing teachers, with the exception of teachers teaching mathematics and physical science, met mathematical literacy requirements. There is evidence to suggest that even though some schools are equipped with technologies, access to these resources is challenging and limited (Minty & Pather, 2014). In addition, the manner in which information and communication technologies were selected and used in teaching and learning was affected by teachers' skills, beliefs and practices. Thus, problems also occurred when teachers lacking teaching qualifications were asked to use technologies in their teaching. Lack of financial resources also was a major factor as many schools, specifically in townships and rural areas, were unable to afford technology, including the Internet (Minty & Pather, 2014). Vale (2013) showed that space and shape should be referring to how teachers need to understand the relevant positions of learning. Studies showed that a teacher can make a decision during teaching by grouping tasks with the same rules so that similarities in the rules and language can be used to provide consolidation of the rules (Bansilal et al., 2015).

2.3.4 Policies related to mathematical literacy

In this study, a policy is a course or principle of action adopted or proposed by Further Education and Training to implement mathematical literacy (Shujahat, Hussain, Javed, Malik, Thurasamy & Ali, 2017). Winter (2014) suggested that a central argument in the mathematical literacy-related policy was that mathematical literacy was primarily concerned with the preparation of learners for the quantitative demands of everyday life. The implication was that the aim of mathematical literacy could be viewed in terms of promoting tools that teachers must draw on in order to explore and make sense of appropriate contexts. In addition, according to Ngoepe and Kaino (2014), ML should not be taught to learners who do intend to study disciplines which are mathematically based. However, mathematical literacy teachers were expected to know the core agenda of content and context-driven defining of mathematical literacy. Hence, Machaba and Mwakapenda (2017) argued that teachers need to be fully inducted into the mathematical literacy discourse.

Mhakure and Mokoena's (2011) study indicated that a multi-pronged approach was complex in achieving mathematical literacy. Teachers should adopt the best mathematics instructional and assessment strategies with an emphasis on strategies to promote mathematical literacy (Vilakazi, 2010). This would assist to achieve the vision of reaching the majority of learners leaving grade 12 every year without mathematics and reaching the majority of additional learners who fail mathematics yearly. A study by Geldenhuys, Kruger and Moss (2013) concurred with Vilakazi's (2010) research findings that the mathematical literacy programme in schools was implemented as a need to improve the numeracy level of South African citizens. One of the reasons for introducing ML was to reach the majority of learners leaving Grade 12 without mathematics every year (Geldenhuys et al., 2013). Many learners in South Africa could not achieve the minimum requirement to pass matric standard grade mathematics. Then learners were leaving school without mathematical skills, which could put them at a disadvantage with respect to their future expectations and livelihood. Too many learners were not achieving the minimum required competency in matric standard grade mathematics in South Africa. Consequently, learners were leaving school with an incomplete set of skills that, according to the policymakers, would put learners at a disadvantage with respect to their future prospects and livelihood (Geldenhuys et al., 2013). A study conducted by Hechter (2011) indicated that there were some tensions in the implementation of mathematical literacy in South African that were associated with the increased language and comprehension required by mathematical literacy due to its contextualised and real-life problem-solving nature (Hechter, 2011). Hence policymakers and interested parties were recommending that mathematical literacy should be a compulsory subject instead of a choice subject because it prepared learners for real-life situations (Houston et al., 2015). Mathematical literacy offers greater access to mathematics for all learners and could offer a more accessible opportunity for learners to succeed in a mathematical subject (Houston et al., 2015).

Mathematical literacy provided teachers with an understanding of the role mathematics played in the modern world (Botha et al., 2013). Hence mathematical literacy was on the application of mathematics in everyday life situations. However, translating these ideals into practice had been a challenge, one of which has been the

issue of teachers' competencies in the subject. There was a growing consensus that the creation of tasks for mathematical literacy with its emphasis on real-life contexts had created a demand, encountered in mathematics tasks (Bansilal & Debba, 2012). Adding to this, Debba (2011) posited that teachers need to design a mathematical literacy program that includes tasks that provide learners with the opportunity to demonstrate competence with both mathematical content and the ability to make sense of real-life, every day meaningful problems.

Vale, Murray and Brown (2012) reported that many more poorly constructed examination papers find their way into the examination room. The guidelines for mathematical literacy emphasised the principles of reality, as well as fairness (Vale et al., 2012). Furthermore, ML examinations did not merely require the processing of text, but also the interpretation presented in symbolic notation, diagrams, graphs and tables. Another study attested that teachers could support students' mathematical literacy learning by providing strategies for understanding mathematics and solving problems (Lin & Tai, 2015). Teachers should consider methods of memorisation and elaboration learning strategies in the classroom (Lin & Tai, 2015). Literature studied indicated that appropriate and effective learning strategies were crucial for positive educational outcomes (Lin & Tai, 2015). In the context of Magen-Nagar's (2016) study, learning strategies were found within the realm of simple memorisation strategies used for problem-solving and reasoning. Thus, students need to acquire learning strategies (Magen-Nagar, 2016). In essence, ML integrated mathematical calculations with the need to solve problems in a range of everyday situations (Hechter, 2011).

2.4 Strategies used by teachers in handling mathematical literacy

Arthur (2012) stated that strategies are techniques and principles used to collect the evidence necessary for building theories. After completing the Advanced Certification of Education Mathematical Literacy Programme, teachers see the specific emphasis mathematical literacy has on content knowledge being linked to real-life situations (Arthur, 2012). Teachers' involvement in the programme contributed to the learning (Nel, 2012). A similar view was expressed by Thomson, Hillman and Bortoli (2013) who indicated that engagement with mathematics was an important aspect of

mathematical literacy. It was argued that mathematical content should not be taught in the absence of context (The Department of Basic Education, 2011). It was broadly accepted that teachers need a programme that exposes them on a regular basis to mathematical content (Owusu-Mensah, 2014). Owusu-Mensah (2014) also argued that a proper mentoring programme was required to enhance the mathematical content knowledge.

Ozgen (2012) highlighted that concepts of mathematical literacy and connections to the real world were not different. Research by Ozgen (2012) further indicated that connection with the real world was creating connections between mathematics and the external world. Hence it was important to explore the effects of ML teachers' self-efficacy beliefs on their views on connection with the real world (Ozgen, 2012). In this sense, the implication was that a functional understanding of mathematics was the key to successful engagement with situations (Winter, 2014). There was also a difference between teachers who teach from a content-driven approach (Winter, 2014). Research by Memnun, Akkaya and Hacıomeroglu (2012) revealed that teachers utilised different educational methods to teach the learners. It was widely accepted that the resistance to the use of real-life contexts in the mathematical literacy classroom was based on disinterest (Botha & van Putten, 2018). Botha and van Putten (2018) indicated that teachers found it difficult to go beyond intra-mathematical problems to address the problems. It is argued that the majority of the teachers did not carry out modelling processes (Botha & van Putten, 2018). However, results from prior studies showed that due to their exposure to mathematics, one would expect mathematics teachers to perceive mathematics-orientated tasks in terms of mathematics. Similarly, ML teachers' exposure to mathematical literacy led to the perception of mathematical literacy-related tasks (Machaba & Mwakapenda, 2017).

Furthermore, mathematical literacy for social change had a primary concern for the use of mathematics education to promote critical citizenship (North, 2015). In this conception, mathematics, particularly statistics, was seen as an essential instrument for critically analysing existing social and political structures and for challenging social problems. In so doing, mathematics was seen as devoid of political, social or cultural flavour; it was viewed as an objective entity that existed outside of the influences of

the aspects of society and able to cast a critical gaze on existing structures. It had been clear from Ilbagi and Akgun's (2013) study that mathematical literacy took notice of a wider and more functional use of mathematics, and covers the skill of recognising and formalising mathematical problems in various circumstances (Ilbagi & Akgun, 2013).

North (2015) showed that mathematical literacy for developing human capital comprises the mathematisation and modelling perspective to provide a core set of mathematical knowledge and skills that could be used to solve any problem encountered in daily life. Bansilal (2014) stated that contextual domains in mathematical literacy had different and specialised resources that were appropriate within the parameters of the context. Hence a key issue on which mathematical literacy teachers need guidance was how teachers could enable cumulative learning in a situation where the meanings of the tools and resources had a strong semantic gravity (Bansilal, 2014). A study by Botha et al. (2013) revealed that it is important for mathematical literacy teachers to know about difficulties which may be a result of certain misconceptions that were carried along from a mathematics perspective into mathematical literacy. Ngoepe and Kaino (2014) found that "mathematical literacy should not be taken by learners who intended to study disciplines which were mathematically based".

This researcher found that mathematical literacy needs proper exercise to train teachers' ability to develop (Khaerunisak et al., 2017). It is advisable that teachers do an analysis of learners' difficulties in resolving the question to improve teaching and learning (Khaerunisak et al., 2017). One way to practice mathematical literacy was to adopt realistic mathematical education learning with a scientific approach (Khaerunisak et al., 2017). Mathematical literacy was one of the most important skills in learning mathematics (Bansilal et al., 2015). It was important to mention that the same overarching ideas were practically the same as those underpinning the concept of mathematical literacy in the South African context. However, designing tasks for mathematical literacy required much skill in ensuring that crucial information was presented clearly (Bansilal et al., 2015). Teachers know their learners' context of life therefore they are the best in designing tasks that would assist to achieve the mandate

of mathematical literacy. It was acknowledged that mathematical literacy was an understanding of mathematics (Bansilal et al., 2015).

2.5 Theoretical framework

The theoretical framework is underpinned by pedagogical content knowledge (PCK) which calls for the experiences and knowledge of the content by the teachers. The theoretical framework encompasses the principle of social constructivist theory that is of importance in the use of strategies in teaching mathematical literacy. A study by Bansilal, Webb and James (2015) defined mathematical literacy pedagogic content knowledge as "the knowledge needed by the teacher to successfully conciliate mathematical literacy content teaching". In view of this, Mhakure and Mokoena (2011) pointed out that the content component should be consisting of a list of overarching ideas to meet the requirements for development in mathematics. Hence teachers need knowledge of the strategies in order to be fruitful in reorganising the understanding of learners in order to deal with misunderstanding (Bansilal et al., 2015).

Piaget (1973) emphasised the role of association and interaction with others in the learning process since the ML teachers will be interacting with learners in class through various methods of teaching and also learners will be interacting with one another through discussion. Learning is viewed as a social, cultural and motivational process derived from communication with people who are meaningful to the learner (Rodoff, 1998).

Educationalist and philosophers like Piaget, Vygotsky and Perkins suggested that constructivism and social constructivism solve the problems of traditional teaching and learning. This was concurred by both Brown (1994) and Rodoff (1998) with the view that the classroom of the constructivist teacher should create situations that challenge the assumption of traditional teaching and learning This study is concerned with the teaching methods used by teachers in the classroom to improve teaching and learning. Botha, Maree and Stols (2013) helped us to understand that the "teaching of mathematical literacy was to provide opportunities to engage with mathematics in

various contexts from a mathematical literacy pedagogic content knowledge point of view". This was, however, contrary to Machaba and Mwakapenda (2017) who claimed that "mathematical literacy had been criticised as having too much traditional mathematic content". Consistent with the mathematical literacy pedagogic content knowledge perspective, Bansilal, Webb and James (2015) attested to the fact that teachers should be able to recognise similarities between certain contextual rules. This perspective fitted well with this study of experiences of mathematical literacy teachers. This was because mathematical literacy is a subject that involves the use of mathematics resources from the contextual field in order to solve the mathematics problem which should be interpreted in the mathematical literacy pedagogic content knowledge.

Hare (2005) emphasised that a learner-centric instructional method is one of the methods used in the constructivist learning approach. In this study, one of the methods used by teachers in the classroom is learner-centred approach. According to Lester and Onore (1990), it was observed that teachers' personal beliefs about teaching are important and determine the kind of changes they are able to make. Hence the study is concerned with the experiences of teachers in teaching ML in the FET Phase

2.6 Chapter conclusion

This chapter focused on the review of literature which was pertinent to the experiences of mathematical literacy teachers. The chapter was organised following the order of objectives which started with the literature review on the relationship between teachers' demographic data and their experiences in teaching ML. The literature review revealed that the choice of variety of teaching and assessment was associated with the teachers' demographic data and gender did not influence learners' learning. It was followed by the review of literature on teachers' experiences in the teaching of mathematical literacy in the FET phase. The literature reviews revealed that teachers' resistance to the use of real-life contexts in the mathematical literacy classroom was based on the lack of interest in the context itself. The literature review also brought to light the fact that the mathematical literacy curriculum aimed to build a bridge between

school and society. The section also included a literature review on resources and policies related to mathematical literacy. The literature review highlighted that the lack of teaching aids and learning materials caused challenges in the teaching and learning of mathematical literacy. It further suggested that a central argument in the mathematics literacy-related policy was that mathematical literacy was primarily concerned with the preparation of learners for the quantitative demands of everyday life.

Further, the chapter reviewed literature on strategies used by teachers in handling mathematical literacy in the classroom both internationally and locally. The literature review indicated that teachers' involvement in the Advanced Certification of Education Mathematical Literacy Programme contributed to the learning. The literature review also discovered that engagement with mathematics in a variety of situations is an important aspect of mathematical literacy. The theoretical frameworks of mathematical literacy have also been presented. The next chapter will elaborate on the research methodology.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The aim of this chapter is to outline the research process for this study to achieve the research objectives (Section1.5). The chapter starts with by unpacking the research paradigm and research design. It also outlines the research method. A sampling design or sampling procedure is selected to identify the target population and a sample that answers the questions in an impartial manner whilst using the available resources. Further, the focus of this chapter is to provide a detailed instrumentation. The chapter discusses the measures used to enhance the ethical considerations of the study and ends with a chapter conclusion.

3.2 Research paradigm

The positivist paradigm was adopted in this study to investigate the experiences of teachers in teaching mathematical literacy in the FET phase in the King Cetshwayo District, in the province of KwaZulu Natal. The positivist paradigm relied on the ability of the researcher to collect evidence to support the research question and to analyse the data to answer the research question (McDevitt & Ormrod, 2013).In this study the researcher was able to collect data from teachers who teach ML in the FET Phase. The data collected supported all research questions .This study emphasised the positivism of administered questionnaires to mathematical literacy teachers which is often associated with quantitative research. The researcher collected the data from teachers who are currently teaching ML in the FET Phase.The interpretivism and constructivism paradigms were also not considered because they both give a holistic approach to the construction of social realities - the individual and the society. Whilst the mixed-methods research is largely aligned with the pragmatism paradigm, the positivist paradigm is based on the realisation that the primary focus of this study was to measure research participants' perceptions of the experiences of teachers in teaching mathematical literacy in the FET phase in the King Cetshwayo District. The researcher wanted to look at teachers' behaviour when teaching ML in the classroom.

3.3 Research design

The research design which was used in this study is descriptive research design because it incorporates the first research question on demographic data which best describes the sample. Grove, Burns and Gray (2013) reported that explanatory studies build on descriptive studies to investigate causes and reasons for the described phenomenon. A descriptive research design investigates one or more variables by using a wide variety of quantitative and qualitative methods. The descriptive research design aimed at finding the relationship between variables and the quantitative approach method (McCombes, 2019).

The descriptive research design was used to provide an accurate description of the intervention of the experiences of teachers in teaching mathematical literacy in the FET phase in the King Cetshwayo District. The reason for this was that the present study is a descriptive research

3.4 Research methodology

Research methods are strategies, processes or techniques used in the collection of data or evidence for analysis in order to uncover new information or create a better understanding of a topic (Blaikie, 2010)**.** In this study, a quantitative research method was adopted to afford the researcher the benefit of applying statistical methods to analyse and interpret the data of the study. The data for this research study was sourced from 150 teachers who taught mathematical literacy in the King Cetshwayo District. The main aim of a quantitative study is to measure the social world objectively (Schurink, Fouche & De Vos, 2011). The researcher wants to reveal the objective truth about the experiences of teachers teaching ML in the FET Phase using the collected data.This study aimed at determining the experiences of teachers teaching ML at the FET phase in the King Cetshwayo District.

3.5 Sampling design/sampling procedure

Sampling is the process of selecting units of analysis from a population (Jennings, 2010). The population is any group of entities, for example - people, sharing the same set of characteristics (Zukmund, Babin, Corr & Griffin, 2013). The population of this study was made up of 301 teachers teaching mathematical literacy in 147 schools in the King Cetshwayo District. The researcher targeted all ML teachers in the King

Cetshwayo District to participate in the study. The researcher requested permission from the district director to conduct the research (Appendix F). The researcher then contacted the ML subject advisor in the district to provide the researcher with the number of teachers teaching ML in the district as well as the number of schools doing ML. A sample of 150 teachers responded to the questionnaire. The researcher used the probability sampling procedures where the study sample was selected using the purposive sampling technique. The schools in the King Cetshwayo District were grouped into three (3) groups. The first group comprised of 50 schools close to the researcher's home because the researcher was able to visit these schools during break time and after school. The second group consisted of 90 schools whose educators attended a workshop in January 2018. The third group was made up of 7 schools that did not attend the workshop and were too far from the researcher's home about 180 km away from researcher's home. King Cetshwayo is a very big district; some schools are in deep rural areas and it was impossible for the researcher to go there during school hours. The researcher did not want to use schools that were only in urban areas; that is why schools in deep rural areas also participated in this research.

3.5.1Target population

Target population is the entire group of people whom the researcher wants to study. The population is any group of entities, for example, of people sharing the same set of characteristics (Zukmund, Babin, Corr & Griffin, 2013). Sampling is the process of selecting units of analysis from a population (Jennings, 2010)

The target population for this study are ML teachers in KwaZulu Natal Province in King Cetshwayo district. The population was made up of 301 teachers from 147 schools in King Cetshwayo District. A sample of 150 knowledgeable mathematical literacy teachers was drawn from this population

3.5.2 Sample

A sample is a group of people that are selected from a large population for measurement (Singh, 2018). The sample for this study consisted of 150 teachers teaching ML at King Cetshwayo District from a population of 301 teachers teaching mathematical literacy in the District.

The researcher used probability sampling procedures where the sample was selected using random cluster sampling techniques which entail methods that select participants randomly, (Burns & Bush, 2010). Participants in this study were randomly selected. Everyone in the population of 301 teachers had equal chances of getting selected. The researcher randomly selects a small group of participants i.e. 150 participants from 301 teachers and predicts that all their responses will match the overall population. Probability sampling is classified into four types, simple random sampling, stratified random sampling, random cluster sampling and systematic sampling (Welman, Kruger & Mitchell, 2007). Random cluster sampling was used in this study because the researcher used the sample that was obtained from the representative of the relevant population of teachers who were teaching mathematical literacy in the FET Phase in King Cetshwayo District at the time of conducting this study.

3.6 Data collection

Research instruments are measuring devices or tools that are used to collect data and may come in a form of questionnaires, tests, structured interview schedules and checklists (Seaman 1991). At the beginning of the questionnaire was a cover letter that informed the participants about the researcher's identity and the aim of the study to motivate participants to answer the questions. At the end of the questionnaire the researcher reassured participants about their confidentiality. Questions were grouped into research objectives sections to ensure that each section made sense to the research participants. The questionnaire was divided into three main sections. Section A consisted of demographic data which were used to find out about the history of the participants. The demographic data consisted of gender, age group, educational level and working experience of teachers teaching ML at FET Phase. This section was included as a measure of the degree to which the sample was representative of the target population. The researcher requested information from ML subject advisor of

the district, of the number of ML teachers in the district and the number of schools doing ML. The subject advisor responded positively. The research participants were required to make a cross in the numbered square; that also applied in section B. Section B consisted of Likert-type questions on a 5-point frequency scale with descriptors ranging from 1 (strongly agree) to 5 (strongly disagree). These questions were grouped into research objectives to determine the teacher's experiences in the teaching of ML in the FET Phase in terms of pedagogical content knowledge, curriculum design, resources and policies related to mathematical literacy**.** Section C consisted of open-ended questions where participants wrote the strategies they use in the classroom when teaching ML in the order of importance

3.7 Data collection procedure

The researcher collected quantitative data using a questionnaire. A questionnaire was chosen because it was cost-effective, it is an affordable way to gather quantitative data some people do not like to write, questionnaire for them will put less pressure. It is a quick way to get results, it covers every aspect of a topic, results are easily analysed it is uniform, respondents will be straight to the point when answering questions. Questionnaires may be administered in many ways and implementation could take place in many forms (Saunders, Lewis & Thornhill, 2015).

The researcher requested permission from the Department of Basic Education to conduct research in King Cetshwayo District. The Department of Education requested the list of schools to be visited by the researcher. Then the researcher contacted the subject advisor requesting the list of schools that were doing mathematical literacy in King Cetshwayo District. The researcher also requested the number of teachers who were teaching mathematical literacy in those schools. The subject advisor provided information that was requested by the researcher. The list of schools was given to the department as per their request. The researcher obtained permission before embarking on field-work (Appendix B).

To assess the accuracy of the questionnaire the internal consistency and reliability was determined using Cronbach's alpha. A pilot test was administered to 19 teachers. The teachers who were in the pilot study were not considered for the final study. A

Cronbach's alpha of 0.77 was considered acceptable since it was higher than 0.6 (Pietersen & Maree, 2010).

The data collection strategy had to include the collection of data for analysis and inference to contribute to the scientific body of knowledge. Data was collected by the researcher from the participants while they were attending workshops at the beginning of the year January 2018 in their circuits. The researcher spoke to the subject advisor prior to the workshop telephonically requesting the advisor to allocate the researcher a slot after the workshop was completed. The subject advisor agreed. After the workshop, the subject advisor requested teachers to give the researcher time to speak to them. They agreed and the researcher got the opportunity to request them to participate in the study and explain the purpose of the study and asking them to complete the questionnaires. The questionnaire and cover letter were given to participants (Appendix C). The requested letters were submitted to the district director and principals of school requesting them to allow the researcher to conduct research (Appendix F and G) The questionnaire was administered in English as this is the language of instruction in the FET phase in King Cetshwayo District. It was also important to make contact with research participants by means of personal introduction to the study which helped to build trusted relationships with participants who demonstrated an interest in contributing to the study. The respondents responded after the workshop and the researcher took the questionnaire after it was completed. The researcher visited teachers in the workshop, who came from ninety (90) schools. The teachers were not from neighbouring schools where the researcher reside but from other circuits in King Cetshwayo District. A total of 130 teachers attended orientation workshops. Only ninety-five (95) teachers completed the questionnaire out of one hundred and thirty (130) teachers who attended workshops. Other teachers did not respond, some brought back the questionnaire unanswered.

The researcher also used break time to go and collect data from fifty (50) neighbouring schools with fifty-five (55) teachers. The researcher requested permission from the principals to allow the researcher to conduct research at their schools (appendix C) and the principals agreed and data were collected from those schools close to the researcher. The participants were given two weeks to complete the questionnaire and

the data was collected after two weeks. Only forty-five (45) teachers participated in the study out of fifty-five (55) teachers. Ten of them did not respond.

Some data was collected using emails in seven (7) schools. The data that was collected through emails were from those participants whose schools were too far where the researcher could not reach. The researcher requested one of the teachers who was the researcher's neighbour who teaches around those schools to assist the researcher by asking those teachers to participate in the study. They agreed to participate and gave their email addresses to that teacher. Then the researcher emailed the questionnaire to them and was given two weeks to respond. Those teachers who received the questionnaire via email responded positively although not all of them emailed back but the response was positive since only seven schools with fourteen teachers (14) were used and ten (10) of them responded. Those who responded sent the completed questionnaire back to the researcher.

3.8 Ethical Considerations

Ethical considerations refer to the appropriateness of behaviour regarding the rights of people participating in the research study (Babbie, 2014). The researcher adhered to crucial issues in carrying out this study in observance of ethical considerations as discussed in the subsections that follow.

3.8.1 Permission to conduct the research study

After submitting the research proposal, ethical approval was obtained (Appendix D), from the University's Ethics Committee. Bless, Higson-Smith and Sithole (2013) attest that the reason for approval of research with human participants is to protect the rights of the researcher to carry out any legitimate study as well as the reputation of the University for the research conducted.

3.8.2 Participants informed consent

The researcher provided the participants of this study with a cover letter which described the nature of the study and gave the research participants the choice of participating in the study. The information provided on the cover letter was explained

to participants by the researcher through email conversation and verbally to those participants at the workshop and those that were visited. De Vos, Strydom, Fouche and Delport (2011) emphasised that researchers should inform the research participants openly and completely about the research purposes, the research methods and the supposed duration of the questionnaire.

3.8.3 Protection from harm

The research participants were not exposed to any physical or emotional harm in any manner. The well-being of all participants was set as a priority while the data were being collected, processed and interpreted and no participants were disadvantaged in any way. Any participant in a research project is protected from physical and psychological harm (Creswell, 2014).

3.8.4 Voluntary participation

Participants were informed about their right to withdraw from the study at any time without any penalty or being required to give a reason. Participants were very comfortable and volunteered willingly to be part of the study. Leedy and Ormrod (2010) have shown that the main ethical issues anticipated for the study and the steps taken to address include the voluntary participation and consent of participants

3.8.5 Anonymity and confidentiality

The researcher in this study protected the privacy and confidentiality of study participants by not revealing their identities. The information attained from the participants was used for the research and not for any other purposes. The responses and information provided by participants were treated with the necessary confidentiality in order to keep participants' information private and the required anonymity in order to protect the participants' identity. The issues of confidentiality and anonymity are closely connected with the rights of beneficence (Beckett & Maynard, 2013).

3.9 Chapter conclusion

The aim of this chapter was to provide a detailed explanation of the manner in which the researcher conducted empirical research to achieve the research objectives. The chapter started with the definition of the terms ‘research paradigm’ and ‘research design’. This chapter also outlined the research method. The point of departure in choosing a sampling design or sampling procedure was to consider a target population, sample and sampling techniques that answered the questions in an impartial manner whilst using the available resources. Further, the focus of this chapter was on a detailed discussion of the data collection procedures or administration of research instruments were also discussed. Ethical consideration was also discussed. The researcher concluded the chapter by discussing conclusion. The next chapter presents the analyses of the data that were obtained from the research questionnaire.

CHAPTER 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

4.1. Introduction

In this chapter, the researcher presents, analyses and interprets the data collected for this study. The purpose of this study was to determine the relationship between teachers' demographic data and their experiences in teaching ML to determining teachers' experiences in the teaching of ML in the FET phase and the strategies used by teachers in handling the subject in the classroom (Section 1.5).

The results, interpretation and discussion follow the order of the research questions, stated in Section1.3, which are:

(i) What is the relationship between teachers' demographic data and their experiences in teaching Mathematical Literacy in the FET Phase?

(ii) What are the teacher's experiences with regards to the teaching of Mathematical Literacy in the FET Phase?

(iii) What strategies do teachers use in handling Mathematical Literacy in the classroom?

4.2 Descriptive Statistics

The descriptive statistics of the data was done using Microsoft Excel and Stata 14.0. Table 4.1 provides the summary statistics of the respondent's demographics. It indicates that over half of the sample (55.35%) were under the age of 40years and only 1 individual was above age of 60years. Also, the majority of the participants were females (57%) and almost 69% of them had a 0 to 13 years working experience as teachers. Furthermore, 94% of respondents were of African race, 2.67% of respondents were Indians and 3.33% were Whites and no mixed race were represented in the study participants. Percentage in Table 4.1 means per hundred. It is one of the most frequently ways to represent statistic It is equal to the proportion

times hundred (100).In this table it calculated by diving number of respondents (N) by sample size times hundred ($\frac{N}{150} \times 100\%$). Cumulative percentage is another way of expressing frequency distribution. It is a running total of percentage values occurring across a set of responses. In this research the percentage of N is added up unit it reaches 100%.

Table 4.1: Respondent's Demographics

Age	**N**	**Percentage (%)**	**Cumulative Percentage (%)**
20-29 years	32	21.33	21.33
30 -39 years	51	34	55.33
40-49 years	49	32.67	88
50-59 years	17	11.33	99.33
More than 60 years	1	0.67	100
Total	**150**	**100**	
Gender			
Male	65	43.33	43.33
Female	85	56.67	100
Total	**150**	**100**	
Experience			
0-6 years	52	34.67	34.67
7-13 years	51	34	68.67
14-20 years	35	23.33	92
21-27 years	7	4.67	96.67
28-34 years	2	1.33	98

More than 34 years	3	2	100
Total	**150**	**100**	
Race			
African	141	94	94
Indian	4	2.67	96.67
White	5	3.33	100
Total	**150**	**100**	
Qualification			
Matric only	1	0.67	0.67
Matric + Teacher's certificate	5	3.33	4
Matric + Teacher's Diploma	37	24.67	28.67
Degree	64	42.67	71.33
Degree + Diploma	25	16.67	88
Senior Degree	9	6	94
Senior Degree + Diploma	9	6	100
Total	**150**	**100**	

Participants responded to a questionnaire in Appendix C, Section A. The majority of the response (71%) had at least a university degree, indicating a highly educated sample.

To evaluate perceptions, respondents were asked to respond to the 13 Likert-scale questionnaire in Table 4.2. Each question had 5 categories: Strongly agree, Agree, Neutral, Disagree, and Strongly disagree. The codes were formulated following the questionnaire (Appendix C, Section B). To assess if the respondents' responses to

these questions were gender dependent, a T-test was run on the sum of the responses (where Strongly agree=1 and Strongly disagree =5) for each individual.

Table 4.2 : Questionnaire Items

Item	Statement
b01	In order to teach Mathematical Literacy, one needs Mathematics knowledge.
b02	Mathematical Literacy must be taught by teachers who have studied Mathematics.
b03	Mathematical Literacy caters for learners with problems in Mathematics.
b04	Learners understand Mathematical Literacy better when it is integrated with other subjects.
b05	There is a misconception that Mathematical Literacy is inferior to Mathematics.
b06	Mathematical Literacy is regarded as the application of Mathematics in a real-life context.
b07	At my school, we do team teaching when teaching Mathematical Literacy.
b08	The assessment strategies in the Mathematical Literacy curriculum provide teachers with the framework on the integration of content and context.
b09	I can teach mathematics irrespective of the class size.
b10	Resources in the teaching of Mathematical Literacy are required for effective learning.
b11	Support from subject advisers inspires the teaching of Mathematical Literacy.
b12	Workshops for Mathematical Literacy improve one's teaching of the subject.
b13	Policy changes in the education system affect Mathematical Literacy teaching in a positive manner.

The T-test result was present in Table 4.3 and indicated that although the majority of respondents were female. Females' respondents are more than males' respondents, (Appendix C, Section A), there were no significant differences in the average to the sum of their answers to the 13 opinion/perception questions, suggesting that the opinions were not gender-dependent.

Table 4.3 : T-test of gender difference in teachers experiences in teaching Mathematical literacy

Group	N	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Male	65	26.32	0.74	5.99	24.84	27.81
Female	85	26.34	0.80	7.34	24.76	27.92
Combined	150	26.33	0.55	6.77	25.24	27.42
Difference (diff)		-0.02	1.12		-2.23	2.19
diff = mean (Male) – mean (Female)						t = -0.0162
Ho: diff = 0						degrees of freedom = 148
Ha: diff < 0		Ha: diff !=				Ha: diff > 0
Pr(T < t) = 0.4936		Pr (|T| >|t|) = 0.9871				Pr (T > t) = 0.5064

Similarly, other demographic characteristics were checked for gender balance to evaluate if the higher representation of females in the sample also skewed the other demographics (Table 4.4). The results of the Pearson's Chi-square for gender differences in age, experience, race, and qualification in Table 4.4 indicate that on average, these demographics are balanced by gender.

Table 4.4: Demographics by Gender with Pearson Chi-square

Age	Male	Female	Total	Pearson Chi-square and Significance
20-29 years	17	15	**32**	
%	11.33	10	**21.33**	
30 -39 years	24	27	**51**	
%	16	18	**34**	
40-49 years	15	34	**49**	
%	10	22.67	**32.67**	
50-59 years	9	8	**17**	**Pearson chi2(4) = 6.1707 Pr = 0.187**
%	6	5.33	**11.33**	
More than 60 years	0	1	**1**	
%	0	0.67	**0.67**	
Total	**65**	**85**	**150**	
%	**43.33**	**56.67**	**100**	
Experience	**Male**	**Female**	**Total**	
0-6 years	24	28	**52**	
%	16	18.67	**34.67**	
7-13 years	21	30	**51**	
%	14	20	**34**	**Pearson chi2(5) = 1.9981 Pr = 0.849**
14-20 years	16	19	**35**	
%	10.67	12.67	**23.33**	
21-27 years	3	4	**7**	
%	2	2.67	**4.67**	

28-34 years	0	2	**2**	
%	0	1.33	**1.33**	
More than 34 years	1	2	**3**	
%	0.67	1.33	**2**	
Total	**65**	**85**	**150**	
%	**43.33**	**56.67**	**100**	
Race	**Male**	**Female**	**Total**	
African	63	78	**141**	
%	42	52	**94**	
Indian	1	3	**4**	
%	0.67	2	**2.67**	**Pearson chi2(2) = 1.7604 Pr = 0.415**
White	1	4	**5**	
%	0.67	2.67	**3.33**	
Total	**65**	**85**	**150**	
%	**43.33**	**56.67**	**100**	
Qualification	**Male**	**Female**	**Total**	
Matric only	1	0	**1**	
%	0.67	0	**0.67**	
Matric + Teacher's certificate	4	1	**5**	
%	2.67	0.67	**3.33**	**Pearson chi2(6) = 8.9503 Pr = 0.176**
Matric + Teacher's Di	16	21	**37**	
%	10.67	14	**24.67**	
Degree	28	36	**64**	

%	18.67	24	**42.67**	
Degree + Diploma	6	19	**25**	
%	4	12.67	**16.67**	
Senior Degree	5	4	**9**	
%	3.33	2.67	**6**	
Senior Degree + Diplo	5	4	**9**	
%	3.33	2.67	**6**	
Total	**65**	**85**	**150**	
%	**43.33**	**56.67**	**100**	

Finally, the respondents' opinion on the teaching of Mathematical Literacy was tabulated by their response categories (Table 4.2 for question code reference). Table 4.5 represent opinion statements because the respondents respond to their own opinions on the strategies they use when teaching ML (Appendix C) The summary of this is presented in Table 4.5 and Figure 4.1. In all questions except b09 which is the research question number 9 (i.e., *I can teach mathematics irrespective of the class size*), the majority of respondents (i.e., over 50%) agree or strongly agree with the statement.

Table 4.5 : Respondents responses to opinion statements (in percentage)

Question	Missing	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
b01	0.0	44.7	46.0	0.7	4.7	4.0	**100**
b02	1.3	23.3	40.7	2.7	23.3	8.7	**100**
b03	0.7	24.7	28.7	5.3	33.3	7.3	**100**
b04	0.0	40.0	36.7	8.7	9.3	5.3	**100**
b05	0.0	35.3	26.0	10.7	20.0	8.0	**100**
b06	0.0	58.7	26.0	3.3	7.3	4.7	**100**
b07	0.0	34.0	40.7	2.7	16.0	6.7	**100**
b08	0.0	40.7	44.7	6.0	7.3	1.3	**100**
b09	0.0	20.0	28.0	12.0	33.3	6.7	**100**
b10	0.7	68.0	26.0	1.3	2.7	1.3	**100**
b11	0.0	72.7	22.7	1.3	2.0	1.3	**100**
b12	0.0	76.0	18.7	1.3	1.3	2.7	**100**
b13	0.0	21.3	48.0	17.3	10.7	2.7	**100**

In b09, 52 percent of respondents disagree or strongly disagree with the statements and only 48% agree or strongly agree.

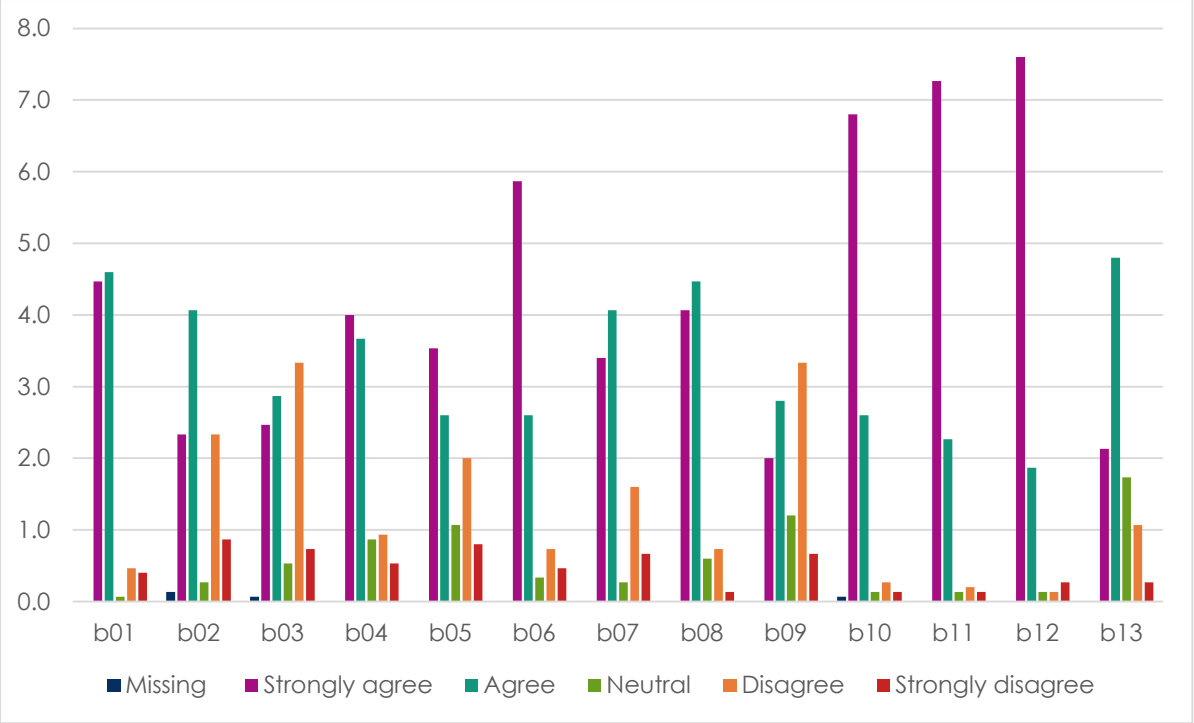


Figure 4.1: Teachers' opinion on teaching Mathematical Literacy

4.3 Factor analysis of Teachers' Experiences in the teaching of Mathematical Literacy in the FET Phase

To meet with the second objective of this study to determine teachers' experiences in the teaching of ML in the FET phase, the thirteen (13) items of teachers' experiences (Table 4.2) were factor analysed to test for construct validity. The researcher used factor analysis to analyse the questions in the questionnaire to test the validity. The principal component factor analysis (PCF) with varimax rotation was used to detect underlying constructs in the dataset, this means that and in terms of the current study what would this mean? The Kaiser-Meyer-Okin (KMO) measure of sample adequacy returned a value of 0.743, which exceeds the recommended 0.6, demonstrating that the sample is large enough to extract factors. The correlation matrix of the items presented in Table 4.6 shows that the items do not correlate too lowly with each other. This is confirmed by Barlett's test of sphericity which gives a significant result (i.e. chi-square (78) = 532.1, p = 0.000).

Table 4.6 : Correlation Matrix of the 13 Items in the dataset

	b01	b02	b03	b04	b05	b06	b07	b08	b09	b10	b11	b12	b13
b01	1												
b02	0.55	1.00											
b03	0.19	0.35	1.00										
b04	0.21	0.03	0.10	1.00									
b05	0.24	0.39	0.27	0.05	1.00								
b06	0.29	0.16	0.12	0.53	-0.02	1.00							
b07	0.06	0.07	-0.07	0.36	-0.10	0.34	1.00						
b08	0.19	0.25	0.17	0.19	0.19	0.34	0.25	1.00					
b09	-0.03	0.07	0.15	-0.11	0.31	-0.13	-0.17	0.11	1.00				
b10	0.08	-0.06	-0.02	0.34	-0.13	0.45	0.24	0.32	0.05	1.00			
b11	0.15	0.05	0.11	0.29	-0.06	0.38	0.29	0.37	0.03	0.58	1.00		
b12	0.12	0.04	0.00	0.31	0.00	0.40	0.22	0.37	0.17	0.56	0.73	1.00	
b13	0.13	0.06	0.09	0.10	0.02	0.21	0.13	0.28	0.18	0.26	0.29	0.35	1.00

Following the recommendation to retain factors with Eigenvalues greater than 1 (Costello & Osborne, 2005), three factors were identified (see Table 4.7 and Figure 4.2).

Table 4. 7: Eigenvalues of factors from PCF

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	3.59458	1.49169	0.2765	0.2765
Factor 2	2.10289	0.63792	0.1618	0.4383
Factor 3	1.46497	0.58351	0.1127	0.551
Factor 4	0.88145	0.043	0.0678	0.6188
LR test: independent vs. saturated: chi2(78) = 534.90; Prob>chi2 = 0.0000 Number of observations = 146; Retained factors = 3; Rotation: (unrotated); Number of parameters = 36				

The three factors derived were identified as follows:

1. Factor 1 – Teacher and learner pre-requirement
2. Factor 2 – How Mathematical Literacy is taught
3. Factor 3 – Input resources for Mathematical Literacy success

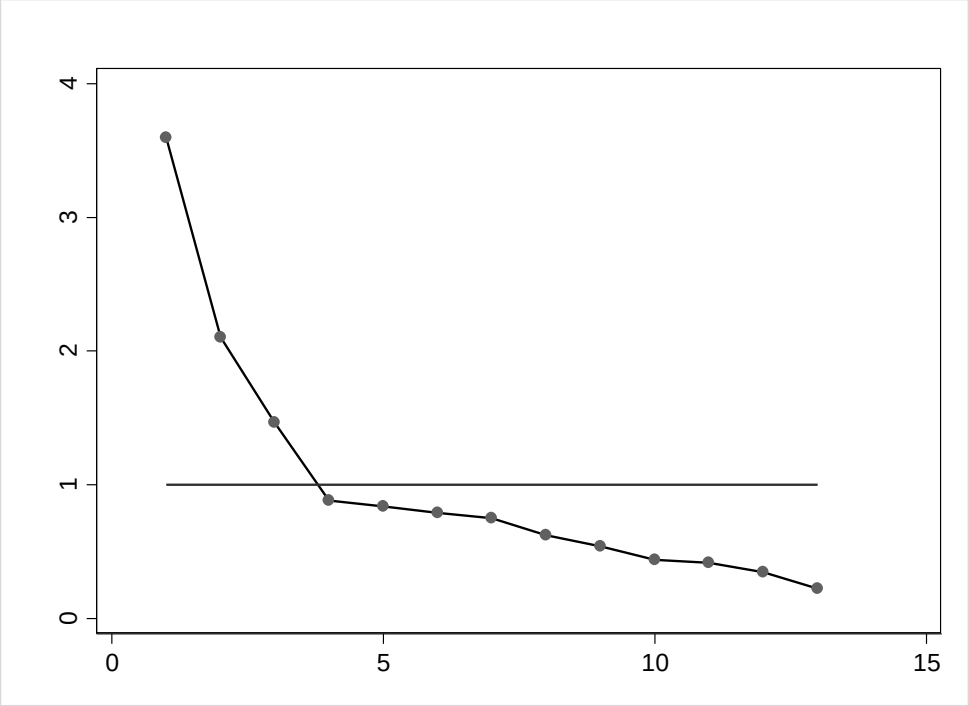


Figure 4.2: Scree plot of factors underlying the data

The first factor consisted of four items, namely, (1) in order to teach Mathematical Literacy, one needs Mathematics knowledge; (2) Mathematical Literacy must be taught by teachers who have studied Mathematics; (3) Mathematical Literacy caters for learners with problems in Mathematics; and, (4) there is a misconception that Mathematical Literacy is inferior to Mathematics. The second factor consisted of five items: (1) Learners understand Mathematical Literacy better when it is integrated with other subjects; (2) Mathematical Literacy is regarded as application of Mathematics in real-life context; (3) at my school, we do team teaching when teaching Mathematical Lteracy; (4) the assessment strategies in the Mathematical Literacy curriculum provide teachers with the framework on the integration of content and context; and, (5) I can teach mathematics irrespective of the class size. Finally, the last factor identified four items: (1) Resources in the teaching of Mathematical Literacy are required for effective learning; (2) Support from subject advisers inspires the teaching of Mathematical Literacy; (3) Workshops for Mathematical Literacy improve one's teaching of the subject; and, (4) Policy changes in education system affect mathematical literacy teaching in a positive manner.

4.4 Reliability

Reliability is concerned with the questionnaire's internal consistency, that is, whether or not individual items measure the same underlying construct as the questionnaire (Field 2009). The Cronbach alpha method was used to test the internal consistency of the items in the questionnaire. Based on the Cronbach alpha results on the individual contribution of each item to the questionnaire's reliability, as well as the resulting alpha value resulting from deleting each of the items, items 5 and 9 were suggested to be deleted as this significantly improved the alpha value (see Model 3 in Table 4.8), and hence internal consistency, of the questionnaire.

However, upon consideration reliability of each factor, as separately evaluated by including the selected item per factor (Arifin, 2017), the Cronbach alpha values suggest that although Model 2 (i.e., deleting items 5 and 9) and 3 (i.e., deleting item 9 only) in Table 4.7 yields not too different alpha values, the alpha value per selected factor performs better in Model 3 (see Table 4.8).

Table 4.8 : Original vs Final Cronbach alpha values

Item	Alpha		
	Model3	**Model 2**	**Model 3 (Adopted)**
b01	0.691	0.722	0.704
b02	0.696	0.742	0.713
b03	0.706	0.754	0.728
b04	0.689	0.713	0.700
b05	0.712	-	0.739
b06	0.675	0.691	0.684
b07	0.709	0.730	0.721
b08	0.676	0.708	0.692
b09	0.727	-	-
b10	0.694	0.717	0.709
b11	0.684	0.707	0.699
b12	0.681	0.709	0.699
b13	0.696	0.730	0.717
Test scale	**0.712**	**0.739**	**0.727**

The Cronbach alpha in the adopted model (i.e., Model 3) is equal to or exceeds the recommended level of approximately 0.7 in both Tables 4. 8 and 4.9 (Lance et al, 2007; Field, 2009). This demonstrates that the questionnaire is reliable and construct valid.

Table 4.9 : Cronbach Alpha values

Item	No. of Observations	Sign	Alpha
Factor 1 (selected model)			
b01	150	+	0.594
b02	148	+	0.464
b03	149	+	0.644
b05	150	+	0.612
Test scale			**0.651**
Factor 1 (alternative model)			
b01	150	+	0.504
b02	148	+	0.298
b03	149	+	0.694
Test scale			**0.612**
Factor 2			
b04	150	+	0.576
b06	150	+	0.543
b07	150	+	0.628
b08	150	+	0.672
Test scale			**0.675**
Factor 3			
b10	149	+	0.695
b11	150	+	0.635
b12	150	+	0.603

b13	150	+	0.828
Test scale			**0.751**

4.5 Confirmatory factor analysis

To confirm that the factors suggested by the PCF analysis measured only the latent variable that is intended to measure and that there were no cross-loadings, confirmatory factor analysis was performed. The confirmatory factor analysis for the three-factor latent constructs identified in the EFA was conducted using Stata's *sem* command. The goodness of fit statistics for the adopted mode in Table 4. 4 (i.e., Model 3) and the suggested modification indices (from running Stata's *estat mindices* command) (see Table A1 and A2 in the appendix A) indicated the fit of the model was ideal, there were no apparent cross-loadings, hence, the model would not benefit significantly from further modification

4.6 Analysis of Coded Qualitative Data

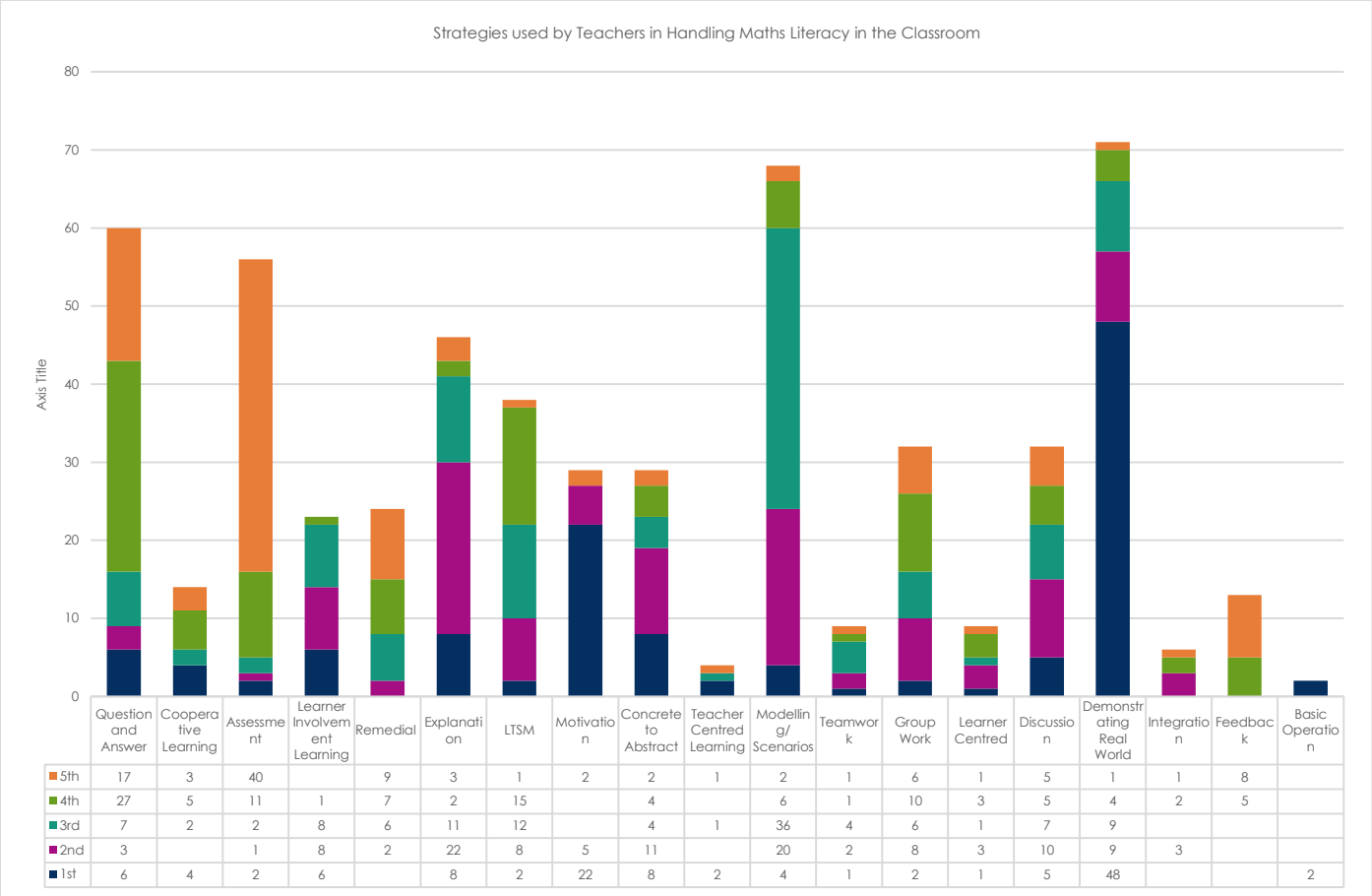
To meet with the second objective of this study, the responses to the open-ended questions on strategies used by teachers in handling Mathematical Literacy were coded into 20 unique themes based on literature. The most frequently occurring strategy adopted by teachers in teaching Mathematical Literacy in the classroom was "demonstrating real world", followed by "modelling/scenarios", and then "question and answer". These themes are presented in Table 4.10.

Table 4.10 : Themes

1		Total (1st to 5th)	Blank	Total
2	**Question and Answer**	60	90	150
3	**Cooperative Learning**	14	136	150
4	**Assessment**	56	94	150
5	**Learner Involvement Learning**	23	127	150
6	**Remedial**	24	126	150
7	**Explanation**	46	104	150
8	**LTSM**	38	112	150
9	**Motivation**	29	121	150
10	**Concrete to Abstract**	29	121	150
11	**Teacher Centred Learning**	4	146	150
12	**Modelling/ Scenarios**	68	82	150
13	**Teamwork**	9	141	150
14	**Group Work**	32	118	150
15	**Learner Centred**	9	141	150
16	**Discussion**	32	118	150
17	**Demonstrating Real World**	71	79	150
18	**Integration**	6	144	150
19	**Feedback**	13	137	150
20	**Basic Operation**	2	148	150

Figure 4.3 breaks down these themes according to how the respondents ranked them. The top strategy used by most respondents was “demonstrating real world” (i.e., 48

respondents ranked it 1st), followed by “motivation” (22 respondents) and then jointly by “concrete to abstract” and “explaining” (eight respondents, respectively). The “assessment” strategy was the most used strategy ranked the least (5th position) among respondents. Respondents indicated that they favoured the use of “demonstrating real world” and “modelling/scenarios” strategies with them occurring as the1st and 2nd most occurring strategies, respectively and being most ranked in the 1st to 3rd category of strategies used. The least popular strategy was “basic operation” with a total of only two people using this strategy. The use of ‘feedback” and ‘teacher-centred” learning was also not particularly favoured by the respondents in this study.



	Question and Answer	Cooperative Learning	Assessment	Learner Involvement Learning	Remedial	Explanation	LTSM	Motivation	Concrete to Abstract	Teacher Centred Learning	Modelling/ Scenarios	Teamwork	Group Work	Learner Centred	Discussion	Demonstrating Real World	Integration	Feedback	Basic Operation
5th	17	3	40		9	3	1	2	2	1	2	1	6	1	5	1	1	8	
4th	27	5	11	1	7	2	15		4		6	1	10	3	5	4	2	5	
3rd	7	2	2	8	6	11	12		4	1	36	4	6	1	7	9			
2nd	3		1	8	2	22	8	5	11		20	2	8	3	10	9	3		
1st	6	4	2	6		8	2	22	8	2	4	1	2	1	5	48			2

Figure 4.3: Strategies used by Teachers in Handling ML in the Classroom

4.7 Chapter conclusion

This chapter presented the analyses of data that was collected using a questionnaire. The data was collected, analysed and presented quantitatively. This study indicated that half of the sample (55.35%) of teachers teaching ML in the FET phase in King Cetshwayo District were under the age of 40 and the majority of them were female (57%) teachers, which means that young teachers are now engaged in the teaching of ML. These teachers have 0-13 years of teaching experience (69%). The majority of the respondents had at least a university degree which indicates that teachers are highly educated (71%) and that will minimise the problem associated with teaching and learning in schools.

The 13 items of teachers' experiences were factor analysed to test for construct validity. Three factors were identified. The first factor was the teacher and learner prerequirement. It was noted from this study that teachers need mathematics knowledge in order to teach Mathematical Literacy. The second factor that was identified in this study was how ML is taught. This study revealed that team teaching and integration with other subjects are important methods that teachers use when teaching ML in the classroom. The third factor was about the resources that were required for the effective teaching of ML. Support from the subject educational specialist is needed, and organising workshops for teachers will improve the teaching of ML in schools.

The findings, conclusions and recommendations based on the results of this chapter are provided in Chapter 5.

CHAPTER 5

DISCUSSION OF FINDINGS, IMPLICATIONS, CONTRIBUTION OF THE STUDY, RECOMMENDATION, LIMITATION AND CONCLUSION

5.1.1 Introduction

This chapter discusses the summary findings from the data analysed in response to the research questions. It also discusses the implications, contribution of the study and makes recommendations, limitations and concludes the study.

The questionnaire was administered to teachers who are teaching Mathematical Literacy at the Further Education and Training Phase. The teachers responded to questions about the prerequisite knowledge needed for ML teachers and learners to teach and learn the subject, respectively.

This chapter details the research findings which are discussed in terms of statistical analyses using Microsoft Excel and Stata14.0, to find out about the views and experiences of mathematical teachers on the teaching of ML. The analysis was done to respond to the objectives of the study, which were:

1. To determine the relationship between teachers' demographic data (age, gender, years of teaching experience, race and qualifications) and their experiences in teaching Mathematical Literacy in the FET Phase.

2. To determine the teacher's experiences in the teaching of Mathematical Literacy in the FET Phase in terms of:
    - Pedagogical content knowledge
    - Curriculum design
    - Resources
    - Policies related to Mathematical Literacy

3. To find out what strategies are used by teachers in handling Mathematical Literacy in the classroom.

.Bansilal, Webb and James (2015) regard mathematical literacy pedagogic content knowledge as the knowledge needed by the teacher to successfully moderate the teaching of mathematical literacy content. This study revealed that mathematical literacy teachers need mathematical content knowledge in order to teach mathematical literacy in the FET phase. One of the prerequirement for teachers to teach ML in this study was that the teacher must have studied mathematics. These findings support the MLPCK.

The findings also support the MLPCK because teachers have knowledge of different strategies to be used in the classroom when teaching ML. The strategies they use in the classroom bring the real world to the classroom and prepares learners to adult life, where learners will use what they have learnt in the classroom to the outside world.

5.2.1 Findings in relation to objective number one

> The first objective of the study is *to determine the relationship between teachers' demographic data (age, gender, years of teaching experience, race and qualifications) and their experiences in teaching Mathematical Literacy in the FET Phase.*

This study revealed that half of the sample of teachers are under the age of 40 years and most of them are female teachers, which means that young teachers are now engaged in the teaching of ML. This finding is in agreement with Durodolu's (2018) findings which showed that there are more female teachers than male teachers. In this study, teachers' experiences in teaching mathematical literacy are between 0-13 years and most of them have a university degree which indicates that they are highly educated. These results match those observed in the earlier studies conducted by Lazarus (2017) which found that educational qualification and teaching experience influence teachers' use of teaching strategies. Other demographic characteristics were checked for gender balance using Chi-square, i.e., age, experience, race and qualification. The results indicated that on average these demographics were balanced by gender. Gender balance has no significance in the achievement of research question 1.3.1 on the relationship between teachers' demographic data and their experiences in the teaching of ML in the FET Phase.

5.2.2 Findings in relation to objective number two

The second objective of the study is *to determine the teacher's experiences in the teaching of Mathematical Literacy in the FET Phase in terms of:*

- *Pedagogical content knowledge*
- *Curriculum design*
- *Resources*
- *Policies related to Mathematical Literacy*

The purpose of this objective was to determine whether experiences of teachers in teaching the subject depend on PCK, knowledge of the curriculum, adequate resource could be an advantage or policies related to ML. All this are significant factors to teachers' experience in teaching M in the FET Phase.

The findings of this study revealed that teachers need mathematics knowledge in order to teach ML in the FET phase. The problem was that there was no initial teacher education training or offering for ML specialisation when the subject was introduced in 2006 (Bansilal, 2014). The Universities opted to offer in-service programmes for practicing teachers to be retrained as ML teachers (Winter, 2014). The Department of Education had to work together with the Higher Education Institutions (HEIs) to offer professional development programmes for practicing teachers as well as to expand pre-service teacher programmes in mathematical literacy (Bansilal et al, 2015). The requirement for HEIs to retrain teachers was that it must be a teacher who has studied mathematics at a High school level (Bansilal, 2014). This was also supported by the findings of Vilakazi (2010) who provided the evidence that the invitation for teachers to be retrained as ML teachers was extended to teachers who had studied mathematics up to grade 12. The study conducted by Owusu-Mensah (2014) showed that none of the existing teachers with the exception of teachers teaching Mathematics and Physical Sciences could meet the requirements. This was the prerequisite for teachers who would teach ML. These findings further support the ideas of Botha, Maree and Stols (2013) which revealed that knowledge of mathematics, as well as teaching and learning skills, are necessary for teachers who are teaching ML. These findings also corroborate the ideas of Owusu- Mensah (2014) that ML teachers with

problems with mathematical content knowledge have a negative effect on the confidence in the teaching of ML. Another prerequirement that was revealed by this study was that ML caters for learners with problems in mathematics, this is supported by Bansilal et al., (2015) that ML was compulsory for learners who were not enrolled for mathematics in the FET phase. This finding corroborates the ideas of Ngoape and Kaino (2014), who suggested that ML should be taught to learners who do not intend to study disciplines which are mathematically based. The study shows that most teachers agreed that there is a misconception that mathematical literacy is inferior to mathematics. These findings support the idea of Hetcher (2011) that mathematical literacy teachers must understand the relationship between mathematics and mathematical literacy so that teachers do not propagate the misconception that ML is simplified Mathematics. The two subjects should be treated equally. This is also confirmed by the study conducted by Long, Bansilal and Debba (2014) that ML differs from mathematics in purpose and content.

The study further revealed that ML is taught better when it is integrated with other subjects. This finding is consistent with those of other studies that indicated that there are some tensions in the implementation of ML in the South African classroom (Hetcher, 2011). Some of these tensions suggest the difficulties faced by teachers which are associated with increasing language and comprehension required by mathematical literacy due to its contextualised and real-life problem-solving nature. The study conducted by Minty and Pather (2014) showed that there will be a problem in the manner in which information and communication technologies are used in teaching and learning by teachers who lack teaching qualifications. It is this study that revealed that the majority of the respondents had a university degree which indicates that teachers are highly qualified and will have no problem in using information and communication technologies during teaching and learning in the classroom.

The study also revealed that mathematical literacy is regarded as the application of mathematics in real-life contexts. The present finding seems to be consistent with other researches which found that in mathematical literacy, the emphasis is on the application of basic mathematics to understand the situation in real life (Long et al., 2014). It is encouraging to compare the findings of this study with those found by Botha

and Putten (2018) that teachers who do not like to use real-life context in mathematical teaching are disinterested in the mathematical context.

It is also noted in this study that team teaching should be used at school to improve teaching and learning. Owusu–Mensah (2014) also emphasises that ML teachers should engage themselves with experienced colleagues to ask for assistance and guidance on the topics they find difficult to understand and that will improve mathematics content knowledge.

This study found that resources play an important role in effective teaching and learning of mathematical literacy; without resources teaching and learning will be ineffective. These results match those observed in the earlier studies by Winter (2014) that the introduction of mathematical literacy increased the need for qualified teachers to implement mathematical literacy at schools. The problem discovered by Ngoepe and Kaino (2014) was that there were few teachers who have experience in teaching mathematical literacy and there were inadequate teaching resources. The success of the implementation of ML depends on appropriate learning support materials. The other problem found by Bansilal et al., (2015) is that there was no in-service programme to reskill teachers in order to teach ML and there was silence regarding continuity of professional development of ML teachers who were trained in the initial programme. Considering that there are no pre-service ML teacher training initiatives, the situation is serious. Higher HEIs and DoE need to work together to offer professional development for practicing teachers as well as to expand the in-service teacher programme in mathematical literacy.

This study found that teachers should attend ML workshops organised by subject advisers to improve the teacher's skills in teaching the subject. This is also confirmed by Long et al. (2014) that adequate training for ML teachers in the content of ML is required. The present finding seems to be consistent with other research which found that teacher educators should do a demonstration process clearly to teachers at the workshop and give a clear understanding of activities dealing with word problems (Botha & Putten, 2018). This will improve the teacher's confidence and learners' results.

The results of the study also revealed that policy changes in the education system affect ML teaching in a positive way because it will provide teachers with an awareness and understanding of the role mathematics plays in the modern world. These findings

further support the idea of Winter (2014) that mathematical literacy is primarily concerned with the preparation of learners for the quantitative demands of everyday life.

It is in this study where it is revealed that assessment strategies in mathematical literacy curriculum provide teachers with the framework on the integration of content and context. This result supports the suggestion by Vilakazi (2010) that teachers must focus on adopting the best mathematics instructional and assessment strategies with an emphasis on strategies to promote mathematical literacy.

5.2.3 Findings in relation to objective number three

> The third objective of the study is to *find out what strategies are used by teachers in handling Mathematical Literacy in the classroom.*

The findings of this study reveal that the most frequently used strategy adopted by teachers in handling mathematical literacy in the classroom was demonstrating real-world followed by modelling /scenarios. This finding is in agreement with the findings of Pillai, Galloway and Adu (2017) that there are different approaches used by teachers when teaching mathematical literacy. However, this finding differs from the study conducted by Botha and van Putten (2018) in that the majority of teachers do not carry out the modelling process. However, the finding of this study is consistent with Long et al., (2014) who suggested that the emphasis in mathematical literacy is in the application of basic mathematics to understand the situation in real life. The finding of the current study is consistent with those of Ozgen (2012) which highlighted that the concepts of mathematical literacy and connections to real-world are no different. It further indicates that connecting with the real-world is creating connections with the external world. These findings support the idea of Pillai et al, (2017) that teachers should use available resources to assist them in increasing the use of scenarios for mathematical teaching.

When teachers demonstrate real-world in ML teaching, they align life-preparation orientation goals that develop learners' skills in line with ML curriculum at accessing numerical information used in a real-life context (Bansilal, 2014). These strategies

prepare learners for adult life where they will use what they have learnt in class in the outside world (Gal, 2009).

The findings of the study also found that another strategy that was used by teachers in the classroom was motivation after demonstrating real-world, modelling and scenarios. The results also revealed that if learners are not motivated to love the subject and are not told the importance of the subject that might lead them not to pass the subject. In contrast to earlier findings, however, no evidence of motivation as one of the strategies used by teachers in teaching mathematical literacy was detected. Other strategies used in this study were teaching from concrete to abstract, explanation and assessment. The least popular strategies were basic operation, feedback and teacher-centred learning. In contrast to the current findings, Pillai et al., (2017) revealed that mathematical literacy encourages teachers to use learner-centred and activity–based approaches.

This study gives the evidence that teachers know different strategies that are used in handling ML in the classroom for effective teaching and learning.

5.3 Implications

This study revealed the experiences of teachers in the teaching of mathematical literacy in the FET Phase in King Cetshwayo District. It revealed that experiences of teachers in teaching ML in the FET Phase do not rely on the gender and age of teachers but any teacher can teach ML irrespective of gender and age. Though teachers in this study are highly educated, it does not show whether they are trained to teach ML in the FET Phase or not. That might cause teachers not to apply the correct approach when teaching the subject. For future research, researchers can research whether the teachers who are currently teaching ML at the FET Phase are trained in ML teaching or not. That will have an impact in the sense that HEIs will see the need to open courses that will train teachers in the teaching of ML in the FET Phase.

Future research on strategies used by teachers when teaching ML in the classroom should mostly address the approach and implementation of these strategies using a qualitative research method. The starting point could be interviews and observations,

where the researcher will be engaged with the activities done in the classroom. By so doing the researcher will be able to know how ML is facilitated and understood in the classroom.

5.4 Contribution of the study

The study will contribute to the needs of the society where learners will become citizens who can contribute to the economic world by negotiating and functioning with everyday mathematical calculations and problems. It is also hoped that the study will encourage teachers to use correct strategies during teaching. This study also contributes to the existing literature on the introduction of ML in schools. The study constitutes literature that shows that ML was introduced as an intervention to improve the numeracy skills of South African citizens, which is consistent with the study of Geldenhuys, Kruger and Moss (2013) and Vilakazi (2010). It is also hoped that the South African economy will improve when teachers produce learners who are knowledgeable and have skills to participate in the growth of the economy and development of a democratic society.

5.5 Recommendations for further study

Based on the findings of the study, the researcher makes the following recommendations:

The study focused on the experiences of teachers in the teaching of ML in the FET Phase in King Cetshwayo District. The study could be extended to other districts and also include other races to compare the findings as well. It is recommended that a further study should investigate the experiences of teachers in the teaching of ML in other districts as well as other races.

The demographic data of the respondents shows that teachers are highly qualified to teach but it does not show whether their qualifications are of teaching ML or not. In the literature review of this study, it was observed that there is a need for ML teachers to be retrained in teaching ML since they were not trained to teach the subject. That will assist them in choosing the correct strategies they will use in teaching ML and improve

the facilitation and understanding of ML, since the strategies they use might be strategies they use in teaching other subjects that they were trained to teach; such strategies might not be applicable to the teaching of ML. For future research, it is recommended that an investigation should be conducted on the qualifications that ML teachers must have in order to teach ML in the FET Phase and whether they use the correct strategies when teaching learners.

It is recommended that the Department of Education provides on-going support to teachers teaching ML in the FET Phase. This study recommends that support from subject education specialists like workshops and resources is required for effective teaching. Subject education specialists should visit teachers at schools to find out the challenges that teachers are experiencing and support according to the school's needs. For further study, the researcher could investigate the kind of support the Department of Education gives to ML teachers to improve their teaching skills.

It is also recommended that teaching of ML as a subject must be taught by teachers with a background in mathematics since the majority of teachers agreed that mathematical knowledge is a prerequisite for teachers teaching ML. The teaching of ML brings the real world into the classroom; this will build a bridge between schools and society and provide teachers with awareness and understanding of the role ML plays in the modern world. Learners will go and apply what they have learnt in the classroom to the outside world. One of the strategies teachers use is demonstrating the real world and modelling scenarios. This means that the curriculum should prepare learners for adult life after their studies.

5.6 Limitations

The researcher acknowledges that the study had certain limitations. A common limitation is when the respondents do not respond truthfully to items on an instrument like questions; their response reflects neither true perception nor the perception of the population from which they were drawn (Prince & Murnan, 2004). From this study, respondents could have listed any strategies even if they do not use it in class.

This study was conducted in King Cetshwayo District in KZN. Some circuits were not represented since the district is too big. The sample consisted of 150 respondents

which means, not all teachers were represented in the study since the researcher could not reach those schools. A quantitative research method was used in the study.

The study used mostly African public schools but not all the races were represented in the study. This could also hinder the actual results. In this study, the focus was only on teachers who are fully engaged with the teaching of ML in the classroom; subject education specialists were not part of the study. Other researchers can conduct research on the things that were not covered in this study.

5.7 Conclusion

This research report on the experiences of teachers in the teaching of ML in the FET Phase in King Cetshwayo District. This study found that teachers must be mathematically knowledgeable in order for them to teach ML. The findings from this study also show that the majority of teachers in King Cetshwayo District agree that ML must be integrated with other subjects that will make learners understand better and be able to apply ML in real-life situations.

The study also investigated the best teaching strategies used by teachers in teaching ML in class. The best strategies were demonstrating the real world in the classroom and using scenarios/ modelling during lesson presentations bringing the outside world into the class. This will make learners be knowledgeable and skilful and be able to participate and contribute to the democratic society and economy. The study also reveals the need for teachers to be equipped with knowledge and skills so as to teach ML in a more meaningful way. The researcher strongly believes that further training and support from the Department of Education is needed.

REFERENCES

Aaker, D. A., Kumar, V., Day, G. S., & Leane, R. P. (2011). *Marketing research.* International student version (10th ed.). Singapore: John Wiley & Sons.

Abidin, Z., Mathrani, A., Parsons, D., & Suriadi, S. (2015). *Opportunities and challenges of mobile learning for promoting mathematical literacy.* Australasian Conference on Information Systems 2015, Adelaide, South Australia**,** Australia.

Adams, A. (2010). *Rehearsal or Reorganization Two Patterns of Literacy Strategy Use in Secondary Mathematics Classes*. Montana Mathematics Enthusiast, 7(2/3), 371-390.

Arbuckle, J. L. (2014). *IBM SPSS Amos 22 user's guide*. Armonk, USA: IBM Corporation.

Arifin, W. N. (2017). Exploratory factor analysis and Cronbach's alpha. *dim (data1),* 1(150), 12.

Arthur, J. (2012). *Research methods and methodologies in education*. London, UK: SAGE.

Babbie, E. (2010). *The practice of social research (12th ed.).* Southbank, Victoria, USA: Wadsworth/Thompson.

Babbie, E. (2013). *The practice of social research* (13th ed.). Wadsworth: Cengage learning.

Babbie, E. (2014). *The basics of social research* (6th ed). California, USA: Cengage Learning.

Babbie, E., & Mouton, J. (2011). *The practice of social research.* South African Edition, Cape Town, SA: Oxford University Press.

Bansilal, S. (2014). Exploring the notion of Mathematical Literacy teacher knowledge. *South African Journal of Higher Education*, 28(4), 1156–1172.

Bansilal, S., & Debba, R. (2012). Exploring the role of contextual attributes in a mathematical literacy assessment task. *African Journal of Research in Mathematics, Science and Technology Education,* 16(3), 302-316.

Bansilal, S., Goba, B., & Webb, L. (2012). Tracing the impact: A case of a professional development programme in Mathematical Literacy. *Africa Education Review,* 9(1), 106-120.

Bansilal, S., Goba, B., Webb, L., James, A., & Khuzwayo, H. (2012). Tracing the impact: A case of a professional development programme in mathematical literacy. *Africa Education Review*, 9(sup1), 106-120.

Bansilal, S., James, A., & Webb, L. (2015). Teacher training for mathematical literacy: a case study taking the past into the future. *South African Journal of Education,* (1), 1.

Bansilal, S., Mkhwanazi, T., & Mahlabela, P. (2012). Mathematical literacy teachers' engagement with contextual tasks based on personal finance. *Perspectives in education,* 30(3), 98-109.

Bansilal, S., Webb, L., & James, A. (2015). Teacher training for mathematical literacy: A case study taking the past into the future. *South African Journal of Education*, 35(1), 1-10.

Beckett, C., & Maynard, A. (2013). *Values and ethics in social research.* London, UK: Sage Publications.

Blaikie, N. (2010). *Designing social research* (2nd ed.). Cambridge, UK: Polity Press.

Bless, C., Higson-Smith, C., & Sithole, S. L. (2013). *Fundamentals of social research: An African perspective* (5th ed.). Cape Town, SA: Juta & Co. (Pty) Ltd.

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2011). *Business research methods* (3rd ed.). London: McGraw-Hill.

Botha, H., & van Putten, S. (2018). How mathematical literacy teachers facilitate mathematisation in Modelling Situations. *African Journal of Research in Mathematics, Science and Technology Education,* 22(1), 93–102.

Botha, H., Maree, J., & Stols, G. (2013). Mathematical literacy teachers: Can anyone be one? *Perspectives in Education*, 31(4), 180-194.

Brown, AL.,(1994).The advancement of learning.*Educational researcher,4-12.*

Bryman, A., & Bell, E. (2011). *Business research methods* (3rd ed.). New York: Oxford University Press.

Burns, A. C., & Bush, R. F. (2010). *Marketing research* (6th ed.). Upper Saddle River: Prentice-Hall.

Burton, D., & Bartlett, S. (2009). Key issues for educational researchers, SAGE Publications. Retrieved from: http://0-dx.doi.org.oasis.unisa.ac.za/ 10.4135/9781446269480.n2 (Accessed on 3 July 2018).

Churchill, G. A., Brown, T. J., & Suter, T. A. (2010). *Basic marketing research* (7th ed.). Australia: South-Western. Cengage Learning.

Cooper, D. R., & Schindler, P. S. (2011). *Business research methods* (11th ed.). New York, USA: McGraw-Hill.Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd edition). Thousand Oaks: Sage.

Daniel, J. S. (2012). *Sampling essentials: Practical guidelines for making sampling choices.* Los Angeles, USA: Sage.

De Vos, A. S. Strydom, H., Fouche, C. B., & Delport, C. S. L. (2011). *Research at grassroots: For the social sciences and human service professions,* 4th ed.). Pretoria, SA: Van Schaik publishers.

Debba, R. (2011). *An exploration of the strategies used by grade 12 mathematical literacy learners when answering mathematical literacy examination questions based on a variety of real-life contexts.* Submitted in partial fulfilment of the academic requirements for the degree of Master of Education in the School of Science, Mathematics, and Technology Education Faculty of Education University of KwaZulu-Natal.

Dede, Y. (2013). The effect of German and Turkish mathematics teachers' teaching experience on mathematics education values: a cross-comparative study. *International Journal of Mathematical Education in Science & Technology, 44*(2), 232-252. doi: 10.1080/0020739X.2012.714489.

Delport, C. S., & Roestenburg, W. J. H. (2011a). *Quantitative data collection methods: Indexes and scales.* Research at grassroots: For the social sciences and human service professions (4th ed.). Pretoria, SA: Van Schaik Publishers.

Department of Education (DoE) 2003. *National Curriculum Statement, Grade*

10-12(General): Mathematical literacy. Department of Education Pretoria: Government Printers.

Department of Basic Education (DBE) (2011). *Curriculum and assessment policy statement grades 10-12 mathematical literacy.* The Department of Basic Education, Pretoria: Government Printers.

Department of Basic Education (DBE). (2011). *Curriculum and assessment policy statement (CAPS) mathematical literacy final draft.* The Department of Basic Education, Pretoria: Government

Du Plooy, C. F., Davis, C. & Bezuidenhout, R. M. (2014). *Research matters*. Cape Town, SA: Juta.

Durodolu O.O. (2018). Secondary school teachers' perception of Information Literacy Skills.*Journal,* 36(20), 1-20

Feinberg, F. M., Kinnear, T. C., & Taylor, J. R. (2013). *Modern marketing research: Concepts, methods, and cases* (2nd ed.). Michigan: Cengage.

Field, A. (2009). Discovering Statistics using SPSS. Sage: London.

Flick, U. (2011). *Introducing research methodology: A beginner's guide to doing a research project.* Thousand Oaks, USA: Sage Publications.

Frith, V. (2009). Mathematical literacy for higher education. Journal of *Learning and Teaching Mathematics,* 10(1), 3-7.

Gal, I. (2009). South Africa's mathematical literacy and mathematics curricula: Is probability literacy given a fair chance? *African Journal of Research in Mathematics, Science and Technology Education,* 13(1), 50-61.

Geldenhuys, J. L., Kruger, C., & Moss, J. (2013). Selected South African grade 10 learners' perceptions of two learning Areas: Mathematical Literacy and Life Orientation. *Africa Education Review,* 10(2), 298-322.

Gerrish, K., & Lacey, A. (2010). *The research process in nursing* (6th ed.). West Sussex, UK. Blackwell Publishing Ltd.

Gleeson, M. (2015). 'It's the nature of the subject': Secondary teachers' disciplinary beliefs and decisions about teaching academic language in their content classes. *Australian Journal of Language & Literacy, 38*(2), 104-114.

Goos, M. (2013). Knowledge for teaching secondary school mathematics: what counts? *International Journal of Mathematical Education in Science & Technology, 44*(7), 972-983. doi:10.1080/0020739X.2013.826387.

Graven, M., & Buytenhuys, E. (2010). *Mathematical literacy in South Africa: Increasing access and quality in learners.* Mathematical participation both in and beyond the classroom. Mapping equity and quality in mathematics education, Johannesburg: University of the Witwatersrand.

Grove, S. K., Burns, N., & Gray, J. R. (2013). *The practice of nursing reIsearch*. Appraisal, synthesis and generation of evidence (7th ed.). Missouri: Elsevier.

Guvendir, M. A. (2017). Determination of the relationship between the students' mathematical literacy and home and school educational resources in Program for International Student Assessment. *Mersin University Journal of the Faculty of Education,* 13(1), 94-109.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: A global perspective* (7th ed.). Upper Saddle River, N.J.: Pearson.

Hare,D., Howard ,E., & Pope, M. (2005). Enhancing technology use in student teaching. Acase study. *Journal of Technology nd Teacher Education, 13(4), 573*

Hechter, J. E. (2011). *Analysing and understanding teacher development on a Mathematical Literacy ACE course* (Published Masters dissertation). University of the Witwatersrand, Johannesburg, South Africa.

Helga Gunnarsdóttir, G. (2014). Professional development: Possibilities and restrictions for mathematics teachers in lower secondary school in Iceland. *Mathematics Enthusiast, 11*(1), 155.

Higgs J., & Cherry N. (2009). *Doing qualitative research on practice.* Rotterdam: Sense Publishers.

Hof, M. (2012). Questionnaire Evaluation with Factor Analysis and Cronbach's Alpha An Example.

Available:https://pdfs.semanticscholar.org/77d6/d6c8cdcbdd201e86472e2ba5924c4f4bdc1d.pdf?_ga=2.215095582.865133155.1581516211-1914099591.1581516211

Houston, J., Tenza, S. P., Hough, S., Singh, R., & Booyse, C. (2015). The rationale for teaching quantitative literacy in 21st century South Africa: A case for the renaming of mathematical literacy. *The Independent Journal of Teaching and Learning*, 10(1), 6-36.

Iacobucci, D., & Churchill, G. A. (2010). *Marketing research: Methodological foundations* (10th ed.). Mason: Cengage

Ilbagi, E. A., & Akgun, L. (2013). An investigation of the mathematical literacy of students aged 15 in terms of Pisa 2003 mathematical literacy questions: Results from Turkey. *International Journal of Progressive Education*, 9(3), 194-217.

Jennings, G. (2010). *Tourism research* (2nd ed.). Milton: John Wiley.

Jita, L. C., & Akpo, S. E. (2013). The influence of selected teacher inputs on students' academic achievement in the junior secondary school certificate mathematics in Namibia. *TD* (3), 465.

Kapucu, S., & Yıldırım, U. (2014). Physics teachers' behavioural, control and normative beliefs about teaching physics according to the national high school physics curriculum in Turkey. *International Journal of Environmental and Science Education*, 9(2), 133-157.

Kerlinger, F. N. (1972). Draft report of the APA Committee on Ethical Standards in Psychological Research: A critical reaction. American Psychologist, 27(9), 894-896. doi: 10.1037/h0038038

Khaerunisak, E., Kartono, P., Hidayah, I., & Fahmi, A. Y. (2017). The analysis of diagnostic assessment result in Pisa mathematical literacy based on students' self-efficacy in RME Learning. *Journal of Infinity*, 6 (1): 77-94.

Kogar, H. (2015). Examination of factors affecting PISA 2012 mathematical literacy through mediation model. *Journal of Education and Science,* 40(179), 45-55.

Kotler, P., & Keller, K. L. (2012). *Marketing management* (14th ed.). Boston, USA: Pearson.

Kumar, R. (2011). *Research methodology: A step-step guide for beginners* (3rd ed.). London: SAGE Publications Ltd.

Lance CE, Butts MM, Michels LC. (2006). The Sources of Four Commonly Reported Cutoff Criteria: What Did They Really Say? Organizational Research Methods. 9(2):202–20.

Lazarus K.U., (2017) Demographic determination of teachers' use of scaffolding strategies in reading instruction for pupils with disabilities. *An International Journal,* 25(2), 51-65

Lee, J. A., & McDougall, D. E. (2010). Secondary school teachers' conceptions and their teaching practices using graphing calculators. *International Journal of Mathematical Education in Science & Technology, 41*(7), 857-872. doi: 10.1080/00207391003777889.

Leedy, P. D., & Ormrod, J. E. (2010). *Practical research: Planning and design* (9th ed.). Boston: Pearson Education

Lester, N.B., & Onore, C.S., (1990). Learning Change: One school district meets language across the curriculum Portsmith, NH: Boynton/Cook Publishers.

Lin, S., & Tai, W. (2015). Latent class analysis of students' mathematics learning strategies and the relationship between learning strategy and mathematical literacy. *Universal Journal of Educational Research,* 3(6), 390-395.

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). *Paradimatic controversies, contradictions, and emerging confluences, revisited.* The Sage handbook of qualitative research, Los Angeles, USA: Sage.

Long, C., Bansilal, S., & Debba, R. (2014). An investigation of mathematical literacy assessment supported by an application of Rasch measurement. *Journal of Pythagoras,* 35(1), 1-17.

Machaba, F., & Mwakapenda, W. (2017). Implications of differences and similarities of mathematics and mathematical literacy. *International Journal of Educational Sciences,* 17(1-3), 148-160.

Magen-Nagar, N. (2016).The effects of learning strategies on mathematical literacy: A comparison between lower and higher achieving countries. *International Journal of Research in Education and Science,* 2(2), 306-321.

Malhotra, N. K. (2012). *Basic marketing research, integration of social media* (7th ed.). Pearson Education International. New Jersey.

Pietersen, J & Maree, K. (2010). Standardisation of a questionnaire. In K. Maree (Ed.), *First steps in research* (pp. 215-222).Van Schaik Publishers, Pretoria

Maxwell, J. A. (2012). *A realist approach for qualitative research.* Thousand Oaks: SAGE Publications.

Mbonambi, M. S, & Bansilal, S. (2014). Comparing grade 11 mathematics and mathematical literacy learners' algebraic proficiency in temperature conversion problems. *African Journal of Research in Mathematics, Science and Technology Education,* 18(2): 198-209.

McDaniel, C., & Gates, R. (2010). *Marketing research with SPSS* (8th ed.). New Jersey, USA: John Wiley & Sons.

McMillan, J. H. (2012). *Educational research: Fundamentals for the consumer* (6th ed.). Boston: Pearson.

McMillan, J. H., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry* (7th ed.). Boston: Pearson.

McMillan, J., & Schumacher, S. (2014). Research in education: evidence-based inquiry: Pearson Education.

Memnun, D. S., Akkaya, R., & Hacıomeroglu, G. (2012). The effect of prospective teachers' problem solving beliefs on self-efficacy beliefs about mathematical literacy. *Journal of College Teaching and Learning – Fourth Quarter,* 9(4), 289-298.

Mhakure, D., & Mokoena, M. A. (2011). A comparative study of the FET Phase mathematical literacy and mathematics curriculum. *US-China Education Review,* B3, 309-323

Migiro, S. O., & Magangi, B. A. (2011). Mixed methods: A review of literature and the future of the new research paradigm. *African Journal of Business Management*, 5(10), 3757-3764.

Minty, R., & Pather, E. U. (2014).The integration of ICTs in the teaching and learning of mathematical literacy -A study conducted in eight schools in Gauteng, South Africa. *International Journal of Science Commerce and Humanities,* 2(1), 47-60.

Monde, M. (2011). Teachers' views on mathematical literacy and on their experiences as students of the course. *Pythagoras* (63), 22.

Moses, J. W., & Knutsen, T. L. (2012). *Ways of knowing* (2nd ed.). Palgrave Macmillan, New York.

Muijs, D. (2011). *Doing quantitative research in education with SPSS* (2nd ed.). London: Sage Publications.

Nel, B. (2012). Transformation of teacher identity through a mathematical literacy re-skilling programme. *South African Journal of Education*, 32(1), 144-154.

Neuman, W. L. (2011). *Social research methods: Qualitative and quantitative approaches* (6th ed.). Boston, MA: Pearson.

Ngoepe, M. G., & Kaino, L. M. (2014). Governance and management support for mathematical literacy teaching and learning at a school in Mpumalanga Province of South Africa. *Mediterranean Journal of Social Sciences*, 5(1), 579-585.

Nieuwenhuis, J. (2012). *Qualitative research designs and data gathering techniques.* First steps in research, Pretoria, SA: Van Schaik Publishers.

North, M. (2017). In pursuit of an orientation for life-preparation: A case study of the subject mathematical literacy in South Africa. *African Journal of Research in Mathematics, Science and Technology Education,* 21(3), 234-244.

North, M. P. (2015). *The basis of legitimisation of mathematical literacy in South Africa* (Published PhD thesis). University of KwaZulu-Natal, Pietermaritzburg, South Africa.

Organ, D. D., Ndekugri, J. E., Oduoza, C. F. and Khatij, J. M. (2016). Principles for developing an effective framework to control minerals and rocks extraction impacts, mitigate waste and optimise sustainable quarries management. *Journal of Resources Policy,* 47(1): 164–170.

Owusu-Mensah, J. (2014). The value of mentoring for mathematical literacy teachers in the South African school system. *International Journal of Education Science,* 7(3), 509-515.

Ozgen, K. (2012). Self-efficacy beliefs in mathematical literacy and connections between mathematics and real world: The case of high school students.

Journal of International Education Research – Fourth Quarter, 9(4), 305-316.

Piaget.J, (1973). To understand is to invest: The future of education.

Pillai, S. P. M., Galloway, G., & Adu, E. O. (2017). Comparative studies of mathematical literacy/Education: A Literature Review. *International Journal of Educational Sciences,* 16(1-3): 67-72.

Price, J. H., & Murnan, J. (2004). Research limitations and the necessity of reporting them. *American Journal of Health Education*, *35*(2), 66–67.

Rajasekar, S, Philominathan, P., & Chinnathambi, V. (2013). *Research methodology.* Retrieved from: http./www. arXiv:physics (Accessed on 3 July 2018).

Rea, L. M., & Parker, R. A. (2012). *Designing and conducting survey research: A comprehensive guide.* New York, USA: Wiley.

Reid, R. D, & Bojanic, D. C. (2010). *Hospitality marketing management* (5th ed.). New Jersey: John Wiley & Sons.

Rogoff , B(1998). Cognition as a collaborative process. In W. Damon, D Knhn &R.S.Siegler (*ed*). *Hand book of child psychology (5th ed, vol1.2). New York : Wiley.*

Saunders, M. Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (6th ed.). Essex: Pearson Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2015). *Research methods for business students* (7th ed.). Essex: Pearson Education Limited.

Schurink, W., Fouche, C. B., & De Vos, A. S. (2011). *Qualitative data analysis and interpretation.* Research at grassroots for the social sciences and human service professions (4th ed.). Pretoria, SA: Van Schaik.

Schuwirth, L. W. T., & Van der Vleuten, C. P. M. (2010). *How to design a useful test: Principles of assessment.* London, UK: Wiley-Blackwell.

Sharma, S., & Bansal, G. (2009). *Research methodology*. New Delhi, USA: Jain Book Agency.

Shiu, E., Hair, J., Bush, R., & Ortinau, D. (2009). *Marketing research.* London, UK: McGraw-Hill.

Shujahat, M., Hussain, S. Javed, S., Malik, M. I., Thurasamy, R., & Ali, J. (2017). Strategic management model with lens of knowledge

management and competitive intelligence: A review approach. *Journal of information and knowledge management systems,* 47(1), 55-93.

Stephen, E. (2012). *Principles of research methodology.* A guide for clinical investigators. London, UK: Heidelberg Dordrecht.

Stol, K.J., & Fitzgerald, B. (2014). *Research protocol for case study of crowdsourcing software development.* Retrieved from: http.//www.staff.lero.ie/stol/publications, university of Limerick. (Accessed 3 July 2018).

Suharta, G. P., & Suarjana, M. (2018). A case study on mathematical literacy of prospective elementary school teachers. *International Journal of Instruction,* 11(2), 413-424.

Tai, W., & Lin, S. (2015). Relationship between problem-solving style and mathematical literacy. *Educational Research and Reviews,* 10(11), 1480-1486.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach"s Alpha. *International Journal of medical education,* 2(1), 52-55.

Teddlie, C., & Tashakkori, A. (2010). *Mixed methods in social and behavioral research*. Thousand Oaks: Sage Publications Ltd.

Thompson, A. A., Peteraf, M.A., Gamble, J. E., & Strickland III, A.J. (2014). *Crafting and executing strategy: The quest for competitive advantage*. Concepts and cases, 20th ed. New York: McGraw-Hill Education.

Thomson, S., Hillman, K., & Bortoli, L. (2013). *A teacher's guide to PISA mathematical literacy.* Victoria, 3124, Australia: Australian Council for Educational Research Ltd.

Turney, W., & Robb, G. P. (1971). *Research in education: an introduction*: Hinsdale: Dryden Press.

Umugiraneza O., Bansilal S., & North D. (2017). Exploring teachers' practices in teaching mathematics and statistics in KZN. *South African Journal of education,* 37(13)

Urbach, N., & Ahlemann, F. (2010). Structural equation modelling in information systems research using partial least squares. Theory and application, *Journal of Information Technology,* 11(2), 8-22.

Vale, P. (2013). Describing the relationship between the cognitive and linguistic complexity of a mathematical literacy examination and types of student errors (Published Masters thesis). Rhodes University, Grahamstown, South Africa.

Vale, P., Murray, S., & Brown, B. (2012). Mathematical literacy examination items and student errors: An analysis of English second language students' responses. *Journal of Language Learning,* 28(2), 65-83.

Veal, A. J. (2011). *Research methods for leisure and tourism: A practical guide* (4th ed.). Edinburgh Gate, UK: Pearson Education Limited.

Venkat, H. (2010). Exploring the nature and coherence of mathematical work in South African mathematical literacy classrooms. *Research in Mathematics Education,* 12(1), 53-68.

Vilakazi, A. S. (2010). *An exploration of mathematical literacy teachers' perceptions of, and performance in mathematical literacy tasks based on Algebra* (Published Masters thesis). University of KwaZulu-Natal, Pietermaritzburg, South Africa.

Vos, A. S., Strydom, H., Fouche, C. B., & Delport, C. S. L. (2014:37). *Research at grassroots: For the social sciences and human service professions* (4th ed.). Pretoria, SA: Van Schaik.

Welman, C., Kruger, F.,& Mitchell, B.(2007). *Research methodology (3rd edition*). South African Edition, Cape Town, SA: Oxford University Press.

Wilson, J. (2010). *Essentials of business research: A guide to doing your research project.* London, UK: Sage Publications Ltd.

Winter, M. M. J. (2014). *Pre-service teacher learning and practice for mathematical literacy* (Published PhD thesis). University of the Witwatersrand, Johannesburg, South Africa.

Zandvanian, A., & Dryapoor, E. (2013). Mixed methods research: A new paradigm in educational research. *Journal of educational and management studies*, 3(4), 525-531.

Zikmund, G. W., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods* (9th ed.).Toronto, South-Western: Cengage Learning.

Zikmund, W.G. & Babin, B.J. (2013). Essentials of marketing research (5th ed.). South-Western, USA: Cengage Learning.

APPENDIX A: Adopted models

Table A1: Detailed Goodness of Fit Statistics for Adopted Model

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(51)	77.373	model vs. saturated
p > chi2	0.01	
chi2_bs(66)	515.208	baseline vs. saturated
p > chi2	0	
Population error		
RMSEA	0.06	Root mean squared error of approximation
90% CI, lower bound	0.03	
upper bound	0.085	
Pclose	0.266	Probability RMSEA <= 0.05
Information criteria		
AIC	4746.286	Akaike's information criterion
BIC	4862.647	Bayesian information criterion
Baseline comparison		
CFI	0.941	Comparative fit index
TLI	0.924	Tucker-Lewis index

Size of residuals		
SRMR	0.065	Standardized root mean squared residual
CD	0.989	Coefficient of determination

Table A2: Suggested Modification Indices based on Adopted Model

		Modification Indices	Degrees of Freedom	P>MI	Expected Parameter Change	Expected Parameter Change
Measurement						
b01 <-						
	F2	7.148	1	0.01	0.315454	0.232776
	F3	3.959	1	0.05	0.278606	0.151324
b08 <-						
	F1	5.092	1	0.02	0.303783	0.204519
	F3	5.549	1	0.02	0.54167	0.317946

Appendix B: Letter of permission to conduct the study

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma Tel: 033 392 1041 Ref.:2/4/8/928

Mrs PN Memela
17 Grevillae
Arboretum
Richards Bay
3900

Dear Mrs Memela

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"EXPERIENCES OF TEACHERS IN THE TEACHING MATHEMATICAL LITERACY IN THE FURTHER EDUCATION AND TRAINING PHASE IN UTHUNGULU DISTRICT",** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 31 October 2016 to 26 April 2018.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UThungulu District

Dr. EV Nzama
Head of Department: Education
Date: 02 November 2016

...Championing Quality Education - Creating and Securing a Brighter Future

KWAZULU-NATAL DEPARTMENT OF EDUCATION
Postal Address: Private Bag X9137 • Pietermaritzburg • 3200 • Republic of South Africa
Physical Address: 247 Burger Street • Anton Lembede Building • Pietermaritzburg • 3201
Tel.: +27 33 392 1004/41 • **Fax.:** +27 033 392 1203• **Email:** Kehologile.Connie@kzndoe.gov.za/Phindile.Duma@kzndoe.gov.za •**Web:**www.kzneducation.gov.za
Facebook: KZNDOE....Twitter: @DBE_KZN....Instagram: kzn_education....Youtube:kzndoe

Appendix C: Research questionnaire

EXPERIENCES OF TEACHERS IN TEACHING MATHEMATICAL LITERACY IN THE FURTHER EDUCATION AND TRAINING PHASE IN KING CETSHWAYO DISTRICT

Dear Respondent

QUESTIONNAIRE ON EXPERIENCES OF TEACHERS IN TEACHING MATHEMATICAL LITERACY IN THE FURTHER EDUCATION AND TRAINING PHASE IN KING CETSHWAYO DISTRICT

I am studying at the University of Zululand, conducting research as a requirement of completing my Masters' Degree on teacher's experiences and views with regard to the teaching of Mathematical Literacy and the strategies they use in handling Mathematical Literacy in the classroom in the Further and Education Phase.

.

The results of this study will improve the content knowledge to those educators who did not do mathematics at a tertiary level

Please mark with an **x** or tick **{√}** in the box with the appropriate response. Mark one box only.

SECTION A: DEMOGRAPHIC DATA

1. **Age:**

20-29 years	30-39 years	40-49 years	50-59 years	More than 60 years
1	2	3	4	5

2. **Gender:**

Male	Female
1	2

3. **Experience:**

0-6years	7-13 years	14-20 years	21-27 years	28-34 years	More than 34 years
1	2	3	4	5	6

4. **Race:**

African	Coloured	Indian	White	Other
1	2	3	4	5

5. **Qualifications:**

Matric only	1
Matric + Teacher's Certificate	2
Matric + Teacher's Diploma	3
Degree	4
Degree+ Diploma	5
Senior Degree	6
Senior Degree+ Diploma	7

SECTION B: QUESTIONNAIRE

Please respond to each statement by marking a cross (X) on the option of your choice.

NO	STATEMENT	OPTIONS				
		Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
1.	In order to teach Mathematical Literacy one needs Mathematics knowledge.	1	2	3	4	5
2.	Mathematical Literacy must be taught by teachers who have studied Mathematics.	1	2	3	4	5
3.	Mathematical Literacy caters for learners with problems in Mathematics	1	2	3	4	5
4.	Learners understand Mathematical Literacy better when it is integrated with other subjects.	1	2	3	4	5

5.	There is a misconception that Mathematical Literacy is inferior to Mathematics	1	2	3	4	5
6.	Mathematical Literacy is regarded as application of Mathematics in real-life context.	1	2	3	4	5
7.	At my school, we do team teaching when teaching mathematical literacy.	1	2	3	4	5
8.	The assessment strategies in the Mathematical literacy curriculum provide teachers with the framework on the integration of content and context.	1	2	3	4	5
9.	I can teach mathematics irrespective of the class size.	1	2	3	4	5
10.	Resources in the teaching of Mathematical Literacy are required for effective learning	1	2	3	4	5
11.	Support from subject advisers inspires the teaching of Mathematical Literacy	1	2	3	4	5
12.	Workshops for Mathematical Literacy improve one’s teaching of the subject.	1	2	3	4	5
13.	Policy changes in education system affect mathematical literacy teaching in a positive manner	1	2	3	4	5

SECTION C

14. What is your experience **in order of importance** the five teaching strategies you use in teaching Mathematical Literacy?

14.1……

……..

……

……..

14.2 ……

……

……

……

14.3 ……

……

……..

……

14.4 ……

……

……

……

14.5 ……

……

……..

……

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE!!

Appendix D: Ethical clearance

UNIVERSITY OF ZULULAND

February, 2019

ACTIVE SAFTEY MONITORING & RECERTIFICATION REPORT

To be completed electronically by the principal investigator/researcher in accordance with the Standard Operating Procedures for Safety Monitoring and Recertification of the UZREC. Must be submitted to UZREC.

Title of the study: Experiences of teachers in teaching mathematical literacy in the further education and training phase in King Cetshwayo District			
Name and qualification of principal investigator (researcher): Patience N Memela (Honours Bachelor of Education)		Name and qualification of supervisor(s): Prof DC Sibaya(Doctor's Degree in Education)	
Name of qualification/project: Master's Degree on Education		Student/Staff Number: 201445508	
Ethical approval number: UZREC 171110-030PMG 2016/289		Research site: King Cetshwayo District	
SELECT NATURE OF APPLICATION (*Mark appropriate box with* X):			
Safety Monitoring Report	x	Recertification	

SECTION A – To be completed by the principal investigator/researcher	Yes	No	N/A
Has sufficient progress been made with respect to anticipated timeframes in the research protocol? (If not, please explain reasons and attached in a report)	x		
Have there been any deviations (intentional/unintentional) from the approved research protocol (If yes, please attach a detailed report)		x	
Have any adverse events occurred since commencing the research?		x	
Has an adverse event reporting form been submitted to the UZREC?		x	
Have there been any unforeseen events or circumstances which have/may jeopardize participant safety or result in contravention of the approved research protocol. (If yes, please attach a detailed report)		x	
Are you aware of any complaints from participants or staff or stake holders regarding the conduction of the research? If yes, please attach report)		x	
Are you aware of any incidents whereby participants have been managed /treated in a manner other than that stated in the approved research protocol? (If yes, please attach a detailed report)		x	
Has appropriate informed consent been obtained from all participants in keeping with the method stated in the research protocol and is documentary evidence thereof available for inspection? (If no, please attach a detailed report)			x
Has it been necessary to exclude any participants who were previously recruited for the study? (If yes, please attach a detailed report)		x	
Have any participants requested to be withdrawn from the study prematurely? If yes, please details the reasons for such withdrawal in an attached report)		x	
Have any participants absconded from the study? (If yes, please attach a report)		x	
Are the infrastructure, equipment and manpower at the research site/sites suitable and/or appropriate for the successful conduction of the research in keeping with the approved protocol? (If no, please attach a detailed report)	x		
Are the experimental interventions being administered in keeping with those described in the research protocol? (If no, please attach a detailed report)			x
Is experimental medication being stored, labelled, dispensed, and administered according to the approved protocol? (If no, please attach a detailed report)			x
Is all critical documentation (see attached list) available for inspection at the research site(s)? (If no, please attach a detailed report)			x

Appendix E: Declaration

ANNEXURE A: PARTICIPANT INFORMED CONSENT DECLARATION

INFORMED CONSENT DECLARATION
(Participant)

Project Title: Experiences of teachers in teaching Mathematical Literacy in the Further Education and training Phase in Uthungulu District

Patience Nompumelelo Memela from the Department of education University of Zululand has requested my permission to participate in the above-mentioned research project.

The nature and the purpose of the research project, and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

1. The purpose of the research project is to find out about the teacher's experiences in teaching Mathematical Literacy in the Further Education and training in Uthungulu District
2. The University of Zululand has given ethical clearance to this research project and I have seen/ may request to see the clearance certificate.
3. By participating in this research project I will be contributing towards the improvement of our curriculum in the education system
4. I will participate in the project by answering the questions based on my experience in teaching the subject and the strategies I use in teaching the subject.
5. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.
6. I will not be compensated for participating in the research.
7. There are no risks associated with my participation in the project.
8. The researcher intends publishing the research results in the form of an article. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research.
9. I will not receive feedback/will receive feedback in the form of writing regarding the results obtained during the study.

10. Any further questions that I might have concerning the research or my participation will be answered by P.N. Memela (0715355772).

11. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies.

12. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I, ... have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the above-mentioned project.

....

Participant's signature **Date**

RESEARCHER'S DECLARATION

(**Annexure B** must be inserted here)

INTERPRETER'S DECLARATION

(If applicable, **Annexure C** must be inserted here)

ANNEXURE B: RESEARCHER'S DECLARATION

RESEARCHER'S DECLARATION

I, P.N.Memela declare that:

- I explained the information in this document to

  .....

- requested him/her to ask questions if anything was unclear and I have answered them as best I can
- I am satisfied that s/he sufficiently understands all aspects of the research so as to make an informed decision on whether or not to participate.
- The conversation took place in isiZulu / English
- I used/did not use an interpreter

Memela..... 25/05/14.....

Researcher's signature **Date**

ANNEXURE C: INTERPRETER'S DECLARATION

INTERPRETER'S DECLARATON

I, ...declare that:

- I assisted ..... (**name of researcher**) to explain the information in this document to

  ..... (**name of participant, parent or guardian**)

- The languages I used were English / isiZulu
- I conveyed an accurate version of what was related to me
- I am satisfied that s/he sufficiently understands all aspects of the research and the content of this document so as to make an informed decision on whether or not to participate.

....

Interpreter's signature **Date**

Appendix F: letter to the District director

17 Grevillae
Arboretum
Richards Bay
3900

Attention to: The District Director
Uthungulu District Office
Private Bag
EMPANGENI
3880

Sir

RE: REQUEST TO CONDUCT A RESEARCH PROJECT

I am currently studying for a Master of Education at the University of Zululand. I am required to conduct a research as one of my degree requirements. I therefore, kindly seek for the permission to conduct a research project in some Secondary schools at Richards Bay Ward Schools. The title of the research project is: **Experiences of Teachers in teaching Mathematical Literacy in the Further Education and Training Phase in Uthungulu District.**
The objectives of the study are:

(a) To determine the teachers' experiences in the teaching of Mathematical Literacy in the FET Phase.
(b) To find out what strategies are used by teachers in handling Mathematical Literacy in the classroom.

The project involves questionnaires. Confidentiality and anonymity will be highly observed. The findings from research will be only used for the writing of my theses. Participation is voluntary and they are free to withdraw should they feel no longer interested to participate. There will be no financial benefits for participation in the research project. However, the findings of the research will be useful to schools and policy developers. The gathered data will be the property of the University of Zululand. For more clarity regarding this project you can contact my supervisor Prof. PT Sibaya at (035) 902 6628 email: SibayaP@unizulu.ac.za or SibayaD@unizulu.ac.za
Website:http://www.geocities.com/ptsibaya

Thank you for your support and co-operation regarding this matter.

Yours sincerely,
Patience N Memela (0715355772/patiencemdletshe@yahoo.com)

Appendix G: Letter to the principals of schools

17 Grevillae
Arboretum
Richards Bay
3900

Attention to: The Principal
Richards Bay Circuit Office
Private Bag
Richards Bay
3900

Sir

RE: REQUEST TO CONDUCT A RESEARCH PROJECT

I am currently studying for a Master of Education at the University of Zululand. I am required to conduct a research as one of my degree requirements. I therefore kindly seek for the permission to conduct a research project with teachers in your school. The title of the research project is: : Experiences of Teachers in teaching Mathematical Literacy in the Further Education and Training Phase in Uthungulu District.

The objectives of the study are:

(a) To determine the teachers' experiences in the teaching of Mathematical Literacy in the FET Phase.

(b) To find out what strategies are used by teachers in handling Mathematical Literacy in the classroom.

The project involves questionnaires. Confidentiality and anonymity will be highly observed. The findings from research will be only used for the writing of my theses. Participation is voluntary and they are free to withdraw should they feel no longer interested to participate. There will be no financial benefits for participation in the research project. However, the findings of the research will be useful to schools and policy developers. The gathered data will be the property of the University of Zululand.

For more clarity regarding this project you can contact my supervisor Prof. PT Sibaya at (035) 902 6628 email: SibayaP@unizulu.ac.za or SibayaD@unizulu.ac.za
Website:http://www.geocities.com/ptsibaya

Thank you for your support and co-operation regarding this matter.

Yours sincerely,
Patience N Memela(0715355772/patiencemdletshe@yahoo.com