

**Pre-service teachers' understandings of teaching measurement as
Mathematics component in Foundation Phase**

By

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DECLARATION

I, **Zodwa Eunice Mvuyana**, hereby declare that this dissertation is my original work. I have produced this work under the supervision of **Dr Jabulile Mzimela** at the School of Education, University of KwaZulu-Natal. I sincerely declare that this work has never been submitted in any University, whatsoever for degree purposes and that all information cited from other sources have been referenced in text as well as in the reference list section.

Signature-----

(Candidate)

Date: 15 November 2020

Signature:

(Supervisor)

Date: 17/11/2020

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DEDICATION

This piece of work is dedicated with my deepest sorrow to my late husband, *Saphiwa Mvuyana* who always encouraged me to carry on with my studies and my late mother *MaHlatshwayo Khumalo* who also encouraged her children to further their studies

ABSTRACT

Teaching measurement as one of mathematical components in Foundation Phase classrooms is significant. Different studies conducted discovered that pre-service teachers should possess Mathematical Content Knowledge for the effective teaching of measurement. This could be achieved through using measurement tools in order to understand non-standard and standard measurement units or instruments. It was in this context that this study aimed to explore pre-service teachers' knowledge of teaching measurement in Foundation Phase classrooms. This study was conducted in one of the previously disadvantaged university located in a rural context of Kwa-Zulu-Natal. This university is known for training preservice teachers from Quintile 1 and 2 who are coming from disadvantaged backgrounds. The study adopted a qualitative research approach where a case study methodological design was used. Ten pre-service teachers enrolled for Bachelor of Education degree and specialising in Foundation Phase teaching were purposively and conveniently sampled. This study approved an interpretive paradigm in order to understand how the participants interpreted their world their lives. Data was generated by using the semi-structured interview and questionnaire. Document analysis was also used in order to comprehend how the participants understand the teaching of measurement in Foundation Phase. The findings revealed that pre-service teachers are struggling to teach measurement in the FP classrooms during their teaching practicum. Various motives were realised to be contributory to these struggles. The study's findings revealed that these pre-service teachers lacked pedagogical content knowledge of teaching measurement as a mathematics component. Subsequent to that, they failed to effectively use the measurement tools for teaching Foundation Phase learners because they lack knowledge of this content area when undergoing their training as teachers.

Keywords: *foundation phase classroom, mathematics component, measurement, pre-service teachers*

LIST OF ABBREVIATIONS

AATM	Australian Association Mathematics Teachers
CAPS	Curriculum and Assessment Policy Statement
CK	Content Knowledge
ECD	Early Childhood Development
FP	Foundation Phase
MSK	Measurement Content Knowledge
MTK	Mathematical Teachers Knowledge
NCTM	National Council of Teacher of Mathematics
NCPE	National Council of Primary Education
PC	Pedagogical Content
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
SKC	Specialised Content Knowledge
TUFM	Thoughtful Understanding of Fundamental Mathematics

LIST OF FIGURS AND TABLES

Table 2.1	Standard Tool: Ruler	24
Table 2.2	Non-Standard Tool: Rope	25
Table 3.1	Theory Underpinning Data Generation	47

LIST OF APPENDICES

Appendix 1	Ethical Clearance Certificate	95
Appendix 2	Informed Consent Letter	96
Appendix 3	Application to conduct study in an institution	98
Appendix 4	Permission to conduct study in an institution	100
Appendix 5	Interview Schedule	101
Appendix 6	Questionnaires	102
Appendix 7	Certificate of language editing	103

TABLE OF CONTENTS

1.	Declaration	ii
2.	Acknowledgement	iii
3.	Dedication	iv
4.	Abstract	v
5.	List of Abbreviations	vi
6.	List of Tables and Figures	vi
7.	List of Appendices	vii
CHAPTER ONE: INTRODUCTION TO THE STUDY		
1.1	Introduction	1
1.2	Background of the study	1
1.3	Mathematics as a subject	1
1.3.1	Background History of Mathematics	2
1.3.2	History of Measurement teaching in South Africa	4
1.4	Understanding South African education system	6
1.5	Location of the study	8
1.6	Pre-service Teachers' Profiles	8
1.7	Statement of the Problem	9
1.8	Scanned Literature Review	10
1.9	Purpose and Rationale of the Study	12
1.10	Research Objectives	13
1.11	Research Questions	13
1.12	Synopsis of Research Design and Methodology	14
1.12.1	Research Paradigm	14
1.12.2	Research Approach	15
1.12.3	Research Methodology: Case Study	16
1.12.4	Sampling	17
1.12.5	Data Generation Methods	17

1.13	Overview of Chapters	19
1.14	Conclusion	20
CHAPTER TWO: LITERATURE REVIEW		
2.1	Introduction	22
2.2	Conceptualisation of significant terms	22
2.3	Teaching Measurement as a Mathematics component	24
2.4	Content taught to pre-service teachers about teaching measurement	25
2.5	Understanding the preparation of pre-service teachers	27
2.6	Conceptualisation of pre-service teachers' Mathematics competence	31
2.7	Effective learning of Measurement in Foundation Phase	34
2.8	Barriers to effective teaching of Measurement in Foundation Phase	35
2.9	Theoretical Framework	37
2.10	Conclusion	39

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY		
3.1	Introduction	40
3.2	Research Paradigm	40
3.3	Qualitative Research Approach	43
3.4	Research Methodology	45
3.5	Sampling of Research Participants	45
3.6	Data Generation Methods	46
3.7	Data Analysis	51
3.8	Ethical Considerations	52
3.9	Credibility and Trustworthiness	55
3.10	Problems Experienced and Limitations	58
3.11	Conclusion	59
CHAPTER FOUR: DATA PRESENTATION, DISCUSSION AND FINDINGS		
4.1	Introduction	60
4.2	Pre-service teachers' pedagogical content knowledge of teaching Measurement	61
4.3	Pre-service teachers' content knowledge of teaching measurement	66
4.4	Pre-service teachers' situational knowledge of teaching measurement	68
4.5	Pre-service teachers' knowledge of teaching measurement	72
4.6	Data presentation based on questionnaires	77
4.6.1	Elaboration on questionnaires	78
4.7	Data presentation based on document analysis	82

4.7.1	Mathematics curriculum documents	82
4.7.2	Curriculum and Assessment Policy Statement as a teaching guideline	82
4.8	An analysis of data generated	83
4.9	Conclusion	85
CHAPTER FIVE: SUMMARY OF FINDINGS AND RECOMMENDATIONS		
5.1	Introduction	87
5.2	Summary of the study	87
5.3	Pre-service teachers' inadequate content knowledge	88
5.4	Pedagogical knowledge and pedagogical content knowledge	89
5.5	Recommendations for future studies	90
5.5.1	Handling of Mathematics lectures in lecture theatres	90
5.5.2	Pre-service teachers' training in universities	92
5.6	Future implications of the study	92
5.7	Conclusion	92
REFERENCES	93	
APPENDICES	95	

CHAPTER 1

BACKGROUND OF AND INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter grants a conversation of the background of the study. It is divided into five segments, namely, 1) Mathematics, 2) teaching measurement in Foundation Phase, 3) background history of teaching measurement, 4) Geographical Features of South Africa 5) It continues conversed the location where the study was undertaken the account of the problem and the motive of the logic of the study: The study research question and the study objectives that engaged my study are accessible in this chapter. The paradigm and approach that reinforced my study are conversed. The three data generation tools that were utilised to generate pragmatic data for the study are similarly argued. Moreover, the theoretical framework that funnelled the study is nominated and presented. Lastly, definitions of the concepts utilised in the study and the outline of all chapters are obtainable.

1.2 Background of the study

The study was based on teachers in the making comprehending teaching of measurement as a Mathematical component in Foundation Phase Grade R to three classrooms. There is an ample knowledge in teaching of pre-service teachers. It would be crucial to pre-service teachers to unload some of the concepts that underpinned pre-service teachers' awareness, particularly in terms of teaching of measurement in foundation phase. Three concepts will be discussed to ease an understanding of the study background. These concepts are, the background history of measurement, and the pre-service teachers' South African history. These two concepts will bring clarity in connection with them.

1.3 Mathematics as a concept

According to Naude and Meier (2019), mathematics is defined as a “thing of the world” and is also explained as the explanation of how we arrange our daily lives to understand what is going on around us. If people neglect the importance of mathematics work, it is an injury to all knowledge. The existence of man on planet earth and our understanding largely depends on mathematics.

How does mathematics relate to the things to the world? Mathematics is a language, a universal language and is well understood by different cultures, regardless. Mathematics is an old concept. In order for all human beings to communicate they use language using words and sentences. In mathematics addition, subtraction, multiplication and division are used. Mathematics is for everyone and is everything. Everything that is living are meant for mathematics.

According to Chio (2007) monkeys could be reliable and estimate accurately a total number by adding dots and getting a total. Britt (2005) stipulates that there is conclusive proof that infants could show an internal understanding of “two-ness” or “three-ness”. Pre-service teachers need to know that Mathematics can be applied in many meaningful ways. Being a Foundation Phase teacher focusing on mathematics, one should be assisting learners to become aware of the importance of Mathematics. The pre-service teachers could understand reading/writing movements or even Art, but Mathematics goes beyond all those skills. Pre-service teachers should pay attentions to the importance of studying Mathematics because there is a huge demand in South Africa so that there will be no need to hire Mathematics teachers from other countries to assist the nation.

Naude’ and Meier (2014) emphasise the major role of Mathematics in the education of young learners. Pre-service teachers must be constant in studying Mathematics because they can expose themselves by writing Mathematics books for young learners. They can also develop countries’ materials to assist the country and other countries. Due to scarcity of Mathematics teachers and materials, these qualified teachers can get higher position to assist the nation.

1.3.1 Background History of Measurement

Measurement is taught in early years of Foundation Phase commencing from Grade R. Learners use their footsteps from the classroom door to their tables. They stand side by side with their classmates in order to identify their height differences. They also use strings to measure their body’s circumference, and by so doing they learn measurement through play, Naude and Meier (2014). Pre-service teachers need to prepared to teach in this manner. They need to be effective in their teaching and acquire this skill in order to better at their practice.

Teachers in the making as well as learners must be hands on in the teaching and learning of measurement. Measurement domains accuracy and reliability. Required tools are of vital importance for learners to measure in the Foundation Phase. If pre-service teachers are well trained and understand the importance of teaching measurement, that will assist learners in measurement and when they grow they will not

forget it. Hence, Grade R is a solid foundation for Foundation Phase. The repercussion is that a good foundation should be laid for the benefit of the learners' progress.

In the Foundation Phase and beyond. Pre-service teachers ought to be good and well-trained to teach Foundation Phase.

While, naturally, some learners will take time to understand measurement concepts, teachers are expected to use traditional ways of teaching measurement. It is crucial for teachers to understand what they teach. It is a commonly known perception that national and international learners and students of all ages experience a problem of understanding the measurement concept as well as the ways of measuring using required skills. Kastrier (2013) wrote about the role of number sense in young children's measurement activities.

Clements (2004) disputes that many students depend upon the use of tools in order to measure and the mental calculations are a challenge. Visual measurement always depends upon standard measurement tools. In early childhood, learners learn number sense during measurement period. To conclude; Coulter (2009) and Naude' & Meier (2014) and Bosman (2004) emphasised that measurement should be used in everyday situations. Therefore, it is concurred with Burns (2004) because young learners in Grade R, whether they are four to five-year-old, understand measuring differently based on context, imagining and background. Moreover, most of the time learners and students struggle to get correct answers relating to measurement.

Van De Walls (2007) articulates that in early grades measurement of length, weight and time are good to begin with. It is crucial for pre-service teachers to explore teaching by telling learners how long the object is, and the weight of the book. Mc Millan and Schumacher (2006) and Wall (2004) also argued for the use of the scales of measurement to get the weight and length of an object and learners. As a final point measuring tools are reliable because they produce the exact measurement.

Himbert (2009) explains background history of measurement as that there are different epistemology gaps occurred in the history of measurement in countries. Those gaps are described as the relationship to the evolution of the internationally-agreed system of units. The author explains that when we talk of measurement, it is spoken and expressed in numbers. The goal for measuring is to get a reliable knowledge of concepts. There are things which can be measured. Instruments are used to achieve reliable results. Measurement can be used to quantify the characteristics of volume, area, time, mass, etc. According to Himbert (2009), every expression of quantity consists of two factors for example the Mathematical value and units. The ancient testimonies of measurement were first used in mid-eastern Africa. The history of measurement relied on counting, where they used clay balls (6000 BC) were found in Mesopotamia, where they counted the number of sheep and the owner used clay balls.

They were able to solve measurement difficulties which occurred in measurement. Measurement of distance between point A to point B was estimated for example 800km measured by walking.

1.3.2 History of Measurement Teaching in South Africa

According to the Curriculum and Assessment Policy Statement (CAPS) (2011), all learners from Grade R to three will learn measurement as it is stipulated by CAPS. The current curriculum was introduced to all South African schools in 2012 by the Department of Basic Education (DBE). Pre-service teachers training from Universities are using teaching practicum in order to prepare themselves to teach foundation phase learners accordingly. Measurement is one of the Mathematics components and is taught simultaneously with other components.

All nine provinces in South Africa have advocated for teaching measurement and integrate it in their respective schools. During teaching practicum, it has been noticed that many schools do not teach measurement. There could be different reasons, for example; teachers lack knowledge of teaching measurement, teachers lack motivation of teaching measurement and teachers' negative attitude towards teaching of measurement. They need workshops to cascade information on how measurement should be taught in foundation phase in order to motivate teachers. There should be an internal workshop done by management or teachers themselves after attending the circuit workshop cascaded by people with expertise.

1.4 Understanding South African Education Systems

The facility of Education in South Africa is mainly on government and community. South African's education is divided into four phases, Foundation Phase (FP), Intermediate Phase (IP), Senior Phase (SP), Further Education and Training (FET). The Foundation Phase takes four years (Grade R -3) . .

The learners proceed to Intermediate educational phase for three years (Grade 4-6) and proceed to Senior Phase that takes three years (Grade 7-9). The learners proceed to Further Education and Training (FET) from Grade 10-12 and beyond.

In high school after completion of grade nine a certificate is awarded to learners who met all the requirements. After grade nine the learners who are able to proceed with Further Education and Training (in school) remain in school for additional three more years (Grade 10-12). After completing Grade twelve, others attend Training and Vocational Education Tertiaries (TVET) and universities, those who decide to do some trade are accredited and do level four of trade because they have completed their Grade twelve of education. Applications depend on the pass rate of a learner. At the University the

choice in courses depend on what the student wants to do. Most courses in University takes four years except for medicine which takes more. If a student decides to do vocational training of a particular trade, they can do so.

The study's focus was on pre-service teachers understanding of teaching measurement as a Mathematical component in the Foundation Phase. Grade R learners are admitted at the age of four or five years on/before June in the entrance years. The educators are there and trained to teach and look after them accordingly.

According to The Constitution of the Republic of South Africa (1996), everyone has the right to basic including adult basic education, to further education, which the state through reasonable measures must make progressively available and accessible. Everyone has the right to receive education in the official language or languages of their choice, in public educational institutions where that education is reasonably practicable, in order to ensure the effective accesses to implementation of this right, the state must consider all reasonable education. Alternatives, including single medium institutions, considering equity, practicability and the need to address the results of the past racially discriminatory laws and practices.

1.5 Location of the Study

The study was conducted in one of the universities in the province of Kwa-Zulu Natal in UThungulu district for concealment. The research site was found in 1960, the only one faculty had only one thousand students, most were from deep rural areas and very few students from urban areas. The people teaching the first students were soldiers. All of the students were able to study without any impairments. The University provides education to all students equally. The University provides education and boarding facilities separated between females and males and no other gender was supposed to be found either in male or female boarding rooms. There were very strict matrons and wardens keeping a close eye on both genders. Now the lecturing staff of the University were lecturing according to a particular curriculum specified for all Universities in addition to develop like and social skills of the students. The University provides the Foundation Phase to teach from Grade R to three, whereby pre-service teachers are trained and they are taught how to take care of young learners. That is grooming pre-service teachers to be patient because in some schools most of Grade one learners do not attend Grade R class because of parents' unforeseen reasons but teachers are expected to treat all learners equally.

The study's research site accommodates students with various impediments but they are few. Some pre-service teachers experience some challenges in students studying, for example, a student with good results from Grade twelve and unable to proceed to the following level because they are unsuccessful. They will still be in level two for about four to five years doing the same module. They are failing to study Mathematics for Foundation Phase. At the time of study, lecture theatres are congested and the number of students has increased tremendously because of the number of student increase in the University. The education faculty is overcrowded, in such a way that, the Education faculty uses the other faculty theatres and there are clashes.

There are few ramps for students who experience physical challenges, lifts for them are there as well but most of the time they are not working (out of order) and that forces the physically impaired students not to attend that particular module. Most of the lecture halls are from 1st floor to 13th floor which makes it is difficult for the physically impaired students to attend, which is an issue the University management should look at. The University is not user friendly at all. It is a serious matter altogether. The lectures walked from their offices for sixty-four steps to and from the lecture hall twice per day. At the pre-service lecturers' office there are twelve lecturers, one boardroom, kitchen and restroom. There is one Rector in-charge of the University and the management team. There are Deans of each faculty, Heads of Departments, administrators and staff. The University accommodates students for four different faculties, most of the students speak IsiZulu, however they come from diverse cultural backgrounds. The one eighth includes three ethnic groups; coloureds, Indians and Whites. At the time of study there were approximately sixteen thousand (16,000) male and female students and the boarding is now mixed gender. There is an old residence that accommodates only male students and it is called Africa.

The physically impaired residents stay at the ground floor for easy access to their rooms. The three quarters of the university students which stay off campus, meaning that they are renting in poorly-built cottages. They stay without the landlords/landladies and it is not safe for students. Now and again, they are robbed by the thugs at night and their lives are at risk. The landlords/landladies are unavailable but they collect rent every month. If the thugs decide to attack on a particular day, the students do not attend the classes because of various reasons. The students of the University do not pay to study using their parent's money but most of the students receive a financial aid called National Students Financial Aid Scheme (NSFAS) and Fundza Lushaka financial aid scheme.

During the time of my visit at the University, the lecture theatres were packed of students except one lecture theatre that I requested for my usage. Within the campus there was Rector's house but it was empty and no one utilising that house unfortunately. There are houses in the campus for some lecturers to stay. The campus needs to be revamped. The University should prohibit outsiders from walking through the campus, it needs to be properly-fenced.

The next section presents a brief profile of each pre-service teacher who participated in the study.

1.6 Pre-service teachers' profiles

For the purpose of anonymity, all pre-service teachers who participated in my study are referred to by pseudonym:

Pre-service teacher A: was in his early twenties. He was doing his third year in Foundation Phase. He was from Inanda, training to become a teacher and after obtaining his qualification from the University he will be teaching young learners from five years to eight years. At that time of my study he had two years and six months left to obtain his qualification.

Pre-service teacher B: was in her twenty years of age in 2019. She was still studying in the university to become a Foundation Phase teacher. She was from Mandeni area. She had one year six months left of her studies.

Pre-service teacher C: was nineteen years old. He was from Empangeni and had completed two years six months of training to become a Foundation Phase teacher after the completion of his degree. He was in his second semester during the data collection at the University.

Pre-service teacher D: was nineteen year of age from Mandeni area. He was studying at the University to become a Foundation Phase teacher and doing his third year left with one and a half years to complete his degree.

Pre-service teacher E: was from Umlazi Township. She had two and a half years in training and he was also nineteen years of age. She was at the University. It was the second semester and training to become a Foundation Phase teacher.

Pre-service teacher F: was from KwaDlangezwa Township in her early twenties. She was also finished her two years of training at the University. It was the second semester and she was left with one and a half years to complete her degree in the Foundation Phase.

Pre-service teacher G: was from Newcastle and she was twenty years of age during the second Semester at the University. She was studying, and training to become a Foundation Phase teacher after completion of her degree.

Pre-service teacher H: was in his twenties completed his two year and a half year in training. It was the second Semester at the University studying to become a Foundation Phase. Musa was from Kwa Maphumulo.

Pre-service teacher I: was from Pinetown, and was in her early twenties. She had completed her two and the half year training at the University and she is left with one and a half years to complete her degree. She is training to become a Foundation Phase teacher.

Pre-service teacher J: was nineteen years of age, from Ulundi. He had completed his two and a half years training as a Foundation Phase teacher at the University. Specialising in Mathematics, Life Skills and Literacy.

1.7 Statement of the Problem

The Curriculum and Policy Statement Assessment (DBE, 2011) by the Minister of Basic Education and Training in South Africa states that pre- service teachers are to be knowledgeable of all mathematics concepts content knowledge. This study focuses on measurement teaching as a Mathematics component. Pre-service teachers should understand how measurement is taught from Grade R to three. According to Naude and Meier (2014), the Mathematics classroom environment should be conducive for learning and teaching measurement. For example, vibrant materials, relevant charts and harmless equipment. Curriculum and Assessment Policy Statement (DBE, 2011) explains that all Mathematics concepts should be taught simultaneously, by using numbers or figures to count, as well as language to communicate the knowledge. In Grade R classroom counting should be taught thoroughly for a strong, solid background in Mathematics, specifically, measurement. Each figure will be represented by a picture for Grade R to understand the number concept and writing knowledge. I discussed my interview and questionnaires with the pre-service teachers, they shared a feeling that they focused mostly on numbers/figures and measurement tools because if Foundation Phase classroom is understood, the learners from a Foundation Phase have to understand their figures as well as measurement tools relevant to their age.

Fleisch (2008) and Malosi (2010) claim that pre-service teachers experience numerous challenges that emanate from the lack of teaching mathematics in Foundation Phase. This claims further supported in Meyer, and Lombard, Warnich and Wolhuter (2010) and Jansen (2009). Literature further reveals that foundation phase teachers lack the content knowledge to teach Mathematics.

Mathematics is taught simultaneously including all mathematics components. However, most of the pre-service teachers indicated that they did not teach measurement during their teaching practicum, but only one pre-service teacher confirmed that he was taught measurement once during the teaching practicum. I felt that it is crucial that all third-year teachers in the making should teach measurement during their teaching practicum, because after completion of their training they will be entitled to teach measurement. In order for them to increase extensive and in-depth understanding of the phenomenon, in their respective classrooms. This study was conducted in the University and involved pre-service teachers' understanding of teaching of measurement in the Foundation Phase classroom. I predicted that a survey of pre-service teachers' knowledge will contribute greatly to the knowledge associated with the education of pre-service teachers' understanding of teaching of measurement in Foundation Phase classrooms.

1.8 Scanned Literature Review

Van De Walls (2007) stipulates that in early Grades measurement should be developed as early as in Grade R s' education whereby they learn measurement by using length, time and weight. It will be very effective when they learn it in their later stages. It is vital for teachers in the making to understand as well as explore teaching by telling how long the object is and how heavy the book is. They will be receiving content knowledge of mass and weight. The Grade R use an integrated approach. Naude' and Meier (2014) argue that it is important that learners are engaged in various active activities such as playing with number charts to activate their minds. Pre-service teachers must not think that all learners know how to measure.

It is crucial to assist Foundation Phase learners in order for them to understand the concepts first. The pre-service teachers need to understand how to teach measurement in foundation phase. Informal measurement refers to when the pre-service teachers use non –standard tools, for example learners are taught to use hands, feet, fingers, strings etc. to measure. It is called informal because learners in the foundation phase have different feet and hand sizes. On the other hand, formal measurement is when all the learners use the world-wide tools called standard measuring tools like rulers, tape measure and bathroom scales because the standardised measuring tools are reliable and standardised. Literature to be reviewed will be based on current and previous researchers in this particular discourse.

Literature on pre-service teachers understanding of teaching measurement in Foundation Phase using informal and formal measurement tools has been reviewed as soon as the scholars had alluded to the claims that workshops in South Africa are generally poorly planned and would normally leave teachers confused.

Pre-service teachers should utilise a variety of teaching materials during the teaching practicum period because the resources assist young learners to understand what they are learning freely. The different types of measurement tools should be used and young learners should practice measurement in their homes as they do it in everyday life. Grade R classrooms should have colourful charts and they should use integrated approach. Naude' and Meier (2014) stipulate that they should socialize on their arrival during free-play.

The free-play promotes socialisation amongst learners and also promotes Mathematical discoveries. The mathematical discovery takes place while learners are playing. It has become common knowledge that Mathematics is language of teaching in Foundation Phase. Teachers need to be well-trained, highly-motivated, dedicated and competent practitioners in their areas of expertise. Training programmes need to be evaluated and further reviewed for adequate implementations of the curriculum. Ngware, Abuya, Mutes and Oketch (2009) illuminate the fact that the review of a planned p r o g r a m in preservice teachers' training curriculum in Malawi and Madagascar was done by the Malawian Teachers. Pre-service teachers should provide learners during teaching practicum with a variety of resources to enable the learners to measure at their own pace and time for different reasons. I suggest to this study that teachers should be part and parcel of developing the curriculum because they are hands on with teaching of learners in their respective classrooms.

Pre-service teachers are teachers in the making, they are training to become qualified teachers. After completion of their studies and fulfilment of the needs of the degree they will have qualified to be teachers. The Teachers in the making need to understand how to teach measurement in the Foundation Phase. Literature to be reviewed on current and previous researchers in the particular discourse.

Literature on pre-service teachers' comprehension of teaching measurement in Foundation Phase using formal and informal tools will be reviewed as some of the scholars have alluded to the claim that workshops will be available for the teachers in order to understand everything relevant to them.

Pre-service teachers need adequate knowledge of mathematics for their effective teaching of measurement. Shulman (1987) states that there are several types of knowledge which can build up the teaching base for the teaching profession; content knowledge, pedagogical content knowledge (PCK),

curriculum knowledge and pre-service teachers' educational contexts, and the drive of education. In the mathematics education there is much interest in environment of PCK, which is the better ways of expressive and voicing mathematics which makes it logical to others. Chick, Pham and Baker (2006) used an outline of what is development from the classroom to investigate the PCK of individual teachers. The framework describes aspect of PCK that are clearly, for example, pre-service knowledge way of thinking about mathematical concepts. Finally, the graph activities can be used for pre-service teachers, for example, using months of the year young learners were born in order for them to understand measurement concept. The pre-service teachers will be able to comprehend the concept very well and they will never forget that example, because they were taken as Grade R learners to understand the concept of measurement. Learners are taught with their mother tongue (MT) and it is compulsory.

Teachers must be able to teach learners with passion love, care and respect as well as understanding that teachers are dealing with young learners with different learning styles in their respective classrooms. Further, in the foundation phase it is where teachers identify learners with impediments, and teachers must teach them as they are, and teach them holistically.

It is crucial that Foundation Phase teachers work intensively because they have to open the learners' mind. The learners are further characterised by the fact that they come from different family backgrounds. Learners in the F/P had never been to school meaning that they had never been exposed to the environment of the school. The Foundation Phase teachers need to be skilful in preparing these young learners in the foundation phase as transition into the higher grades. There is a huge importance of foundation phase teachers and learners in the learning and teaching process.

1.9 Purpose and Rationale of the Study

The purpose of the study was to detect how pre-service teachers' understanding of teaching of measurement as a Mathematical component in Foundation Phase (FP), I was incited to conduct the study because of my personal experiences. I worked in a Foundation Phase for thirty years. During this period, I observed that Grade two learners do not seem to grasp measurement as a Mathematical component. In 2016, I decided to register my postgraduate degree at the University of Kwa-Zulu Natal (UKZN) at Edgewood campus focus on pre-service teachers understanding of teaching measurement as Mathematical component in Foundation Phase.

There seems to be various reasons why Foundation Phase teachers experience challenges when it comes to effective teaching of measurement. During my long years as an F/P teacher, I have tried to conduct

workshops in order to develop and enhance knowledge on the teaching conceptualisation and understanding of measurement as an important mathematical concept as well as to equip my fellow colleagues with fundamental principles of measurement so that they could cascade the information on how best they could teach the measurement component in the foundation phase classrooms. I taught these pre-service teachers for one and a half months' years. I realise that teachers in the field are not teaching measurement in their schools. I taught measurement to pre-service teachers so that they will be of a female pre-service teacher, who experience many challenges. She could not comprehend the theory and practice of measurement.

That female teacher had to repeat the Mathematics module three times and after third year she was struggling. I tried various strategies to assist her even one-on-one talking and explaining but she could not understand concept altogether. I was encouraged to study the concept of measurement in order to explore pre-service teachers' knowledge of teaching measurement to Foundation Phase learners. I even noticed that most teachers are not teaching measurement in their classrooms there could be various reasons; lack motivation from the school management, it could be the teachers' negative attitude in teaching of measurement in their classrooms, lack of information on how to teach Foundation Phase measurement and it could be laziness, they are not proactive about their work. Some even said to us "Your Mathematics thing is difficult" forgetting that we learnt it in order to teach young learners.

1.10 Research Questions

- a) What is the extent of pre-service teachers' understanding of the concept of measurement?
- b) Why pre-service teachers 'understanding of the teaching of measurement in Foundation Phase classes is what it is?

1.11 Research Objectives

- a) The pre-service teachers' understandings of teaching measurement as a
- b) Understanding why pre-service teachers understand the teaching of measurement as a Mathematical component the way they do.

1.12 Synopsis of Research Design and Methodology

1.12.1 Paradigm

I engaged an interpretive paradigm because it is suitable for my study. This was an attitude of optimal importance because I believe that numerous authenticities can be erected from my understandings of pre-service teachers' understanding of teaching of measurement in Foundation Phase classrooms.

Cohen, Manion, & Morrison (2011) states that interpretivism is a theory of values, individual experiences and human behaviours. Hence, my aim was to comprehend and pronounce how pre-service teachers interpret measurement tools and definitions in their real-world situations. The drive of employing interpretive paradigm and in-depth understanding of how pre-service teachers make sense of the field they are employed in. In this respect, a set of truths that cannot be generalised may be encountered.

My aim was consequently to use an interpretive paradigm in order to attain numerous responses from the pre-service teachers about their knowledge of teaching measurement in foundation phase, and to regulate how the knowledge and teaching measurement using standard and non-standard measurement tools. This interpretive paradigm supported me in thoughtful how pre-service teachers made the meaning of their measurement during their teaching practicum period in their different schools. I had an opportunity to have a straight discussion with the participants during teaching and learning of Mathematics, as I was one of their lecturers. I had interviews with the participants who were also the same participants who answered the questionnaires. The answers from the interviews and the questionnaires were used as data necessary to respond to the research questions. All this directed them in their response to enhance and generate realistic data that was obtained from the participants. This also enabled the development of triangulation to confirm the legitimacy and consistency of the data. Research paradigm is a way of viewing, thinking, doing and describing things. It also an attempt of clarifying the word meaning. According to Guba (1990) paradigm can be characterised through their methodology, ontology and epistemology. Hesser-Biber and Leavy (2011) dispute that paradigms are the tools that researchers use to collect data about social reality from groups individuals and texts in any medium.

I also concur with the authors mentioned above because these are the tools that will be used in this study. Hence, I have seen the interpretive paradigm as most applicable and also suitable for my study; because the participants will interpret the real situation of their lived experiences. The research methodology should be distinguished so that research methods are individual concepts. Method is referred to as a set of stages to move amongst point A to point B (Jonker and Pennink, 2010). Methodology is a typical behaviour research inside the framework of a specific paradigm. Methodologies are quicker to research rehearsal than the philosophical. The researcher is steered by essential circles of theories that are attended by a scholar to select unique study techniques above other methods, since procedures are to

study research than the theoretical. Researchers always say that they are steering qualitative in the place of interpretivist study (Sarantakos, 2005).

There are specific techniques and procedures in a study process together with data analysis. Sarantakos (2005) explains that theoretical is autonomous since paradigm can exist without methodology. Hence, a study process for instance, questionnaires can be used in diverse methodology which is the hypothetical basis of a technique. Study strategy formerly develops critical thinking to join procedure suitable sets of study devices to discourse, study questionnaire and theory that is well-known to public phenomenon.

1.12.2 Research Approach

This education espoused a qualitative approach. Rendering to Creswell and Clark (2011), the qualitative approach supports the researcher in generating data in the arena by position. Researchers consuming this approach are then able to generate data in the arena at the location wherever the contender's involvement is difficult beneath the education. Linchon and Guba (2013) have allowed for flexibility in writing this approach. Semi-structured interview was used.

Creswell (2016) articulates that this approach by a researcher is viewed as a key instrument because the researcher is the one who generates data over the various generations of data gears. As a key instrument, I visited the third-year pre-service teachers at their University campus. I used the semi-structured interviews, questionnaires and data analysis to generate empirical data, that is my study mandate.

Additionally, the qualitative approach enabled sound communication during interview meetings with my participants and it is where I got to know them better. I observed them during the period when they were responding to the interview questions.

This study adopted both descriptive and exploratory qualitative approaches. Descriptive research can serve a variety of research objectives. Descriptive studies tend to be primarily concerned with finding answers, for example, what are the pre-service teachers' attitudes towards teaching measurement in foundation phase? This is one of the questions that this study attempts to respond to.

1.12.3 Research Methodology: Case Study

This study espoused a case study as a methodological approach. Van Manon (1997) elucidates that a case study is an "organized and in-depth study of one specific case in its perspective," This case study

is functional in one University situated in KwaZulu-Natal in South Africa where teachers in the making are in training to teach measurement in F/P classrooms. Research methodology is a simple term which can be defined as giving a clear understanding on what method or process, the researcher is going to use in their research to achieve objectives. The researcher should choose a correct research methodology.

My study approved a case study as its methodological approach. Rule & John (2011), clarify the case study that elucidates that “it is logical and in-depth study”. Ten pre-service teachers at the University campus were selected to be participants in the study. I was lucky because no one withdrew from the study. As a result, there were no replacements. Subsequently, the meetings went well without any obstacles. It was their opening week of the second semester and teachers in the making were arriving at the beginning week to the University campus. The venue was well prepared, I started with interview, and my attempt was to obtain an in-depth understanding of the knowledge the participants had about teaching measurement as a Mathematical component in the foundation phase classroom. I also discovered their maturity knowledge of measurement as a Mathematical component in Foundation Phase classroom.

Scapens (2004) stipulates the importance of sectioning of a case study, because a researcher should be clear with the case study. Interpretive case study always emphasises on diagnostic and to grow and encompass philosophy. The researchers’ question ought to remain driving because they offer the features of the cases to be considered. Scapens (2004) suggested a critical case or an exciting case should represent the case.

1.12.4 Sampling

Maree (2016) states sampling as the result the researcher creates about which individual, setting of measures or behaviours to embrace in the study. Hence, as a researcher decided to embrace pre-service teachers purposively because I viewed them as the potential receptacles of the required data for my study. I built my verdict on the appearances that I hypothetically told them to have in order to study them as relevant data holders. At the time of study, they were doing third year of training as F/P teacher’s understandings of teaching measurement as a Mathematical component in F/P classrooms at the University. Hence, I personally decided to include third year teachers in the making purposively because they are the potential holders of the required data for my study. I based my decision on their information that I hoped to have in order to consider them as potential data holders.

Maree (2016) stipulates that there are two main sampling methods. These are sampling methods are random and purposive. Rule and John (2011) mention convenience sampling as a third method of sampling. Purposive random sampling is deemed convenient for my study because of easily availability of students. The reason is that I teach the third years Mathematics students in the Early Childhood Education.

I realised that purposive random sampling will be suitable for my study; because the participants would be chosen purposively and randomly based on three characteristics which are that they should be pre-service teachers in training and should be doing third year of the study of Bachelor degree programme at one of the rural South African universities. There would be ten participants made of five male and five female students. They were then regarded as the potential holders of the required data in teaching measurement as a Mathematics component in foundation phase.

1.12.5 Data Generation Methods

Data generation tools are the instruments used to generate data in a study. Creswell (2016) further explains the qualitative research consents manifold sources of data tools in order to generate trustworthy data. Rule & John (2011) support that in a qualitative manifold source could be used in order to yield rich and trustworthy data; hence, in the study engaged, two different data tools will be used, which are semi-structured interviews, questionnaires and document analysis of pre-service teachers teaching measurement using CAPS (2011). In support of the use of several data tools, Kumar (2014) state that in qualitative research, various sources produce rich and trustworthy data. Beneath is the brief conversation on each of the data tools that have been used in this study to generate the pragmatic data.

Interviews

I directed a semi-structured interview with the respondents and I used an interview program. I inquired inquisitive questions in order to gain an in-depth understanding of what knowledge respondents had understood, what they understand about pre-service teachers teaching measurement as Mathematical component in Foundation Phase classrooms and to determine how the respondents' knowledge of teaching Mathematics persuaded their teaching of measurement in Foundation Phase classrooms. Cohen ,et al (2011) explains that an interview is a structured and well-planned dialogue between the researcher and the participants. In my study, I shall use the semi-structured interviews.

The semi-structured interviews allow for probing and further questioning on unclear responses. Schumacher (2006) states that semi-structured interviews are followed by a set of choices and the respondents select one of the choices. Having face-to-face conversation permitted me as a researcher for example, to read facial expressions of my interviewees, by doing so I was able to notice that the teachers in the making were not confident enough and I could ask the same questions to probe more in-depth. I realised that the interviews endorsed good shared-relationships between the interviewees and the researcher. I gave them roughly twenty minutes per interviewee.

Questionnaires

According to Cohen, et al, (2011) a questionnaire is a series of questions which are pre-defined used to collect data from individuals. Maree & Peterson (2016) defines questionnaires as the most used method for data collection. Mc Millan and Schumacher (2006) states that questionnaires are relatively economical, has the similar questions for all respondents and can ensure anonymity. I concur with McMillan and Schumacher (2006) who have said what is in this study. Firstly, questionnaires assist me as a researcher to collect appropriate data. Secondly, they assist on styling data generated analogues and enable the study. Thirdly, bias in formulating and asking questions will be minimised. Lastly, they will sort out questions whereby I shall be engaging with third year Bachelor of Education students in Foundation Phase Education.

Document Analysis

This refers to written, printed or faxed matter that provides information or evidence that serves as an official recorded document, for example, constitution, contract title deed, license warrant, drawings, photographs, television programmes and more. The document may have been established as part and parcel of the research study or that of an already existing document, establishing the author and what was the reason behind it. Cohen, et al (2011) states that the document the researcher considers might be published or unpublished. In this study the documents that were considered relevant were, Curriculum and Assessment Policy Statement (CAPS) (2009) and information from the book “Teaching Foundation Phase Mathematics” by Naude’ and Meier (2014). This book considers major facts about third years in chapter seven, that deals with teaching of measurement in Foundation Phase classroom. I analysed those documents to ensure if the Mathematics curriculum covered the domain that is considered as major aspects of child development; language, cognitive, aesthetic, spiritual, affective and social. I also looked

at the participants approaching the question because the participants were responding to the questions differently as they are unique. It was a good idea for them to use English because it is a popular language of instruction.

1.13 Overview of Chapters

This study report is divided into five chapters:

Chapter One presents an account of the study of the background which contains the following sessions: teaching measurement in Foundation Phase, background history of Mathematics, teaching of measurement in the history of South Africa, geographical feature of South African's educational systems. The location of the study is presented. The statement of the problem, literature review that steered this study, purpose and the rationale of the study. Moreover, the research objectives and questions that are concentrated on in this study are discussed in this chapter. The research approach and the research paradigm that underpinned this study and other aspects are briefly illuminated. I also afford a short-term clarification of the purposive selection technique and the data generation tools that were engaged. Dewey's theoretical framework of pre-service teacher's understanding of teaching of measurement in Foundation Phase promotes the use of building blocks which promote the use of measurement in Foundation Phase. Finally, I presented a discussion of definition key concepts of the study and a short-lived overview of all chapters.

Chapter Two is a synopsis conversation of books, journals and intellectual articles that were utilised in relation to this study, titled Pre-service Teachers' Understanding of Teaching Measurement as a Mathematical Component in the Foundation Phase Classrooms. Dewey's theoretical framework of teachers in the making knowledge of teaching measurement in Foundation Phase classrooms states that knowledge is taught in-depth. He then states that young children playing designate a child mental attitude.

Chapter Three grants the conversation on the research paradigm and approach that strengthened this study. The case study approach and the purposive selection of ten participants, five females and five males were clarified. In my study I utilised three data generation methods that assisted me to generate data that has been clarified. This method embraced structured interviews, questionnaires and document analysis.

Chapter Four grants a discussion on the data that was produced. Based on data, the outcomes of the study were discussed by a researcher. The data was analysed deductively and inductively by arranging, gathering and the information will be categorised. There was identification according to themes that emerged and categorised.

Chapter Five offers the conclusions that were drawn from the main finding of the pragmatic research. The implications for future research and endorsements are presented.

1.15 Conclusion

This chapter dealt with the background of the study. The five main zones were enlightened, namely, background of the study, brief history of mathematics, background history of measurement, features and South Africans' educational system, a short-lived history of measurement, teaching measurement in the Foundation Phase and geographical features of South Africa. The study location was discussed. I additionally offered a statement of the problem. I was able to review the literature that shaped the foundation of my study, that was also conversed. Hence, the drive of the rationale of the study and the research questions that focused my study were shortly identified. I also discussed the study paradigm and the research approach that supported my study. The case study approach using one University was explained and short-lived explanation that had been selected purposively was existing. The data tools that I used throughout generation of the data was also debated. The study engaged on two types of tools, namely, semi- structured interviews, questionnaires and document analysis of the participants and the Mathematics and measurement curriculum. The next chapter presents an overview of the literature which was also relevant to my study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The previous chapter provided the background of the study while also discussing the rationale objectives based on key research questions and objectives based on sub-research questions. The statement of the problem and the location where the study was conducted was also presented in the previous chapter in order to give illumination of what was entailed in this study. It also presented a brief discussion of the journey that was undertaken when conducting this study through presenting the synopsis of research design and methodology that were used for the study. The chapter was concluded through providing the overview of all the chapters entailed in the study.

This literature review chapter aims at awarding a literature discussion that was relevant in this study. It will display the roles and responsibilities of pre-service teachers in teaching measurement as one of the mathematics components. It will then further discuss the effective learning of measurement in F/P. It will go on to discuss appropriate planning of teaching measurement in F/P including content, instructions, classroom environment, materials and activities and the importance of learning measurement in the lives of learners from Grade R to 3. The barriers to effective teaching and learning of measurement in mathematics will be explored. The theoretical framework that underpinned this study will also be dealt with in more detail. _

Kumar (2014) states that the literature review is an integral part of the research and makes a valuable contribution to almost every step. It is essential to think of literacy review before thinking of the first step of the research question. The literature review has to serve to enhance and consolidate the researcher's knowledge based on the subject area. A literature review has to enable the researcher attain how findings have contributed to the current knowledge of the researcher. The literature review can play a vital role in influencing the nature of the researcher's problem. A literature review is a continuous process.

2.2 Conceptualisation of significant terms

Pre-service teachers

Watson (1997) explain that pre-service teachers are also known as teachers in the making. Foundation Phase after completion of their degree, will be able to teach from Grade R to Grade three learners. Grade

R learners should be five years of age and Grade three should be eight years of age, it is possible for the foundation phase learner/learners to spent five years in a phase, this happened because of unforeseen circumstances. Pre-service teachers are individuals who are motivated to teach or interact with learners. Motivation come from within. I wanted to become a teacher and I focused on that, although it was impossible because we did not have much at home. One day my late mother inform myself that I must be ready to go to attend the training college. It is where everything changed.

Foundation Phase

Foundation Phase consist of Grade R, Grade one, Grade two and Grade three. Grade R it is called the reception year; it takes only one year before a learner goes to Grade one. It is compulsory for each learner attend Grade R at the age of five years before or in June of that academic year. The following year they attend the formal school called Grade one, after completion of Grade one, they go to Grade two carry on with formal schooling and to Grade three provided they meet the standard of the promotion. The foundation starts between five and nine years to eight or nine years for those learners who can repeat any formal class. The Current Curriculum allows the foundation phase learner to spend only five years in a phase. Coullen's theoretical framework of pre- service teachers of other Mathematics arears integration, which drove this study, is illuminated. Finally, I also explain definitions of the of the key concepts of the study and present a short-term overview of all chapters.

Measurement

Naude' and Meier (2014) explain measurement as concepts and skills are directly linked to the world everyone lives in". Measurement grants about information of everyday aspects of everyone environment that involve "area, capacity, distance, length, mass, perimeter, time and volume." Measurement as a concept in the Foundation Phase is often observed through learners' attention in their surroundings and conspiracy in ideas that develop concepts such as smaller/ bigger, longest/shortest, tallest/shortest in their edge of reference. Therefore, measurement forms their vital parts of Foundation Phase learners' real -world experiences and important that they are expose understand the above-mentioned concepts and processes to measure.

Measurement teaches pre-service teachers and learners about measurable qualities of objects, events, time and shapes as well as the developments, units and instruments. Measurement is capable through existing activities. Concrete activities by using a non- standard measurement instruments and units. Foundation Phase learners learn easily when there are concrete activities because they see, touch and manipulate real objects. Estimation activities assist learners to develop awareness of different units of

the concept. Foundation Phase should practice in order to understand the concept faster. After learners understanding the concepts, they should be given challenging or complex measurement problems. Learners also leading the relationships involved in calculating different measurement concepts. When the learners comprehend measurement key concepts, learners are able to secure their skills in numbers. There are different measurement tools, for example; “rope, hand, pencils, paper clips and threads. These tools are called non- standard measurement tools because they don’t have numbers to measure.” The following, are standard measurement tools because they are used world-wide. For example, rulers, tape measures, tea cup, kitchen scales and bathroom scales.

In order for FP pre-service teacher and teaching of measurement needs to have an in-depth knowledge of measurement, teaching and learning styles, and other theories. Pre-service teachers should understand the concept of measurement and measurement process in order to teach to learners accordingly. Emphasis should be on the correct and straight to the point use of informal measuring tools and formal measuring instruments. Measurement teaches learners about the measurable attributes of objects, shapes and events as well as instruments, the instruments process and tools used in measurement.

There is also expertise in the classroom of measurement and expertise is a rich resource and can be accessed by all. It is important to teach and learn measurement. It is crucial for learners to understand different approaches in teaching measurement in the Foundation Phase. In order for the reason of measurement chapter seven of Naude and Meier (2014), teachers in the making should be aware of diversity for example, age, race, gender, manifold intelligences in measurement.

2.3 Teaching Measurement as a Mathematics component in the Foundation Phase

Naude’ and Meier (2014) explain clearly in Chapter seven on how to teach measurement in Foundation Phase. This book explains in-depth and all measurement spheres are explained thoroughly on how to teach measurement by using a book called: Teaching Mathematics in Foundation Phase (TMFP). This book explains how to measure distance, length, capacity, volume, weight, mass, time and area. For example:

Table 2.1 Standard Tool: Ruler

10	20	30	40	50	60	70	80	90	100
1	2	3	4	5	6	7	8	9	10

Table 2.2 Non- Standard: a rope

Mathematics is a universal language that is well understood in different cultures regardless language issued correctly not to harm anyone. In measurement language is used to impart knowledge. We all use language to communicate, using words and sentences. In Foundation Phase we use the four basic operations for example, addition, subtraction, multiplication and division. In measurement there is language by understanding the facts of measurement and also meaning for Grade R to three learners. In Foundation Phase we use language to count. Mathematics is an old concept. Mathematics is ancient Greek word 'Mathematical' a subject of instructions.

2.4 Content taught to pre-service teachers about teaching of measurement

An examination process of measurement suggests that there are numerous continuous stages. Pre-service teachers study how to measure first and become aware of physical attributes of objects and therefore identifying what is to be measured. When pre-service teachers observed ***belonging to be measured they then compare and match an object without the use of other tools of measurement. This contrast leads to the essential *** for a measurement tool. Initially, the tool might be selected by the pre-service teachers from everyday objects. The use of informal measurement tools leads to the need for formal measurement tools for better precision and clear conversation.

This series is rather common and can apply to the measurement of any attribute. In fact, we believe that one of the general goals of teaching or lecturing measurement is for the pre-service teachers' benefit to cultivate an overall picture of coping with any measurement situation.

a) Learning of Measurement Sequence

When learners identify their attributes, the first step in the measurement process is comprehending that objects have attributes that can be measured. Primary experiences are required to raise awareness of the attribute and to introduce the necessary language, for example, small, light, short, and empty. The pre- service teachers need a lot of opportunities to manipulate the feature being explored and to discuss these experiences with others. The considerable spell may have to be spent

on these experiences to allow the pre-service teachers to become aware of what can be done to an object without changing the quantity of the attribute that is being investigated. It is sometimes described as conversation of measurement, for example, does the length of a pen change when it is moved? Does the volume of a liquid change when it is poured into a different container?

b) Comparing and Ordering

Zacharos (2006) articulate that the cause of poor measurement learning is the teachers, who had a shallow training and that affect learners. Learners enjoy learning measurement as one of mathematics components in F/P, provided that it's standard measurement and use it almost. Menon (1998) Simon and Blume (1994) articulate that most researchers concur on learners perform well when measurement is practiced, using relevant objects. Learners are interested in effective learning of measurement in the following; - length, time, and volume and capacity.

Classroom and school are of vital importance. This assist learner to learn measurement and understand the knowledge. Friend and Barsurck (2012) further allude that there must be adequate light in the classroom and should be on the correct side of learners this information is true because there will be no teaching and learning in a dark and unfriendly classroom. Foundation Phase, moreover, Grade R to 3 teachers should structure the classroom for the benefit of the learners to interact with their peers.

Hirstan, Lamb and Osborne (1978), Martin and Strutchen (2000) stipulate that measuring of an area is collective for measurement of two dimensional and lack of integration in two dimensional with area it should be taught with understanding. Learners failed to master area measurement. Barantes and Blanco (2006) Stratchen et al; (2001). Mathematics (NCTM) (2003) further more discuss that it is vital for learners to understand the concept in mathematics. The learners would understand the formula for measuring an area. Fendel, (1987) further stipulate that concept of congruence, and addition and area. In South Africa F/P learners closely experience challenges in learning an area. The formula is $\text{Area} \times \text{Length} \times \text{Width} = L \times W$.

2.5 Understanding the preparation of pre-service teachers

Teachers in the making are studying to be qualified teachers after the completion of a four (4) year Bachelor of Education degree. Third-year teachers in the making are expected to have ample understanding of measurement concepts as a mathematical component. The approach was

encouraged by Civil (1993) and Szydlik, and Benson (2003). The Approach was adopted in the sequence reinforced practicum whereby the teachers in the making were fortified by their study of mathematics that is about processes, dictatorship, repetition, knowledge, and request of methods. The pre-service teachers are encouraged to teach the learners that they can learn from each other. They should embark on teaching practicum during the third year the second semester. There are two types of qualifications for pre-service teachers. There is a very popular one called Post Graduate

Certificate of Education (PGCE). PGCE is done by the students who were studying a Bachelor's Degree from another faculty, excluding education, for example, a student who has completed an

Industrial Sociology Degree and has chosen to want to become a teacher. They then have the option to bridge into teaching by studying a PGCE.

Teachers in the making should equip the prospective with vital pedagogic skills. The main aim is to become a qualified teacher and develop skills. It is an idea to encourage to always estimate until they get the measurement correct by utilizing relevant measurement tools. When teachers in the making are in teaching practicum they must know the correct measurement. During practicum teaching of Grade R, the pre-service teachers should know that they must use the non-standard tools. On the other hand, when they are teaching Grade one, Grade two or Grade three they need to utilize standard tools because they know how to count from one to one thousand.

It has been time for pre-service teachers and identifies vital research this is or core teachers in the making at the period of philosophy practicum in relative to others and the world. Maclure (1993, p. 31) states that qualified teachers have been extensive on pre-service teachers and carry on the teaching profession. Pre-service teachers will be preparing themselves and that will be affecting by their concrete behaviours in their training as teachers. Korthagen (2004) "teachers should be included in designing the curriculum" as other African countries do; I agree with him. Leaners indeed suffer because of teachers' scarcity of knowledge. Mockler (2011) stipulates "this study was conducted in England and it was about longitudinal research. Zhang et al;(2010) also conducted with the teachers in making education. The results indicated that teachers in the making influence the program, principles values, and extensive learning and impetus. Moore and Hofman (1998) stipulate that "teachers do not upgrade their profession and their performance is low but teachers with high professional identity are probable to astounded with severe functioning settings because they do not feel any challenge. Moore and Hoffman (1988) and Gaziel (1995) articulate that those teachers with low-esteem should quit the profession. Instead, the

teaching practicum is more of an intention and as far as the research is concerned. Bulough and Gitin (2001) also emphasised the importance of teaching practicum.

Though, researchers have different definitions of the teaching profession. Other researchers call teachers self-concept, for example, Ketchtermans (2000) contended that education career is self-involved and being proud that educators are not productive, the only status of being an educator. Volkmann and Anderson (1998) denied the “teacher profession requires a complex and dynamic equilibrium between self-image and the teacher’s role”. Akkerman and Meijer (2011) proposed that “teachers’ professional identity as a process and narrating and relating numerous positions develop in the form of participation and self-engagement in the course of trying to maintain continuity and consistency”.

This study agrees with Ackermann and Meijer because a teacher is a teacher by production, but it is for positions that are not welcomed. Ketchtermans (2000) argues “that now teaching profession is highly self-involved and that teacher’ professional identity is a concept of the teacher as a teacher”. That teacher is better to quit the profession; some qualified teachers are unemployed they need jobs. According to my perspective teaching is a calling not for positions. Young and Graham (1998). Identify teachers of an ideal. I agree with them because teachers are trained to impart knowledge to learners. Gaziel (1995) argued “that teachers’ profession as identity is similar to a list of items only that presents an aspect of the profession” This study agrees with him because the teaching profession has been taken lightly because some teachers are there in the profession for different things, like money and security. Beijaard et al (2000) decided to identify teachers’ profession as aspects of a subject matter, didactic and pedagogical expertise. This study agrees with that because professional teacher you are called by those three terms. Professional identity is based on emotions and cognitive elements.

Nevertheless, these two elements are not discrete but jointed cognitive and emotions, they both can be separated. The same teacher has considered the teachers’ profession as multifaceted. Hong (2010) considered that more things can be considered a teacher profession: value self. This study agrees with him because the value is a core element of teacher professional identity. There are different types of teachers with different professional teachers. The pre-service teachers only lack experience and some pre-service teachers are far better than teachers in the field because I have been involved with teachers in the field and as well as teachers in the making. Hong (2010) articulate that pre-service teachers are ready to go to the field and teach because they gain confidence from teaching practicum, they want to focus on value as a core of the teaching profession, for example, the university's fourth years are focusing

on their degree completion. Zhang (2016) states that pre-service teachers love becoming teamers and that is from within them. They have that intrinsic value. Although, those teachers who are for positions and learners' enrolment for them to receive fat checks should resign and the willing teachers take over. There is a proverb that says "We are teachers to teach not teachers to sit".

Teacher in the making during the period of education practicum, they have gained experience as well as intrinsic value. When they qualify there will be negotiations of their professional stage. They will inherit the features of the teacher profession. As soon as they are employed they will focus on value, cognition work environment income which is the last resort. The teachers in the making will be investigated and analysed. Given pre-service teacher's experience, some researchers will focus on intrinsic. Korthagen (2006) state that will be a fundamental change which will occur. He articulates that there will evolution when teachers in the making move in the real teaching stage in the field. Teachers in the making will be determined and they will be like to confirm instead of confronting. Teachers in the making are in the field they need to believe themselves so that more gain more information. Teachers in the making are expected to be aware of the learners that they will teach are from different backgrounds. They need to focus more than teaching the practicum period that there were many items they are dealing with and the learners' future.

Pre-service teachers are expected to display what they have taught and impart the knowledge to learners, if they are unsure of something they should ask for clarity from the mentor colleague failing which seek for assistance from the learning area specialist. Naude and Meier (2014 p. 38). Volkman and Anderson (1998) Kelechtermans and Ballet (2002). Sometimes teachers in the making underestimate the completion of the degree. This study does not approve an internship in the teaching profession because pre-service teachers have been trained for four years and numerous teaching practicum during their training "It is unfair for pre-service teachers to undergo internship after spending four years of training together with teaching practicums." Hong (2007) agreed with this study.

Nevertheless, in agreement that there are factors that will change teachers in the making when in the field of education stage. Johnson and Ridler (2004) articulate that teachers in the making will be provided with support guidance in the real teaching jobs. This study agrees with them because support is needed when teachers in the making join the teachers' profession. The mentor should guide teachers in the making who has just completed their degree that will minimize the load and anxiety of the teachers in the making. "The changeover decreases quicker" state both Avalos and Avlin (2007) Oplatka and

Eizenburg (2007). Furthermore, there was numerous educations on teacher profession distinctiveness but qualitative research is the key technique.

Mitchel and Weber (1999) stipulate that the inventive addresses of instruction survive. Sfard and Prusak (2005) and Alsup (2006) articulate about images of teachers. Hunt (2006); Leavy et al, (2007) state about structured or unstructured or semi-structured interviews and self-recording, observation, written reflection. For example, Hong (2010) “steered a cross-sectional and quantitative study with four groups, including pre-service teachers which experience internship, (but my study is not supporting internship to ore-service teachers,) dropout teachers and non-dropout teachers”. Moreover, the quantitative research education added discovers and expounds on variations belongings and protagonists and professionals and teachers in the making expert distinctiveness concluded the qualitative study.

Friedman (2000) concurs with Vermin and Huberman (1998) articulate that newly appointed teachers experience shock in the field. Meshach and Leiter (1997) articulate the problem the qualified teachers, encounter in the field, because they become rigid, burnout, and absenteeism from work. The current study articulates that the experience of shock, it is about individual qualified teachers, who behave otherwise in the field. The current study concurs with Darling Hammond (2005) argues that the well trained, confident teachers are successful in the field.

Curriculum and Assessment Policy Statement (CAPS)

Curriculum and assessment policy were sent to schools and was firstly used in 2012. It is still in use in schools and in Universities to equip pre-service teachers to understand that teaching of measurement starts from Grade R.to Grade twelve. This study starts from Grade R to three. The Curriculum and Assessment Policy Statement Grade R-12 came to effect January (2012). It was developed for each learning area and is also a learning guideline as learning area as well as Assessment Guidelines in Grades R to 12.

There are broad goals of the South African Curriculum:

- (a) By giving appearance to what is viewed to be knowledge, skills and values with learning. (b) To furnish learners regardless of their socio- economic background, race, gender, physical ability and intellectual with knowledge and physical disability.
- (c) Social revolution making sure that the differences in education of the past are looked at again and that equal education openings are made available for all sections in our society

- (d) To identify and solve problems and make decisions using critical and creative thinking.
- (e) This can only occur if all teachers have a comprehensive know how of how to identify and address obstacles to learning, and how to plan for diversity. The key in managing inclusivity and ensuring barriers are that included teachers. All phases are included from Grade R to 12. Time allocation is included.

2.6 Conceptualisation of pre-service teachers' mathematics competence

Blomeki (2012) articulates about the conceptualization of mathematics competencies in teachers in the making would be able to define mathematical measurement terms. Blomeki (2012) articulates that teachers in the making must have sufficient mathematical knowledge. This study concurs with Blomeki. Dorman et al, (2012) articulate that teachers in the making need to devise a talent to identify key areas for mathematics. Teachers in the making must understand the connection in the curriculum for them to understand the mathematics language /vocabulary. Ball et al. (2008) articulate that pre-service teachers must study specific strategies and techniques to address learning needs. It should be the original notion of pedagogical content knowledge (PCK). This currently concur with Ball et al, (2008).

Quantity the beginners will be talented to use suitable determining items, tools, and methods in a diversity of frameworks. The capability to quantify applicably has remained advanced by individuals finished stretch and finished numerous values. Dimension emphasizes the collection and custom of appropriate units, instruments, and procedures to quantify characteristics of proceedings, shapes, objects and the atmosphere. Gaging tells straight to the technical, industrial, and fiscal creations of the beginners to:

- a) Variety functional guesses:
- b) Remain attentive to the reasonableness of quantity outcomes.
- c) Settings would persist designated in which the beginners can size in a way that builds consciousness of added education parts, as well as social truths, common, radical, commercial, social, and ecological matters.

For example, the beginners must stay capable of size and associate detachment and periods reserved by beginners from household to organization associate the volume of rivers and the bulk of aquatic accessible complete successes in a specific public. Amount occupied days and their relative to payment received. Match the spread and distribution of land-living parts to the resident's extent.

Basis Stage emphasis in this stage the beginners' idea of quantity is to grow by working hands-on with various concrete objects and shapes. These inquiries ought to occur finished creation straight comparison besides utilizing informal measuring and formal measuring units (for example, using the beginner's hands, ropes, pens ruler, tape measurer, and measuring wheel. The learners should progress the proper language to express this assessment. For example, 'fat and' fatter than'. Actions connecting to spell must be designed by the attentiveness that the beginners comprehending of the shifty of the period would take place earlier they state to spell.

Teachers in the making involve, analyse, interpret, and estimate their mathematics problem-solving. South African pre-service teachers are competent compared to Northern African countries because there are better resources in South Africa. Pre-service teachers must believe in themselves because they are capable of the teaching of measurement as a mathematics component. This study is to equip the teachers in the making to teach measurement accordingly in their classes. The teachers in the making studied about two types of non - standardized and standardized measurement tools. Pre-service It is vital for teachers in the making towards remain knowledgeable so that the learners they learn through senses and learners are learning through senses. Those senses make their learning welcomed by using; touching, smelling, tasting seeing, and hearing. That is why when they touch the object they can explain what are they touching and can respond to the teacher. Through hearing the noise, tasting fruit, and trough smelling a burning food they will know what is smelling. The sense of taste is also remarkable, even if their eyes are closed but they can taste. The Grade one who did not attend Grade R, they understand which sense doing what, by hearing the grade R learners, sometimes they do not understand the concept. The pre- service teacher should understand that learners are unique. Recent research on teacher effectiveness Ball (1990). This research has exposed ways in which teachers understanding a learning area. If their pre- service teachers' opportunities to learn and thus have led to a renewed interest in their lecturer's subject knowledge. The definition of the subject matter is to include features than other is reflected in the aims of this study. Measurement is single of the record real-world activities at basic schools Naude' and Meier (2014). Mathematics curriculum in that when conversing education and knowledge of dimension, we need to keep in mind there are three diverse features that pre-service teachers should learn.

In conditions wherever it is not, it is occasionally valuable to usage a third article than can be likened straight to apiece of the dual substances and presentation as state amongst them. For instance, if one entranceway is broader than your arm span but another doorway is narrow than your support mark, you

know that the initial one is wider than the second one. The unforeseen assessment delivers additional elasticity as you relate two items. It also provides opportunities for beginners to exercise vital precise possessions of associations called transitivity. Of sequence, the proper study of such stuff will not take dwelling until far progressive.

Pre-service teacher's difficulty in applying for coherent numbers as measures found that the tool and concepts do not occur naturally. Furthermore, the solid material was used as a tool, and converging on the iteration of the tool helped pre-service teachers to develop measurement "sense". Changing from concrete representation to more abstract representation for example the number line which is critical to fully understanding rational numbers as measures.

This point would be reiterated, pre-service teachers' comprehension of "piece" as a tangible length measurement is important to teachers in the making for the understanding of balanced numbers as measures. When units remain nested within well-developed part-whole instructional histories, pre-service teachers exhibit several misconceptions concerning the use of rational numbers as measures. When length measurement was concretized with a physical object of some of our case their tables, pre-service teachers were able to connect the broad concept "piece" within the measurement context.

2.7 Effective Teaching of measurement in Foundation Phase

Clements and Bright (2003) articulate that learning and teaching of measurement has been poorly learned and taught. This current study agrees with that there's weakening learning of measurement. The global researchers reconsidered learning of measurement in schools and out of school. There were lawful questions of why teachers are doing in the teaching and learning if so poorly in measurement? It is essential for curriculum designed to include the teachers, relevant materials should be there for effective teaching and learning measurement.

Stein (1990) articulate that to learn measurement it's interesting provided it could be hands on. The current study agrees with Stein that learners cannot survive with theory only, but practicality is needed. Baturo and Nason (1996); Chapel and Thompson (1999); Clements and Bright (2003); Iwin, Vistro-Yu and Ei (2004); Zacharos (2006) articulate that the cause of poor measurement learning is the teachers, who had a shallow training and that affect learners. Learners enjoy learning measurement as one of mathematics components in F/P, provided that it's standard measurement and use it almost. Menon (1998) Simon and Blume (1994) articulate that most researchers concur on learners perform well when measurement is practiced, using relevant objects. Learners are interested in effective learning of measurement in the following; - length, time, and volume and capacity.

Classroom and school are of vital importance. This assist learner to learn measurement and understand the knowledge. Friend and Barsurck (2012) further allude that there must be adequate light in the classroom and should be on the correct side of learners this information is true because there will be no teaching and learning in a dark and unfriendly classroom. Foundation Phase, moreover, Grade R to 3 teachers should structure the classroom for the benefit of the learners to interact with their peers.

Hirstan, Lamb and Osborne (1978), Martin and Strutchen (2000) stipulate that measuring of an area is collective for measurement of two dimensional and lack of integration in two dimensional with area it should be taught with understanding. Learners failed to master area measurement. Barantes and Blanco (2006) Stratchen et al; (2001). Mathematics (NCTM) (2003) further more discuss that it is vital for learners to understand the concept in mathematics. The learners would understand the formula for measuring an area. Fendel, (1987) further stipulate that concept of congruence, and addition and area. In South Africa F/P learners closely experience challenges in learning an area. The formula is $\text{Area} = \text{Length} \times \text{Width} = L \times W$.

2.8 Barriers to effective Teaching of Measurement in Foundation Phase

A barrier is an obstacle that keeps a thing or an individual apart from being unable to perform effectively. An individual may experience a barrier in doing something or action, for example, social issues. Individuals face barriers in their lives. Giangree (2003 p. 78-79) articulate that Inclusive Education (IE) means that all learners are welcomed in general education classes in their local schools. It will depend on the barrier, but there will be no separation of learners according to his or her barrier.

South Africa. A barrier to learning is an obstacle that prevents an individual concerned from fully engaging in any action that most individuals have experienced several challenges. etc. Different barriers can be an obstacle for example, unable to understand information, unable to communicate or perform new skills as well as having difficulties reading, talking, emotional and to write. Barriers are not in learners only teachers need the training to be able to assist learners with barriers. There was a non-Governmental project called MIET which assisted teachers of full-service schools on how to go about learners with barriers leadership lacking leadership skills. Inadequate leadership training leads to poorly run teams and chaos during the period of innovation. A manager not prioritized from the top-down there will be no progress but merely focused more on learners with barriers.

A great number of children are infected and affected by the HIV pandemic can be a barrier to teach and learn measurement, others are child-headed households and those headed by grandparents that cause a barrier because the grandparent will be unable to assist her grandchildren to learn measurement effectively because the grandparent is illiterate. It is indeed difficult to overemphasize the devastating conditions that many young children in South Africa grow up in. Lack of skills of teaching learners with barriers as far as measurement is concerned. Practical solutions are needed for learning. Pre-service teachers should identify and overcome barriers to learning. Learning barriers affect learners to understand information, communicate and or learn new skills.

Learning has negative outcomes and potentials and the reason that most of the time they are affected by numerous difficulties, for example, child labour, abuse, and violence, that cause a huge problem in their learning. The government should take precautions to protect learners from violence in educational exploitation. They experienced difficulties in learning of measurement. Data coverage in the area is scant. The child protection was an international commitment. There was the commitment of learners' protection in April (2014) for about 194 counties. Learners from the poor community and disadvantaged were unable to learn measurement freely, because of numerous reasons. The early Childhood learners were more of a target of abuse and 4 per-cent of learners, who are physically abused each year, and 10 per-cent are neglected or are psychologically abused. Mostly, learners are from low income and immigrant families and they lack access to better quality early childhood care and support. Learning Mathematics is for every individual regardless of physical challenges. CAPS articulate that it is important to learners who have barriers towards learning Mathematics. Learners experience being exposed to activity-based learning. Learners with physical barriers do practical activities so that they use the tangible and concrete object. The learners experiencing barriers must be given a longer time to complete tasks, they also acquire given adequate time to think and finish their assessment activities. There are different types of physical barriers affecting young foundation phase learners in the Foundation Phase.

As an example, there was a male learner in Grade Two who was physically impaired, he did not have arms, hands, and fingers. There were only two elbows. Towards the end of a right elbow was a small piece of flesh that was unnoticeable. A foundation phase teacher at that time tried various methods which were all in vain. The first term the learner could not write but was assessed orally and was good at speaking. The second term, the learner was asked him to try and utilize that piece of flesh next to his elbow. The learner tried and at the end of the second term, he was the best hand writer, better than those

have two hands, that young boy was not discriminated but the teacher provided extra assistance to help the learner overcome his barrier.

White Paper⁶ (2000) articulates that there should be no segregation in learners regardless of barriers. White Paper 6 concur with the South African constitution Bill of rights (p.5 1996) everyone is equal before the law. Other barriers are teachers themselves because they are not well trained on how to teach measurement. The other problem could be the negative attitude towards teaching of measurement by teachers, or they lack interest in the teaching of measurement. Gangers (p 78-79 2003) articulate that what inclusive means, inclusive means no discrimination of learners or anyone with impairment or impairments. According to the Constitution of the Republic of South Africa (1996, p. 6) “everyone has inherent dignity and the right to have their dignity respected and protected.” In p. 12 of the South African constitution, “everyone has the right in basic education School could be a barrier to effective teaching measurement, in school resources scarcity. School buildings could be a huge hindrance to learners with physical and other barriers. Grade three learners experience difficulties as they were instructed to measure their classroom with a one-meter stick. The other school challenge could be door steps whereas learners with physical impairments, using a wheelchair is unable to get inside the classrooms. There should be buddies who are there to assist the wheel chaired learners Emmerantia Landsberg (2013). The challenge is that the learners of Grade three did not think of using the meter stick repeatedly to get the correct measurement and that is called Discrete measurement Naude and Meier (2014) as they are explaining all the terms of measurement. One learner in Grade three suggested using the same one meter sticks repeatedly. The challenges are misconception and miscommunication of learners who perform low in measurement. The manner of putting a finger was not correct because it is untrustworthy.

2.9 Theoretical Framework

Dewey's theory of experience (1938) has been considered as having impending benefits to further the research agenda on the principle of experience and its relevance to teaching and learning. This study will consider amongst many others, Dewey's theory of Experience argues that “all genuine education comes about through experience (this) does not mean that all experience is genuinely or equally educated” (p.25) In attempt to further illuminate and advance further understanding of Dewey's theory of experience, literature advances two principles that inform the theory; that the pedagogical task involves the individual and the society. The constructs of Dewey's theory argue for the two principle linkages, the first being continuity and the second interactions. The principle of continuity argues for the assessment of the quality of experience where the educative value of experience is assessed to

measure or the efficacy of experience with reference to growth, development, the value of future experience as well as the future direction that the experience may lead to (Giles,1987).

The principle of Continuity argues for those aspect of experience as the relate to the individual. An appropriate experience modifies the person who has experience, and the quality of subsequent experience. Continuity is desirable when it fosters growth, arouse curiosity, and carriers a person to a new and stronger place in the future. The purpose of the study is to explore teachers in the making. In teach measurement as a Mathematical component in foundation phase classroom. Coullens (2009) understand the teachers in the making in training of teaching of measurement in foundation phase; promotes the use of building blocks in order to teach measurement in early childhood education. Jean Piaget's cognitive development discovered that young children under the age of five judge length in terms of end points only. Coullens (2009) claims is a build on what Naude' and Meier (2014) claims; that young learners use their feet to measure. The use of measurement as a concept could include ordering and comparing.

During the teaching of the concept measurement, language is learnt and developed. It is very important to develop a good level of measurement reasoning, as well as to develop measurement concept to young learners. It is crucial for the teacher s teaching in early childhood to find relevant activities suitable to produce the ideas. Measurement is used daily in early childhood classes. Learning measurement concept will assist the learners to understand the concept clearly. Different strategies could be used to represent the subject matter for pre-service teacher's better comprehension of the concept. Teaching foundation phase means to always using relevant teaching and learning materials as needed by Mathematics in the classroom. Relevant and specific content should be facilitated to learners. Teachers in the making reaches should know how to manage teaching and learning in order to facilitate Mathematical component called measurement.

2.10 Conclusion

This chapter dealt with the literature that was studied to explore pre-service teachers' understanding of the teaching of measurement in the Foundation Phase. It has discussed how pre-service teachers should teach measurement in F/P. It was further discussed that Foundation Phase Learners are Grades R to three. It was also important in terms of the effectiveness of the requirement (FP) learning environment. It is important to extend the discussion to include the importance of teaching measurement in F.P. The

theoretical framework that underpinned the study in the chapter to follow was also discussed. A discussion on the research methodology emanate in the study will be presented. This chapter has five categories.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter grants the research design and methodology that were used in generating of data that were targeted to the research questions. The chapter is alienated into five different categories. First, is to uncover the research paradigm that fortified my study, second category is to discourse the approach that was engaged to ease the study, third is to aluminate the case study methodology that was advocated for the sampling measures, the fourth category denotes the date generation tools that were cast off in this research project in order to gather pragmatic data that were analysed later for procument of realistic evidence on the generated data and the fifth category includes ban discussion of the credibility and trustworthiness of the study by illuminating the ethical issues that were well-thought-out when commission this study field; and the manner in which the issues that were encountered were committed. Finally, a sudden of the complete chapter is accessible.

3.2 Research Paradigm

Interpretivist believe that people's perception and social actors build it. The individuals with their different backgrounds are recognised in the interpretivist. Individual assumptions and their experiences contribute to the continuation of construction of reality is prevailing in individuals in them thicken social context interaction. The humans are independent because of social reality which changes and can have multiple perspectives Hennink, Hutter and Bailey (2011).

Research paradigm is a way of thinking, an integral part of good professional practice. Kumar (2014, p.3) articulates that "researchers suggest and see the world in various ways". It is through this review of the world in different means that decides the particular paradigm. Cohen et al (2011) support the argument, constructivist and some extent critical realistic epistemological paradigms refers to the nature of how knowledge is known, while methodology focuses of how research accomplish knowledge about

data is generated. The interpretive paradigm is suitable to my study, believe that multiple veracities could be constructed from pre-service teachers understanding teaching of measurement in Foundation Phase Grade R-3 learners.

The interpretivist paradigm believes that reality is multifaceted and a single portent can have multiple interpretations. Studying a phenomenon, different research techniques are used that will assist us in understanding how people interpret and interact within the social environment. Interpretive approaches incorporate social theories and perspective that embrace a view of reality as socially constructed or made meaningful through actors' understanding of events. The assumptions restrain from different views of reality or philosophical beliefs as to what is real and what constitutes facts or truths. Interpretive approaches integrate social theories and perspective that hold a view of reality as socially constructed or made meaningful through artists' understanding proceedings. In organisational communication, researchers focus on the densities of meaning as endorsed in language, symbols, and social interactions. This entry described the unique of interpretive features of interpretive approaches, links to naturalistic research, and directions for future studies. Organisational communication scholars have embraced interpretive approaches in Rowlands (2003).

The research design starting point is a research purpose and research questions provide a crucial clue about what is to be researched (Yin, 2011). There are circumstances for connecting a case study and numerous case studies design involve multi-sites to be studied and strategies to analyse data collection. The reason for multiple is to analyse the generated data. The rationale behind the choice is to acquire more comprehensive understanding of this practice.

Furthermore, the interpretive paradigm was engaged because it allows the exploration of human behaviours belief as part of experience (Koshy et al; 2011; Small and Uttal 2005). Its aim is therefore to understand and describe how people make meaning of their experience and they interpret the real – world situation. Therefore, I engaged in direct face to face conversation with ten (10) third year students for me to understand the real situation in teaching of measurement as mathematics component in Foundation Phase learners. In this context, I allowed respondents to describe and explain the experience they encountered but in an uninterrupted manner.

Hence, interpretivist reject objectivism. As a researcher I favour interpretivist because it allows a researcher to interact and it have a dialogue with the participants. That is why I chose interpretivist theory because it works well with the qualitative data as it affords rich description of social paradigm. Interpretivist utilise narrative procedure of data analysis, in order to describe comprehensive

interpretation of a particular social reality studied, which is known idiographic approach Neuman (2011).

Boland (1991) Deetz (1996) stipulate that according to Kaplan & Maxwell (1994) interpretive assumes that “our knowledge of reality” is gained only through, for example, language documents tools etc. An interpretive research is worried with understanding the world as it is from biased experiences of individuals. They use meaning versus measurement-oriented methodologies, such as interviewing that rely on a subjective relationship between the researcher and the learning area.

An interpretive framework has been proposed a research of Higher Education Institutions based on activity theory. First, activity theory will be explained. Next, two alternative interpretivist theories are concisely discussed. Finally, the concepts of activity theory will be applied and the context in the form of a textual interpretation framework of interpretive. There are many methods and perspective of interpretive approaches, namely, hermeneutics, metaphor, rhetoric, symbolic interactionism and critical discourse analysis. To all of these fields above dashed following reasons.

The ontology of interpretive researchers' confidence is that there are sets of truths about the world. Creswell; (2016) argues that researchers cannot know the true nature of the world; but they can be closer to the truth. Consequently, were numerous practices because of the participant's varied background experiences and their knowledge of understanding teaching of measurement in foundation phase as a mathematics component permitted me to get different responses in their understanding teaching of measurement in 3rd year. I also observed how the participants interacted with questionnaires while answering. I researcher visited the pre-service teachers at their campus where engaged probing an open –ended questions, the reason was to acquire in-depth knowledge pre-service teachers had with, teaching of measurement in Foundation Phase Grade R-3 to validate data.

A paradigm is a viewpoint grounded on assumptions usual, collect and value that they are alleged in researchers or public. During the 20th century quantitative paradigm was dominant. During (1988), the qualitative paradigm came to practice in order to work together with quantitative paradigm. Lastly, while the current origins of mixed research started as late as (1950s). It developed the authentic third paradigm on the Handbook of mixed methods in Societal Behavioural Study was published by Tashakkon then Teddies in (2003). At the similar spell, mixed research has been steered through the research history.

Characteristics of Three Research Paradigm in education now, are presently three major research paradigms as well as in the behavioural sciences and in the societal. They are namely qualitative and fixed research.

3.3 Qualitative Research Approach

This study exposed qualitative research approach from social sciences research. According to Creswell (2016) qualitative approach is grounded in a naturalistic setting of the phenomenon that is under study. Researchers who are using this approach are likely to generate data in the field where the participants experience the issue or problem under study. In addition to this, Creswell (2016) says that the approach used makes the researcher a key instrument because he or she who generates data through the use of various data generation tools. In elaboration Hennink, Hutter and Bailey (2011, p. 89) define a qualitative approach as “an approach that allows one study people’s experiences in detail in their natural settings, by utilising a specific set of research methods such as in-depth interviews, focus groups, observation and content analysis,” They further state that the qualitative researchers identify how people’s experiences and behaviour are moulded by the context of their lives such as the societal, economic, realistic and cultural environment in which they live. Qualitative research also looks to understand and embrace the contextual influences that impact the researcher issues.

Quantitative research is defined as a research which depend on collection on data collection of data quantitatively. Qualitative researchers are that realise on the data qualitative data qualitative data. Mixed research is defined as the research that mixing both quantitative and qualitative research paradigm characteristics.

Mixing of quantitative and qualitative research can yield multiple forms and this should be taken into consideration. The possibilities are almost, infinite because the two paradigms are mixed are mixed. A crucial qualitative attitude factor is that qualitative research aspect is that qualitative research does not involve numerical data generation. (Murray & Burglar 2011) In this context, the pragmatic data had enough opportunity to understand how third years (3rd) pre-service teachers understanding teaching of Grade R to 3 classrooms were interpreted qualitatively utilising words. There was no static or numerical data were secured. The respondents’ appealing socially created meanings allowed mean plentiful opportunity meaning to understand how these pre-service teachers interpret the real world of teaching measurement as a Mathematical component in a real style. Ranjit Kumar (2014) confirms that qualitative approach allows researchers to talk to the respondents directly their place of studying to obtain a multifaceted detailed understanding of the unruly hat is being discovered. For this reason, I visited ten (10) third year pre-service educators at the University in Dlangezwa campus. My purpose was to

advance dense explanations of their knowledge of understandings teaching of measurement as mathematics component in F.P. learners. I, therefore conducted a face to face interview sessions in which I asked probing and open-ended questions in order to obtain in- depth understanding of their existed familiarities with respects to teaching of measurement as mathematics component in Foundation Phase Grade R to 3 learners.

In the lecture hall it is where the interview and questionnaire also helped me in generating deeper understanding of the respondents' information of teaching measurement to the Mathematics to Grade R to three in FP. The data was engendered and additional authenticates by the process of triangulation. I utilised the opportunity to check if there were loopholes that the respondents' feedback to confirm the data that were acquire from the interview and questionnaire.

3.4 Research Methodology

The study engaged a case study attitude as the research methodology. The desire of the original purpose stood to influence in-depth understanding how successfully pre-service teachers teaching of measurement understand teaching of measurement as a Mathematical component in Foundation Phase Grade R to three classrooms. In this case study I visited the respondents at their place of study where I interview, questionnaire and document analysis to them during their time. Bromley (1991, p.83) explicate that a case- study as orderly and in-depth study of one specific case in its setting.” He added state that case studies “are usually descriptive in nature as they describe ‘what it is like’ to be in a specific context” Bromley (1991, p.83) state that there are different types of case studies, an ethnographic case study. My study espoused an exploratory case study approach in order to attain a deeper comprehension of how pre-service teachers understand the teaching of measurement in Foundation Phase, Grade R to three classrooms. Baxter & Jack (2008) state that an exploratory case study scrutinizes occurrence that has not been studied. It can lay the foundation for advance studies for are advance studies as its efforts to clarify what occurs in a specific condition and why it transpired like that.

I considered this type of methodology because it is best fitted for my study and the focus was to acquire a deep comprehension on how pre-service educators understand teaching of a Mathematics component. This attitude also endorsed me to attain insight into the challenges and experiences that the respondents were encountered in their real-life context (the University they are studying). The case included only one University where they were interviewed were checked and analysed to improve the reliability and validity of the study I had undertaken.

3.5 Sampling of the Research Participants

Sampling deals with the decision-making reference population in the study results. Research participants is called a human subject. The participants should be granted enough time to decide whether or not to be part of a research and they must make those decisions without pressure from the researcher. To refuse to be in the study at all, or to stop participating at any time even after a participant can stop participating. Sampling refers to the researcher's discussion whereby members of a sample are chosen with a purpose "to represent a phenomenon group. Ritchie & Lewis (2003).

Therefore, I met all ten 3rd year students, five females and five males. I discussed with my research participants and ask is it the best suitable time to conduct interview and questionnaire. During the discussion with my participants. I stated the title of my study and the purpose as well they participated in that discussion. I clarified to them that they will participate voluntarily and if they feel to withdraw they had the right to withdraw any time from the study. I explained to them that they would not lose anything if they withdraw, no penalties will be offered to them altogether. I also assured them that their names would not be used; instead pseudonyms would be used for secrecy sake. The participants gave me a go 'ahead with my study purpose, using and audio-recording and the consent form was signed for me to proceed. Suitable time was established by myself for the interview and questionnaire for each participants Sampling is how to select participants in my research study it also includes the whole together. I also guaranteed them that their names and their University won't be used; instead pseudonyms would be used for they give me a go anonymity sake. The participants they give me the go' ahead with my study purpose using an audio-recording device. Consent form was signed for me to go ahead. The appropriate time was stablished for the interview and questionnaire during the meetings with each respondent.

Patton (2002) stipulates that there are too many sampling methods that could be satisfied. He stated that proportionate stratified sampling is the main sampling method which is purpose, random and purposeful. Sampling methods are stratified when the sampling has five categories, for example females and males who study for Early Childhood Education in a rural University. Finally, these sampling methods Ranjit Kumar (2014) articulates that there are other sampling methods such as quota, convenience, expect cluster, snowball and others that could be selected by the researcher. Maree (2016) specify that sampling selected should be determined by a particular approach.

3.6 Data Generation Methods

Data generation tools are instruments used to generate data. Creswell (2016) defines data generation that can be a number of different methods used to collect data from sample of respondents. Creswell

explains that qualitative research permits multiple sources of data tools to generate trustworthy data. Hence, a variety of data collection tools namely, Questionnaires, interviews and analyse document. I used various data tools in support Creswell (2016) and Kumar (2014) specify in qualitative research multiply sources could be used to harvest rich and trustworthy.

Data was generated from pre-service teachers in two different meetings during the second term of 2019 academic year at a public University. One section was interviews and the second section was questionnaire. There were one hundred and sixty-eight (168) pre-service teachers enrolled for the second semester. There were five females and five males involved in the study, they were studying mathematics in their third years.

The three data generation methods helped in the collection of data from the preservice teachers who were doing third year. The interviews allowed information to be collected through word of mouth resulting in answers that are more organic to provide an instant understanding of exactly what the participants know about how measurement should be taught in the Foundation Phase. The questionnaires, although not providing instant answers like the interviews, allowed the pre-service teachers the time to think through their answers to provide more detailed answers due to the time they had to answer said questionnaires. The document analysis helped in terms of confirming that the teachers were indeed taught the correct way to teach measurement in the Foundation Phase and also in terms of general fact checking for the theories that were provided as basis for answers in the interviews and questionnaires. All of these methods assisted in ensuring that the answers that were obtained for the main research questions were rich and accurate because they were cross referenced from the different data generation methods which provided answers that were similar.

Interviews

According to Creswell (2016), an interview is a two –way conversation and a well-planned conversation is between the person doing the research and the participants. Burns (1997) further states that in-depth interviews which deals with student’s experience. The interview was conducted in the respondent’s lecture theatre where they indicated that would be most comfortable. I had a one on one with third years’ pre- service educators, at the time scheduled and it was convenient time. Kumar (2014) further states that a researcher is the only one that directs the conversation and asks questions leading towards the information he/she asking the participants.

Recording interview data when the researcher is writing. The interview should be done in a meticulous manner, but the researcher must remember to get permission from the participants before doing anything or before digital recording. It is helpful to take notes while recording. Regardless the interview is recorded. It is helpful to take notes while you busy recording.

Creswell (2016) stipulates that there are five different types of interviews whom researchers is conducted. There is unstructured interview, structured or semi- structured interviews and focus group interview. Semi-structured interviews are the ones that allow the researcher to ask open-ended questions whereas unstructured interviews take direction of probing or asking understanding of participants had concerning to research questions. It is possible that the final question discovers the background information of the teacher and address the key question; and guide during the interview. Also, to check what challenges encountered the pre- service teacher's understanding teaching of measurement in Foundation Phase Grade R to 3 learners. All interviews were recorded during the interview session. I recorded interviews in order to understand whether my spoken word, expressions or phrase. This assisted during the transcriptive process. The interview guide that I had assisted in asking probing questions to get deeper understanding of pre-service teacher's understanding teaching of measurement in Foundation Phase Grade R to 3 learners.

Interview is helping a data generation method as I was given information on what respondents knew. (information & knowledge) liked or disliked (preferences & values) and thinking, attitudes and beliefs (Wolcott's (2001), for example during her interviews of one pre- service teacher stated that measurement means shape of an object, width and height. Another respondent was not able to correct to the question about measurement concept, while third participants designated that measurement is important to be taught from Foundation Phase Grade R to 3. The other respondent that; according to her perspective it is important to teach measurement to all Foundation Phase learners as they are unique. Semi structured interview is ongoing and continuous. Nova Southern University, Fort Lauderdale, Florida USA articulate that in interview qualitative is flexible and powerful tool to collect data by voice capturing. Interviews are also done in health, and art skills. Interview is done to explore and investigate the relevant topic. Pursuing research in the content is very intensive experience. As a researcher I want to capture their voices and give meaning to their experience.

Lincoln (2005) recommends reading the categories of qualitative interviewing. As a researcher, I selected the semi- structured interview because it's easy to tapered down some areas that I want to ask pre-service teachers' participants.

Questionnaires

Kumar (2014) articulates that “a questionnaire a list of questions, the answer to which are recorded by respondents”. Hence, respondents read questions deduce is expected and then write down the answer. Kobus Maree and Jacques Peterson (2016). Define questionnaire as most used method for data collection and is used to group administration of questionnaire where the researcher wants whereas a whole group responds to complete questionnaire. Questionnaire is voted as an extremely important part of the research since questionnaire is an instrument which is used to generate data. There are different types of questionnaires the researcher should give attention to question sequence, appearance of the question, wording of questions. A questionnaire should be done in a collaborative style, meaning that the people answering should feel free to respond without fear. A questionnaire can be administered in different ways. A particular method should be administered depending upon the ease in the respondent populate researcher discovers that, mixed ideas on teaching of measurement during the respondents responding on the written questionnaires, that most agree that anyone can teach measurement in Foundation Phase learners. Few suggested that qualified teachers should teach measurement as Mathematics component. They alluded that if anyone can teach measurement there will be lots of problems towards learners. Few of the pre-service teachers suggested that teaching of measurement should start in level one to the exit level. According to my knowledge there’s a specified programme designed for level one. According to my knowledge is that measurement is introduced in level two at the University level and pre-service teachers they study in-depth knowledge at level three. Unfortunately, they have mentioned prior that they never studied it. Some of the pre-service teachers agree that measurement should be taught by specialised teachers, this concur with others said the teacher should be qualified to teach measurement. Very few pre-service teachers in F. P. said that content to be taught has to be easy.

Document Analysis

Document analysis is a type of qualitative research that uses a systematic procedure to analyse documentary evidence and answer specific research questions in which documents are reviewed by the analyst. It is similar to other methods of analysis in qualitative research. Document analysis requires repeated review, examination and interpretation of the data in order to gain meaning and empirical knowledge of the construct being studied. Document analysis can be conducted as a standalone study or as a component of a large qualitative or mixed method study, where it is often used to triangulate findings gathered from another data source. Dissecting documents includes coding content into a subject.

The purpose of using document analysis is to assist the researcher in understanding certain aspects of the systems and to provide all answers in one place. Ample documentation is available for users to assist researchers understand and properly use a certain product or service.

Document or textual data is primary and secondary source: Primary sources are newspapers or unpublished articles, a company report or correspondence. The secondary sources refer to any materials for example, a book because it is based on previously published work. Journals are also secondary sources.

A personal document is another crucial source. A personal document can also assist in reforming critical incidences. The evidence lead at a punitive hearing can shed great light on the event and assist to reconstruct the case and, in addition, deliver information about social relationships within the school Creswell (2016).

Some of the advantages of document analysis are that it increases the collective knowledge of those assisting the researcher and in sharing information. The researcher then benefits from the increased transparency and a culture that is more collaborative and strategic is created. Some disadvantages of document analysis are that it can be extremely time consuming, especially when relational analysis is used to obtain a higher level of interpretation. It is often devoid of theoretical base, or attempts to liberally draw meaningful inferences about the relationships and impacts implied in the study.

In essence Creswell (2016) states that the researcher desires to know the root for an inspiration for which they accumulated. There are also strong data sources when conjunctions are used with other methods.

3.7 Data Analysis

Pearson (2014) defines data analyses as a method of splitting, (Phelps, 2008) different parts of data. It emphasised that in qualitative data analyses could be analysed deductively and inductively. Inductive its where fresh data have I to be generated and patterns, themes and groupings are abstracted. Once common identification of patterns the classification according to Pearson (2014). In this study deductive and inductive were used to analyse generated data. In my exploration of pre-service educators understanding teaching of measurement in Foundation Phase learners was classified and incipient patterns were classified and identified.

The participant's commentaries were transcribed by myself to get an understanding of their views in their own words and expressions. The way I understood the meaning of the participants concerning pre-service educators understanding teaching of measurement in Foundation Phase learners. Study participant's names were taken away in pre-service participations anonymity by replacing names with pennames. I developed coded from the interview guide and the literature review Ranjit Kumar (2014). There is drawing of implications involving fresh data. The data analysis involved multiple methods and there are in sequence. Multi-methods conducting research is called methodological triangulation. Triangulation is a method used to find distance and position. It is usually on a map and is done by measuring the distance between two fixed point on the measuring an angle.

Data analysis can be done in different ways namely qualitative, quantitative and mixed methods. Qualitative research is an approach which involves collecting and analysing non numerical data and it is also good for understanding opinions and concepts. Qualitative research is a very strenuous and time-consuming process in this context due to having to collect data through interviews from people one at a time. This approach did help in gaining answers of what pre-service teachers know off the top of their head based on what they were taught thus providing swift and honest answers due to open ended questions which also helped in providing extra information. Quantitative methods emphasise statistical analysis of data collected through the questionnaires in this context. This allowed the comparison of answers obtained from the questionnaires to be grouped to find common answers from the pre-service teachers to lead to an answer that would assist in answering the main research question. Mixed method is the collection of both qualitative and quantitative data and it is then analysed using both methods to find a common ground in the answers so as to have the final answer be something that has been thoroughly researched and analysed.

It is true that a researcher moves back and forth between data collection and data analysis in order for the researcher to get the exact data. The collected data is in numerous page of written words and the researcher has to interpret the data and analyse it. The researcher has to analyse data because there will be no computer programme that will do it. Different mechanisms can be tried roused but the researcher is still left with data analysis.

3.8 Ethical Considerations

Firstly, I applied for ethical clearance from the Research Office of the University of Kwa Zulu Natal (Edgewood Campus). Upon their endorsement to conduct my study at the university at KwaDlangezwa campus in KwaZulu Natal Province. I emailed all the needed documents to University and I was granted a permission to conduct the research at my chosen study site in a written, signed letter. I communicated with the Acting Head of department in Early Childhood Education Department, the (ECD) for venue and utilising 3rd year students. I was allowed to talk to participants. I explain to them my visit at the campus at that time the students were informed.

Hence, I met all ten 3rd year students, five males and five females as they are participants. Fortunately, there was no decline of participants of my study. I discuss with my participants the best suitable time to conduct interview and questionnaires. While we were communicating with my participants. I specified the title of my study and the purpose as well. In that conversation I clarified to them that they will participate voluntarily and if they fill to withdraw, they had a right to withdraw any time from the study. I explained to them that won't lose anything if they withdraw no penalties will be offered to them. Questionnaires were distributed to the respondents and I read the questions thoroughly to the respondents and that assisted me to understanding of elicits deeper the respondent's knowledge of teaching measurement in F/P Grades R to 3 learners. The data was generated and were authorized by the process of triangulation. I will use the opportunity to examine all documents that respondents used in their understanding of teaching measurement as a mathematics component in F/P Grade R to 3 learners. The validating of data was obtained during the interview and questionnaires.

The research methodology should be distinguished that research methods are distinct concepts. Method is referred as a set of steps to travel between two places, for example, from point A to point B Jonker and Penninkk (2010). In methodology is about a model to conduct a research within the context of a specific paradigm. Methodologies are closer to research exercise than the philosophical. The research is guided by underlying sets of beliefs that guide a researcher to select one research method over other methods, because methodologies are to research exercise than the philosophical concepts found in paradigms. The researchers always say that they are conducting "qualitative" instead "inteprevist" research Sanantakos (2005).

There are specific tools, procedures and techniques which together analysis data research methods. Sanantakos (2005) explains that theoretical are independent from paradigm and methodology. Hence, a researcher method like a questionnaire can be made use of in a different methodology which is the theoretical foundation of a method. The research design then becomes crucial to join methodology and

appropriate sets of research methods to address research questions and hypotheses that established to social phenomena.

My study advocated that this methodology is best suited for my study because it gives an in-depth understanding of measurement in the Foundation Phase. Exploratory approach is permissible to me to gain more insight into the challenges and experiences that were faced by the participants in their real – life context. The case study was done from one university where pre-service teachers were studying, they were interviewed and responded to questionnaire. All these as done to perused validity and trustworthiness of the study.

In chapter two I indicated that Collen and Kaasen Chiu's theory of pre-service teacher's understanding teaching of measurement in Foundation Phase Grade R to 3. Learners because they share common social cognitive variables as predictors fortified the data generation that is required for the study Collen & Kaasen (2014). Pre-service teachers required for Mathematics integration which encompasses of measurement content knowledge, content knowledge, world- wide knowledge, pedagogical knowledge content and pedagogical knowledge.

Kobus Maree (2016) explain the differences between two types of population in a sample. The homogeneous and heterogenous that means the population sample of homogeneous that is smaller sample. Heterogeneous population sample is bigger and it assist the researchers to be able to include diversity to identify participants needs some help to identify the challenges participants experience in their daily lives different. Both of them represent samples and checking the variables. The aim of these two types of sampling is to identify the how much information both sample know about a title with a particular context (Kobus Maree 2016) state that "the data should be accuracy of estimating characteristics of the population". "There is theory involved in the sampling called statistical" which calculate the sample. When the researcher chooses a bigger sample because of his or her choice depending on his or her title information. There are three factors which will assist a researcher use the to regulate an example, the availability of financial plan and if not having enough money, whatever finances available should be utilise.

Hence, no one declined to as I projected to use a qualitative approach, which required in depth description, but I argued because I thought purposive sampling would be the greatest suitable for my study. According to Ranjit Kumar (2014) because can provide the best information and refers to the choosing of participants based on the particular characteristics which is required by data for a study for

example relevant participants. The participants in my study were third year pre-service teachers, who study measurement in Foundation Phase Grade R to 3 learners studying at University in Kwa-Dlangezwa campus. The responsive of the participants in the University ranges from twenty-one years to twenty-three years. The participants are pre-service teachers, meaning that they are undergoing training and they are in their third year, only one year remaining for them to complete their respective studies. My participants were ten, five females and five males from one-hundred and sixty-eight pre-service teachers (168). As far as my data collection, concern there was no comparing purpose. I viewed the respondents who avail themselves as potential holders of the required data; that they should all understand teaching of measurement in Foundation Phase. There was balance for equal gender. Where sampling comes, a very crucial consideration done, and the sample is equal which represent the population, which is good than small sample.

The receptive of the participants in University ranges from nineteen to twenty-two years. The participants were pre-service teachers. Meaning that they are undergoing training and they are in third year, only one- year remaining for them to finish their studies. My participants were from one-hundred and sixty-eight (168) pre-service teachers. In my data generation there was no comparative purpose. I regarded the respondents who avail themselves as potential holders of the required data; that they should all understand teaching of measurement in F P Grade R to three learners. There was gender balance purposively for equal gender. Then ten pre-service teachers were respondents in my study did not have certificates as they are in training at that time of data collection.

3.9 Credibility and Trustworthiness

Credibility of the study, or confidence in the truth of the study and therefore the findings, is the most significant principle Polit & Beck (2014). This concept is analogous to interior legitimacy in quantitative research. The question a reader might ask is “was the study conducted using standard procedures typically used in the indicated qualitative approach, or variations?”

Therefore, a stuck theory should be conducted parallel to other grounded theory studies. Different techniques were used to advance the credibility and resulted in a lengthy meeting. Trustworthiness or truth value of qualitative research and transparency of the conductive study as conclusive to the usefulness and integrity on the findings Cope (2014). In this column, I shall discuss the apparatuses of trustworthiness in qualitative research.

The trustworthiness of a study looks to the degree of confidence in data, understandings and methods used to assure the quality of the study Pilot & Beck (2014). In each study, researchers would create the protocols and techniques essential for a study to be deliberated worthy of deliberation by reader Amankwaa (2016). Though, most specialists concur that trustworthiness is necessary, debate have been rewarded in the literature as to what institutes trustworthiness Leung (2015). For the study to be accepted as trustworthy the qualitative researcher must demonstrate data analysis which would have been conducted in an exact, reliable, and complete manner through recording. It is crucial for all qualitative researchers to safeguard credibility and trustworthiness of the engendered data as qualitative research must be contingent on dense accounts that affords ample detail and depth. It is also vital that researcher does not have to generalise the conclusions Guba (1981). The purpose is that the participants do not represent the complete people. The discoveries that arose from this study would not be generalised. I alluded generalisation through sampling by purposively selecting pre-service teachers who taught mathematics to Grade R to three classrooms. Numerous data tools were utilised to generate trustworthiness and credibility to the generated data Guba (1981) designate that using more than one data tool adds value of trustworthiness to the study. I played and replayed the audio-recorder tapes of the participants, and then I transmuted the participant's remarks specific. Lincoln & Guba (1994) later added authenticity in credibility, dependability and transferability. They both explain that the attractive of transcripts back to the respondents as "member checks," which imply that as a researcher I shall submit my transcripts to the participants to verify the data which was gathered in earlier interviews for the participants to authenticate.

Kumar (2014) mentions that "the person doing the research has to protect the participants at all costs making sure that the information provided does not cause any damage to any other circumstances." I first applied for ethical clearance from the Research Office (Edgewood Campus) of the University of KwaZulu-Natal where I am trailing my Masters Once I received an approval that allowed me to conduct my study from the Research Office of the University of Zululand to conduct my study. I shall elucidate the purpose of my presence and inform the respondents that I request permission to conduct a study. They all agreed to participate, they were asked to sign the voluntary consent form. The purpose of my study was clearly stated to on the consent form. I gave my participants assurance that all information they will give will remain anonymous and they will be unable to identify anything related to them and their University. I stated that the respondents were free to withdraw from the study at any time should they wish to do so. Kumar (2014) stipulates that the researcher should make sure that confidentiality is maintained.

In addition, I also safeguarded that I took the same rare produced data to my supervisor and another person to read so as to check for any oversights and imprecisions. Linchon and Guba (1985) refers this as a process of “confirmability” (p.125). That is the one most crucial action in social sciences research that suggestions another individual a prospect to participate with one engendered data to see whether the individual will arise up with alike or diverse findings (Jijiga, 1994: Mukherjee,1993: Seale, 2000) participants, they signed the consent form which permit me as a researcher to use an audio-device to safeguard constancy in recording the complete discussion and safeguard that I exactly detained the distinct words of the participants that I would not miscue any important points. Guba and Linchln (1994) inspire the use of audio-recording because it safeguards credibility and reliability because the recorder will record the complete communication, while decently scribble some points could affect in imprecisions. The advantage of utilising an audio-device recorder permitted researcher a chance to re-play the conversation at my own time for the word by word record of the participants’ remarks. This is what make data to be genuine and become a real replication of participant’ involvements and activities.

3.10 Problems Experienced and Limitation

Most if not every study has limitations. Difficulties can exist due to limits on research design or methodology, and these factors may impact the information of a study. The restrictions of the study are those characteristics of design or methodology that impacted or persuade the application or interpretation of the results of the researchers’ study. There are limitations on generalisability and utility of findings that area the results of means in which a researcher chose to design the study or the method used to establish internal and external legitimacy. A researcher should always acknowledge his or her study’s’ limitations is an opportunity to make suggestions for further research, the ways in which these unanswered questions may become more focused on the researcher Prozesky (2014).

Acknowledgement of a study’s restrictions also offers a researcher with a chance to exhibit that as a researcher they have thought critically about the research problem, understood the relevant literature publish about it, and correctly assessed the methods chosen for studying the problem. An important objective of the research process is not only realising new knowledge but also to confront assumptions and explore what we do not know. All studies have limitations.

In spite with announcement that I gave my respondents that my existence in their lecture theatre must be unnoticed, participants must feel free and welcomed during my stay in their lecture theatre of University because I taught them the previous years. Some of the participants experienced tension because I asked them questions one by one. Otherwise everything went well. Most of the time there was

stoppage between participants and myself. Two of them responded were vague, it could be tension, shyness and being not familiar with the study topic. However, Creswell (2016) state that being a trespasser in the individual lecture theatre, it permits that person an opportunity to detect private information that specific may not like to be exposed. I anticipated that some of the lecturers will complaint that my study is time consuming and students will not be able to do their work properly.

There were none participants withdrew from my study and that gave me confidence that the participants are willing to participate in my study. I proceeded with ten pre-service, five females and five males. Hence the participants felt the impact, I manage to continue with my research study.

I as a researcher an extra limitation that took place is that lecturers came to the same lecture theatre, demanding the venue where I was still busy interviewing the pre-service teacher. We walked out and make another arrangement. I expected was if those participants in my study can withdrew it would not be easy finding replacement because it is not allowed to surprise participant and would be unready to participate, I proceeded with ten participants and nothing disturbed the data generation. I generated the data effectively and I manage to carry on with my research study but in other manner.

3.11 Conclusion

This chapter delivered a short-lived account of a paradigm that fenced a research approach that reinforced the study. The following data tools generation were semi-structured interviews, questionnaire and document analysis. The analysis of this data intricate triangulation, which has enhanced the legitimacy and reliability of the study. I also sketched the ethical issues that were crucial in the manner I elaborated with my participants. The difficulties of the study were discussed and their resolutions. The subsequent chapter will present and discuss the results of the data and provide an analysis of the findings.

CHAPTER FOUR

DATA PRESENTATION, DISCUSSION AND ANALYSIS

4.1 Introduction

The chapter before the one at present emphasized the research design and methodology that were active in the study. This chapter highlights the findings that were derived from the data that has been generated by means of interviews, questionnaires and document analysis. Only four themes were materialized from the data. All these things were taken from the interview with the participants. The following themes were developed as pre-service teacher's content knowledge in the teaching of measurement.

- Content Knowledge
- Methods of Teaching Measurement
- Situational Knowledge of Struggling Learners
- Knowledge of use of Non-Standard and Standard Measurement

The findings which were obtained from the lecture theatre interview of the pre-service teachers in-depth will be discussed. The answers from the questionnaires will also be discussed. To authorize findings, the discourse to the findings that were derived from the scrutiny of the documents used by respondents pertaining to the teaching of measurement in foundation phase classrooms were also discussed.

4.2 Content Knowledge

Prior to the presentation of the data obtained, it important to have an understanding of Content Knowledge. Content Knowledge generally refers to the facts, concepts, theories and principles that are taught and learned in specific academic courses rather than to related skills such as, reading writing or researching that pre-service teachers also learn in an institution.

The findings from the ten participants during the interview sessions and the answers from the questionnaires assisted in finding out the content knowledge required to teach measurement in the F/P the possible gaps in it. The interviews led to the discovery of the fact that due to the way in which teachers were taught the content of measurement in the F/P, it may have hindered their ability to potentially teach it effectively in the future. From the questionnaires it was discovered that mathematics is generally a difficult learning area to teach in the foundation phase.

Data Retrieved from Interviews

From the interviews, the pre-service teachers commented that the teaching of measurement was a problem to the most of the pre-service teachers except for one who has an idea on how to teach measurement in F/P. Hence, some pre-service teachers lack knowledge to be imparted to learners after the completion of their degrees of teaching in foundation phase. Naude' and Meier (2014) explain the importance of possessing content knowledge meaning that they have the knowledge of a learning area compulsory to be taught in Foundation Phase classrooms. It is crucial for teachers to have a know-how in teaching of measurement, and they must bear in mind that they will be teaching unique learners. The first question that was asked was, what was the pre-service teacher's understanding of what measurement is and the answers are as follows:

Pre-service teacher A said:

I ...think measurement is length, height of a shape.

Pre-service teacher B said:

I think measurement it is a term that is used by different stakeholders or individuals to measure a particular thing like height, width and length, using different units called standard or standard units.

Pre-service teacher C said:

I understand the learners measure distance. Distance they walk using distance to.

Pre-service teacher D said: *Breadth, length, square. I understand it is.*

Pre-service teacher E said:

Measurement is using a ruler and a string.

Pre-service teacher F said:

No, I do not have confidence to teach measurement because I have not studied it, but it is about something to measure.

Pre-service teacher G said:

I am failing to understand the meaning of measurement term because is the first time hearing of this terminology.

Pre-service teacher H said:

Measurement is not taught in foundation phase because learners are young to understand.

Pre-service teacher I said:

Measurement is a matter of using any object to measure, using a table to measure.

Pre-service teacher J said:

If I can guess because we have not been taught measurement but we are in third year now, measurement is to use any object to measure.

When interrelating with the pre-service teacher A displayed a shallow knowledge understanding of mathematics curriculum. He was unable to utter examples and comprehend about the concepts found in mathematics especially in a component of measurement. The pre-service teachers B, C and H showed good understanding of measurement key concepts. One of the pre-service teachers (H), was explaining the knowledge they had for teaching measurement in F/P. He taught measurement during the teaching practicum period.

The responses of the above exposed that more participants had restricted knowledge, only pre-service teachers B, C and H were close to the correct definition. They all very restricted measurement content knowledge. Most of the pre-service teachers they did not use the measurement concepts which is included in mathematics teaching as quantified by Naude' and Meier (2014) chapter seven. Those

concepts are key concepts of measurement and their definitions. Other pre-service teachers mentioned that they have not been taught measurement concepts since the beginning of second semester (2019), although it was in the curriculum for that year.

The next question that the pre-service teachers were asked was if they thought that measurement is an important mathematics component that has to be taught in F/P. The answers were as follows

Pre-service teacher A said:

It is important because it is all start in foundation phase and give young children an ability to identify width.

Pre-service teacher B said:

Learners measure in their daily –lives, it is important because learners can get more information in measurement.

Pre-service teacher C said:

Learners should learn measurement at an early stage understand the process.

Pre-service teacher D said:

It is important that every learner learn measurement concepts because it is for rea-life measurement. These pre-service teachers were not aware that measurement can be taught in Foundation Phase. Most of them seem to deny that it can be taught. In measurement strings can be used as well as rulers. Pre-service teacher B agreed that measurement should be taught in early years of learners in foundation phase. Thames and Phelps (2008) articulate that pre-service teachers should know that learners are unique. It is important to treat learners the same. Pre-service teachers should know different learning styles. It was obvious that most of the pre-service teachers were experiencing challenges in responding to the question. They had restricted content knowledge at all costs.

Pre-service teachers could not think of utilising measurement concepts in responding to the questions, and some of them mentioned one in the same challenge. Others were contradicting themselves instead of responding correctly, that shows most of them cannot re-call from second year (2018) information

that learners as young as Grade R can learn measurement. Pre-service teachers should remember that there are numerous teaching strategies to utilise in teaching and learning measurement.

Data Retrieved from Questionnaires

The questionnaires also helped in discovering the views and requirements regarding content knowledge from the pre-service teachers. One of the questions that the pre-service teachers were asked was if they believed that they have to be trained to teach measurement as a mathematics component. They were given the option to strongly agree, agree, disagree and strongly disagree. From the 10 participants, who were the same ones from the interview, four agreed and six strongly agreed. This proves that they understand the importance of them as pre-service needing training to be able to teach measurement as a mathematics component.

The answers derived from the question above from the questionnaire support the second question from the interview references in this section in that the pre-service teachers understand that they need to be taught measurement as a component of mathematics because, as the answers from the interview question state, they understand that learners also need to learn measurement as a mathematics component in the F/P.

4.3 Methods of Teaching Measurement in Foundation Phase

Prior to discussing methods of teaching measurement in the foundation phase, it is important to understand what pedagogic knowledge is. Pedagogic knowledge is a special combination of content and pedagogy that is uniquely constructed by pre-service teachers. J. Loughran (2012) defined pedagogic content as the knowledge that pre-service teachers develop overnight, through experience, about how to teach particular content in a particular way. This is important to know because one does not simply tell a foundation phase learner how to measure, there are specific ways to explain and teach measurement to foundation phase learners. By reviewing literature and comparing answers received from the interviews, it is visible the way in which measurement is meant to be taught versus the reality of how it is taught to learners in the foundation phase.

Naude' and Meier (2014) explain 4 Steps to be followed in teaching measurement in F/P. The first step is that the pre-service teacher must understand the features that have to be measured. Secondly, pre-service teachers must understand the units that will be used. Thirdly, pre-service teachers must

know which measurement strategy to use to determine the measurement. Lastly pre-service teachers use number measurement in order to develop and solve their own real life problems.

Data Retrieved from Interviews

The findings revealed that the pre-service teachers engrossed mainly teaching methods which can enable learners to learn more about measurement and understand it faster. Only two pre-service teachers should demonstrate during teaching for the sake of learners. Other two pre-service teachers said the pair work; group work and individual methods are better because the learners understand faster when they learn in pairs and groups. Almost all participants displayed a good understanding of required methods in teaching measurement in F/P Grade R to 3 learners. Pre-service teachers explained that when F/P learners understand measurement methods, they will be practical so that learners will practice to measure objects in their classroom.

For example, he will ask learners in his class to bring sticks of different size and the pre-service will assist learners with their non-standard units, because some of the learners will use the smaller object and they will repeat and object. Naude' and Meier (2014) called that term as discrete measurement. In Foundation Phase Grade R learners are taught distance by counting how many steps he /she walked from the classroom door to her/his chair They responded to the probing question or what Foundation Phase learners started with measurement. Some said measurement starts in Grade R by using non-standard unit. Explains that methods of teaching measurement are different and complicated especial in Grade 1 learners who never attended Grade R because those learners do not have good background of non- standard units etc.

According to pre-service teacher H knowledge methods of measurement can be put in place, could be they should work in pairs, in groups and after that they can work individual, but working more in groups help the learners to understand faster. I think teachers can use methods that can be used in the classroom and demonstrate how to measure a particular object to enable learners. Teachers can use teacher centred and learner centred approaches to demonstrate in front of the classroom

In the interviews, the pre-service teachers were asked which teaching methods do they think can enable learners to learn more about measurement and understanding it faster. The answers were as follows:

Pre-service Teacher B said:

Can demonstrate in the classroom how to measure by using tools

Pre-service Teacher D said:

They can work in pairs

Pre-service Teacher H said:

I can use demonstration method.

Data Retrieved from Questionnaires

In this theme the questionnaires assisted in showing the general opinion of the participants as a whole based on the direction of the answers they provided. The following statement was given to them with the options of strongly disagreeing, disagreeing, agreeing and strongly agreeing:

Measurement as a mathematics component has to be introduced as early as grade R in early mathematics learning. Out of the ten participants, three disagreed, three agreed and four strongly agreed. From this it can be deduced that a majority of the pre-service teachers who were participants of the questionnaire understand not only the importance of measurement in the F/P but exactly how early it should be taught.

This links in with the methods that the pre-service teachers said they would use to teach learners in the interviews in that the methods they mentioned could also cater to learners as early as grade R. This shows that although there may be doubts about exactly how to teach measurement to learners in the F/P, there is an awareness that is important to note, especially from the questionnaires that it is something that must be taught.

Pedagogical knowledge is basically what the teacher needs to know prior to being in front of learners imparting knowledge on a specific subject and what they need to do in that situation. The literature quoted outlines that the best method for teaching measurement is for the pre-service teacher to know as much as possible on what is being measured and how it must be measured including what units need to be used. The interview shows that as much as some pre-service teachers have a vague understanding about how to teach measurement, as they explain that they would demonstrate proving that they also know the work, they have no formal knowledge that has been taught to them about how exactly to teach measurement to F/P learners.

4.4 Situational Knowledge of Struggling learners

Situational knowledge is the knowledge gained from personal experience from dealing with and understanding certain situations. In the context of struggling learners, one is not simply taught how to handle or teach struggling learners as the struggles are unique for each learner so the best way for pre-service teachers to be able to teach learners who are struggling is to try think of the situations they have seen and try to adapt as best to the learners' unique needs.

Data retrieved from Questionnaires

Using the interviews, information on what ideas pre-service teachers had to help struggling learners were discussed to identify if they would be able to teach measurement to learners who had difficulty understanding the concept of measurement. The pre-service teachers were asked how they can assist those learners who are struggling to learn measurement using different things (liquid, solid or otherwise) in their classrooms. The answers were as following:

Pre-service teacher F said:

As a teacher I will draw bright and relevant resources to assist struggling learners.

Pre-service teacher G said:

The real objects will be utilised in the classroom for the benefit learners of the struggling.

Pre-service teacher H said:

During the teaching practicum I discovered that learners are unique. There were about five, not und. Unfortunately, I left them trying to understand all learners even those struggling.

Pre-service teacher I said:

I tried to demonstrate using the available resources to assist with learners struggling in learning measurement.

Pre-service teacher J said *demonstrated to learners struggling in learning measurement using different apparatus in order to assist them and try to be close to them all the time.*

The respondents confirmed that this group of learners are struggling in measurement and they need engagement in activities in order to explore, to classify and eventually see the concrete tools to be used by them.

Learners who are struggling in learning measurement require activities such as measuring the classmate using real tools such as a string. The activity that was done was using a string to measure one another. During their measurement activity they were able to do it without any hindrances. The struggling learners were not removed from the main classroom they were assisted in the same class by the teacher as a facilitator to avoid discrimination, Emmerantia Lansberg(2013).

Pre-service teacher A said:

It might be insufficient concrete objects.

Pre-service teacher B said:

Inadequate tangible concrete objects.

Pre- service teacher C said:

No resources in the classroom so that teacher an

The measure obstacle is that there are no concrete measurement objects used during teaching of measurement

Pre-service teacher D said:

Teachers do not make physical concrete if is there is not done properly.

Further Comment on Interviews and Pre-Service Teachers Challenges

The interview went well without any hindrances of teachers in the making knowledge of being teachers in the making' studying measurement as a mathematics component. The participants were able to put the researcher to a picture that have some challenges of studying measurement since I left the University early (2019).

They explain that they heard severe problems in learning of mathematics as a module. They experienced difficulties of not taught according, other reasons were that the lecturer concerned did not teach them measurement at all even during first semester, they did not study as they were supposed to, the of them state that they were taught the second-year curriculum and rest state that Teaching Foundation Phase Mathematics books Naude' and Meier (2014) was not opened by the lecturer who replaced the researcher. During the second semester on my arrival it was worse because the participants and the whole class had never been in a mathematics class.

An Interview is a frequently used method of gathering information from individuals. There are plenty of meanings of interview, but it is an interaction between two or more people, either face to face or otherwise. The interviews held generally have a purpose. The process of questioning can be either very flexible, where the person asking h questions is liberated to think about and come up with questions as they come to your mind around the issue being investigated, or inflexible where you have to follow the questions that were made beforehand, including their sequence, wording, and the way in which they are asked. Interviews are classified into different categories according to this degree of flexibility. One of the participants who will be named John, articulated that the lecturer concerned was bunking classes, not attending them and that was sad to hear that. Shulman (1986) proposed that the lecturer should have good content knowledge in particular subject and pre-service teachers must be able to teach that specific subject. They have to be well taught because they are trained to become competent teachers but "a teacher without knowledge is like an empty slate" These pre-service teachers are expected to teach the young learners' measurement but it is a pity because the pre-service teachers are not taught.

John states that "the delays of lecturers or institution is negligence of both." "The staff lacks motivation to come to the lecture theatres to lecture." He carries on by saying "ever since we arrived for the second semester, they had nothing from the mathematics lecturer, but only one who always came to teach us English." John added that "some actions should be taken by the next person in-charge, for example, the dean of that particular faculty to intervene." John stated that "lecturers concerned are supposed to teach everything in the programme, but the lecturer skips chapters and teaches what interest her." John carried on saying "some lecturers are not teaching properly sometimes, lecturers themselves cannot understand what they teaching." Both pre- service teachers who had explained their feelings about studying of

measurement seem to have logical thinking and understanding. They also both seem to have a clear understanding of their rights and concepts.

Research participants are also called human subjects of a study. Participants must have enough time to decide whether or not they must be in the research study or not. That is legal it is their rights to do so. The decision should be taken without pressure from the researcher. It is free not to participate. Participants play a vital role in a research.

4.4 Knowledge of use of Standard and Non-Standard Measurement

General pedagogic knowledge is the broad principles and strategies of classroom management and organisation that appear to transcend learning area, F. Depaepe (2018). This is highly relevant in this section where the use of different methods to measure will be explored as well as how they assist learners in understanding measurement as well as helping teachers relay the message across better to learners including those who are struggling with concepts

Standard measurement is the formal tools used to measure objects for example by using a ruler, measuring tape, scale, analogue time amongst other ways. While non-standard measurement is more informal in terms of the tools used to measure objects for example sand/timer, sundials, sticks, rope amongst things.

Data Retrieved from Interviews

To understand the way in which pre-service teachers teach measurement to F/P learners, the pre-service teachers were asked what they think should be done in order to improve foundation phase learners' use of measurement in their everyday life.

Pre-service B said:

More effect and more practical measurement projects and learning will improve.

Pre-service teacher C said:

Pre-service teachers create focuses on measurement objects.

Pre-service D said:

Enough resources for the school to encounter measurement.

Pre-service teacher E said:

Real objects should be used in order to improve learning of measurement by foundation phase.

The information gathered revealed that teachers in the making lack the know-how of teaching measurement to F/P learners. Some of them are failing to assist struggling learners in learning measurement. Landsberg (2013) explains that teachers should develop an Individual Support Plan (ISP), which means the pre-service teachers should be taught to assist learners who are struggling. The lessons should be adjusted to the level of struggling learners and learner assessment will be conducted on what they have learnt regardless of their age and ability to learn. There should be no discrimination of any human being.

Learners struggling in learning measurement should be assisted. It is crucial for teachers in the making to understand the learner's socio-cultural and diverse background. Pre-service teachers should know various teaching and learning styles. Lemmer, Meier and Van Wyk, (2012) articulate that there are effective guidelines in culturally diverse classrooms as well as an expectation from teachers' expectations in the diverse mathematical classroom, because they are stereotypical people. Banks (2010) says that every teacher and learner is made in their own way and learners of different cultural backgrounds bring into classroom a diversity of beliefs, experiences and values which influence attitudes, behaviour and perception.

There are various reasons why learners struggle, for example, language could be the first barrier and causes the learners to struggle in learning Mathematics. The other reason of a language barrier could be learner's parents immigrating to South Africa because of many reasons, it could be poverty and wars

etc. The teacher is expected to be diverse in the classroom to accommodate learners with language barriers.

The other reason teachers discourage struggling learners to answer their questions is because teachers are always criticised by them, the teacher's negative expectation could be caused by teachers who are racist, prejudice, stereotyping and xenophobia which detract from learners. The other barrier could be learner's intellectual abilities which causes barriers in learners learning measurement. Hansen (2012) suggests the guidelines to assist learners struggling are experiencing barriers in learning. One of the guidelines was to individualise curriculum. Landsberg concurs with Hansen by developing an Aspin response to the question of how teachers can assist learners who are struggling to learn to measure liquids, solids and otherwise. I think the teachers can bring physical resources in the classroom because learners learn mostly by touching.

Teachers use different strategies because it is pivotal for teachers to bring physical teaching aids which is a strategy that works in a good way. Based on this I think there are a variety of things that teachers could do to assist learners, maybe by providing measurement equipment such as a ruler. Teachers can measure by using relevant objects in the classroom.

The above respondents have confirmed that learners are struggling to learn to measure different objects (liquid, solid or otherwise) in their respective classroom. Pre-service teachers came up with different responses on how they will solve the problem. They identify how they will overcome the problem experienced by the struggling learners to learn measurement. The pre-service teachers were cognisant that learners are unique, other learners struggle and others understand the concept. Sufficient time and understanding are crucial to both parties affected. It is vital for teachers to focus their attention on the struggling learners in learning measurement as a mathematical component.

I think the teachers can assist learners by hosting a demonstration in front of the learners those who struggle in learning measurement because learners learn more easily through touching and seeing. I think using different physical objects in order to assist learners struggling in measuring different objects and different shapes would make a significant difference.

What most participants mentioned in the interview is that they use various resources and teaching aids in the classroom for learners to manipulate and explore the use of objects in order to avoid the increase of struggling learners. They also mention teacher involvement in assisting struggling learners to measure. Teachers in the making understood the uniqueness of educators and learners: They agreed on understanding those learners who struggle and that enough time should be spent to them. All resources

should be available for those learners. Various tactics could be applied to intervene with struggling learners. Measurement is one of the components that are compulsory and learners will gain confidence in measuring the above-mentioned concepts.

Hence, they were in groups to understand the views of their colleagues by manipulating objects used to measure liquids, solids or otherwise. The findings display that pre-service teachers seemed to understand some of the interview questions. Although it is obvious that some of them were not involved in teaching of measurement as a Mathematics component.

4.5 Pre-service teachers' knowledge of teaching measurement as a Mathematics component

Pre-service teachers display below average knowledge in teaching of measurement in the Foundation Phase. The other pre-service teachers display average knowledge on teaching measurement as a Mathematics component in Foundation Phase. They agreed that teachers are unable to teach measurement they should request assistance from other teachers that specialised in the field. The teachers can attend the workshops in order to be capacitated. Most of the pre-service teachers who were respondents agree that the use of physical resources in teaching of measurement were for the benefit of the

F/P learners, this concurs with Naude' and Meier (2014). They agreed that young learners learn through touching and seeing the objects to be utilised. The pre-service teachers were asked as to what teaching methods could enable learners to learn more about measurement and understand it faster. For that question pre-service teacher A said that they can use teacher-centred and learner-centred methods. Pre-service D said that they should work in pairs, and pre-service teacher H suggested that they use tangible resources rather than just visual learning.

In addition to that could be the institution not have motivated staff which makes them not to be keen to lecture. The responses mentioned above displayed that respondents were alert that there were challenges they encounter during measurement as a Mathematics component in their respective institution. Although to my surprise, some of the pre- service teachers were brave enough to applaud, talk about their feelings that some lecturers don't understand the concept of measurement as a Mathematics component. They responded that they are ready and they now utilising the information they have studied during their previous year while they were in second year level. Hansen p;31. (2012) stipulates that if a teacher or a lecturer do not understand the concept he/ she supposed to impart knowledge must seek an information to the relevant person in the same field for assistance.

1. It depends on lecturers who impart knowledge to us as teachers in the making. Concern with teachers in the making that they last heard of measurement the previous year it was an introduction. Honestly, we were not taught in 2019 until when a researcher came for data collection

Concurred with the classmates of what she said with regards to the teachers in the makings' knowledge in teaching of measurement. She agreed that are unprepared to teach Foundation Phase learners during teaching practicum because the university herself did not prepare them to teach measurement component.

Here at the University we had not started studying measurement (as yet) and the institution encounter challenges of in competed lecturers, they teach what is of their own interest but not in a programme.

Since we arrived for second semester, we never had a Mathematics lecturer nothing. We haven't heard anything from lecturer concerned as yet

Pre-service teacher was exceptional together with their responses from questions. Most of the pre-service teachers were trying their level best to respond because they are in training to be qualified after graduation with their degrees. They also heard of the Individual Support Plan (ISP). Landsberg expressed that it should implemented to assist struggling learners learning of measurement. ISP is used in the same classroom; learners should not be discriminated learners must not be removed from their respective class.

4.6 Data presentation based on the use of Questionnaires as a data generation method

Kumar (2014) stipulated that a questionnaire is list of questions that has been written. The answers to which rerecorded by respondents. The people answering the questions read the questions interpret what is expected and then write down the answerers. There is a difference between a questionnaire and an interview schedule and it is that in the former it is interviewer who asks the questions and explains the questions and recorded.

The questionnaire has no one to clarify the meaning of what is being asked to respondents. It is imperative that questions are transparent and easy to understand. The layout of the questions to be such that it is calm read and pleasing to the eyes and the arrangement style. These types of questions will assist respondents; they will feel as someone is talking to them. In a questionnaire should develop an

integration style. Respondents should feel free to respond to the questions. Questionnaire have ways of administering for example questionnaires can be administered.

MC Milan and Schumacher (2001) and Crowther et al. (1994) explain that the questionnaire is a written list of questions to which are recoded by the respondents. It is compulsory for respondents to read the questions and interrupt what is expected and the respondents write down the answer. I use the primary data Kumar (2014) stipulates that main sources that provide primary data such as interview and questionnaires. There's a difference between interviews and questionnaires, interviews the researcher pose a question and respondents respond verbally. In questionnaire no one explain the questions meaning to the respondents. Questionnaires should be perfect and relaxed to comprehend. The design of a questionnaire should be readable easily without hiccups and should be pleasurable to the respondent's eyes. The questionnaire s' development should be in an interaction manner. The researcher should be very sensitive in development of questionnaires. The researcher should assist respondents because respondents will hesitate to respond.

There are two attitudinal scales in questionnaires, for example Likert scale and Thurston scale. As a researcher I have decided to use a Likert scale because the respondents will use the following words; strongly disagree, Agree, Strongly Agree and disagree which is commonly used. There's a semantic different scale where adjective is used to express how you feel from the statement or question. The response could be good or bad weak or strong happy or sad.

This study has chosen the Likert scale because it's a convenient instrument where the researcher will calculate the individual score and the value will be assigned between 1 to 4 and the researcher will add each respondent based on their responses. Strongly Agreed were twenty-one pre-service teachers on statement number one. Statement number two (disagree) in number two were twenty. Statement number three there were the highest score of forty-three. The last statement number four were twenty-eight. It shows that in most statement which they agree as statement number two, they scored higher score.

4.6.1 Elaboration on questionnaires

The questionnaires exposed that more than half of the participants of the pre-service teachers enabled that they have not been taught measurement in their lecture theatre because they responded by articulating that teaching of measurement should commence from level one, of which that is not true

because at level one they studied other type of mathematics. If teaching of measurement commences at level one what will be taught in third year because there is a book directing both lecturers and preservice teachers. The book is called Teaching Foundation Phase Mathematics by Naude' and Meier (2014). It is the second edition book by Naude' and Meier (2019) which stipulates that chapter seven will be still be taught in a third year second semester. There are no changes, because the authors have separated the chapters specifically.

According to Shulman (1986) teachers in the making should have good content knowledge at a certain level of their study and know when the particular content should be taught at each level. The educators should also know how this content should be taught at the University. The teacher in the making is unsure of the responses from the questionnaires.

There are advantages of questionnaires Ranjit Kumar (2014) explains that a questionnaire is cheap and efficient as financial resources and human resources protects time. Using questionnaires is expedient. In questionnaires and offers great anonymity because there is no face -to- face interaction between the respondent and the person conducting the interview. The questions asked helps to upsurge the probability of obtaining the precise data.

Disadvantages are present when doing a questionnaire, hence why it is vital to note that not all data collection using this method has been disadvantaged. The commonness of a particular disadvantage is dependent on a number of different factors. Nevertheless, the researcher needs to be conscious of these disadvantages to comprehend their conceivable bearing on the data quality.

Kumar (2014) stipulates that there are also difficulties of questionnaire. Although a questionnaire has more disadvantages it is crucial that not all data gathered utilising this method has disadvantages. This depend on a number of factors. Nevertheless, the researcher needs to be alert of these disadvantages to recognize their likely an attitude on the eminence of the data. There are other disadvantages of questionnaire are that there are limited applications to a study population that can read and write. It is also cannot be used on young population. The second point is low response rate questionnaires return. Lack of opportunity to clarify issues, if anything the respondents do not understand some questions.

This study concurs with Vygotsky (1978) because learners should start learning from the known to the known subject matter Dumney (1985) concur with Vygotsky that when the teachers start a new lesson, always start with the known to the unknown

The pre-service teacher: One strongly disagreed that mathematics is a difficult subject to teach, eight pre-service teachers disagree on the same statement. No one said agreed and only one pre-service teacher strongly agree. There were mixed responses as they are tabled above.

The **pre-service teachers:** state that nine of them strongly disagree and only One disagree that Mathematics can be taught by any one even those who are unqualified, I agree with them because qualified teachers are unable to teach measurement but as they are taught will be better in schools. That is the reason they were unable to teach measurement during teaching practicum because there was no understanding of measurement, since is the first time hear the term measurement in third year.

The pre-service teachers: Two disagreed with the statement says Mathematics in FP has to be taught by specialised teachers only. Four agreed and the last Four strongly agreed.to the statement mentioned above. The pre-service teachers should be ready to teach measurement in Foundation Phase in order to be able to teach young learners accordingly as they are trained to teach measurement.

The **pre-service teachers:** Four of them approved and six also strongly approved that Foundation Phase pre-service teachers should be trained in order to teach measurement as a Mathematics component. hat according to the knowledge and the way the pre-service teacher understood,

The pre-service teachers: As the University pre-service teachers we should start studying measurement from our first year of their University studying It was also **the pre-service teachers** one of them disagreed that they can start learning measurement in FP. Three of them agreed that they must start learning measurement during their level 1 of arrival and Six of them strongly agreed that measurement should be taught from their first year joining the University. Seemingly most of the pre-service teachers be taught as first year module.

The **pre-service teachers:** Three of them strongly disagree with the statement that early mathematics should be not introduced at the exit level by pre-service teachers. Four pre-service teachers also disagree to the statement that mathematics will not be introduce at an exit level. Two pre-service agreed that it should be learnt at the exit level. Only one strongly agreed that Mathematics module should be introduced to pre-service teachers at an exit level.

The **pre-service teachers:** only one pre-service teacher who disagree with the statement. Three service teachers agreed with the statement that mathematics in FP has to be taught by fully and appropriate trained teachers. Six has strongly agreed to the statement that indeed mathematics in FP should be taught by fully and appropriately trained teachers.

The pre-service teachers: One strongly agreed that learners are failing to understand measurement because teachers also lack knowledge of how to teach it. Four pre-service teachers disagreed that learners are failing to understand measurement because of teachers lack knowledge of how to teach. Five pre-service agreed that learners are failing to understand because teachers lack knowledge of to teach it.

The pre-service teachers: Five pre-service teachers strongly disagreed that measurement as a Mathematics component should be removed, meaning that they need this measurement in Mathematics. Three disagreed and two pre-service teachers agreed that measurement has to be removed from Mathematics. Only one pre-service teacher strongly agreed that measurement as Mathematics component should be removed altogether.

The other pre-service teachers: only one strongly disagreed that pre-service teachers struggle with teaching measurement as a Mathematics component. Four pre-service teachers disagree that pre-service teachers struggle with teaching of measurement as a Mathematics component. Five pre-service teachers agree that they struggle with teaching measurement as a Mathematics component.

The pre-service teachers: Only one pre-service teacher strongly disagreed that FP do not like Mathematics and its content to be taught has to be too easy. Five pre-service teachers disagreed that FP learners do not like Mathematics and its content to be taught has to be easy. One pre-service teacher agreed that FP learners agreed that FP learners do not like Mathematics and content has taught has to be easy. Three pre-service teachers have strongly agreed that FP learners do not like Mathematics and its content to be taught has to be too easy.

The pre-service teachers: Three teachers disagreed that measurement as a Mathematics component has to be introduced as early as Grade R in early Mathematics learning. Three has agreed that measurement as a component has to be introduced as early as Grade R in early in early Mathematics learning. Four pre-service teachers strongly agreed that measurement as a Mathematics component has to be introduced as early as Grade R in early Mathematics learning.

The pre-service teachers: Four pre-service teachers have disagreed Measurement that as a Mathematics component has to be introduce at least in Grade one. Five pre-service teachers have agreed that Measurement as a Mathematics component has to be introduced at least in Grade one. One has strongly agreed that Measurement as a Mathematics component has to be introduced.

4.7 Data presentation based on Document Analysis as data generation method

4.7.1 Mathematics curriculum documents

The mathematics curriculum and Statement Policy Statement (2009) specifies that the mathematics curriculum for teachers in the making is to encourage a multi-sensory approach to measurement concept development, touching skills development and seeing and feeling skills. In this context, the mathematics curriculum that I inspected focused of mathematics skills of counting, thinking, adding, division and problem solving. It was clear that the activities displayed in the curriculum were designed for eagle-eyed teachers in the making because they look appealing and the measurement tools are tangible.

The participants were also eagle-eyed ones and their curriculum is used freely by pre-service teachers. It will be easier for the pre-service teachers to carry when they doing their teaching practicum. Most of the tools are not harmful. Having observed their classrooms during teaching practicum, the measuring tools are well displayed and used accordingly. Other pre-service teachers are creative by developing them measurement tools and they were colourful for the learners' sake. Furthermore, is designed, and particularly for the adulthood, who can run to get in the lecture theatre or classrooms at time. Other lecture theatres are not user friendly. The minister of higher education should be informed in order to address the problems of lecture theatres.

4.7.2 Curriculum and Assessment Policy Statement (CAPS)

Curriculum and assessment policy were sent to schools and was firstly used in 2012. It is still in use in schools and in Universities to equip pre-service teachers to understand that teaching of measurement starts from Grade R.to Grade twelve. This study starts from Grade R to three. The Curriculum and Assessment Policy Statement Grade R-12 came to effect January (2012). It was developed for each learning area and is also a learning guideline as learning area as well as Assessment Guidelines in Grades R to 12.

There are broad goals of the South African Curriculum:

- (a) By giving appearance to what is viewed to be knowledge, skills and values with learning.
- (b) To furnish learners regardless of their socio- economic background, race, gender, physical ability and intellectual with knowledge and physical disability.

- (c) Social revolution making sure that the differences in education of the past are looked at again and that equal education openings are made available for all sections in our society
- (d) To identify and solve problems and make decisions using critical and creative thinking.
- (e) This can only occur if all teachers have a comprehensive know how of how to identify and address obstacles to learning, and how to plan for diversity. The key in managing inclusivity and ensuring barriers are that included teachers. All phases are included from Grade R to 12. Time allocation is included.

4.8 An analysis of data generated

An interview is to organise and facilitate the respondents to share their views regarding a social phenomenon. Those who participate in the process are called participants, they are practitioners in the specialised field, whereby they will give their knowledge to the researcher through a conversation held during the process of interview (Boeije, 2009). The interview is the method that is most designated as man method for relevant practice. The procedures of an interview cover all procedures from designing the interview questions and developing the interview guides, to the process of interviewing itself are also discussed. Saunders, Lewis, and Thornhill (2009) explain that these types of interviews are a hybrid type and it lies as an in-depth interview. Hence, it offers the merit of using a list of predetermined themes and questions are structured. In order to keep the interview free and flexible talking should be freely done and so any topic elevated during interviews. In the case of research in-depth qualitative interview considered as a suitable format. It is expected that the researchers would ask for a more suitable explanation giving in order to advance deep comprehension of the matters at hand.

Rubin (2005) always give way to develop the interview questions and procedures. They have come up with a model of an in-depth qualitative interviewing termed ‘responsive interviewing’ Rubin p.20 (2005), strongly strengthened by interpretive research philosophy. This approach emphasised the importance of keeping the research design and questioning flexible in order to facilitate brand new information to emerge or adapt to an unexpected direct. An interview is a commonly used method of collecting data from individuals. According to Monette (1986 p.156) ‘an interview encompasses interviewer reading questions to respondents and their responses are recording their answers.’

Responsive interviewing is preferable because it concentrates on deep understanding, which is better than breadth which is, inspected topic Ruben and Ruben (2005). The interview questioned are structured to be to open –ended main questions, for example probing questions. All questions should derive from the research problem as well as research questions. There are separate interview questions for each

portion. To be involved in the interview questions; are webpage publications, relevant articles and to gather ideas about pertinent practice should be explored.

In order to discover some specific themes, ideas, concepts, will be developed to follow-up questions and some opinions provided by interviews. The probes should be ready early in order to elucidate about conversations following facts by asking for more facts or what had been said. One, of questions has been resolute.

Prior to conducting the formal interviews with age group to fine tune the research instruments. Finally, some expressions and words could be changed for lucidity. Regularly the structure of the main questions is recorded to advance the flow of communiqué during the planned of communiqué during the scheduled interview.

Besides, interview the researcher should take notes during and after each interview to record additional evidence in research memorandum method, which is recorded for an interview.

The research commences after the interview shortly illumination the goals of the interview and emphasising the confidentiality, anonymity and the voluntary nature of the study. The interviewee is then given a consent form which should be signed by a participant and the researcher with the participants' approval and each interviewee should be recorded.

Each interview should last no more than an hour. Each researcher is given an opportunity to make comments after each interview that is called debriefing interviewees make comments or add information which was undiscussed during interviews. When visiting the researcher should ask for relating documents by practitioners such as the University newsletter and reports which are sustainable reports. The relating documents are classified as secondary data which is obtained for triangulate findings to answer the research questions. Relevant data will be used both qualitative and quantitative in nature which includes a wide range of relevant data at the organisation case. Both qualitative and quantitative are called mixed method.

Measurement curriculum that I inspected at the University was the book called Teaching Foundation Phase Mathematics (2014) in chapter seven. The teachers in the making claimed that they were using and old curriculum before they do their third years. The curriculum was recirculated and it was implemented. It was the pre-service teacher's first experience to learn measurement in full concepts. Their impact of using a recirculated curriculum apprise the pre-service teacher's content knowledge. The responsible lecturer was able to teach the teachers in the making new and relevant curriculum which had been updated. Naude' and Meier (2014) claim that pre-service teachers should have both content

and pedagogical knowledge. This implies that they should also be knowledgeable about the variations that are taking place so as to compromise the pre-service teachers the best studying opportunities.

4.9 Conclusion

The chapter gave a discussion in the study discoveries based on interviews, questionnaires and document analysis. There were four core themes which had emerged from the interview data namely, teachers' pedagogical content knowledge of teaching measurement concepts, pre-service teachers 'situational knowledge of learners and their learning styles, lastly teachers content knowledge of using tangible objects in teaching and learning during teaching practicum. The presentation of emerging themes was followed by a transitory discussion of the theory that enclosed the study.

The participants in the questionnaires responded during responding by writing their responses by answering questions from questionnaires questions focused predominately on teaching of measurement concepts rather than on teaching mathematics as a learning area. The teachers in them making are not ready to assimilate measurement with other learning areas such as science concepts and hence they study measurement as a mathematics component. Some of the teachers in the making seemed to have enough content knowledge (i.e., Mathematics as a learning are), pedagogical knowledge, and pedagogical knowledge. Those who understand measurement concepts, they utilise a multiplicity of teaching.

I also scrutinised relevant documents or books in order to add legitimacy in the data has been generated from interviews and questionnaires. The book that I scrutinised was Teaching Foundation Phase Mathematics by Naude' and Meier (2014). It was clear teachers in the making have not studied chapter seven from the book, but some were clear about measurement. Hence, the mathematics curriculum clear that when teaching mathematics, it is taught simultaneously. Some pre-service teachers had hi-cup in studying and teaching young learners' measurement and they are able to create activities appropriate for foundation phase learners.

The pre-service teachers were using English in their response to questions. I was overwhelmed to see them expressing themselves in and I was impressed international language. Most countries are using English for communication purposes. Only one universal language to understand each other. The next chapter will present a summary of the findings and also my recommendations, and implications for future research.

CHAPTER FIVE

SUMMARY OF THE STUDY AND RECOMMENDATIONS

5.1 Introduction

The previous chapter offered the data that was engendered by means of meeting with pre-service teachers who are in third year, studying measurement as a Mathematical component for teaching Foundation Phase. The pre-service teachers were sampled intentionally as they tailored the requirements to address the research questions. Data was offered and accessible to everyone, it was analysed with reference to emerging themes for comfortable of reading and understanding. This is the final chapter and it presents

summative discussions of the findings followed by my recommendations and repercussions for the future research.

5.2 Summary of the study

This study sightsaw ten pre-service teachers' understanding teaching of measurement as a Mathematical component in Foundation Phase classrooms. They were guided by three questions; (i) What are pre-service teachers' understandings of teaching measurement as a Mathematics component in the Foundation Phase classrooms? (ii) How teachers in the making are trained to teach measurements a Mathematical component in Foundation Phase? (iii) How come do pre-service teachers understand the teaching of measurement as a Mathematical component the way they do?

It is important to understand how teaching of measurement should be conducted with young learners from the F/P classrooms. The past and the present published thesis books, e-books and dissertations were studied. In first occurrence Frederich and Froebel (2012) theory reviewed that the literature of pre-service teachers' knowledge of Mathematical integration could detect the study.

Moreover, the reviewed literature was subsequently elucidated among teachers in the making. Only two of them mentioned that if teachers in the making centred activities and approach, they would be used in lecturing of measurement in the Foundation Phase. These two that mentioned that teachers in the making and lecture approach could be used concurrently. One of the teachers in the making mentioned that

learners master through seeing and touching to explore. Three pre-service teachers express their points by saying that mathematics resources should be used in the classroom. The relevant resources are of vital to assists learners during teaching practicum when they learn measurement. Resources should be in good condition.

The study focused on one University in South Africa known as University of Zululand, it is based in KwaZulu-Natal. Ten pre-service teachers were interviewed and also all of them responded to questionnaires. All this above took place at their own time in one lecture hall and unfortunately we were disturbed in lecture halls. I pursued relevant documents to add more information and validate my study. In this context I pursue the teachers in the making to teach measurement in the Foundation Phase learners. It is also vitally important that Universities utilise CAPS (DBE, 2011). An interpretive paradigm was employed in the study and qualitative approach was underpinned. The findings I

concluded was that pre-service teachers displayed a very limited or shallow knowledge of the domains/spheres of teachers in the making knowing teaching of measurement in Foundation Phase, such as pre-service teachers' knowledge, pedagogical methods in teaching of measurement, situational knowledge of learners struggling in learning measurement as well as the knowledge of teaching measurement as a Mathematical component (i.e., measurement tools and codes). Even though most of them failed to understand teaching of measurement but in the semester the participants were supposed to understand teaching of measurement. There's integration in the learning area but they failed.

5.3 Pre-service Teachers Inadequate Content Knowledge

Bowie (2019) alludes that it is compulsory and essential for teachers to retain knowledge of concept which is of great importance for grades they teach. Hence, the knowledge of Mathematics is a fundamental learning area in the Foundation Phase and it is essential for all pre-service teachers because they are expected to build a solid foundation.

Nevertheless, the findings based on the interviews revealed that teachers in the making had narrow content knowledge of Mathematics as a learning area. During one-on-one interview, pre-service teachers focused predominantly on measurement as a Mathematical component concept. The emphasis was on practice knowledge of measurement concepts during their interview.

In relation to the findings, I recommend that teachers in the making discuss with their fellow colleagues the essential of studying measurement in-depth as a Mathematical component. Teachers in the making should also discuss their concerns with their relevant lecturers. This will assist teachers in the making to acquire required skills.

5.4 Pedagogical Knowledge and Pedagogical Content Knowledge

Pedagogical Knowledge is the knowledge of the teacher and learning methods, which are is practiced and process the content to knowledge construction. Furthermore, postulate what is prepared for teachers in the making and their preparation should be well-planned. They have prior knowledge of measurement; they gain that knowledge even outside the lecture theatres. Pre-service teachers should study various teaching methods in teaching of measurement for the learners' sake. Teaching resources should vary to accommodate the diversity of learners. The pre-service teachers should use different strategies during teaching practicum. Although pre-service teacher D suggests it is vitally important to bring resources because some learners comprehend a practical better than they do in theory.

Good strategies arouse the learners' interest to learn and encourage independent learning. My recommendations were to study and gain knowledge of various strategies during their teaching practicum. Pedagogical content knowledge is pedagogy knowledge which specifies knowledge Shulman (1987). My expectations are that teachers in the making participating in this study gain knowledge for Mathematics as a learning area. I expect teachers in the making to be able to know more of diverse learning to present the learning area content in this context. Pre-service teachers are expected to do more than the limitations of CAPS. Gardner (2011) stipulates the importance of diverse learning in the same classroom. However, they seem to have limited knowledge.

5.5 Recommendations for future studies

I recommend that the Minister of Higher Education and his subordinates capacitate Mathematics lecturers by conducting a workshop or a seminar whereby lecturers will share their concerns and gain more knowledge in teaching measurement as a Mathematical component. Lecturers are bound to follow the national curriculum not to teach only what is in their interest. Various stakeholders should visit all universities monthly so that lecturers' concerns will be shared with them. Even teachers in the making should attend that workshop so that they will understand what they supposed to teach. Mathematics is crucial even for everyday life measurement, as a result, it has to be taught satisfactorily.

5.5.1 Handling of Mathematics lectures in Lecture Theatres

Naude' and Meier (2014) stipulates what is supposed to take place in lecture theatres. It should be the place where teaching and learning takes place freely. In teaching and learning process there should be lecturers and students, in this context it should be pre-service teachers in level three (third year students). Studying should be independent but after the lecturers have taught/shared the knowledge to students. I was surprised when pre-service teachers told me that they haven't started studying measurement syllabus during the interviews because lecturers do not pitch up on lecture theatres whenever they are supposed to, and if they do they teach only what is of their interest. The lecturers are not following the University rules and regulations.

Planning is crucial for the lecturers to prepare for effective teaching and learning. Planning assists lecturers to enjoy lecturing moments, without planning it is impossible to have an effective lecture with students. Left Witch (2010) postulate that during planning, the lecturers identify as to what resources are needed, strategies they should use for comprehensive lectures. That assist both parties involved.

The lecturer should know the outcomes of their planning. During the interview I noticed that pre-service teachers were not taught measurement. In most instances in the questionnaires they were guessing the answers.

It's ideal after lecturing to assess whether outcomes were reached by the lecturer. There are instructions involved in teaching within the curriculum. Consequently, lecturers should use various types of assessment that will reflect pre-service teacher's knowledge. All assessment tools will assist both parties. The pre-service in this study will develop them. Although teaching of measurement was ineffective, I recommend that assessment should be workshopped by the Minister of Higher Education in order to make sure that lecturers cover the needed curriculum for a certain period. That will equip lecturers with knowledge and avoid not pitching up in the lecture theatres.

Rood (2003) states that Mathematics lecturers based on the interpretative perspectives of theatre studies and a mathematics can be experienced in the lecture theatre. Pre-service teachers learn mathematics best when they approach the subject as something they enjoy. While research show that knowledge of Mathematics facts is crucial. Boaler (2015) says that the best way for pre-service teacher to comprehend Mathematics fact by using them regularly and develop understanding of Mathematic relations.

5.5.2 Pre-service Teachers Training in Universities

In South Africa there are too many Universities and pre-service teachers choose where they want to go for training. In the mainstream Universities is where pre-service teachers are able to do everything and there are other students who experience impediments but University welcomes all. The University accommodates rural and urban area students. Pre-service teachers should be taught accordingly so that they will impart relevant knowledge to the learners after completion of their training and become graduates. The pre-service teachers I'm dealing with are in training in Early Childhood Development (ECD) to teach from Grade R to 3. After four years of training, pre-service teachers will be qualified teachers and be able to impart knowledge throughout the country and abroad. Hereafter, the South African Minister of Higher Education should ensure that matriculants enter Universities with needed points for studies of their own choice. It is essential that lecturers equip pre-service teachers.

5.6 Future Implications of the Study

This was a restricted study to an exploration of ten teachers in the making who are in teaching training in the F/P. A wider area should be covered for future studies in this field and in conclusion of all pre-service teachers in teaching of measurement in the F/P from universities. More than ten pre-service

teachers should be involved to further study. This study should be replicated in wider Universities, Africa and other areas for comparative studies by other researchers.

5.7 Conclusion

A summary of this chapter was presented as well as main findings. I concluded that the teachers in the making from the University of Zululand who participated in this study showed an inadequate content knowledge and have an impact negatively in their teaching of measurement as a Mathematical component. They focused on understanding shapes. During an interview one concept of measurement and there was no integration. Recommendations were made by myself based on findings. One recommendation is that the Minister of Higher Education should cascade the information to lecturers of F/P. I further recommended that lecturers of F/P and other relevant stakeholders should meet monthly to monitor lecturing of measurement in F/P for the sake of the teachers in the making.

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APPENDIX 1: ETHICAL CLEARANCE CERTIFICATE



26 February 2019

Mrs Zodwa E Mvuyana 215082471
School of Education
Edgewood Campus

Dear Mrs Mvuyana

Protocol reference number: HSS/1581/017M

Project Title: Pre-service teachers' understandings of teaching measurement as Mathematics component in Foundation Phase.

Full Approval – Expedited Application

In response to your application received 19 December 2017, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

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

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

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

Yours faithfully

Dr Rosemary Sibanda

/px

cc Supervisor: Dr Jabu Mzimela

cc. Academic Leader Research: Prof Simon B Khoza

cc. School Administrator: Ms S Jeenarain, Ms M Ngcobo and Mr SN Mthembu

Humanities & Social Sciences Research Ethics Committee

Dr Rosemary Sibanda (Chair)

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APPENDIX 2: INFORMED CONSENT LETTER

40 Stanbridge Crescent Montclair 4004

20 April 2019

Dear Research Participant

I hereby write this letter to request your permission to be the participant in my research study that I will conduct in your University. Below is a brief description of how I will conduct my research:

My name is Mrs Zodwa Mvuyana, I am a Master of Education student at the University of KwaZulu-Natal. The title of my research project: **Pre-service teachers' understandings of teaching measurement as Mathematics component in Foundation Phase.**

The purpose of the study is to explore the understandings that pre-service teachers have for teaching of measurement as a Mathematics component in the foundation phase (FP) classrooms.

Data will be collected through the use of semi-structured interviews. This will involve asking you open-ended questions which will be audio-taped, if agreed to by yourself. The interview would be approximately for 45 minutes, and could be split if you desire. It will take place at a time and place more convenient for you and would not disrupt your normal responsibilities as a student in your university. Secondly, I will give you questionnaires that will also have the same questions for all the participants. A scale of five ratings will be used, the highest being strongly agree to the lowest which is strongly disagree. I anticipate that using the questionnaires as one of the data generation tools will assist in expediting the collection of data.

It is important for you as a participant to understand that:

- a) Your identity and your school will never be exposed. Pseudonyms will be used when writing this report.
- b) If during the research study you feel like withdrawing due to certain circumstances, you are at liberty to do so.
- c) In cases where you don't want to answer questions posed, you are free to remain silent.

The information that will be collected will be used for research purposes only.
Kindly receive my contact details as well as my Supervisor's:

Mrs Zodwa Mvuyana. Cell phone Number: 0833631368

Email: zemvuyana@gmail.com

Supervisor: Dr Jabulile Mzimela

School of Education

Edgewood Campus

University of KwaZulu-Natal (UKZN)

Yours faithfully
Z.E. Mvuyana

Student No.: 215 082 471

You can also contact our research office at the following contact process:

Phumelela Ximba

HSSREC Research Office

Tel: 031 260 3587

Email: ximbap@ukzn.ac.za

----- **CONSENT**
FORM

I (Name and surname in full), hereby
give consent to be the participant on a study based on: **Pre-service teachers' understandings of
teaching measurement as Mathematics component in Foundation Phase.**

I fully understand that I am permitted to withdraw from this project if need arises.

	Willing	Not Willing
Audio Equipment		
Photographic Equipment		

Video Equipment		
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Signature

Date

APPENDIX 3: APPLICATION LETTER TO CONDUCT STUDY IN AN INSTITUTION

**40 Stanbridge Crescent
Montclair 4004**

March 2016

The Director

University of Zululand Research and Innovation office
Private Bag x 1001
Kwa-Dlangezwa
3886
Sir/Madam

Re: Application to conduct the research study in your institution

I hereby write this letter to request your permission to conduct my research study in your institution. Below is a brief description of how I will conduct my research:

My name is Mrs Zodwa Mvuyana, I am a Master of Education student at the University of KwaZulu-Natal. The title of my research project: **Pre-service teachers' understandings of teaching measurement as Mathematics component in Foundation Phase.**

The purpose of the study is to explore the understandings that pre-service teachers have for teaching of measurement as a Mathematics component in the foundation phase (FP) classrooms.

Data will be collected through the use of semi-structured interviews. This will involve asking the fourth year B. Education pre-service teachers open-ended questions which will be audio-taped, should they agree to be audio-taped. The interview would be approximately for 45 minutes, and could be split if you desire. It will take place at a time and place more convenient to your pre-service teachers and would not disrupt their normal responsibilities as students in your institution. Secondly, I will give them questionnaires that will also have the same questions for all the participants. A scale of five ratings will be used, the highest being strongly agree to

the lowest which is strongly disagree. I anticipate that using the questionnaires as one of the data generation tools will assist in expediting the collection of data.

It is important to note that your participant will have to understand that:

- a) Their identity and their institution will never be exposed. Pseudonyms will be used when writing this report.
- b) If during the research study they feel like withdrawing due to certain circumstances, they are at liberty to do so.

c) In cases where they don't want to answer questions posed, they are free to remain silent.

The information that will be collected will be used for research purposes only.

Kindly receive my contact details as well as my supervisor's:

Mrs Zodwa Mvuyana. Cell phone Number: 0833631368

Email: zemvuyana@gmail.com

Supervisor: Dr Jabulile Mzimela

School of Education

Edgewood Campus

University of KwaZulu-Natal (UKZN)

Yours faithfully

Z.E. Mvuyana

Student No.: 215 082 471

You can also contact our research office at the following contact process:

Phumelela Ximba

HSSREC Research Office

Tel: 031 260 3587

Email: ximbap@ukzn.ac.za

APPENDIX 4: PERMISSION LETTER



University of Zululand, Private Bag X1001, KwaDlangezwa, 3886
W: www.unizulu.ac.za

T: +27 35 902 6731 E: DielanaM@unizulu.ac.za
Deputy Vice-Chancellor: Research and Innovation

Mrs. ZE Mvuyana
School of Education
Edgewood Campus
University of KwaZulu-Natal
South Africa
14 May 2019

Dear Mrs. Mvuyana

REQUESTING TO CONDUCT RESEARCH AT UNIZULU: "PRE-SERVICE TEACHERS' UNDERSTANDING OF TEACHING MEASUREMENTS AS MATHEMATICS COMPONENT IN FOUNDATION PHASE."
Your letter to me, refers.

I hereby grant approval for you to conduct part of your research at UNIZULU, as per the methodologies stated in your research proposal and in terms of the data collection instruments that you have submitted. I note also that University of KwaZulu-Natal, has issued an ethical clearance certificate and having read the documentation, I am happy to accept that certificate.

You may use this letter as authorization when you approach the relevant persons. Please note that permission is based on the documentation that you have submitted. Should you revise your research instruments, or use additional instruments, you must submit those to us as well.

I wish you well in your research.

Yours sincerely,



Professor Gideon De Wet
Chairperson: University of Zululand Research Ethics Committee
Deputy Vice-Chancellor: Research and Innovation

CHAIRPERSON
UNIVERSITY OF ZULULAND RESEARCH
ETHICS COMMITTEE (UZREC)
REG NO: UZREC 171110-30

15-05-2019

RESEARCH & INNOVATION OFFICE

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APPENDIX 5: INTERVIEW SCHEDULE

**PRE-SERVICE TEACHERS ‘UNDERSTAND TEACHING OF MEASUREMENT IN
FOUNDATION PHASE Data Generation Method 1: Semi-
structured Interview Schedule**

1. What do you understand by the term “measurement”?
2. Do you think measurement is an important Mathematics component that has to be taught in Foundation Phase? If so, why do you think it is (not) important?
3. Do you think it is important for you to learn how to teach measurements in your Foundation Phase classroom? If so, why do you think it is (not) important?
4. Do you think learners have any interest in learning about measurement?
5. How can teachers assist those learners who are struggling to learn to measure different things (liquid, solid or otherwise) in their classrooms?
6. What do you think should be done in order to improve Foundation Phase learners’ use of measurement in their everyday use of measurement?
7. Which teaching methods do you think can enable learners to learn more about measurement and understand it faster?
8. What measurement-based content is supposed to be taught to learners as far as the curriculum policy is concerned? Do you think Foundation Phase teachers are really teaching what they are supposed to teach under this Mathematics component? If no, what do you think might be the cause?
9. What do you think are the major obstacles towards measurement teaching in their classrooms?
10. Do you as a pre-service teacher understand the term “measurement” as one of the mathematical components?
11. What are the challenges pre-service teachers encounter during studying measurement as a Mathematics component?
12. Does the University prepare you on how you can teach measurement in your Foundation Phase classrooms during and after Teaching Practicum?
13. If no, what do you think has to be included in the programme? If yes, what is it that the University does that makes you think that the programme is well pitched in preparing your pedagogical knowledge?
14. Do you feel confident with the knowledge (content and pedagogical) that you have on measurement teaching as a Mathematics component when requested to practically apply? If not, what do you think is the cause?

15. How often have you taught measurement as a Mathematics component during teaching practicum? What were your experiences?
16. At which level do you get training on how to teach measurement as a Mathematics component? Do you think that is a right level? If not, at what level do you suggest pre-service teachers need to be trained?
17. Is there any other information that you want to share with me on how you are getting trained on how to teach measurement as a Mathematics component?

APPENDIX 6: QUESTIONNAIRE

Data Generation Method 2: Questionnaires

Read the statements below and respond by putting a cross on ONE numeric value in the boxes on the right.

	Strongly Disagree	Disagree	Agree	Strongly Agree
	1	2	3	4
Mathematics is a difficult subject to teach in FP.				
Mathematics in FP can be taught by anyone, even those who are not qualified.				
Mathematics in FP has to be taught by specialised teachers only.				
FP pre-service teachers have to be trained on how to teach measurement as a Mathematics component.				
Early Mathematics module has to be introduced to pre-service teachers at level 1 and progress to all other levels.				
Early Mathematics module has to be introduced to pre-service teachers at an exit level.				
Mathematics in FP has to be taught by fully and appropriately trained teachers.				

Learners are failing to understand measurement because teachers also lack knowledge of how to teach it.				
Measurement has to be removed as a				

Mathematics component.				
FP pre-service teachers struggle with teaching measurement as a Mathematics component.				

FP learners do not like Mathematics and its content to be taught has to be too easy.				
Measurement as a Mathematics component has to be introduced as early as Grade R in early Mathematics learning.				
Measurement as a Mathematics component has to be introduced at least in Grade 1.				

***If your response was “strongly disagree” or “disagree” to any of the statements, please make comments below.**

APPENDIX 7: TURNITIN REPORT

Turnitin Originality Report

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DISSERTATION by Zodwa Eunice Mvuyana



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INGWEMABALA EDITING



CERTIFICATE OF LANGUAGE EDITING

This certificate confirms that the manuscript listed below was edited by our editors.

The following issues were corrected grammar, punctuation, sentence structure and phrasing.

Manuscript Title: Pre-service teachers' understandings of teaching measurement as Mathematics component in Foundation Phase

Author: Zodwa Eunice Mvuyana

Student No.: 215 082 471

Referencing Style: APA 6th

Date Issued: 30 June 2020

DISCLAIMER

Whilst the English language editor has used electronic track changes to facilitate

APPENDIX 8:

LANGUAGE EDITING CERTIFICATE

corrections and has inserted comments and queries in a right-hand column, the responsibility for effecting changes in the final, submitted document, remains the responsibility of the client and the editor cannot be held responsible for the quality of

English Language expression used in corrections or additions effected subsequent to the transmission of this certificate on 30/06/2020.

Director: TF Ngcobo (M.Ed.: Languages Dept.– University of Western Cape)

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