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TITLE

EXPLORING GRADE TEN TEACHERS' UNDERSTANDING OF MULTIPLE INTELLIGENCES IN TEACHING PHYSICAL SCIENCE IN A RURAL SCHOOL

BY

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DATE SUBMITTED – DECEMBER 2018

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LIST OF ACRONYMS

DoE	Department of Education
ADD	Attention Deficit Disorder
MI	Multiple Intelligences
FET	Further Education and Training
NCS	National Curriculum Statement
HoD	Head of Department
CAPS	Curriculum and Assessment Policy Statement
OBE	Outcome Based Education
KZN	KwaZulu Natal
C2005	Curriculum 2005

LIST OF APPENDICES

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ABSTRACT

Understanding multiple intelligences in teaching is very important in order to achieve effective teaching. The most important tenacity of this research is to show some of the observable structures of a holistic and constructive enriched curriculum for physical science that shapes the strengths of learners within the classroom. Human intelligence varies so much that each learner has a unique combination of intelligences resulting in a unique personal profile for each learner. As a result each learner learns in a unique way. The purpose of this study was to explore physical science teachers' understanding of multiple intelligences in teaching. It is then very important for teachers to understand multiple intelligences teaching, so that they may reach every learner when teaching. The traditional ways of teaching catered for only mathematical and linguistic intelligences, leaving learners with other intelligences behind. When traditional ways of teaching are used physical science appears to be a difficult subject, because most learners fail the subject. This research presents an interpretive case study of four research participants who are Grade ten, physical science teachers in a rural school in Durban, KwaZulu Natal. For data generation, narratives, one on one semi-structured interviews and classroom observations were used. The main findings of this research signify that even though Physical Science teachers understand the different skills that learners have, they fail to show the learners multiple intelligences in their teaching. The other challenge that teachers focus more on is the group teaching therefore treating learners in the same manner. This is also seen when Physical Science teachers assess, their forms of assessments though different but they cannot deal with different types of multiple intelligences to cater for all learners in their classrooms. The study concluded that even though physical science teachers are showing the visibility of understanding multiple intelligences, they cannot articulate what multiple intelligences are. In their teaching there was visibility of the understanding of multiple intelligences, as they use multiple intelligences strategies unknowingly, especially when they use visual aids. I recommend that further research on teachers' understanding of Multiple Intelligences should be done in three contexts. The department of education should organise more workshops for Physical Science teachers. The workshops should have sufficient information about the choice of careers so that Multiple Intelligences could be catered for. Moreover, the school counselors should design methodical interventions that cater for Multiple Intelligences to be incorporated into curricular experiences in hopes of providing learners with various prospects to develop more

mature career decision-making attitudes and competencies. The aptitude tests that address South African measures should be developed so that the learners could do aptitude tests that are in line with South African learners and most of all that cater for their Multiple Intelligences.

CHAPTER 1

ORIENTATION OF THE RESEARCH

INTRODUCTION

This study explored grade ten teachers' understanding of multiple intelligences in teaching physical science. For effective teaching and learning of Physical Science, a school should have the following resources; teachers, learners, laboratory, textbooks, science apparatus and chemicals. In rural schools 'Everything connected with education, apart from learners is in short supply. Typical examples are: schools, classrooms, teachers, teaching materials indeed everything needed for proper education of youth is in short supply, Ukeje as cited in Akinmade (1999). When the resources are a problem, teaching and learning is affected negatively. Over the past years, the pass rate of Physical Science has been very low (DBE, 2011). Some schools have laboratories but lack apparatus and chemicals, because Physical Science is a practical, experimental subject, it then becomes difficult to teach it effectively. Although the Department of Education supplies some books, there is a great challenge in distribution. Some of these resources may be improvised in a very limited degree, teachers cannot be improvised, yet they are in shortage as well. Rural communities are challenged because most of the parents are not working, and they cannot afford to support their children financially, in cases where there are school items to be bought. In the rural areas in South Africa, there are some schools that do remarkable well at producing good matric results in Physical Science and Mathematics. These schools achieve their success in spite of the poverty around them and lack of facilities and resources (Burney & Beilke, 2008). DBE (2011) suggests that the improvement of learner achievement in Physical Sciences and Mathematics depends on competent teaching. The assumption in this study was that, competent teaching can be realised if teachers would understand and employ multiple intelligences teaching strategies in teaching physical science, which will cater for all learners with their different intellectual abilities. This chapter discusses the problem that prompted the need for this study to be done. It reviews related literature and discusses the rationale behind this study. The research objectives and questions of this study are given. The theoretical framework of this study is discussed in this chapter. The research design and methodology are presented.

1.2. BACKGROUND OF THE RESEARCH

This study has contributed to my professional development as a physical science teacher. I am now in a better position to use multiple intelligences in my teaching of physical science. I plan to use the information that has been generated in this study to maximise my learners' learning experience and I have been able to adapt my teaching methods to accommodate differences in learners' intelligences. Furthermore, this study will be appropriate for all physical science teachers.

Practical application of this study has assisted me contribute to the effective teaching of physical science at school. A great number of physical science learners do not achieve good grades in the subject, which is an indication that, teachers are unable to reach some learners. This study examined the problem of ineffective teaching. I decided to focus on grade ten teachers because grade ten is a foundation class for physical science, because leaners do physical science for the first time as a subject. (In the classes prior to grade ten, they do natural sciences, which is an umbrella subject with all natural science subjects). This study focused on grade ten teachers because they build the foundation. I focused on exploring teachers' understanding of multiple intelligences in teaching because a teacher is expected to be both competent in content knowledge and pedagogical skills to teach the subject. By implication, the teacher is expected to explore all necessary avenues that ensure the effective delivery of the subject so as to meet learners' needs and requirements.

1.3 THE EDUCATIONAL SYSTEM OF SOUTH AFRICA

Education in South Africa is governed by two national departments, namely the department of Basic Education (DBE), which is responsible for primary and secondary schools, and the department of Higher Education and Training (DHET), which is responsible for tertiary education and vocational training. The education system runs all the way from Grade 0 to Grade 12. Education is compulsory from the age of seven (Grade 1) to the age of 15 (Grade 9). From Grades 10 to 12, education is optional because an individual may decide to apply for employment after passing grade 9.

There are three main types of schools in South Africa - public government-funded schools, governing body-funded schools and private schools. Public schools in South Africa rely on government funding and are operated at a local level in their province, which means the quality of education varies significantly between areas.

Educational standards tend to be higher in the bigger cities, but with a lack of government financing, some schools lack qualified teachers and specialist equipment. The best schools seem to be those that were known as "Model C" schools during the Apartheid years. These schools are partially funded by governing bodies and parents, resulting in higher educational standards and better facilities. Private schools in South Africa have a very good reputation, with smaller class sizes and more extracurricular activities. Primary schools are divided into junior primary schools (grades 0-3) and senior primary schools (Grades 4-6). Secondary schools are divided into GET phase (7-9) and FET phase (grades 10-12). South African schools follow a January - December school year. The final year of secondary school is grade 12, at the end of which learners sit for the external exam. Passing this external exam is a minimal requirement for university entry. Over the past 20 years, there have been a lot of changes in the system. The changes that have taken place in the Curriculum are, from NATED 550 Curriculum to Outcome Based Education (OBE) to National Curriculum Statement (NCS) to Curriculum and Assessments Policy Statements (CAPS).

1.4 RATIONALE OF THE STUDY

My interest in this research began when I was teaching physical science, both chemistry and physics for more than 20 years. From my experience as a physical science teacher, I have seen how the changes in the physical science curriculum over the years have contributed to the poor performance and the low pass rate in physical science. The changes that have taken place in the Curriculum are from NATED 550 Curriculum to Outcome Based Education (OBE) to National Curriculum Statement (NCS) to Curriculum and Assessments Policy Statements (CAPS). Being a Science HoD for some years, the researcher has attended many subject meetings and physical science content workshops organised by the KwaZulu Natal Department of Education with the aim of stratergising on Grade 12 results improvement plans. The researcher has observed teachers teaching only 'exam guidelines' to achieve a high pass rate. The researcher has tried different teaching methods as well. The researcher has taught in both schools where physical science pass rate was high and where it was low, but generally the pass rate for the Thekwini region has remained low in the subject (Education, 2011b). It is believed that people have different intellectual abilities that could contribute to their success or failure in different subjects. The researcher has seen how learners avoid choosing physical science, because it is believed to be a difficult subject. Hence, this study intends to explore teachers' understanding of multiple intelligences in teaching

physical science. This study has a potential of informing the readers whether teachers understand the multiple intelligence teaching or not.

From what other scholars have written about multiple intelligences teaching, it is evident that there are many benefits from understanding and using multiple intelligences teaching. Douglas, Burton, and Reese-Durham (2008) contend that there is a need for teachers to adopt strategies that could lead to better performance in the academic achievements of learners. Stanford (2003) explains that multiple intelligences teaching provides a way of achieving what competent teachers have always been doing, that is to provide a variety of opportunities for learners to learn and to show evidence of their learning. The use of Multiple Intelligence in assessments gives an all-inclusive as well as a whole picture of learners' achievement, and it would give an incredible boost to learners' self-esteem and confidence, as Multiple Intelligence truly caters for individual differences. A learner who does not do well in the area of logical mathematical intelligence may excel in the area of musical and rhythmic intelligence. Each learner has an area where he can display his ability and experience success. Just as using Multiple Intelligence in class gives educators a variety of strategies and methods to enliven their teaching, assessment too has to be multi-dimensional or multi perceptual. Current performance in most schools concentrate almost solely on verbal-linguistic and logical/mathematical intelligences. A great improvement in learning may be seen, by providing learners with a diversity of options through which they can demonstrate their mastery of the required concepts, processes, ideas and facts and operations (Lazear, 1994)

This research will also contribute to the researcher's professional development as a physical science teacher. She will be in a better position to use multiple intelligences in her teaching of Physical science. The researcher plans to use the information that will be generated in this study to maximise her learners' learning experience. Furthermore, this study will inform all physical science teachers.

A great number of physical science learners do not achieve good Grades in the subject, which is an indication that, teachers are unable to reach some learners. This study will examine the problem of ineffective teaching. Grade ten is a foundation class for Physical science, because leaners do it (physical science) for the first time as a subject. (In the classes prior to Grade ten, they do Natural sciences, which is an umbrella subject with all natural science subjects). This study focuses on

grade ten teachers because they build the foundation. The researcher chose to focus on exploring teachers' understanding of multiple intelligences in teaching because as a teacher, one is expected to be both competent in content knowledge and pedagogical skills to teach the subject. By implication, the teacher is expected to explore all necessary avenues that ensure effective delivery of the subject such that it meets the learners' needs and requirements.

1.5 STATEMENT OF THE RESEARCH PROBLEM

Notari-Syverson and Sadler (2008) state that in order to prepare learners for more formal education and be critical about different issues in life, teachers need to expose them to deep and explicit knowledge of high quality education level at the young age. The purpose of this study is based on the researchers' experience as physical science (both Chemistry and Physics) teacher which form the basis of literature. She has taught both chemistry and physics for more than 20 years. From the researcher's experience as a physical science teacher, she has seen how the changes in the physical science curriculum over the years have contributed to the poor performance and the low pass rate in the subjects. Therefore allowing teachers in physical science to understand multiple intelligences will assist learners to achieve best results. The changes that have taken place in the Curriculum are from NATED 550 Curriculum to Outcome Based Education (OBE) to National Curriculum Statement (NCS) to Curriculum and Assessments Policy Statements (CAPS). Being a Science HOD for some years, the researcher has attended many meetings and physical science content workshops organised by KZN Department of Education with the aim of stratergising on Grade 12 results improvement plans. She has seen teachers teaching only 'exam guidelines' to achieve a high pass rate. Not showing interest on different intelligences. I used to try different teaching methods as I knew at the back of my mind that I teach learners with different skills. I have taught in both schools where physical science pass rate is high and where it is low, but generally the pass rate for the eThekwini region has remained low in the subject. It is believed that people have different intellectual abilities that could contribute to their success or failure in different subjects. I have seen how learners avoid choosing physical science, because it is believed to be a difficult subject. Hence, this study intends to explore teachers' understanding of multiple intelligences in teaching physical science.

1.6 THE PURPOSE OF THE RESEARCH

This study has a potential of informing the readers whether teachers understand the multiple intelligence teaching or not. Multiple intelligences teaching validate educators' everyday experience: students think and learn in many different ways. It also provides educators with a conceptual framework for organizing and reflecting on curriculum assessment and pedagogical practices. In turn, this reflection has led many educators to develop new approaches that might better meet the needs of the range of learners in their classrooms (Smith, 2002). Therefore this research will assist the physical science teachers to understand these multiple intelligences and make sure that they infuse it in their teaching.

1.7 REVIEW OF LITERATURE

Kegan and Kegan (1998) defines multiple intelligence teaching as a powerful catalyst in education: it is revitalising the search for more authentic, learner-centered approaches to the curriculum, instruction and assessment. Multiple Intelligences teaching, is based on the idea that, intelligences are not singular but multiple. Every person has a unique blend of intelligences. Intelligences vary with regard to their development. All the intelligences are not static but dynamic. The use of one intelligence can enhance another of the intelligences (Armstrong, 1994). This means that intelligences can be developed. Intelligences vary with regard to their development. The Multiple Intelligences Theory suggests that learners learn in different ways. Knowing learners' learning strengths and weaknesses will assist teachers in trying new ways of teaching. It will also help teachers in planning according to the classroom's abilities.

In the traditional classroom, students with different ways of learning are often labeled as learning disabled, as having attention deficit disorder (ADD) or simply as underachievers, when their unique ways of thinking and learning are not addressed by a heavily linguistic or mathematical classroom (Armstrong, 2014). Multiple Intelligences teaching helps teachers realise how smart their learners are by providing them with different options of teaching. In order to get rid of the perception that science is abstract and difficult to be understood, instead of straight explanation methods, Multiple Intelligences teaching methods which get positive feedback should be used. (Ucak, Bag, & Usak, 2006).

The master code of multiple intelligences is that, whatever one teaches, he has to link the teaching objective with words, numbers, pictures, music, the body, social interactions and personal experience (Armstrong, 2009). Benefits of using multiple intelligences teaching includes reduced discipline and classroom management problems, it also increases learners engagement and enthusiasm for learning (Christensen, Johnson, & Horn, 2010). Teaching that included nonacademic intelligences was also seen to be beneficial, for learners from non-English-speaking backgrounds, who were not linguistically strong in English. Learners who had a low academic self-confidence demonstrated more confidence and competence when they were able to present what they had learned in their area of strength (Noble, 2004). When teaching an individual, teachers should present the most difficult concepts in the learner's preferred style. Easier concepts should be introduced in a different style. When teaching an entire class, teachers should use different teaching methods to cater for all learning styles in their presentations, if they are to reach every learner (Giles, Pitre, & Womack, 2003).

Multiple intelligences teaching validates educators' everyday experience: students think and learn in many different ways. It also provides educators with a conceptual framework for organizing and reflecting on curriculum assessment and pedagogical practices. In turn, this reflection has led many educators to develop new approaches that might better meet the needs of the range of learners in their classrooms (Smith, 2002). A basic understanding of each of the intelligences shows that they can work together or separate. For example, a dancer can excel in his art only if he has also musical intelligence to distinguish the different rhythms and patterns in music, interpersonal intelligence to grasp how he can emotionally move his audience through his movements, as well as bodily intelligence to complete the movements successfully (Fogarty, 2015).

The more thoroughly teachers understand the differences in learners, the better chance they have of meeting the diverse learning needs of all of their learners. There are three categories of diversity that have important implications for teaching and learning, they are; differences in learning styles, approaches to learning, and intellectual development levels (Felder & Brent, 2005). The way in which a learner approaches or responds to the learning task comprises two aspects: first, cognitive style, which reflects the way in which the individual person thinks; second, learning strategy, which reflects those processes which are used by the learner to respond to the demands of a learning activity. A person's cognitive style is probably an in-built and automatic way of

responding to information and situations. A learner's cognitive style influences his or her general achievement in learning situations (Riding & Rayner, 2013).

1.8 THEORETICAL FRAMEWORK

Theoretical Framework is a collection of interrelated concepts that can be used to direct a study with the purpose of predicting and explaining the results of a study (LeCompte, Preissle, & Tesch, 1993). The following scholars have these to say about the role of the theoretical framework; Theoretical framework; connects the researcher to existing literature (Smyth, 2004). Provides assumptions that guide the research (Miller, 2007). Helps the researcher to choose appropriate question for the study (Miller, 2007). According to LeCompte, Preissle, & Tesch (1993) the theoretical framework convinces the reader of the relevance of the research questions and it guides the choice of a research design The theoretical framework guides the researcher toward appropriate data generation methods (Miller, 2007).

In this study the theoretical framework that will be used is the theory of multiple intelligences (MI) theory. The (MI) theory was proposed by Howard Gardner, the Harvard University professor. Gardner introduced the MI theory in his book, The frames of mind: The theory of multiple intelligence (Gardner, 1983a). He proposed that individuals possess intellectual abilities which will enable them to solve problems, create products or provide services that are valued in the larger society (Gardner, 1983a). In his theory Gardner states that intelligence is not a single capacity. He defined intelligence as the ability to solve problems. He suggested that everybody possesses a different mind and each individual has a personal intelligence profile, which consists of eight different intelligence types. We all share the whole spectrum of intelligences and intellectual strengths which change over time depending on experience and practice (Gardner, 2009). The Multiple Intelligences theory holds that each person possesses eight intelligences, and uses them to carry several kinds of tasks. Although individuals possess all eight intelligences, each has their own particular mix of intelligences, with some dominating over others, but they are not fixed and can change over time.

These eight intelligence types as explained by the MI theory are: Linguistic intelligence, this intelligence has to do with being word smart. It has to do with the ability to use words effectively both orally and in writing. It includes the ability to remember information. Mathematical

intelligence, being number and reasoning smart. Possessing the ability to use numbers and reasoning well. This intelligence includes understanding basic properties of numbers and principles of cause and effect, as well as the ability to predict. Musical intelligence: being sound smart. This intelligence means being able to sense rhythm, pitch, and melody. Musical intelligence includes skills like the ability to recognize simple songs and to vary speed, tempo, and rhythm in simple melodies. Spatial intelligence, being picture smart. Having the ability to sense form, space, colour, line and shape. It includes the ability to graphically represent visual ideas. Interpersonal intelligence, being people smart. It is the ability to understand another person's moods, feelings, and intentions. It includes such skills as responding effectively to other people. Intrapersonal intelligence, being self-smart. Having the ability to understand yourself, your strengths, your weaknesses, moods, desires, and intentions. This includes understanding how you are similar to or different from others. Knowing how to handle your feelings, such as what to do, and how to behave in any situation. Bodily intelligence, being body smart. Being able to co-ordinate your mind with your body. This includes the ability to use your body to express ideas and feelings. It also includes physical skills such as co-ordination, flexibility, speed, and balance. Naturalist, being nature smart. This intelligence means being able to recognize and classify plants, animals and minerals including rocks.

Teaching physical science is not just about giving out facts in the textbooks, it involves helping learners to understand the world. This includes helping learners to use their skills of observing, measuring, describing, classifying, experimenting and predicting. The multiple intelligence theory is valid for use in this study because it gives a clear guide on how teachers can plan their lessons to cater for all differences in learners' abilities. The MI theory also provides a guide on how teachers can help learners to develop the above mentioned skills as physical science demands.

1.9 LOCATION OF THE STUDY

The study was conducted in a rural secondary school in Durban in Umlazi District. The school is about thirty seven kilometers away from the city.

1.10 PHYSICAL FEATURES OF THE SCHOOLS IN THE RESEARCH

The road to the school is a very dusty gravel road. There is a fence surrounding the school but there are many openings on the fence which are cut by learners, so as to walk a shorter distance

home. The lawn is not mowed, the grass is very long. There are vegetable gardens in this school, which are said to be the project run by the Agricultural science teacher and his learners. The school is painted with bright green and lemon paint. There are 6 windows for each class, windows are large, and so there is a lot of natural lighting in the classrooms. The staffroom (staff lounge) has tables and chairs and a lot of books on the floor under the tables. The staffroom has no cupboards. The school uniform is compulsory for all learners in the school. It is a public school.

1.11 THE RESEARCH OBJECTIVES

The research objectives that guided the study were:

- To explore Grade ten teachers' understanding of multiple intelligences, in teaching physical science.
- To explore why Grade ten teachers understand multiple intelligences in physical science in particular ways.

1.12 THE CRITICAL RESEARCH QUESTIONS

The critical research questions of this study were:

- What are Grade ten teachers understanding of multiple intelligences in Physical Science?
- Why Grade ten Physical Science teachers understand multiple intelligences in particular ways?

1.13 METHODOLOGY

Research methodology as defined by Henning (2004) is an articulated group of techniques that complements each other to fulfill the requirements of the study, in as much as the technique could lead to the generation of data that will produce answers to the critical questions asked in the study.

Research design and methodology entails all activities and planning that leads to the main study, and these includes the preparations and procedures that a researcher follows to carry-out a research (Koshy, 2005). Research design and methodology entails all activities and planning that leads to the main study, and these includes the preparations and procedures that a researcher follows to carry-out a research (Koshy, 2005) through a particular methodology chosen, in this case the qualitative research methodology.

This study is located within the interpretivist paradigm. An interpretivist paradigm is of the view that knowledge about reality is socially constructed and could only be accessed through direct social interaction with member shared meaning, language, experiences and consciousness(Myers, 2009). Cohen, Manion and Morrison (2011) argue that the aim of an interpretivist paradigm is to understand the subjective world of human experiences. The purpose of this study is to explore Grade ten teachers' understanding of multiple intelligences in teaching physical science. This paradigm will enable me generate data from the Grade ten physical science teachers. Interpretivist relies on a subjectivity approach of studying social phenomena by attaching significance to a range of research techniques that focus on qualitative analysis, such as personal interviews, participant observations, case study and account of individuals and personal constructs (Dash, 2005).

1.13.1 RESEARCH PARADIGM

This study is located within the interpretivist paradigm. An interpretivist paradigm is of the view that knowledge about reality is socially constructed and could only be accessed through direct social interaction with member shared meaning, language, experiences and consciousness(Myers, 2009). According to Cohen, Manion and Morrison (2011) the aim of an interpretivist paradigm is to understand the subjective world of human experiences. The purpose of this study is to explore Grade ten teachers' understanding of multiple intelligences in teaching physical science. This paradigm will enable me generate data from the Grade ten physical science teachers. Interpretivist relies on a subjectivity approach of studying social phenomena by attaching significance to a range of research techniques that focus on qualitative analysis, such as personal interviews, participant observations, case study and account of individuals and personal constructs (Dash, 2005).

1.13.2 STRENGTHS OF INTERPRETIVE PARADIGM

Interpretive uncovers the meaning and understanding of social phenomena (Papinczak, Tunny & Young, 2009 and Kroeze, 2012). It is an umbrella term which has diverse theoretical and

methodological positions (Potrac, Jones and Nelson, 2014). Interpretivist researchers not only look for the presence or absence of a causal relationship, but also the specific ways in which it is manifested and the context in which it occurs (Morse, 2008). Ormston et.al (2014) argue that qualitative research approaches sometimes leave out contextual sensitivities and focus more on meanings and experiences. Phenomenological approach, for instance, attempts to uncover, interpret and understand the participants' experience (Eisner, 2017).

1.13.3 RESEARCH APPROACH

For the purpose of this study, qualitative research approach was deemed appropriate. Qualitative research approach as was used in this study is one that involves the collection of a large amount of data from a small number of participants (Veal, 2005). According to Johnson (2010) qualitative research is a type of inquiry that uses different techniques in data collection with the purpose of carrying out a realistic analysis of the data generated based on the notion that reality is socially constructed.. The data generated in a qualitative inquiry conveys the views, actions, and motives of individuals and the environment in which they find themselves (Myers, 2009). According to Johnson and Onwuegbuzie (2004) qualitative enquiry affords the researcher an opportunity to generate data on an experience of the participants. Qualitative approach is an inquiry process of understanding, where a researcher develops a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting (Creswell, 1994). Qualitative research aims to explore and to discover issues about the problem on hand, because very little is known about the problem. As articulated by Creswell (2014) qualitative research is intended to enable researchers to comprehend individuals, and the social and social context within which they live. In keeping with the boundaries of the interpretivist paradigm, I initially aimed to be aware of my own subjective reality and truth. An important aspect of the understanding process of understanding Multiple Intelligences through multiple data sources to create meaning between the researched and the researcher the conversations that were created in data generation.

1.13.4 RESEARCH DESIGN

Leedy and Omrod (2013) states that a research design is a planned process of conducting research providing a blue print for data collection. Cohen, Manion and Morrison (2007) agree that the nature of the research question determines the type of research design, methodology, and techniques to be used in a study. A research design is the schematic layout or plan that is used in conducting research in order to generate the data that will provide answers to the critical research questions

set for the study. In this study, the exploratory case study was suitable because this study was aimed at exploring Grade ten teachers' understanding of multiple intelligences teaching in Physical science.

1.13.5 RESEARCH SAMPLING

For the purpose of this study, purposive sampling was chosen. With purposive sampling the possibility of one member of the population to be selected is known (Cooper & Schindler, 2012). The purposive sampling is relevant for this study because in this type of sampling, specific choice about which individuals to include in a sample is clear. Sampling is the process whereby the researcher is selecting a suitable representative part of a population for the purpose of determining characteristics of the whole population. Leedy and Ormond (2013) point that data collection in a phenomenological research design which may involve purposeful sampling. In purposeful sampling, the researcher selects certain participants from the population that is going provide information about the topic of interest (Mcmillan & Schumacher, 2014). The goal of purposeful sampling was to understand a specific phenomenon, not to represent a population, by selecting information-rich cases for the investigation (Creswell, 2014). Studying information-rich cases yields in-depth understanding of the phenomenon and gives insight into critical questions under investigation. Deliberate sampling: Deliberate sampling is also known as purposeful or non-probability sampling. This sampling method involves purposeful sampling or deliberate selection of certain units of the universe for constituting a sample which represents the universe. Three methods of data collection will be used, narratives, interviews and classroom observation will be used.

1.14 SAMPLING PROCEDURE

Purposeful or deliberate sampling was used to select participants. The research participants were Grade ten Physical Science teachers that were purposefully sampled. The purposive sampling is appropriate for this study because the Grade ten physical science teachers are known and the chances of them being selected are known. The sample will consist of four teachers from a rural high school. To recruit the participants, I will ask the principal of this rural secondary school to identify the grade ten physical science teachers, and then I will ask them in writing to participate in the study. With purposive sampling the possibility of one member of the population to be selected is known (Cooper & Schindler, 2012). The purposive sampling was relevant for this study

because in this type of sampling, specific choice about which individuals to include in a sample is clear. The purposive sampling proved to be such an appropriate method of sampling for the research because the Grade ten physical science teachers were known and the chances of them being selected are known. The sample consisted of four teachers from a rural high school. The recruitment of the research participants was purposeful and I was able to ask them in writing to participate in the study.

1.15 METHODS OF DATA GENERATION

Data for the study will be generated using narratives, semi-structured interviews and class observations. In qualitative research, data is based on human experiences and observations (Dawson, 2010). As this study intends to explore teachers' understanding, I will be more interested in the experiences of the participants and will generate more information by observing them. Semi-structured interviews and classroom observations will be used. Using semi-structured interviews will be appropriate for this study because it allows the researcher to introduce the topic and let the participants talk freely about the topic.

1.15.1 TEACHER NARRATIVES

For the purpose of this study free association narrative method will be used for data generation. In narrative method, the researcher's responsibility is to be a good listener and the participant is a storyteller, rather than a respondent. This approach organises human experiences into meaningful episodes. Narratives help the interviewer to understand the participants better. The free association narrative method reveals significant personal meanings which are not necessarily obvious if a participant is a respondent (Hollway & Jefferson, 2008).

1.15.2 SEMI-STRUCTURED INTERVIEWS

A semi-structured interview provides valuable information from the context of the participants experience since it does not limit the respondent (Hesse-Biber & Leavy, 2011). According to Preece, Rogers and Sharp (2002) it is possible to generate rich data and ideas using semi-structured interviews because the level of questioning can be varied to suit the context and that the researcher can ask the research participant more deeply on specific issues as they arise. When doing semi-structured interviews, the researcher will assure the research participants, that there are no right or wrong answers to the interview questions, and that their professional careers will not be affected, as the study is for research purpose only and that their responses will be kept confidential. The researcher will do this so as to encourage participants to give honest and sincere responses which are all parts of ethical considerations. Data will be captured using a voice recorder and a note book for accuracy of data capturing.

1.15.3 CLASSROOM OBSERVATIONS

The researcher will observe each participant in class while teaching physical science in grade ten. Data will be generated by means of note taking. The advantage of using observations to generate data is that the researcher will be able to explore how teachers teach - how they use multiple intelligences in the teaching of the physical science. Classroom observations also allow the researcher to get first hand data. Observations also capture the whole social setting in which people function, by recording the context in which they work (Scott & Garner, 2013; Scott & Usher, 2011). It is important for researchers to gather original first-hand data. Classroom observations offered the researcher an opportunity to gather original data from the respondents. Given the fact that the nature of the study required the gathering of data on how teachers teach, classroom observations were used.

1.16 DATA GENERATION PLAN

The data will be generated over a period of 1 month, which is from 1 to 30 August 2018. This period will be ideal because most schools at this time are orderly, no registrations and it's the period before exams.

Data Generation Plan					
Times	**Research Question**	**Data Source**	**Instrument**	**Location**	**Date**
1	What are Grade ten teachers understanding of multiple intelligences in Physical science?	Grade 10 Teachers	Free association narratives	Rural School in Durban	1-10 August 2018
2	What are Grade ten teachers understanding of multiple intelligences in Physical science?	Grade 10 Teachers	Semi-structured interviews and observations	Rural School in Durban	13-30 August 2018
3	Focusing on the two critical research questions	Documents analysis	Reading and making sense of what the policy says about Multiple intelligences	Rural school in Durban	3-7 September 2018

1.17 DATA ANALYSIS

Gupta and Gupta (2011) refer to data analysis as a process of editing, coding, classification and tabulation of raw data. In other words, it is aimed at the reduction and checking of the research data in a more controllable proportion. Data analysis is conducted to reduce, organise and give meaning to data. In this study data will comprise interview recordings and notes from observation sessions. data will be analysed in stages using the thematic method (Clarke & Braun, 2013; Hesse-Biber & Leavy, 2011).

Note that for the purpose of authenticity the responses by the participating teachers are presented *verbatim* in the text and may contain linguistic inaccuracies which were not edited in the transcription process. The qualitative data will be analysed by using content analysis and forming certain themes based on the content. Content analysis is a form of narrative analysis. Riessman and Quinney (2005) presented four forms of narrative analysis that are thematic or content analysis, structural analysis, interactional analysis and performative analysis. Since this study, focuses on the multiple Intelligences in teaching Grade ten Physical Science, the thematic or content analysis became a natural choice for the analysation method. Qualitative analysis is generally focused on observing the data and looking for similarities and differences from the text based on narratives of Physical Science teachers, semi-structured interviews and document analysis. In qualitative analysis, the data is first broken into small pieces, from where similarities and abnormalities are looked for and later organized thematically. Braun and Clarke (2006) state that thematic analysis is performed through a process of coding which consists of six phases namely: getting familiar with the data, creating first codes, formulating themes among the codes, reviewing those themes, naming the themes and producing the final report. In the study, thematic analysis will be used by coding and categorising the data obtained which will later put into themes and data sets for analysis in order to assist me in understanding and explaining the Multiple Intelligences of teaching Physical Science in Grade ten through Gardener's Multiple Intelligence theory.

Triangulation is defined by Yin (2017) as a procedure where researchers search for union among multiple and different sources of information to form themes or categories in a study. Dependability refers to the extent to which the researcher can replicate the research findings with similar participants in a similar research context (Merriam, 2009). This is concerned with whether or not the same results would be obtained if one could observe the same thing twice, that is, the results should be consistent and can be repeated. I will address the issue of confirmability in this study by making sure that the findings are confirmable when other people confirm them. I will make sure that I have sufficient evidence to back my data interpretations and that I do not make unconfirmed claims in my findings, drawing on the triangulation purposes.

1.18 TRUSTWORTHINESS

The quality and control of a research data as explained by Sekaran and Bougie (2013) depend on the views of the particular researcher and that result to adoption of what he or she will regard as appropriate in terms of trustworthy and quality.

1.18.1 VALIDITY

Creswell (2014), state that validity of the process is critical, thus highlighting the importance of both concept in research. According to Saunders and Lewis (2012) the process in determining the extent at which a research instrument is successful in measuring what it has set out to measure is concerned with validity. The validity of the research instrument expresses whether the research procedures are measuring what it is supposed to measure (Sekaran & Bougie, 2013). In this study research questions will be pretested first by using them with at least two colleagues to check vagueness and ensuring validity.

1.18.2 DEPENDABILITY

Dependability refers to whether or not the results of the research will remain constant if the research was to be repeated in the same context with the same research participants (Mouton & Babbie, 2001). To ensure dependability, the researcher generated data from different research participants from the same context. Furthermore the researcher made sure that the research study is dependable, by doing follow up interview to confirm data.

1.18.3 CREDIBILITY

De Vos and Strydom(1998) explain that credibility aims at ensuring that the research has accurately described the thoughts and opinions of the research participants. For the purposes of this study, the researcher ensured the credibility by voice recording all interviews. The recordings will verify that all interviews took place.

1.18.4 RIGOUR

Every research study is subject to an open critique and evaluation. Contrary to this, the value of the study, soundness of its methods, accuracy of findings and the quality of assumptions made or conclusions reached could have serious result (Long & Johnson, 2000, p. 30). Results of data

generated and analysed in this study will be exposed for criticisms from other researchers in the field of study.

1.19 OVERVIEW OF THE STUDY REPORT

This study report is divided into five chapters, as outlined below.

Chapter	Description
Chapter 1: Background and Introduction of the study	This chapter provides discussion on the background to the study. The chapter also presents the statement of the problem, the rationale for the study, the research questions and objectives, the theoretical location of the study, research design and methodology and definition of terms. Anticipated problems and ethical issues are also discussed in this chapter.
Chapter 2: Literature review and theoretical framework	This chapter reviews literature which is relevant to teachers' understanding of multiple intelligences. In this chapter also the theoretical framework used to guide this study is discussed.
Chapter 3: Methodology	This chapter provides an account of how the study was conducted, unpacking the methodology.
Chapter 4: Data presentation and analysis	This chapter is a presentation of data generated and analysis of data generated.
Chapter 5: Research findings and recommendations	This chapter concludes the findings of the study and suggests recommendations.

1.20 ANTICIPATED PROBLEMS AND LIMITATIONS

Limitations are those factors or conditions beyond the reasonable control of the researcher that affect the execution of the study or the validity of the findings or both (Babbie, Mouton, & Strydom, 2011). Limitations of the study will be both physical and conceptual in nature. Physical will be time constrains. I will not be able to have sufficient time with participants as they are working, and I am also working. Time constraints will impact negatively on the pace and completion of my study. To navigate this limitation, I will use weekends to do interviews. The study focuses on two district offices and two schools per district, so findings cannot be generalized. Yin (2009) posits that qualitative research has limited generalisability. To address this limitation triangulation will be used for data generation. This study will only focus on one school in Durban and therefore cannot generalise the results, to the KwaZulu Natal province, thus a broad conclusion cannot be drawn to South Africa. Another challenge that could arise is the accessibility of research participants where they cannot be available for interviewing due to sickness, absenteeism or holidays. This study will use semi structured interviews which allow individuals to disclose thoughts and feelings which are private. The types of questions to be asked, issues of confidentiality and anonymity may be questionable. This study relies on the interpersonal intelligence of the interviewer, the ability to establish a rapport. The success and validity of this study rests on the extent to which the research participants' opinions are reflected and communicating his/her perspective of the study.

During an interview research participants may respond differently depending on how they perceive the interviewer. The participants may not share their honest opinions, they might respond such that they say what they think the researcher wants to hear.

1.21 ETHICAL ISSUES

Ethics as defined by De Vos (2002, p. 75) is a "set of principles with widely accepted morale suggested by an individual or group, researchers, parents and learners". Besides, ethics centers on moral justification of doing the right or wrong thing when there is interaction with humans, animals or the environment. The researcher will apply for an ethical clearance, from the UKZN ethical office. The letter to the KZN department of Basic Education will be written, making them aware

of intentions to conduct this study. The letter to the school governing bodies and principals of the three schools where the study will be conducted will be written: asking permission to use their schools for this study. Then letters to the targeted participants will be written, requesting them to participate in this study. Through a well-planned and constructive informed consent letter, research participants will be offered information on what the study is about and its benefits (Cooper & Schindler, 2012). Each research participant will also be obligated to give written consent of participation. Research participants will be guaranteed their anonymity and confidentiality at all times. Advice on their right to withdraw from participating in the study at any time should they feel uncomfortable or threatened by the process will be offered. Every human being has a right to privacy (Behi & Nolan, 1995). Bertram and Christiansen (2014) argue that when doing research, there are some ethical issues to be considered and they are as follows **Autonomy-** this one emphasizes the importance of getting consent from your participants and clearly stating the purpose of the research to them. In my case I asked for the permission of the students who will be part of the study, explained the purpose of the study and they also signed consent forms (attached to the research report). **Non-maleficence-** this one emphasises the importance of concealing the identity of the participants as much as possible and ensuring that the research is not harmful to anyone. **Beneficence-** this one emphasises the point that the research should be beneficial to the participants, other researchers and the society at large. In this case as the dominant challenges has been put forward, suggestions and recommendations has been made as to how this issue can be addressed as it affects the future leaders of this country.

1.22 CONCLUSION

This chapter briefly discussed the problem that prompted the need for this study to be undertaken. It reviewed related literature and discussed the rationale behind this study. The research objectives and questions of this study were also given. The theoretical framework of this study was discussed. The research design and methodology and definition of terms were presented. The next chapter presents literature review from various publications.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews literature on teachers' understanding of multiple intelligences in teaching physical science. It also reviews literature on the importance and benefits of understanding multiple intelligences. It is assumed that there is a correlation between the uses of multiple intelligences strategies and academic achievement. Therefore, it is hypothesised that learners who are taught using multiple intelligences strategies will have higher academic achievements than those learners who are taught in traditional ways. Most learners find themselves in a classroom that places too much emphasis on linguistic, word-smart intelligence or mathematical, number-smart intelligence. Campbell, Campbell and Dickinson (1996) maintain that sometimes teachers unconsciously use multiple intelligences theories in their teaching, like when they use visual aid or playing a song. If they fully understand MI theories and its benefits; it could be more beneficial to them in their teaching.

2.2 THE CONCEPTS OF 'UNDERSTANDING' AND 'MULTIPLE INTELLIGENCES'

Understanding which is deeper than knowing and multiple intelligences which refer to different intellectual abilities are discussed below. From the Oxford Advanced Learners Dictionary (1997) the word understanding is a verb meaning to grasp information or evidence through the power thought and intellect or people's perceptions about a specific situation and also understanding implies abilities and characters with respect to an object of knowledge that are sufficient to support intellectual behaviour.

2.2.1 UNDERSTANDING AS THE PHENOMENON

Understanding is a psychological process related to a matter such as a person, situation, or message. Understanding is a relation between a person and an object of understanding. Understanding implies abilities and dispositions with respect to an object of knowledge that are sufficient to support intelligent behaviour. Understanding is related to learning concepts, and theories associated with those concepts. Thus, understanding is correlated with the ability to make

inferences. If you have an understanding of something, you know how it works or know what it means (Collins, 2004).

2.2.2 MULTIPLE INTELLIGENCES

According to Gardner (1999) intelligence is the ability to solve problems and to create issues in the cultural medium in order to progress. Individual learners possess intellectual abilities which enable them to solve problems, create products or provide services that are valued in the larger society (Gardner, 1983a). MI is concerned about, in what ways are learners smart, rather than, asking are they smart. MI theories brought new insights into education, helping students to identify and develop their strengths and discovering more effective teaching methods. Gardner (1983b) states that all the eight intelligences are equally important and essential to an individual's development. Therefore, development in one area often increases the chances of development of another. Gardner, asserts that when it comes to being smart, differences count. The theory takes individual differences seriously, appreciating the giftedness of each individual. It is highly important for teachers to understand MI theories and how to apply it to their teaching.

2.3 THE IMPORTANCE AND BENEFITS OF UNDERSTANDING AND USING MULTIPLE INTELLIGENCES, IN TEACHING PHYSICAL SCIENCE

Multiple Intelligences theory in the classroom has many benefits: the teacher and learners using it realise that there are many ways to be "smart". All forms of intelligence are equally important. It is important for teachers to understand multiple intelligences. A sense of increased self-worth may be seen as learners develop their strengths and work towards being experts in certain areas. Learners may develop strong problem solving skills that they can use those skills in real life situations (Giles, Pitre and Womack., 2003). Stanford (2003) explains that multiple intelligences teaching provides a way of being competent as a teacher. Multiple intelligence teaching provides many different ways for learners to learn and to show evidence of their learning. *According to* Kagan (2000), teachers should understand and use multiple intelligences in the classroom, because it will prepare learners for future's complex life challenges. Multiple Intelligence teaching makes the curriculum accessible to all learners. It also keeps the subject content exciting to all learners. Learners should be taught based on their ability and ways of learning. Benefits of using multiple intelligences teaching includes reduced discipline and classroom management problems, it also increases learners engagement and enthusiasm for learning (Christensen, Johnson and Horn.,

2010). Teaching that includes non-academic intelligences is also beneficial, for learners from non-English-speaking backgrounds, who were not linguistically strong in English. Learners who had a low academic self-confidence demonstrated more confidence and competence when they were able to present what they had learned in their area of strength (Noble, 2004). Benefits of using multiple intelligences teaching includes reduced discipline and classroom management problems, it also increases learners engagement and enthusiasm for learning (Christensen et al., 2010). Multiple intelligences teaching provides educators with a conceptual framework for organizing and reflecting on curriculum assessment and pedagogical practices. In turn, this reflection has led many educators to develop new approaches that might better meet the needs of the range of learners in their classrooms (Smith, 2002). From what other scholars have written about multiple intelligences teaching, it is evident that there are many benefits from understanding and using multiple intelligences teaching.

2.4 DEVELOPING MULTIPLE INTELLIGENCES IN LEARNERS

Gardner(1995) insists that everyone has the capacity to develop all eight intelligences to a competent level of performance, if appropriate encouragement, enrichment and instruction is given. Miller concurs that multiple intelligences can be developed to a level of competence depending upon three factors: **Hereditary,** which has everything to do with one's genetic makeup. **Experience**, which includes experience with family, school, friends and all others who help in developing intelligence, keep them from developing or actively suppress them. Miller (2007) maintains that there are two types of experiences that can affect the development of intelligences: the crystallising experience and paralyzing experience. Crystallising experience refers to an experience which acts as a spark that lights intelligence and starts its development towards an adequate level of competency. On the other hand paralysing experience refers to an experience that deactivates or discourages the development of intelligence. For an example a learner who confidently tries an experiment in chemistry class and it turn out to be a flop. Then the teacher humiliates him in front of the class. This particular learner will be filled with a lot of negative feelings (shame, anger, fear and guilt). This paralysing experience will hinder some of the learner's intelligences from developing. Therefore learners come into the classroom with different sets of developed intelligences, which means that each child will have his own unique set of intellectual strengths and weaknesses (Brualdi Timmins, 1996). This will be mainly due to the experiences

that learners have been exposed to prior to coming to the classrooms. **History and culture**, also historical background of an individual can awaken or hinder intelligences from being developed. This includes time and place of birth and where one is raised. As a result it is very important for teachers to understand the intelligences in their class, taking into account the context (in this study: the rural school). Campbell and Linda (1996) agree that intelligences can be developed. They suggest that there are influences that can either promote or suppress the development of intelligences. They state that the development of intelligence can be influenced by: **access to resources** for example growing up in a home where there is no musical instrument, may suppress the child's development of musical intelligence. **Geographic factors** for example, a learner who grew up in a rural area will have more chances to develop naturalist intelligence as compared to a learner who grew up in urban setting, staying in a 32nd floor in a flat in Ballito. From what these Scholars have written, it is clear that it is important for teachers to understand multiple intelligences in their classes, so that they may be able to teach effectively. Teachers have to also understand their own dominant, well developed intelligences and their undeveloped intelligences so that they may work on developing them. If the teacher understands multiple intelligence teaching strategies, she may ask learners to help her out when there is a need. It is possible that some learners may show expertise in an area where the teacher's particular intelligence is not well developed. For example a teacher might avoid drawing diagrams on the chalkboard or avoid using pictures as teaching aids, possibly because her spatial intelligence is not well developed. There might be learners who are well developed in this intelligence.

2.5 MULTIPLE INTELLIGENCES IN THE CLASSROOM

There are many ways to incorporate Multiple Intelligences theory into the physical science curriculum, and there is no set method by which to incorporate the theory. It is important for teachers to carefully select activities that not only teach to the intelligences, but also realistically match with the subject matter of the lesson. Multiple Intelligences theory should enhance, not detract from what is being taught (Giles et al., 2003). Teaching physical science is not just about giving out facts in the textbooks, it involves helping learners to understand the world. This includes helping learners to use their skills of observing, measuring, describing, classifying, experimenting and predicting. Douglas, Burton, and Reese-Durham (2008) contend that there is a need for teachers to adopt strategies that could lead to better performance in the academic achievements of

learners. When teaching an individual, teachers should present the most difficult concepts in the learner's preferred style. Easier concepts should be introduced in a different style. When teaching the entire class, teachers should use different teaching methods to cater for all learning styles in their presentations, if they are to reach every learner (Giles et al., 2003). In an effort to maximise learners' interest in both the subject matter and their own learning inclination, teachers may wish to teach their students a little bit about Multiple Intelligences. Teachers can brief the class about each type of intelligence and then follow up with a self-assessment for each learner. In this way, learners will be able to capitalise on their strengths and work on their weaker areas (Giles et al., 2003). The multiple intelligence theory gives a clear guide on how teachers can plan their lessons to cater for all differences in learners' abilities. The MI theory also provides a guide on how teachers can help learners to develop the above mentioned skills as physical science demands. Multiple Intelligences teaching, is based on the idea that, intelligences are not singular but multiple. Every person has a unique blend of intelligences. Intelligences vary with regard to their development. All the intelligences are not static but dynamic. The use of one intelligence can enhance another of the intelligences (Armstrong, 1994). This means that intelligences can be developed. Intelligences vary with regard to their development. The Multiple Intelligences Theory suggests that learners learn in different ways. Knowing learners' learning strengths and weaknesses will assist teachers in trying new ways of teaching. It will also help teachers in planning according to the classroom's abilities.

Kegan and Kegan (1998) defines multiple intelligence teaching as a powerful catalyst in education: it is revitalising the search for more authentic, learner-centered approaches to the curriculum, instruction and assessment. Multiple Intelligences teaching, is based on the idea that, intelligences are not singular but multiple. Every person has a unique blend of intelligences. Intelligences vary with regard to their development. All the intelligences are not static but dynamic. The use of one intelligence can enhance another of the intelligences (Armstrong, 1994). This means that intelligences can be developed. Intelligences vary with regard to their development. The Multiple Intelligences Theory suggests that learners learn in different ways. Knowing learners' learning strengths and weaknesses will assist teachers in trying new ways of teaching. It will also help teachers in planning according to the classroom's abilities.

In the traditional classroom, students with different ways of learning are often labeled as learning disabled, as having attention deficit disorder (ADD) or simply as underachievers, when their unique ways of thinking and learning are not addressed by a heavily linguistic or mathematical classroom (Armstrong, 2014). Multiple Intelligences teaching helps teachers realise how smart their learners are by providing them with different options of teaching. In order to get rid of the perception that science is abstract and difficult to be understood, instead of straight explanation methods, Multiple Intelligences teaching methods which get positive feedback should be used. (Ucak et al., 2006).

The guiding principle for multiple intelligences is that, whatever one teaches, he has to link the teaching objective with words, numbers, pictures, music, the body, social interactions and personal experience (Armstrong, 2009). When teaching an individual, teachers should present the most difficult concepts in the learner's preferred style. Easier concepts should be introduced in a different style. When teaching the entire class, teachers should use different teaching methods to cater for all learning styles in their presentations, if they are to reach every learner (Giles et al., 2003).

A basic understanding of each of the intelligences shows that they can work together or separate. For example, a dancer can excel in his art only if he has also musical intelligence to distinguish the different rhythms and patterns in music, interpersonal intelligence to grasp how he can emotionally move his audience through his movements, as well as bodily intelligence to complete the movements successfully (Fogarty, 2015).

The more thoroughly teachers understand the differences in learners, the better chance they have of meeting the diverse learning needs of all of their learners. There are three categories of diversity that have important implications for teaching and learning, they are; differences in learning styles, approaches to learning, and intellectual development levels (Felder & Brent, 2005). The way in which a learner approaches or responds to the learning task comprises two aspects: first, cognitive style, which reflects the way in which the individual person thinks; second, learning strategy, which reflects those processes which are used by the learner to respond to the demands of a learning activity. A person's cognitive style is probably an in-built and automatic way of responding to information and situations. A learner's cognitive style influences his or her general achievement in learning situations (Riding & Rayner, 2013).

2.6 PLANNING AND IMPLEMENTING LEARNER CENTERED LESSONS

Giles et al., (2003) suggests that teachers have to be careful when planning a lesson to use multiple intelligences strategies. He advised that teachers have to consider activities that can be integrated into the lesson that teach to the different intelligences. Teachers need not incorporate all eight intelligences into one lesson. When gathering resources and materials, they should consider those which will allow learners to explore their multiple intelligences. When designing activities and tasks for the intelligences, teachers have to design activities that are learner-centered.

By using the Multiple Intelligences approach in your classroom, you will provide opportunities for authentic learning based on the learners' needs, interests, and talents. The Multiple Intelligences classroom acts like the "real' world. For example, the author and the illustrator of a book or the actor and the set builder in a play are equal valuable creators. Learners become more actively involved. Writing is a creative expression of real or imagined sensory experiences. A sensorimotor and cognitive process, writing serves all of Howard Gardner's multiple intelligences, not just linguistic intelligence (Hanson, 2009). Assisting learners to develop "interpersonal intelligence," you can use cooperative learning groups. After determining some of your learners multiple intelligences, organize cooperative learning groups so there is an interesting distribution in each group. Learners with strong interpersonal skill frequently make excellent theatrical directors, while those with strong visual intelligence enjoy painting lively sets.

2.7 ASSESSMENT IN THE SOUTH AFRICAN CONTEXT

Learners tend to learn in the way they know, or think, they will be assessed. Therefore, to ensure deep, meaningful learning, assessments must be geared to promote cognitive processing that requires complex, contextualised thinking to construct meaning and create knowledge (Bezuidenhout & Alt, 2011). In South Africa teachers administer the following types of assessments. Students must have a clear understanding of how their work will be evaluated. Provide the objectives and expectations of your lesson before beginning to teach. There are many ways to assess students understanding. Begin by developing rubrics (Hampton, Murphy, & Lowry, 2009). The student must know at the beginning of a lesson how his or her demonstration of understanding will be assessed. Assessment becomes more complicated when applying multiple intelligences theory (Educational Broadcasting Corporation, 2004). For example, if the writing assignment requires an illustration, then evaluation will likely include assessment of not only the writing but also the illustration. One student may produce brilliant writing and inadequate illustration while another student may illustrate well and write poorly. Also, if the criteria established to evaluate a piece of writing does not contain a standard for assessing mechanics (e.g. spelling, punctuation, capitalisation, etc.) than poor mechanics should not have an impact on the assessment. There are several ways to address this type of dilemma according to the Educational Broadcasting Corporation.

2.7.1 SUMMATIVE ASSESSMENT

According to Scheepers (2005) summative assessment is used to report to others about the achievements of a learner. Summative assessments are part and parcel of good educational practice, sometimes conducted at the end of a lesson or unit, sometimes at the end of a module or theme, sometimes only at the end of a term, semester or year. Summative assessment means 'summing up' what someone has learnt, it is aimed at determining a person's 'competence', that is, the 'sum total' of knowledge, understanding or ability that s/he has acquired over a period of time. For example the type of assessment in exams which aim to measure where you are at and whether you have achieved enough 'competence' to move to the next grade.

2.7.2 FORMATIVE ASSESSMENT

Formative assessment is assessment that is used to inform educators and learners about a learner's progress in order to improve learning (Black & Wiliam, 2005). As mentioned previously summative assessment is aimed at determining culminating competence, that is the sum total of knowledge, skills, values and/or attitudes acquired during the course of a learning experience. On the other hand formative assessment is aimed at monitoring the learner's progress towards culminating competence so as to pick up weaknesses/flaws and address them timeously. Formative assessment is, therefore, always aimed at supporting the learner in his/her efforts to acquire more knowledge and/or develop more complex skills and is often, but not always, informal and continuous. For example when a teacher does spot tests with the class or weekly tests that aim to get a snapshot of how learners are progressing in the topic / learning area so that corrective adjustments can be taken timeously (if necessary).

2.7.3 CONTINUOUS ASSESSMENT

Continuous assessment is part and parcel of classroom practice. If the teacher assesses each of the sub-tasks, providing the learner with constructive feedback, he/she is doing continuous assessment. He/she monitors the learner's work on a step-by-step basis; he/she is able to pick up learning barriers and to correct them immediately, before they become a more serious problem. Continuous assessment therefore has both summative possibilities (capturing information for recording purposes over time) but also formative possibilities.

2.7.4 STANDARDISED ASSESSMENTS

Standardised assessments are designed, administered, and scored in a standard, or consistent, manner. Standardised tests can be administered to large learner populations of the same age or grade level and the results can be compared across individuals and groups of students.

2.8 TRADITIONAL ASSESSMENT vs. ASSESSMENT USING MULTIPLE INTELLIGENCES

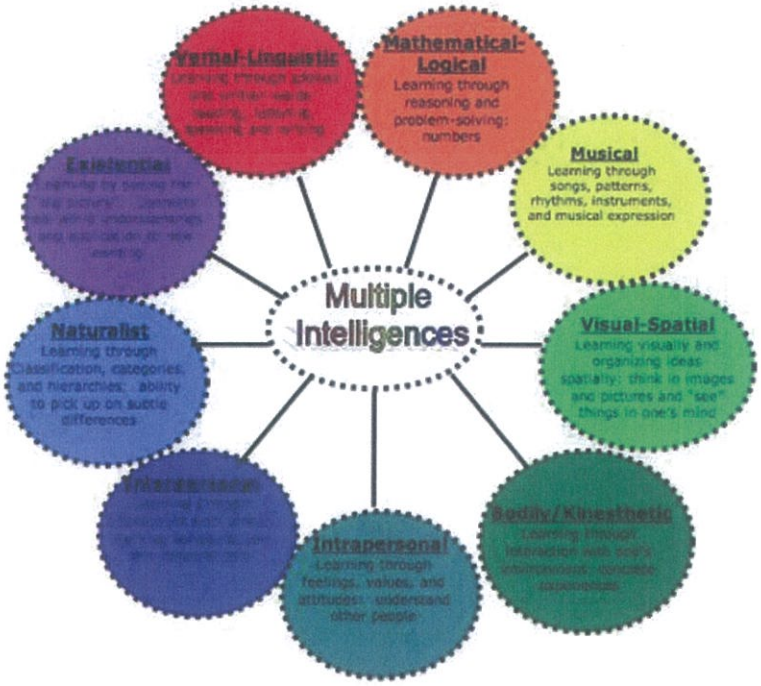
According to Lam (1995), a fair assessment is one in which students are given equitable opportunities to demonstrate what they know. Effective assessment is in alignment with instructional practices (Bellanca, Chapman, & Swartz, 1994). Changing teaching strategies and curricula without changing assessment methods will not bring about the full benefit of MI theory for teaching and learning. Thus, if MI theory is to be used in classrooms, teachers must change the way they assess learning (Chapman, 1993). According to Stanford (2003) traditional assessment limits learners to a pencil-and-paper test as the primary means of demonstrating knowledge and skills. MI theory brings about an awareness of many assessment strategies that allow learners to show that they understand and can use new information in unique ways. Assessment alternatives include logs and journals, graphic organizers, observational checklists, video samples, rubrics, miscue analyses, and portfolios. Such alternative forms of assessment offer learners the potential to demonstrate learning content in a variety of ways. In the multiple intelligence classrooms, assessment and instruction are partners. The MI classroom provides the environment for teachers to use varied teaching strategies, expanded curricula, and authentic assessment to provide creative and active learning that engages all learners (Stanford, 2003).

2.9 THE THEORETICAL FRAMEWORK OF THIS STUDY

The (MI) theory was proposed by Howard Gardner, the Harvard University professor. Gardner introduced the MI theory in his book, The frames of mind: The theory of multiple intelligence (Gardner, 1983a). He proposed that individuals possess intellectual abilities which enable them to solve problems, create products or provide services that are valued in the larger society (Gardner, 1983a). In his theory Gardner argues that the intelligence is not a single entity which can be measured by an IQ test. He defines intelligence as the ability to solve problems. He suggested that everybody possesses a different mind and each individual has a personal intelligence profile, which consists of eight different intelligence types. We all share the whole spectrum of intelligences and intellectual strengths which change over time depending on experience and practice (Gardner, 1999). The Multiple Intelligences theory holds that each person possesses eight intelligences, and uses them to carry several kinds of tasks. Although individuals possess all eight intelligences, each has their own particular mix of intelligences, with some dominating over others, but they are not fixed and can change over time. This means each individual has his/her own intelligence profile.

2.10 DIFFERENT TYPES OF INTELLIGENCES

The eight intelligence types as explained by the Multiple Intelligence theory are as shown in the diagram below. The existential intelligence is not going to be discussed in this study because it is still under scrutiny.



Gardener (1999) - Multiple intelligences

2.10.1 LINGUISTIC INTELLIGENCE

Gardner (1999) defines linguistic intelligence as; the ability to effectively use the words, both orally and in writing. It has to do with being word smart. It includes the ability to remember information. Learners with a dominant linguistic intelligence like to learn new words and play with language crosswords puzzles. They are enchanted by stories and are able to relate occurrences. They have a passion for the meaning of the words, lyrics of songs. Learners with linguistic

intelligence can tell stories. They are able to start conversations or discussions and they are well expressed both orally and in writing. They also like reading books.

2.10.2 MATHEMATICAL INTELLIGENCE

According to Gardner (1999) this intelligence is based on the sensitivity and capacity to perceive logical or quantitative matters. This intelligence is comprised of classification and categorization of logical patterns, the ability to deduce clear information, numerical and logic. Learners with mathematical intelligence enjoy mathematics. They like to discover how things work and they create personal strategies to solve problems. They are able to breakdown events into various stages, and they enjoy the computer. Learners with this type of intelligence have sharp analytical skills, and find it easy to synthesise, deduct and compare information.

2.10.3 MUSICAL INTELLIGENCE

This intelligence means being able to sense rhythm, pitch, and melody. Musical intelligence includes skills like the ability to recognize simple songs and to vary speed, tempo, and rhythm in simple melodies. Musical intelligence is the skill to do and appreciate the performances, and composition of musical patterns. It involves the capacity to recognize and compose music, understand tones, and rhythms. According to Gardner (1999) musical intelligence is parallel to linguistic intelligence. He explains that learners with dominant musical intelligence enjoy music and this gives them an advantage in reading and writing better because similar sounds and speech are present in linguistic intelligence. They also can create music and enjoy singing songs. The musical part of their brains can be motivated by clapping hands, snapping fingers, chanting words or moving rhythmically.

2.10.4 SPATIAL INTELLIGENCE

Spatial intelligence is the capacity to recognize and use the patterns of wide space and more limited areas, (Gardener, 1999). It means being picture smart and having the ability to sense form, space, colour, line and shape. It includes the ability to graphically represent visual ideas. Learners, who have a well-developed spatial intelligence, enjoy art activities, reading maps, charts and diagrams, thinking in images and pictures. Armstrong (1994) states that these students have highly developed senses for color, line, shape, form, space. They also have the ability to visualize ideas.

Learners with a well-developed spatial intelligence, have very unique ability of using imagination. They are also very aware of the space around them and are very good at recognising images.

2.10.5 INTERPERSONAL INTELLIGENCE

Interpersonal intelligence is the capacity to understand the intentions, motivations and desires of others. It means being people smart. It is the ability to understand another person's moods, feelings, and intentions. It includes such skills as responding effectively to other people. It allows people to work effectively with others and for that reason cooperative learning is effective. The people with this type of intelligence make good educators, sales people, religious and political leaders (Gardner, 1999). Learners with dominant interpersonal intelligence prefer to be with people. They are friendly and can get on well with others, so they can easily take part in social activities. These learners are assertive, express their feelings, they make their ideas clear, and can empathise with others in the group. Learners with interpersonal intelligence manifest their ability to work in group with their classmates. They have the ability to resolve conflicts and to integrate different personalities.

2.10.6 INTRAPERSONAL INTELLIGENCE

An intrapersonal intelligent person is someone with the ability to understand himself, his strengths, his weaknesses, moods, desires, and intentions. This includes understanding how one is similar to or different from others. Knowing how to handle one's feelings, such as what to do, and how to behave in any situation. Intrapersonal intelligence is based on the capacity to reflect introspectively, and is the ability to find meaning in the actions of the individual. People who demonstrate this intelligence are often spiritual, and understanding their motivation is important to them, so they analyse their own strengths and weaknesses. Learners with a well-developed intrapersonal intelligence establish and maintain good social relationships; they are friendly and have a good sense of humor. They perceive the feelings, thoughts, motivations, behaviors and lifestyles of others through listening, engaging with others' problems and are interested in helping. They assume different roles within the group and are open to understanding other's points of view.

2.10.7 BODILY INTELLIGENCE

Bodily intelligence is the ability to use the body expressively in different ways. It means being body smart. It means being able to co-ordinate mind with body. This includes the ability to use one's body to express ideas and feelings. It also includes physical skills such as co-ordination, flexibility, speed, and balance. This is the ability humans have to perform physical movements such as dance, theater, aerobics, athletics, etc. and is related to both working and developing aspects such as flexibility, balance, speed, coordination, strength and perception. Students with dominant spatial intelligence can imagine how things are built.

2.10.8 NATURALIST INTELLIGENCE

According to Gardner (1999) this intelligence is associated with students who are in harmony with nature. It is the ability to distinguish, categorise and analyse elements of the environment such as urban and rural objects, animals, and plants. It is well-developed in learners who are sensitive to environmental problems and who are able to recognise and classify plants, animals and minerals including rocks. Learners who are dominant in this type of intelligence like participating in outdoor activities in natural settings. They are nature smart and are respectful with the environment.

2.11 CONCLUSION

This chapter reviewed literature on teachers' understanding of multiple intelligences in teaching physical science. It also reviews literature on the importance and benefits of understanding multiple intelligences. Also the theoretical framework that underpins this study was discussed in this chapter. In the next chapter, a detailed presentation of the research methodology used for this study will be presented.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the researcher presents all methodology used in the study. This is discussions and explanations regarding research design, research questions and research objectives, research sample and sampling methods used, as well as the research process that was followed during data generation. The chapter concludes with the limitations that posed a threat to the study.

3.2 RESEARCH PARADIGM

The paradigm describes the beliefs the researcher has about what can be known about the world (Johnson & Onwuegbuzie, 2004). Maree (2007) argues that a research paradigm is an all-encompassing system of interrelated practice and thinking that defines the nature of an enquiry. A paradigm is a world view of thinking and producing the sense of the complexities of the world. Therefore the term paradigm originated from the Greek word 'paradeigma', which means pattern. The term was first used by Kuhn (1962) who argues that a conceptual framework shared by a community of scientists which provided them with a convenient model for examining problems and finding solutions. Qualitative research is useful when trying to understand the meanings underlying everyday human interactions (Blanche, Blanche, Durrheim, & Painter, 2006). This study is located within the interpretivist paradigm. An interpretivist paradigm is of the view that knowledge about reality is socially constructed and could only be accessed through direct social interaction with member shared meaning, language, experiences and consciousness (Myers, 2009). Cohen, Manion and Morrison (2011) argue that the aim of an interpretivist paradigm is to understand the subjective world of human experiences. This aim allowed the researcher to put the purpose of this study forward, which is to explore Grade ten teachers' understanding of multiple intelligences in teaching physical science. This paradigm allowed the researcher to generate data from the grade ten physical science teachers. A research paradigm represents a particular worldview that defines, for the researchers who hold this view, what is acceptable to research and how this should be done.

3.2.1 THE INTERPRETIVE PARADIGM

I used interpretive paradigm because it aims to develop a great understanding of how people make sense of the context in which they live and work in, it also helps to understand the meaning which informs human behavior and recognize that there are multiple realities and that events and situations can be interpreted differently by different individuals as explained by Bertram and Christiansen (2014)Therefore as a researcher I had to understand a deep insight of grade ten teachers' understanding of multiple intelligences. The interpretive paradigm is the base of qualitative research approach as it centers on social reality and lived involvement of human life Holloway and Galvin (2016). Qualitative research is typically connected with the interpretivist sociological intellectual tradition. Moriarty (2011) is of an opinion that qualitative research is typically connected with the interpretivist sociological intellectual tradition. Furthermore, ascertain that interpretivist is the paradigm of qualitative. These perspectives support that there is possibility that interpretivism and subjective research are firmly interrelated.

Mack et. al (2010, p.7) state that "the interpretivist paradigm is also sometimes referred to as constructivism because it emphasizes the ability of the individual to construct meaning". The interpretivist paradigm was heavily influenced by hermeneutics and phenomenology. Hermeneutics is the study meaning and interpretation in historical texts. This meaning-making cyclical process is the basis on which the interpretivist paradigm was established. Another strong influence is the philosophical movement, phenomenology. A phenomenologist advocates the need to consider human beings, subjective interpretations, their perceptions of the world (their life-worlds). Therefore, the ontological assumptions of interpretivism are that social reality is seen by multiple people and these multiple people interpret events differently leaving multiple perspectives of an incident. Interpretivism research approach is regarded as an ideographic research, the study of individual cases or events and it has abilities to understand different people's voices, meanings and events. Moreover, the source of knowledge in this approach is the meaning of different events (Richardson, 2012).

3.3 RESEARCH DESIGN

The researcher chose to use the exploratory research design, as this study focused on exploring grade ten teachers' understanding of multiple intelligences in teaching physical science. Using this design helped the researcher in generating rich data. According to Mouton and Marais (1990), the aim of exploratory research design is to examine an area of research which has limited information.

3.4 THE CASE STUDIES

I used case studies as a research style because its focuses on people and aims to describe or explain what it like to be in a certain situation hence it is very descriptive in nature and it captures the reality of the lived experiences of the participants Grade ten teachers who are teaching physical science in rural areas and thoughts about a certain situation Bertram *et al* (2014). As case studies are very descriptive using it as a research style gave me sufficient information that helped me draw conclusion with better understanding of Grade ten teachers understanding of multiple intelligences in teaching physical science.

3.5 RESEARCH TOPIC, QUESTIONS AND OBJECTIVES

The research was exploring grade ten teachers' understanding of multiple intelligences in teaching physical science in the rural context. Therefore the researcher chose to study this topic because it is a relatively untapped field. There is limited or no information on teachers' understanding of multiple intelligences in teaching physical science.

3.5.1 RESEARCH QUESTIONS

This study was guided by the following research questions:

- What are Grade ten teachers understanding of multiple intelligences in Physical Science?
- Why Grade ten teachers understand multiple intelligences in Physical science in a particular ways?

3.5.2 RESEARCH OBJECTIVES

- To explore Grade ten teachers' understanding of multiple intelligences, in teaching physical science.
- To explore why Grade ten teachers understand multiple intelligences in physical science in particular ways.

3.6 THE RESEARCH SAMPLING

Patton (1990) states that when data is generated though qualitative approach, the researcher has to make sure that the sample from which data is generated is more likely to provide rich data. "Sampling involves making decisions about which people, settings, events or behaviors to include in the study. Researchers need to decide how many individuals, groups or objects (such as schools) will be observed. In doing so researchers must consider the population from which they are sampling" (Bertram *et al.*, 2014, p. 59). The research sample in this study was composed of only grade ten physical science teachers, who are teaching in a school in the rural context in Durban. The researcher used purposive sampling and sampled only participants who are teachers and were able to provide information on the researcher's field of interest. Sampling is divided into three different types, there is random sampling, purposive sampling and convenience sampling.

3.6.1 PURPOSIVE SAMPLING

I used purposive sampling because I needed to be very specific about the people that I included in my research, hence the researcher specified on sampling only Grade ten physical science teachers who were sampled to understand the multiple intelligences in their teaching of physical science. The researcher opted for the purposive sampling because the purpose of conducting this research was to explore experiences and understandings of multiple intelligences of Grade ten physical science teachers. My intention of this study was very clear and specific therefore purposive sampling was the best choice as Bertram *et al* (2014) explains that in this kind of sampling a researcher makes specific choices about which people to include in the sample. This research used purposive sampling to explore Grade ten teachers understanding of Multiple Intelligences. Purposeful is non-probability sampling. This sampling method involves purposeful sampling of certain units of the universe for constituting a sample which represents the universe. Purposive sampling or deliberate sampling was used to select participants. The research participants were eight learners from grade nine. The rural area Grade ten Physical Science teachers were selected to influence the phenomenon. Purposive sampling is considered desirable when the population happens to be small and a known characteristic of it is to be studied in-depth and require detailed information about the phenomenon under investigation. It is highly subjective and determined by the qualitative researcher generating the qualifying criteria each participant must meet to be considered for the research study. In this study the researcher used purposeful sampling or deliberate sampling, considering that population is sampled is small because the study required an

in-depth and detailed information about career decision making in senior phase. The researcher was required to firstly obtain permissions to recruit participants from the school and department of education. The participants were living at the same geographic location.

3.6.1.1 STRENGTHS OF PURPOSIVE SAMPLING

Purposive sampling uses less cost because what it needs is in-depth information. It also saves time. In purposive sampling the researcher selects the participants who possess certain traits or qualities.

3.6.1.2 LIMITATIONS OF PURPOSIVE SAMPLING

In purposive sampling the researchers can be bias in the sense that the researchers may intentionally craft a sample to achieve the results that they intend to achieve. The research participants can be based on the researchers' judgement, depending on the information required. It is not easy to select participants sample in purposeful sampling (Mihrka, 2014).

3.7 SAMPLE SIZE

The sample size was limited to four participants. The researcher felt this sample size was appropriate and it allowed the researcher to have enough time to explore each participant's understanding of multiple intelligences in teaching physical science. The research participants' profile is as follows: (Pseudonyms are used for anonymity and confidentiality).

3.8 RESEARCH PARTICIPANTS

Research Participant	Gender	Age	Teaching Experience	Professional Qualification
Participant – Maidi	Male	51	27 years	STD and B.A
Participant – Maya	Male	25	3 years	B.Ed.
Participant – Awuse	Female	44	18 years	STD
Participant – Halovu	Male	48	24 years	B.Paed

3.9 RESEARCH SITE

The research study was conducted in a secondary school in Durban in the rural context. The school is about 37 kilo meters south of Durban. It has an enrolment of 670 learners and a staff of 17 teachers including the School Management Team (SMT).

3.10 DATA GENERATION

This section discusses data generation methods and data verification components. The researcher chose to discuss the data generation plan, data generation methods and data verification components in this manner so as to offer a complete description of the data generation tools and the components used for verification in this study.

3.11 DATA GENERATION PLAN

	Focus	**Objective 1**	**Objective 2**
What data is being generated?	Rural Grade ten Physical Science teachers' understanding of Multiple intelligences	Exploring the understanding of Rural Grade ten Physical Science teachers of Multiple intelligences.	Exploring why rural Grade ten teachers understand Multiple Intelligences the way they do.
What is the research strategy?	Semi-structured interviews, classroom observation, document analysis and narratives were used to generate data.	Semi-structured interviews, classroom observation, document analysis and narratives were used to generate data.	Semi-structured interviews, classroom observation, document analysis and narratives were used to generate data.
Who (or what) will be sources of data?	Four Grade ten Physical Science teachers and the	Four Grade ten Physical Science teachers and the	Four Grade ten Physical Science teachers and the

	policy document were used for data generation.	policy document were used for data generation.	policy document were used for data generation.
How many of the data sources will be accessed?	Four Grade ten Physical Science rural area teachers	Four Grade ten Physical Science rural area teachers	Four Grade ten Physical Science rural area teachers
Where will data be generated?	Data was generated in a rural area school using different sources of data	Data were generated in a rural area school using different sources of data	Data were generated in a rural area school using different sources of data
How often will data be generated?	Data was generated on four contact sessions with each participant, that is during narratives writing, semi structured interviews, classroom observations and when confirming data. All this was done within a month.	Data was generated on four contact sessions with each participant, that is during narratives writing, semi structured interviews, classroom observations and when confirming data. All this was done within a month.	Data was generated on four contact sessions with each participant, that is during narratives writing, semi structured interviews, classroom observations and when confirming data. All this was done within a month.
How data was generated?	Data was generated through narratives, semi structured interviews,	Data was generated through narratives, semi structured interviews,	Data was generated through narratives, semi structured interviews, classroom

	classroom observations and document analysis.	classroom observations and document analysis.	observations and document analysis.
Justification of how data was generated	As this research is a qualitative research. My aim was to get a teachers' understanding of multiple intelligences teaching. I used open-ended questions during semi-structured interviews.	As this research is a qualitative research. My aim was to get a teachers' understanding of multiple intelligences teaching. I used open-ended questions during semi-structured interviews.	As this research is a qualitative research. My aim was to get a teachers' understanding of multiple intelligences teaching. I used open-ended questions during semi-structured interviews.

3.12 DATA GENERATION METHODS

The data for this study was generated by means of written narratives, semi-structured one on one interviews and classroom observations. As the data has been generated, the researcher will provide evidence of the participants' sense making of story reading and also provide evidence for the researchers' process of this sense making. The IPA will be used to abstract meaning from the interview transcripts. This was done in four stages, the first stages entails multiple reading and making notes. This stage entails listening to the audio tape of the interviews and reading the transcripts and making notes of the content, metaphors and repetitions(Pietkiewicz & Smith, 2014). It is also during this stage that the observation schedule was viewed to offer the context in which the study has been conducted such as the number of students in class, when the lesson started and ended. The researchers' self-reflection notes were analysed as personal characteristics of the researcher such as gender, age and socioeconomic status might affect rapport with the research participants which might in turn affect the participants" response to the study (Kawulich, 2005).

3.12.1 TEACHER NARRATIVES

For the purpose of this study, free association narrative method was used for data generation. In narrative method, the researcher's responsibility is to be a good listener and the participant is a storyteller, rather than a respondent. This approach organises human experiences into meaningful episodes. Narratives helped the interviewer to understand the participants better. The free association narrative method reveals significant personal meanings which are not necessarily obvious if a participant is a respondent (Hollway & Jefferson, 2008).

3.12.2 SEMI-STRUCTURED INTERVIEWS

The researcher also used one on one semi-structured interviews to generate data. Open ended questions were asked to allow the participants to voice their experiences and perspectives. Probes were used during the interview to follow up on areas of interests. The interviews were recorded using a cellphone recorder, so that all data may be captured. Recording allowed the researcher to focus on facilitating the interview. Using semi-structured interviews aided me to engage in face-to-face interaction with the participants. Cohen, Manion & Morrison (2011) suggests that it is important to engage face to face with the participants. The researcher arranged the interview atmosphere in such a manner that she sat down for face to face with each interviewee, as Scott and Usher (2011) argue that sitting face to face with research participants enable the researcher to read non-verbal language such as facial expressions, thus allowing the interviewer to make judgements about significant signs and thereby locating authentic data from participants regarding their experiences and real-life situations.

3.12.3 CLASSROOM OBSERVATIONS

The third method of data generation that was used is classroom observations. According to Glasne (2006) classroom observations allow the researcher to immerse into a social setting enabling the researcher to learn first-hand how actions of participants are compatible with their words. Exploring the classroom environment it appears from my observations that the classrooms had been designed appropriately for different subjects to be taught in FET classrooms. All the classrooms were appropriately designed to cater for learning. For teachers to teach physical science effectively the school must have a laboratory with apparatus, equipment and chemicals which the school lacked.

3.12.4 DOCUMENT ANALYSIS

The documents that were used to analyse data were the Curriculum Assessment Policy Statements as well as the teachers' files. Ahmed (2010) defines documents analysis as a firm and systematic set of process for vigorous analysis. Also Maree (2015) articulates that the documents are provided in order to produce how the teachers do their work in their everyday duties. The last document was the teachers 'files as they were going to show how the Physical Science teachers plan their teaching. It is not significantly stated in this thesis that teachers have to understand the multiple intelligences in their assessment. I was also able to peruse the teachers' files in terms of how they assessed learners. This part of document analysis was very vague because there was no evidence that showed that teachers attended to the different multiple intelligences when they assessed learners in Physical Science.

3.13 DATA VERIFICATION

The four components that assist in ensuring, trustworthiness of data and diminish bias are discussed by De Vos & Strydom (1998) as credibility, transferability, dependability and confirmability. The researcher stated initially that there will be another stage that involves transforming notes into emergent themes. During this stage, the researcher focused more on the notes made from the transcripts with the aim to transform the notes into emerging themes which were viewed as patterns across the data set that are important to the description and understanding of the story reading technique as indicated by the participants. This stage was just followed by seeking relationships and clustering themes (Frost, 2011). The researcher looked for connections between emerging themes and groups these together according to conceptual seminaries to formulate subthemes under a descriptive label or superordinate theme for each cluster of themes. Having completed the first three stages, the researcher then engaged in the last stage which is the writing up stage. These were the narrative account of the study where each of the themes will be described and supported by extracts from the interviews to emphasise the important experiential accounts presented by the research participants as well as interpretative comments by the researcher (Pietkiewicz & Smith, 2014).

3.14 TRUSTWORTHINESS

When collecting and analysing data, any research study raises concerns that the researcher needs to address since there are no instruments with established metrics about validity and reliability in qualitative research. In the present study, the researcher is aware of the need to demonstrate that the findings of this research are trustworthy through establishing these four criteria: credibility, transferability, confirmability, and dependability (Rossman & Rallis, 2016). Credibility is defined as the confidence that the research findings are a true reflection of the participants" views and experiences (Tashakkori & Teddlie, 2010). In an effort to establish credibility, the researcher spent a period of three months gathering data and liaising with the research participants which allow the researcher to gain insight into the context of the study thereby minimising distorted information that might arise in the field. The extended time frame contributed to an improved level of trust between the researcher and the research participants, enabling them to be more forthcoming with data and the researcher to gain a deeper understanding of the participants' culture and context (Houghton, Casey, Shaw, & Murphy, 2013). The use of multiple methods and sources to obtain data, known as triangulation, was used to enhance the quality of the data from which findings were drawn (Flick, 2013). The semi-structured interviews served to obtain information from different research participants who will interact with the presented in narratives.

3.14.1 CREDIBILITY

De Vos & Strydom(1998) explain that credibility aims at ensuring that the research has accurately described the thoughts and opinions of the research participants. For the purposes of this study, the researcher ensured the credibility by voice recording all interviews. The recordings will verify that all interviews took place.

3.14.2 TRANSFERABILITY

According to De Vos & Strydom (1998) transferability refers to whether or not the findings or the study can be replicated with different participants. Because the research design of this study is of qualitative nature, the researcher provided specific data from the purposive sample. This data is presented in its raw form in the next chapter, under data presentation, to allow readers to make their own judgements.

3.14.3 DEPENDABILITY

Dependability refers to whether or not the results of the research will remain constant if the research was to be repeated in the same context with the same research participants (Mouton &

Babbie, 2001). To ensure dependability, the researcher generated data from different research participants from the same context. Furthermore the researcher made sure that the research study is dependable, by doing follow up interview to confirm data.

3.14.4 CONFIRMABILITY

The researcher presented all significant data in the next chapter. The researcher is keeping all the documentation related to this research study safe in the supervisor's office. The documentation may be used to confirm the validity of the findings should a need arise or may be findings questioned.

3.15 RESEARCH ETHICS

Before commencing the study, it was necessary to get permission from the KZN department of Education, University of KwaZulu Natal, the school, which is my research site and the research participants. Once the permission from the gate keepers was obtained and the ethical clearance was issued, the school and the participants were contacted and briefed about the study. The informed consent form was explained with the particular reference to the voluntary nature of the research and the confidentiality of the research. Data was generated from the participants who volunteered to sign the informed consent forms. Confidentiality for the research participants was key in this research as their responses were referenced and discussed in the write-up of the data analysis section of the research, however, the participants were assured that their names or personal information was not revealed, however pseudonyms were assigned for each participant (Flick, 2013). During the transcription stage, I received audio recordings containing pseudonyms of the participants. Furthermore, the audio recordings as well as paper documentation such as consent forms were kept in a safe by the research supervisor. All data generated will be destroyed after a period of five years.

3.16 LIMITATIONS OF THE STUDY

According to De Vos (2002) every research study has its own limitations. In this study the limitation was due to the researcher having limited experience in the research process, the challenges were likely to arise. To counteract this limitation, the researcher followed the research framework and also relied on the guidance of her experienced supervisor.

3.17 PRETESTING

This study was pretested and the semi-structured interview questions were used during the pretesting phase of the study. Pretesting interviews were conducted in a secondary school in Durban, from teachers who were also teaching in rural area schools. These two teachers who matched the profiles of the research participants were interviewed. Pretesting studies are a crucial element of a good study design. Conducting a pretesting increases the likelihood of success in the main study. Pretesting fulfill a range of significant purposes and can provide valuable insights for other researchers (Van Teijlingen & Hundley, 2001). Pretesting this research provided the researcher with an opportunity to check the ambiguity of the interview questions and rephrase questions where necessary. It also allowed the researcher to monitor pace and time management

3.18 CONCLUSION

This Chapter outlined how the research was conducted, illustrating the process used to select the participants, the method used to generate data and how the researcher ensured that data may be verified. The chapter further detailed the ethics that were considered before commencing with the study and discussed limitations of the study. The next chapter presents data that was generated and discusses the data analysis. During data generation, the researcher learned that it is very important to relate well with people and be humbled, being humbled made it easy to get information from participants.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The previous chapter considered the research approach and the research paradigm that underpinned this study. The research tools used to generate the data were described, namely narratives, semi-structured interviews and classroom observations. Data generation was done at one site and the research participants in this case the four teachers, were given pseudo names to protect their identity. This chapter will further look at the themes that were generated as narratives, semi-structured interviews and classroom observations were used. Further in the chapter, I also used a pseudo name for the particular research site located in a rural area, in order to protect the research participants. The discussion of the data presented in this chapter was generated in response to the following research question: Pertinent questions were asked during the semi-structured interviews to determine what grade ten teachers understand about multiple intelligences in teaching physical science. In this chapter, the researcher explains the procedure that was followed in the analysis of data and present themes that emerged from the data. The researcher evaluates whether and how the data answered the research questions. Grade ten teachers' understandings of multiple intelligences in teaching physical science were explored in an attempt to answer the following research objectives and research questions:

4.2 THE RESEARCH OBJECTIVES

The research objectives of this study were to explore teachers' understanding of multiple intelligences, in teaching physical science and also to explore why teachers understand multiple intelligences in physical science in particular ways.

4.2.1 GRADE TEN TEACHERS RESPONDED TO THE FOLLOWING QUESTIONS

- What are Grade ten teachers' understandings of multiple intelligences in Physical Science?
- Why Grade ten teachers understand multiple intelligences in Physical science in particular ways?

4.3 DATA PRESENTATION

The data is presented here in the order in which the generation took place. Initially participants were asked to write narratives on their understanding of multiple intelligences in teaching physical science. Later the semi-structured interviews were conducted with the Grade ten physical science teachers and lastly the classroom observations were done in order to determine whether they understood the multiple intelligences or whatever they were doing was classified as multiple intelligences. On the question asked: What is your understanding of multiple intelligences in teaching physical science? From the two research questions there were four themes that stood out and these three themes were speaking to what the Grade ten teachers understood were their understating of multiple intelligence whereas the literature proved these teachers very wrong.

4.3.1 GENERATED THEMES

The four themes that were generated from the two research question were:

Theme 1	Opinions about Multiple Intelligences
Theme 2	Beliefs Leading to Misunderstandings and not understanding
Theme 3	Teachers' Feelings
Theme 4	Teachers' Experiences

4.3.2 PARTICIPANTS' RESPONSES ON NARRATIVES

When participants were asked to write narratives on their understanding of multiple intelligences in teaching physical science:

RESEARCH PARTICIPANT MAIDI RESPONDED:

> *"I think multiple intelligences teaching is used when the teacher recognises that every student is special and unique. The teacher needs to teach in such a way that all learners benefit from his or her teaching. The physical science teacher has to involve all learners when teaching. There are learners that are active in answering verbally in class and there are those that will surprise you during the test or exam. It is important to have different level tasks in an assessment, like multiple choice, one word answers, and also long questions requiring calculations, discussion and describe. It is important at times to allow learners to teach one another in groups or in pairs because some learners are shy to ask in class even when they do not understand. Such learners might find it easy to ask from other learners. The other important thing is that the teacher must prepare and explain nicely for all learners to understand. The teacher has to give extra work to the fast learners while repeating and answering questions from those that are not as fast. Multiple intelligence teaching should be done in all classed not in grade 10 only. The danger in not taking multiple intelligences into consideration is that some learners may find your lessons boring and could end up failing the subject or dropping it altogether."*

Friend and Bursuck (1999) agree with participant Maidi that every student is special and unique. They are individuals and no two children are alike: physically, emotionally, socially and intellectually, each child is a unique individual. Because children are unique, even if there are common needs and characteristics that children of a particular age or stage of development share, they must be understood by their parents and teachers in their uniqueness, and their individuality must be respected.

ON THE SAME QUESTION RESEARCH PARTICIPANT MAYA RESPONDED:

> *"I understand that learners have different ways of understanding what they are taught due to their different intelligences which vary from learner to learner. From what I know learners may be visual, auditory or kinesthetic. These three types of learners happen to be in one class which makes it difficult to reach out to all of them at the same time. For physical science in grade 10, we as teachers are guided by the Annual Teaching Plan (ATP), as a result due to trying to keep up with the ATP, we end up focusing to one or two types of intelligences. We as teachers, also fall amongst certain type of intelligences, so we tend to make our lessons focus on more on that intelligence, especially in subjects like physical science. For instance, if a teacher is more kinesthetic he or she will make his or her lessons more practical without noticing that learners who are auditory are sacrificed in that process. In conclusion, I think incorporating different multiple intelligences in our teaching of physical can make learners understand better. It would be convenient if the curriculum can be shaped in a manner that will allow teachers to use multiple intelligences."*

Denig (2004) disagrees with participant Maya; he argues that multiple intelligences are not learning styles. Gardner also states that there is a difference between multiple intelligences and learning styles.

RESPONDING TO THE ABOVE QUESTION RESEARCH PARTICIPANT AWUSE WROTE:

> *"My understanding of multiple intelligences in teaching physical science is that to teach physical science one has to deal with diverse class of learners with different learning styles. What causes this is the fact that learners' backgrounds are different. Some are from homes where parents can afford to buy everything the learner needs whereas some are from homes where no one is working, and parents are struggling to put food on the table, not to mention school needs. The physical science teacher has to teach in such a way that she accommodates all learners. There are learners that are active in answering questions in class; there are also those that will surprise you in a test. It is important to make different tasks when assessing, like multiple choice, one word and also long questions that will require one to describe, explain or discuss. It is also important to allow learners to learn from each other, by letting them have group discussions or discuss in pairs. This is important because some learners are shy to ask in class, even when they do not understand. Such learners may find it easy to ask from other learners. Team teaching also helps to achieve multiple intelligences in teaching. If you are not comfortable topic, you have to ask your colleague who is comfortable to do it."*

Alexopoulou and Driver (1996) agree with participant Awuse on the importance of group discussion in teaching and learning physical science. They state that the importance of group discussion in facilitating learning in science is widely acknowledged. At the same time, it is recognized that in the social context of small groups, peers' discussion processes and their subsequent learning are influenced by many factors like each learner's understanding of the concept discussed.

RESEARCH PARTICIPANT HALOVU'S RESPONSE ON NARRATIVES WAS

> *"Multiple intelligences is about using all different intelligences in a learner to make sure he understands what is taught. The multiple intelligence way of teaching is applicable when the class has few learners. Multiple intelligences teaching is not applicable to physical science because, physical science is a formal subject. It needs learners to focus, unlike the languages and L.O. which can be taught in the sports field. What I understand is that there are learners who are gifted in music but they cannot use it in physical science, because it is irrelevant to physical science. Physical science cannot be done by all learners; it requires skills that not all learners possess. It demands skills such as scientific reasoning, which cannot be taught. Learners should know themselves well and know their abilities. They should know what they can do and what they cannot do, so that they make a wise choice of subjects. It is also critical that the school provide proper guidance to grade 9 on subject choices. The most important thing is that the teacher must know the subject matter. He must be able to explain any concept. The teacher must give extra work to fast learners while doing remedial work with the slow learners. Multiple intelligence teaching is one of the new methods of teaching, it consumes a lot of time, doing all activities. There is a lot of content to be done in physical science, if one would follow multiple intelligence teaching, I am sure only half a year's work would be taught by end of the year."*

Some scholars disagree with participant Halovu, who believes multiple intelligences strategies of teaching are not applicable in teaching physical science. Sulaiman, Abdurahman, and Rahim (2010) suggest that instructions in physical science and mathematics require various teaching strategies to ensure successful teaching and learning process. Physical science and mathematics teachers can optimise the effect of teaching when they realise the strengths of multiple intelligences they possess and how they can apply them in their teaching and also the multiple intelligences of their learners.

4.3.3 SEMI STRUCTURED INTERVIEWS

The four recorded interviews were transcribed into written narratives. The main question in this section was: what are teachers' understandings of multiple intelligences in teaching physical science in grade ten? During the semi-structured interviews, after the rapport was established, the above question was asked to initiate the interview and to direct it. The interview was then allowed to flow natural. All questions asked were seeking to determine whether grade ten physical science teachers understand multiple intelligence teaching or not, whether they use the MI strategies in their teaching and why they understand multiple intelligences in particular ways. The interview questions also tried to determine whether teachers are willing to use MI strategies in their teaching.

RESEARCH PARTICIPANT MAIDI'S RESPONSES TO INTERVIEW QUESTIONS WERE:

Researcher: *Where did you complete your grade 12?*

Research Participant Maidi: *I completed*

Researcher: *Are you qualified to teach physical science or you are privately practicing?*

Research Participant Maid: *I am qualified; I have a Secondary Teachers' diploma. I got it from Eshowe College of Education. My majors were Mathematics and Physical Science. I also have a degree from oPhikweni (University of Zululand branch).*

Researcher: *How long have you been teaching?*

Research Participant Maidi: *I have been teaching since I completed from Eshowe College. That is more than 20 years. This is my 27th year.*

Researcher: *What is your experience in teaching physical science?*

Research Participant Maidi: *My experience is that physical science is not a popular subject to learners. Learners avoid choosing it and as a result we always have few learners doing physical science.*

Researcher: *How do you select learners to do physical science in grade ten?*

Research Participant Maidi: *We don't select but we encourage those who pass natural science in grade 9 to choose physical science in grade ten.*

Researcher: *what are challenges in teaching physical science in the rural area?*

Research Participant Maidi: *"I think there is not much difference with township schools. We are in the same cluster with them. The other thing I have noticed in learners is that if a learner is good, that learner will pass well regardless of the conditions around him. We have some learners from the previous years, who were good in physical science, they are now studying engineering and they are coping competing with learners from different schools. There is also an engineer now working for ESKOM he completed grade 12 here".*

Researcher: *Remember our topic of interest is multiple intelligences in teaching, what is your understanding of multiple intelligences in teaching physical science?*

Research Participant Maidi: *Eeii can you explain to me what is multiple intelligences then I will answer from there.*

Researcher: *Multiple intelligences refer to different intellectual abilities. The researchers suggest that learners have different intellectual abilities. Each learner is unique and has a unique intelligence profile.*

Research Participant Maidi: *"Ok I understand, we do have learners that are good in science and very poor in language. If I can tell you, there is a boy in grade 12 who is good at science but language teachers are complaining about him. We have talked to him about it, he said if he tries to read the novels or anything which is language it bores him".*

Researcher: *Tell me, in your class with learners with different intellectual abilities, how do you teach so as to accommodate all learners?*

Research Participant Maidi*: "Most learners have a challenge in understanding English and expressing themselves in cases where they have to describe concepts. For example we are doing motion now; most learners find it difficult to describe motion in words. What I always do to assist in cases like this, I give them more problems to solve until they understand.*

Researcher: *"There are other learners that are very intelligent musically or bodily, they can dance and they can sing. Do you think such intelligences can be considered when teaching physical science?*

Research Participant Maidi: *"If a learner is good at music, I have never thought of teaching to accommodate his intelligence. I regard such learner as talented in music. It's not easy for me to think of anything musical in the subject because I'm not a musical person.*

Researcher*: if I hear you well, you are saying you don't cater for all intelligences?*

Research Participant Maidi: *"I am not saying I don't cater for all the intelligences, I'm talking about the two examples you mentioned musical and bodily intelligences. I have never considered these in physical science".*

Researcher: *Which ones do you cater for?*

Research Participant Maidi: *I accommodate those, some of the activities I give to the class are to be done alone and some are working in groups.*

Researcher: *What makes you understand the intelligence in the way that learners with musical or bodily intelligences cannot be catered for in a physical science class?*

Research Participant Maidi: *I can answer that question by asking you a question, how can I do it if I want to cater for the person who is musical intelligent?*

Researcher: *Let me make an example, let's assume you are teaching the module waves, sound and light. You can bring a cd player to class play some music; invite one or two who can dance to the song or who can sing along. Opportunities of learning will be increased for the musical intelligent learner. This will make it easy for you to teach about differences between the pitch and loudness of sound.*

Research Participant Maidi: *Ok I understand the way you are explaining it. The other thing you would do is to you can increase volume and decrease it as you explain concepts.*

***Researcher**: It is said all human beings have 8 different intelligences, which make up their intellectual profiles. Are you aware of them? Can you list them?*

***Research Participant Maidi:** No I was not aware of them, as I was telling you I never thought of music in a physical science class.*

***Researcher:** If you look at your class, is there any learner with any other intelligence besides mathematical and linguistic?*

***Research Participant Maidi:** Yes there are boys who are musical; it's just that I was not looking at it as being intelligent.*

***Researcher:** What are the challenges that you have experienced in teaching physical science?*

***Research Participant Maidi:** The main challenge is that the physical science syllabus is too long, so we are always working under pressure. We have time which is always against us. These good teaching strategies are impossible to practise because we have to finish the syllabus. We also have challenges of practicals. We borrow from casme. Time is really a challenge if you want to do this multiple intelligent teaching.*

***Researcher:** What is your opinion here is there anything that can be done by the stakeholders to deal with the challenges?*

***Research Participant Maidi:** Yes the department should increase the NGOs that assist learners during the weekend and on holidays. NGOs like Kutlanong, Dinaledi and such schools. These NGOs should not be in townships only we also need them.*

***Researcher:** If I heard you well, you said you don't use some intelligences because using them may consume a lot of time. Did I get that well? There are learners who are good at working alone and there are those who prefer working in groups. How do you accommodate such learners in your class?*

***Research Participant Maidi:** I cater for those learners because at times, I give individual work and sometimes I give group work. Even with experiments I do group work and also individual work.*

Researcher: *That's interesting. Do you have any comment about what we were talking about or is there anything you would like to ask before we part?*

Research Participant Maidi: *Thanks I learned a lot from this interview. I have realised that multiple intelligences teaching can be used in all subjects.*

Researcher: *Thank you very much for all the valuable information. I will call you next week to arrange for classroom observation.*

RESPONDING TO SIMILAR QUESTIONS RESEARCH PARTICIPANT MAYA RESPONDED:

Researcher: *Where did you complete your Grade 12?*

Research Participant Maya: *I completed my grade12 in a school in Adams mission area.*

Researcher*: Is that school in the rural or urban area?*

Research Participant Maya: *It is in a rural area.*

Researcher*: Are you a private practicing teacher or a trained teacher?*

Research Participant Maya: *I am a qualified teacher.*

Researcher*: Which university or college did you go to?*

Research Participant Maya: *I went to University of KwaZulu Natal Edgewood campus.*

Researcher*: Are you trained to teach physical science?*

Research Participant Maya: *Yes I possess a bachelor of education degree from Edgewood. Physical science is one of my majors.*

Researcher*: How long have you been teaching physical science?*

Research Participant Maya: *This is my 3rd year, I started teaching in 2016.*

***Researcher**: Generally how are physical science results in your school?*

***Research Participant Maya:** We have just restarted the subject because the subject has not been chosen by learners, the results are poor but we push the grade 12 and we manage to help some pass. It is not easy.*

***Researcher**: I heard you have very few learners in science classes. How do you select learners to do physical science?*

***Research Participant Maya:** They choose on their own, but we discourage those who failed the subject in Grade 9*

***Researcher**: What do you think causes learners to choose or not to choose physical science?*

***Research Participant Maya:** Learners were discouraged by the fact that the subject was taught by someone who came from outside South Africa, so they complained that they don't understand the way he pronounced words and when they ask him to explain, it was more complicated because he couldn't explain in their mother tongue. The other reason they don't choose physical science is that learners believe it is a difficult and a failure subject.*

***Researcher**: Tell me about your experience teaching physical science in the rural area?*

***Research Participant Maya:** Learners have a language challenge. They struggle so much with English which is the medium of instruction. If you want them to understand, one has to explain in their mother tongue. This becomes a problem when they write tests and exams, they struggle to understand questions. Their spellings are bad, I think social networks contributes to this.*

***Researcher:** What is your understanding of multiple intelligences?*

***Research Participant Maya:** My understanding is that learners are not the same, they learn in different ways. The teacher has to vary his methods to accommodate all learners.*

***Researcher**: How do you cater for all different intelligences when teaching physical science?*

Research Participant Maya: *I vary my teaching methods to accommodate all learners. At times I use DVDs to break the monotone. At times I let learners teach each other.*

Researcher*: Is it easy to recognise different intelligences in a physical science class?*

Research Participant Maya: *No, it is not easy to recognise them because we are always rushed to cover specific topics.*

Researcher*: What makes you understand multiple intelligences in this way?*

Research Participant Maya: *I remember at university we studied about the multiple intelligences, I still remember them very well.*

Researcher: *Do you know any learner who has a different intelligence in your class, either than linguistic and mathematical intelligence?*

Research Participant Maya: *Yes, I know a few that are good in soccer and the other one who is like a herbalist, he knows all the healing plants by heart.*

Researcher: *That herbalist is naturalist intelligence. How do you assess to cater for all your learners with their different intellectual abilities?*

Research Participant Maya: *To be honest, I don't consider all intelligences when I assess. The challenge would be that the assessment will not be fair if the papers would be different. I set one paper with questions of different levels of difficulty in one paper.*

Researcher: *Okay, Do you have any comment about what we were talking about or do you have any question you would like to ask before we part?*

Research Participant Maya: *Tell me, how is this going to benefit you and me or the school?*

Researcher: *As I explained before you signed the consent form, you or the school will not benefit anything directly. You are helping me generate data, for my masters' thesis writing.*

Research Participant Maya: *I understand.*

Researcher: *Thank you very much for all the valuable information. I will call you next week to arrange for classroom observation.*

DURING THE INTERVIEW RESEARCH PARTICIPANT AWUSE RESPONDED:

Researcher: *Where did you complete your Grade 12?*

Research Participant Awuse: *I completed my Grade 12 in one of the schools in Umlazi Township.*

Researcher*: Ok, that is a township school.*

Researcher*: Are you a private practicing teacher or a trained teacher?*

Research Participant Awuse: *I am qualified trained teacher.*

Researcher*: Which university or college did you go to?*

Research Participant Awuse: *I went to Adams College.*

Researcher*: Are you trained to teach physical science?*

Research Participant Awuse: *Yes I have a secondary teachers' diploma, STD. My major subjects are physical science and mathematics.*

Researcher*: How long have you been teaching physical science?*

Research Participant Awuse: *18 years.*

Researcher*: Tell me about your experience in teaching physical science in the rural area?*

Research Participant Awuse: *Learners here are struggling when it comes to school needs because most parents are not working.*

Researcher*: What is your understanding of multiple intelligences?*

Research Participant Awuse: *I understand it to mean teaching and accommodating learners who have different levels of intellect. Some are brilliant whereas some are academically challenged. Most of these learners have a low IQ. Most of them never passed*

primary school but were condoned to progress to the next grade because of age or having repeated the phase more than it is allowed.

***Researcher**: How do you deal with multiple intelligences in teaching physical science?*

***Research Participant Awuse:** I am not familiar with multiple intelligences; it is the first time hearing about it. I understand that there are different learning abilities in my class.*

***Researcher:** How do you teach to cater for all learners with different intelligences?*

***Research Participant Awuse:** I try and expose them to streams like drama and art. I also do remedial work. But honestly I don't cater for all learners because a lot of them are very lazy.*

***Researcher:** How do you assess to cater for all your learners with their different intellectual abilities?*

***Research Participant Awuse:** I give the slow learners simplified questions. I also let those that understand easily to assist others. When it is assessment to be recorded I give them the same test.*

***Researcher:** What are the challenging experiences of teaching physical science in the rural area?*

***Research Participant Awuse:** Most parents are not working, so they are unable to support their children with school needs. We requested sponsorship from Sanlam, to buy calculators for our learners because it was very difficult to teach physical science without calculators. Sanlam them and keeping them for Grade 12 examination. We only give them in the exam room and they leave them in the exam room.*

***Researcher:** In your opinion is there anything that can be done by the stakeholders to deal with the challenges?*

***Research Participant Awuse:** Parents should support their children and commit to the education of their children. Parents should also help us deal with the issue of theft in the*

school. The government should assist poor communities, in our case with laboratories. If we want to do experiments we have to borrow from the science center in Gateway.

Researcher: *Do you have any comment about what we were talking about or is there anything you would like to ask before we part?*

Research Participant Awuse: *I don't have any questions I have one comment. Please if there is a way report our situation to the relevant people maybe someone may listen and help us with the laboratory.*

Researcher: *I cannot promise anything, as I explained before that my research is for study purposes only. I'm sure the university will submit the findings to the department of education; it is up to the department to decide what to do with the findings.*

Research Participant Awuse: *Okay, I hear you.*

Researcher: *Thank you very much for all the valuable information. I will call you next week to arrange for classroom observation.*

RESEARCH PARTICIPANT HALOVU RESPONDED:

Researcher: *Where did you complete your Grade 12?*

Research Participant Halovu: *I completed my standard ten in High School in one of the Esikhawini schools.*

Researcher*: Is that school in the rural or urban area?*

Research Participant Halovu: *The school is at Esikhawini Township.*

Researcher*: Are you a private practicing teacher or a trained teacher?*

Research Participant Halovu: *I possess a Bachelor of Pedagogics degree.*

Researcher*: Which university did you go to?*

Research Participant Halovu: *I went to University of Zululand.*

Researcher*: How long have you been teaching physical science?*

Research Participant Halovu: *24 years in different schools.*

Researcher*: Generally how are the results of physical science in your school?*

Research Participant Halovu: *It depends on the kind of learners we have on that year, in some years it its bad in some it ok. So I can say we are average.*

Research Participant Halovu: *They choose whatever subject they like.*

Researcher*: I heard you have very few learners who are doing science as compared to other choice subjects, What do think causes only a few learners to choose physical science?*

Research Participant Halovu: *It is because physical science is not very easy, most learners like subjects like drama where they are always playing, dancing and acting.*

Researcher*: Tell me about your experience teaching physical science in the rural area?*

Research Participant Halovu: *This is my forth year teaching in this school, learners are so much undisciplined when it comes to arriving at school on time, and worse when it comes to school uniform on a cold day, they wear jerseys of all colours and most teachers understand. I used to be frustrated and try and be strict with my class. I have given up.*

Researcher: *What made you give up?*

Research Participant Halovu: *I appeared as an enemy who is insensitive that learners don't have money for transport, so they walk the distance that's why they were late. I was also made to understand that some parents don't have money to buy school jerseys. So on a cold day we have to appreciate that they came to school wearing whichever coloured jersey.*

Researcher*: Remember our topic of discussion is multiple intelligences. What is your understanding of multiple intelligences?*

Research Participant Halovu: *I understand it to mean learners are different in their intelligences, others are good in mathematics others are good in language and some in history. But they are all intelligent.*

Researcher*: How do you deal with multiple intelligences in teaching physical science?*

Research Participant Halovu: *Physical science is a different subject; you can't use all the new methods. We teach the subject matter, derive formulae, analyse and apply the laws and do calculations where necessary. I would be lying if I say I use multiple intelligences when I am teaching.*

Researcher*: Why don't you use multiple intelligence teaching because it helps the teacher to effectively reach all learners.*

Research Participant Halovu: *The method is time consuming; we have work to complete in each term. It is important to cover all topics because papers for Grades ten to twelve are not set within the school.*

Researcher: *How do you then ensure that learners understand the subject and are able to write exams and pass?*

Research Participant Halovu: *Experience has taught me that, the exam guidelines are exactly what will be there in the paper.*

Researcher*: What about making sure that they understand the subject content?*

Research Participant Halovu: *The most important thing for the learners is to pass. Not only to learners, parents want them to pass, the department wants them to pass and I want them to pass too. So I teach exactly the guidelines and this help them pass.*

Researcher: *How do you assess to cater for all your learners with their different intellectual abilities?*

Research Participant Halovu: *As I have explained before, I don't even consider multiple intelligences in my teaching, but my learners pass.*

Researcher: *Okay, Do you have any comment about what we were talking about or Is there anything you would like to ask before we part?*

Research Participant Halovu: *No I don't have any questions or comment.*

Researcher: *Thank you very much for all the valuable information. I will call you next week to arrange for classroom observation.*

4.3.4 CLASSROOM OBSERVATIONS

RESEARCH PARTICIPANT OBSERVED: MAIDI

Subject: Physical science **Grade:** 10 **Time:** 8h45 – 9h30

Topic: Calculating the average velocity of a trolley pulling a ticker tape

Teacher's activities Maidi was well prepared, comfortable and in control of the class. He asked good engaging questions. He demonstrated to the class how ticker timers, pulley trolleys, mass piece and a stop watch are used in the experiment to calculate the average velocity of a trolley pulling a ticker tape. He analysed the tape and calculated average velocity of the trolley. All learners could see well because he has a class of only 12 learners. They were all standing around his table. He gave learners the class exercise to do the experiment he demonstrated.

Learners' activities

Learners took turns (in groups of three) to perform the ticker timer experiment. Each group had its own ticker tape to analyse. Learners seemed excited to do the experiment and to analyse and do the relevant calculations from their experiments. All learners were actively involved.

Were multiple intelligence strategies used?

Yes the MI teaching strategies were used. All learners were kept active throughout the lesson. Number reasoning, intrapersonal, visual, linguistic intelligences were used in this lesson.

Researcher's comment

The lesson was successful because learners were participating and also responded to the questions asked by the teacher. Maidi has been teaching physical science for more than 20 years, and Principal. Learners have great respect for him. Even though in his narratives and semi structured interviews he said he doesn't use multiple intelligences teaching strategies because of time constrains, during observation he used them successfully.

PARTICIPANT OBSERVED: MAYA

Subject: Physical science **Grade:** 10 **Time:** 9h30 – 10h15

Topic: Acceleration and Equations of motion.

Teacher's activities

The teacher was comfortable and seemed to enjoy the lesson. Maya drew diagrams of cars in motion on the chalkboard and cars at rest to explain acceleration. He derived equations of motion; he used a falling rubber block to explain initial and final velocity. He did calculations using equations of motion.

Learners' activities: Learners were actively involved throughout the lesson. They were even given a chance, in turns to write on the chalkboard.

They wrote classwork applying equations of motions.

Learners who needed more clarity raised their hands to draw the teacher's attention. Participant Maya attended to them, individually.

Were multiple intelligence strategies used?

Yes a variety of MI techniques were used, Maya used diagrams on the chalkboard but diagrams used were too small, this robbed spatial dominant intelligent learners an opportunity to learn effectively.

Researcher's comment

Participant Maya was knowledgeable about the subject content. Participant Maya is very energetic. He was impatient with learners who asked questions during the lesson, but he answered all questions confidently. I was uncertain of the cause of his impatience, whether it was because he was trying to cover a lot of content in a given time. The lesson was a great success.

PARTICIPANT OBSERVED: AWUSE

Subject: Physical science **Grade:** 10 **Time:** 13h15 – 14h00

Topic: Motion in one dimension

Teacher's activities: Awuse introduced the topic by defining terms, frames of references, position, direction, distance and displacement.

She derived formulae for calculating average speed and velocity. She did some calculations on instantaneous speed and velocity on the chalkboard. She then gave classwork to the learners.

Learners' activities:

Learners were passive most of the time.

Whenever the teacher asked if they understood what she was teaching them, they responded by saying yes in a chorus.

Were multiple intelligence strategies used?

No, participant Awuse seemed not to be aware of multiple intelligences in her class. She presented a lecture. She did not engage learners in anyway, except by giving them classwork.

Researcher's comment

Participant Awuse was inadequately prepared. The lesson provided limited learning opportunities. I felt the classwork activity she gave to the class could have worked better if it was given as a group work. I assumed that the teacher had limited knowledge about the subject content. This was evident when one learner asked the question about the difference between instantaneous speed and velocity. Participant Awuse ignored the question. I assumed that she did not know the answer to the question. Not much learning was achieved during the lesson.

RESEARCH PARTICIPANT OBSERVED: HALOVU

Subject: Physical science **Grade:** 10 **Time:** 09h30 – 10h15

Topic: Vectors

Teacher's activities:

Halovu explained the properties of vectors, the differences between vectors and scalars. He used tail to head method to get the resultant vector. He also used the parallelogram method to further explain finding the resultant vector by construction. Learners were given activities to in class, as the lesson progressed. They were assessed throughout the lesson.

Learners' activities:

Learners were actively involved. They competed in a tug of war game while the teacher was demonstrating opposing forces and the resultant force. They were drawing vectors and measuring them throughout the lesson.

Were multiple intelligences strategies used?

Yes, a variety of them were used.

Researcher's comment

Participant Halovu contradicted himself, in his narrative he expressed that MI techniques are not applicable to physical science. Also when he was interviewed, he explained that he does not consider using multiple intelligences strategies because they consume a lot of time and he strongly felt they were not relevant to the subject. But when I observed him in class, he used some of the MI teaching strategies. For example, he grouped the learners into two teams to compete in a tug of war game to illustrate forces. My observation of lessons revealed that although some participants had little or no understanding of multiple intelligences in teaching physical science, they use such strategies unknowingly.

4.4 DATA ANALYSIS PROCESS

There is a relationship between data generation and data analysis. The two cannot be separated. Analysis changes data into findings, by giving meaning to the data generated. Data analysis reduces the large amount of data by separating what is relevant from that which is irrelevant (De Vos, 2005).

4.5 CODING THEMES

I numbered all data presented in this chapter, that is (participants' narratives, transcribed semi structured interviews and classroom observation notes). Numbering was very useful when I presented themes and was using quotations to support themes. I followed the theme analysis process as suggested by (Newman, 2000).

4.6 EMERGING THEMES

I read and reread the transcribed data several times, until I understood all data generated (Agar. 1980). I identified common participants' responses, then I scrutinised data carefully. Four themes emerged from the data that was generated.

4.6.1 THEME 1: OPINIONS ABOUT MULTIPLE INTELLIGENCES

When the main research question was posed (what is your understanding of multiple intelligences in teaching physical science?) different opinions were expressed:

> Participant Maidi: *"I think multiple intelligences teaching is used when the teacher recognises that every student is special and unique."*

On the same question research Participant Maya responded:

> *"I understand that learners have different ways of understanding what they are taught due to their different intelligences which vary from learner to learner."*

Responding to the above question research participant Awuse said;

> *"My understanding of multiple intelligences in teaching physical science is that to teach physical science one has to deal with diverse class of learners with different learning styles."*

And research participant Halovu's response was:

> *"Multiple intelligences teaching is about using all different intelligences in a learner to make sure he understands what is taught."*

4.6.2 THEME 2: BELIEFS LEADING TO MISUNDERSTANDINGS AND NON-UNDERSTANDING

Participants reflected their beliefs about multiple intelligences and physical science:

> *"Physical science is not an ordinary subject and should not be done by any learner who wishes to do it but by those who are capable of doing it."*

> *"The multiple intelligence way of teaching is applicable when the class has few learners. Multiple intelligences teaching is not applicable to physical science because, physical science is a formal subject. It needs learners to focus, unlike the languages and L.O. which can be taught in the sports field."*

> *"What I understand is that there are learners who are gifted in music but they cannot use it in physical science, because it is irrelevant to physical science."*

(Participant Halovu)

> *"If a learner is good in music, I have never thought of teaching to accommodate his intelligence. I regard such learner as talented in music. It's not easy for me to think of anything musical in the subject because I'm not a musical person."*

(Participant Maidi)

4.6.3 THEME 3: TEACHERS' FEELINGS

The common response was that the method is time consuming. The participants' opinion that multiple intelligences teaching consume a lot of time and the pressure to produce good results is the main reason for teachers not using multiple intelligences teaching in their classrooms. The fear to lose their jobs if learners do not choose physical science as one of their choice subjects pushes them to a desperate state to teach only guidelines for exams, with the hope of teaching exactly what will be asked during exams. The participants' concern about time is confirmed by the following responses:

> *"For physical science in Grade 10, we as teachers are guided by the Annual Teaching Plan (ATP), as a result due to trying to keep up with the ATP, we end up focusing to one or two types of intelligences."* (Participant Maya).

> *"The main challenge is that the physical science syllabus is too long, so we are always working under pressure. We have time which is always against us. These good teaching strategies are impossible to practise because we have to finish the syllabus. We also have challenges of practicals. We borrow from CASME. Time is really a challenge if you want to do this multiple intelligent teaching."* (Participant Maidi).

> *"The method is time consuming; we have work to complete in each term. It is important to cover all topics because papers for Grades ten to twelve are not set within the school."*
>
> (Participant Halovu)

4.6.4 THEME 4: TEACHERS' EXPERIENCES

When the researcher asked about the research participants' experience of teaching physical science in the rural area, participant Maidi's response was:

> *"I think there is not much difference with township schools. We are in the same cluster with them. The other thing I have noticed in learners is that if a learner is good, that learner will pass well regardless of the conditions around him. We have some learners from the previous years, who were good in physical science, they are now studying engineering and they are coping competing with learners from different schools. There is also an engineer now working for ESKOM he completed Grade 12 here."* He added and said:
>
> *"My experience is that physical science is not a popular subject to learners even in township schools. Learners avoid choosing it and as a result we always have few learners doing physical science."*

Participant Maya responded:

> *"Learners have a language challenge. They struggle so much with English which is the medium of instruction. If you want them to understand, one has to explain in their mother tongue. This becomes a problem when they write tests and exams, they struggle to understand questions. Their spellings are bad; I think social networks contribute to this."*

...and Participant Halovu's response:

> *"Experience has taught me that, the exam guidelines are exactly what will be there in the paper. The most important thing for the learners is to pass. Not only to learners, parents want them to pass, the department wants them to pass and I want them to pass too. So I teach exactly the guidelines and this help them pass."*

4.7 CONCLUSION

This chapter discussed the data analysis and findings and presented them. Literature was used to indicate similar findings. The data generated from four Grade ten physical science teachers revealed that there are non-understandings, limited understandings and misunderstandings of multiple intelligences in teaching physical science in Grade ten teachers. Almost all participants acknowledged that, they have little, non-understanding or misunderstanding of multiple intelligences teaching. The next chapter discusses findings and recommendations.

CHAPTER 5

FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

In this chapter the researcher will present findings which are drawn from data analysed from narratives, semi-structured interviews and classroom observations. Findings will be followed by the researcher's recommendations.

5.2 RESEARCH FINDINGS

The main question for this study was: *Do Grade ten teachers understand Multiple Intelligences in teaching physical science?* The general answer to the above question, based on the findings of this study indicates that Grade ten teachers have limited understandings and misunderstandings of Multiple Intelligences in teaching physical science. The researcher discusses findings below, in relation to the research objectives.

5.2.1 FINDINGS ADDRESSING RESEARCH OBJECTIVE 1

- To explore Grade ten teachers' understanding of Multiple Intelligences in teaching physical science.

Research results reflect that Grade ten teachers have limited understanding of Multiple Intelligences in teaching physical science. Almost all participants agreed that each learner is unique, but their understanding was limited in that some participants assumed that Multiple Intelligences teaching is not applicable to physical science but to other subjects; like languages and life orientation.

The results further indicate that there are misunderstandings of Multiple Intelligences teaching. This is evident in participants' responses where they were confusing Multiple Intelligences and learning styles. They were also confusing gifts/ talents and multiple intelligences.

The other finding is that non-understanding exists among the participants. The lack of understanding may be seen where participants blamed their not using Multiple Intelligences in their classrooms to lack of resources. This showed that participants did not understand that there are no special resources needed to administer Multiple Intelligences strategies in their teaching. In particular, participants expressed in different ways that they believed Multiple Intelligences to be the waste of time. Creswell (2008) define triangulation as a method where a researcher uses two methods of data generation concurrently about the same phenomenon, and where data from both methods is compared, contrasted and different findings produce a well-validated conclusion. Denzin and Lincoln (2011) posit that triangulation is using different methods interviewing the same occurrence or research question. In ensuring transferability of this study I will use triangulation and three data generating methods which are semi-structure interviews, focus group interviews and document analyses.

5.2.2 FINDINGS ADDRESSING RESEARCH OBJECTIVE 2

- To explore why Grade ten teachers understand Multiple Intelligences in physical science in particular ways.

The results indicate that teachers have neglected some of their seven roles as teachers; which are: Learning mediator, interpreter and designer of learning programmes and materials. The leader, administrator and manager. Also the teacher as a scholar, researcher and lifelong learner. In the community, teachers as citizens and pastoral role models and making sure that they assess in a way that is able to cater for all the learners. Therefore such leadership skills lead teachers towards becoming learning area or phase specialist (Boerboom et al., 2009).

From the study, the teachers seem to be failing on their role as a scholar; the researcher finds it worth noting that one of the participants mentioned that it was her first time hearing about Multiple Intelligences teaching, this indicates that this particular participant is not researching at all and is not a scholar.

Participants assumed Multiple Intelligences teaching was time consuming because they misunderstood competency in teaching to be finishing the syllabus on time. The results also indicated that participants did not know that Multiple Intelligences may be developed. Because of their lack of this knowledge, learners were not afforded opportunities to develop their intelligences to the competent level.

The teachers understanding of Multiple Intelligences was a huge confusion with the learning styles as also stated by Gardner (1995) that it is not correct to use multiple intelligences and learning styles interchangeably. It is important to understand that Multiple Intelligences and learning styles are, according to Gardner, two different things.

5.2.3 FINDINGS FROM TEACHER NARRATIVES

Qualitative researchers use to triangulate data within a study using only one research method, for example, an ethnographer might triangulate data from interviews with data from observations (Myers, Montgomery & Anderson-Cook, 2009). In this qualitative study I triangulated teacher narratives, classroom observations and semi structured interviews. Qualitative research methods of generating data quite often articulate the research participants' views (Bertram & Christiansen, 2014, p. 82) because of their nature of being descriptive of people's worldview. That is why I used semi-structured interviews and teacher narratives here so as to find out whether the Physical Science teachers in the rural school, understood the Multiple Intelligences. This gave the research participants the voice.

From the teachers' narratives I was able to gather that they misinterpreted the Multiple Intelligences with the different types of learning styles. Even during the interviews one of the research participants stated:

> "Learners *are different therefore they need to be taught differently, I also make sure that even in the assessment, I pay particular attention to the average learners".*

Campbell, Campbell & Dickinson (1996) maintain that sometimes teachers unconsciously use MI theories in their teaching, like when they use visual aid or playing a song. If they fully understand MI theories and its benefits; it could be more beneficial to them in their teaching. The above

statement stated that the teacher did not understand the Multiple Intelligences. Gardener (1995) states that intelligence is not the same as a learning style or a working style.

Therefore that states that the rural Physical Science teachers did not understand what Multiple Intelligences are but during the classroom observations teachers were able to pose different types of questions using the Blooms Taxonomy and this showed that maybe the challenge is in the articulation of what Multiple Intelligences are.

Emmitt, Zbaracki and Pollock (2010) argue that the notion that learning is about 'making meanings that is, about comprehending'. Narratives are an account of a situation containing affective, practical, and theoretical descriptions of the observation of that situation and of the events and actions in the situation. An educational narrative is more than a story about a situation; it is integral to communication among educators and, as a consequence, to the development and sharing of educational knowledge (Gudmundsdottir, 1995). The Grade ten teacher narrated that when he has to do "suspension" learners, it is quite significant that he uses his observation skills whilst learners are involved in the process. But when I was observing the same teacher in the classroom, it looks as if he was doing all the work himself.

5.2.4 FINDINGS FROM CLASSROOM OBSERVATIONS

The four research participants' classroom observations were used in this qualitative research (Gay, 1987; Borg & Gall, 1989). According to Gay (1987), ethnographic studies are characterized by some kind of participant observation at an overt level. In data generation, the ethnographer employs a variety of strategies in conjunction with observation, both verbal and non-verbal (Pelto & Pelto, 1978). Verbal strategies include the interview; both structured and unstructured, in which there is interaction between researcher and participants in order to obtain the necessary data. Non-verbal strategies in terms of observing Multiple Intelligences were quite vague because it looks as if the teachers did not recognise that the Physical Science learners were having different skills for example, they wanted to use their hands in terms of building and constructing resources. Further, classroom observations have the potential of providing formative feedback to teachers that helps them improve their practice, whereas the summative feedback to teachers from state achievement tests is too delayed and nonspecific to provide direction to teachers on how they might improve their teaching and advance learning in their classrooms. Gay (1987) argues that there are less

disruptive and less likely to influence the behaviour being studied. There was more that was expected from the learners as well as the Physical Science teacher here because when I had to do observations I had to look into what the Physical Science teacher had to do in terms of the recognising the Multiple Intelligences.

Maree (2007) argues that classroom observations are significant instrument for data gathering because when recorded efficiently it can provide the reader with an "insider perspective" and it places the researcher in the participants' shoes. Bertram (2004, p. 90) states that "observation is going to the classroom and observing what actually takes place there". For such as a researcher I made sure that I visited the classrooms. After generating data through semi-structured interviews, I needed to give the teachers some time therefore the teacher narratives were done in my presence but I was not interacting with the teacher in terms of probing for clarity. I was able to get more information on the day I went back to confirm the data in what space the teachers were and I was able to get a very clear picture of why the understood Multiple Intelligences the way they do. At the beginning of the year, Physical Science teachers go for workshops but the clarity on what is done is not important at this stage. They are therefore expected to be very confident when presenting lessons.

5.2.5 FINDINGS FROM DOCUMENT ANALYSIS

Another tool that was used to generate data was document analysis. Maree (2009) indicates that data could be obtained by perusing published or unpublished documents, for instance documents like reports, minutes of meetings, and newspaper articles. Lodico *et al.* (2010) point out that the research questions of a study enable the researcher to decide on relevant documents to be analysed. Due to the suggestions by Maree (2009) and Lodico *et al.* (2010),

The Curriculum Assessment Policy Statement (Department of Basic Education, 2011) document on Multiple Intelligences in the classrooms explains formative assessment in Multiple Intelligence as "a range of formal and informal assessments employed by academics during the learning process that focuses on the details of content and performance in order to modify teaching and learning activities to improve student attainment."

For this research, relying only on the semi-structured interviews and classroom observations could not be sufficient, as the document analysis was used to compare data from teachers. Nieuwenhuis (2007) asserts that document evidence is a data source that overlaps with the other sources. The documents are used as a source of information that is valuable to qualitative researchers. Mouton (1996, p. 53) offers one important reason for using multi-methods of data collection when he asserts that "the multi-methods technique is used for the betterment of the research".

5.2.6 FINDINGS FROM SEMI-STRUCTURED INTERVIEWS

The researcher also used one on one semi-structured interviews to generate data. Open ended questions were asked to allow the participants to voice their experiences and perspectives. Probes were used during the interview to follow up on areas of interests. The interviews were recorded using a cellphone recorder, so that all data may be captured. Recording allowed the researcher to focus on facilitating the interview. Using semi-structured interviews aided me to engage in face-to-face interaction with the participants. Cohen, Manion & Morrison (2011) suggests that it is important to engage face to face with the participants. The researcher arranged the interview atmosphere in such a manner that she sat down for face to face with each interviewee, as Scott and Usher (2011) argue that sitting face to face with research participants enable the researcher to read non-verbal language such as facial expressions, thus allowing the interviewer to make judgements about significant signs and thereby locating authentic data from participants regarding their experiences and real-life situations.

From the semi structured interviews, the researcher found out that most of the participants had limited information about multiple intelligences. They misunderstood multiple intelligences, they thought multiple intelligences strategies of teaching were time consuming. The researcher also discovered that no workshops on teaching strategies were attended by these teachers. The only workshops they were exposed to, were content workshops and planning workshops.

5.6.7 ALIGNING THE FINDINGS WITH THE THEORITICAL FRAMEWORK BY HOWARD GARDNER.

Gardner has identified the following eight and a half intelligences:

Verbal-linguistic: determines strong unwritten communication, advanced vocabulary.Gardner emphasises that there exist many methods or approaches of learning and perceiving. It is also important to remember that, each learner is different. Linguistic intelligence is most commonly used as we use it in daily communication, whether formal or informal, written or spoken. Learners are called upon to use verbal or linguistic intelligence when learners are expected to write essays or poetry. Teachers understandings of Multiple Intelligence in this aspect was only seen when learners were grouped to perform an activity. Their communication was not guided but they had to respond to the questions asked by the teacher. It was also seen through different activities that not all learners possess equally strong linguistic intelligence. This was very visible when questions about activities were asked, and a couple of learners interacted with the teacher.

Logical-mathematical: appreciates logical and numerical patterns as well as abstract concepts. The learners were guided to think independently as individuals like to experiment, solve puzzles, and ask different types of questions. This shows their independence and understanding of the content in Physical Science. Traditionally linguistic intelligence and logical-mathematical intelligence have been identified and highly valued in education and learning environments.

Spatial-visual: visualises perfectly the use of abstract information to picture the information in learners' minds. Learners' potential can be tied to one's preferences to learning; thus, Gardner focusses on human potential lies in the fact that people have a unique blend of capabilities (intelligences). This model can be used to understand "overall personality, preferences and strengths". This kind of Intelligence was quite difficult to see in the learners and also that Physical Science teachers were not focusing so much on the different skills learners have.

Bodily-kinesthetic: skillfully uses and controls the body and objects. Physical Science teachers encouraged learners to grow in this area of different intelligences through physical activity, hands-

on learning, acting out, role playing, and physical relaxation exercises. This was seen when learners were given activities to do in the classroom. Though there was some of the teachers' interference in what learners had to do but they were very much involved in the lessons and activities that were learners-centred.

Musical: produces rhythm and pitch, and appreciates musical values. The research focussed on Multiple Intelligences in rural area teachers who were teaching Physical science and how thinking skills can be taught based on this theory of Multiple Intelligences. Surprisingly, not even a single teacher focussed on the musical side or giftedness of the learners. It is quite understandable though that music and play are not part of the teaching and learning approaches in High Schools. It would have been great though to see learners singing or rhyming the terms used in Physical Science.

Interpersonal: responds appropriately to others by understanding social cues, motivations and moods. Banks, Leach, & Moon (1999) present a model of teachers' professional knowledge in which 'school knowledge, subject knowledge and pedagogical knowledge are linked by a teacher's 'personal subject content knowledge'.

Intrapersonal: aware of learners' own feelings, values and thinking methods. A learner who thinks rationally is not only able to learn independently, but is more imaginative and experiences improved self-esteem. This is one other factor that was not attended to by teachers in the classrooms. This is one Multiple Intelligence factor that made me see that when teachers stated that they understood MI they were focussing on the different types of learning.

Naturalist: identifies and categorises animals, plants and other aspects of nature. Using Multiple Intelligences in Physical Science allowed the teachers to use an approach that was suitable for learners in rural area classroom. This was done by providing opportunities for authentic learning based on your learners' needs, interests, and talents. The Multiple Intelligences classroom acts like the "real' world. For example, the author and the illustrator of a book or the actor and the set builder in a play are equally valuable creators. The learners in these classrooms became more active, involved in the lesson.

Existential: contemplates deep questions about human existence, including the purpose of life, how we came to be, etc. (this intelligence has not been discussed in this study because it is still under scrutiny this is the reason it is referred to as 'half').

5.3 RECOMMENDATIONS

Exploring Grade ten teachers' understanding of Multiple Intelligences in teaching physical science, brought to mind some recommendations to be considered. These recommendations will be discussed below.

5.3.1 FOR FUTURE RESEARCH

While I was reading literature to be cited and referenced in this study, it became apparent that there is a gap in research. There is limited literature from previous research, about teachers' understanding of Multiple Intelligences in teaching physical science. Most of the available literature is on Multiple Intelligences and language teaching and also on Multiple Intelligences and science education, nothing on teachers' understanding. For this reason, I recommend that further research on teachers' understanding of Multiple Intelligences should be done in three contexts.

5.3.2 FOR TEACHERS' ENRICHMENT

There are a couple of recommendations the researcher had to come up with, like the workshops on Multiple Intelligences should be organised for teachers, to address this lack of understanding. Also the researcher also suggests that in service training should be conducted to ensure teachers know their duties and responsibilities as educators. Maybe after 20 years of democracy in South Africa, teachers in rural areas need to be supported by resources as it is not every teacher in a rural school who is creative and able to improvise.

The department of education should organise more workshops for Physical Science teachers. The workshops should have sufficient information about the choice of careers so that Multiple Intelligences could be catered for. Moreover, the school counselors should design methodical

interventions that cater for Multiple Intelligences to be incorporated into curricular experiences in hopes of providing learners with various prospects to develop more mature career decision-making attitudes and competencies. The aptitude tests that address South African measures should be developed so that the learners could do aptitude test that is in line with South African learners and most of all that cater for their Multiple Intelligences.

5.3.3 FOR INTERGRATING MI STRATEGIES IN THE RURAL CONTEXT SCHOOLS

To integrate Multiple Intelligences into the classroom, it is important to teach subject matter through a variety of activities and projects. Therefore, teachers in the selected rural schools should be encouraged to make sure that their classrooms contain compelling activities that activate a range of intelligences. Furthermore, they have to encourage learners to work collaboratively as well as individually to promote both their interpersonal and intrapersonal intelligences. Assessments should be integrated into learning. According to Gardner, all learners have all nine intelligences. Teachers can enhance learners learning and strengthen their intelligences by nurturing the whole spectrum of intelligences. Three types of classroom teaching strategies are conducive to nurturing the whole spectrum of intelligences: "presentations, simulations, and learning centers" (Educational Broadcasting Corporation, 2004). Teachers' beliefs could also be misleading where Multiple Intelligences are concerned.

5.4 CONCLUSION

This chapter presented findings and recommendations in this study. Findings were discussed according to the research objectives. The main finding is that teachers do not understand Multiple Intelligences teaching as they should. Even though the research findings indicate that teachers have limited understanding of MI teaching strategies, surprisingly they use Multiple Intelligences strategies in their classrooms unknowingly. Considering these findings, feasible recommendations were suggested. Finally the theory by Gardener has emerged from cognitive research and documents the point to which learners possess different kinds of intelligence and therefore learn in different ways. Gardner (1983) articulates that learners possess all nine intelligences. Where learners differ is in the strength of their Multiple Intelligences, Gardner's theory argues that learners are better served by a broader visualisation of education where teachers use different methodologies, approaches and activities to cater for all learners, not just those who excel at linguistic and logical intelligences. This is not referred to as the different types of learners but different intellectual abilities that learners have. The National Curriculum Assessment Policy, DBE (2011) emphasises the value of directed discovery learning and an experiential approach, which are in line with Multiple Intelligence approach.

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Appendix A

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

21 June 2018

Mrs Nkosingiphile Pearl Blose (SN 218086443) School of Education
College of Humanities
Edgewood Campus
UKZN
Email: ncane.blose @yahoo.co.za ndlovubl@u kzn.ac.za

Dear Mrs Blose

RE: PERMISSION TO CONDUCT RESEARCH

Gatekeeper's permission is hereby granted for you to conduct research at the University of KwaZulu-Natal (UKZN), towards your postgraduate studies, provided Ethical clearance has been obtained. We note the title of your research project is:

"Exploring grade ten teachers' understanding of multiple intelligences in teaching physical science in rural school':

It is noted that you will be constituting your sample by conducting semi-structured interviews with Grade 10 teachers in a school in Durban.

Please ensure that the following appears on your notice/questionnaire:

- Ethical clearance number;
- Research title and details of the research, the researcher and the supervisor;
- Consent form is attached to the notice/questionnaire and to be signed by user before he/she fills in questionnaire;
- gatekeepers approval by the Registrar.

You are not authorized to contact staff and students using 'Microsoft Outlook' address book. Identity numbers and email addresses of individuals are not a matter of public record and are protected according to section 14 of the South African Constitution, as well as the Protection of Public Information Act. For the release of such information over to yourself for research purposes, the University of KwaZulu-Natal will need express consent from the relevant data subjects. Data collected must be treated with due confidentiality and anonymity.

Yours sincerely

Office of the Registrar
Postal Address: Private Bag X54001, Durban, South Africa
Telephone: +27 (0) 31 260 8005/2206 **Facsimile:** +27 (0) 31 260 7824/2204 **Email:** registrar@ukzn.ac.za
Website: www.ukzn.ac.za

Appendix B

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

KWAZULU-NATAL DEPARTMENT OF EDUCATION

Postal Address: Private Bag X9137 • Pietermaritzburg • 3200 • Republic of South Africa

Physical Address: 247 Burger Street • Anton Lembede Building • Pietermaritzburg • 3201

Tel.: +27 33 392 1063 • **Fax.:** +27 033 392 1203•
Email: Phindile.Duma@kzndoe.gov.za •**Web:**www.kzneducation.gov.za

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma Tel: 033 392 1063 Ref.:2/4/8/1532

Mrs N.P Blose

Dear Mrs Blose

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"EXPLORING GRADE 10 TEACHERS UNDERSTANDING OF MULTIPLE INTELLIGENCES IN TEACHING PHYSICAL SCIENCE IN THE RURAL CONTEXT,** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

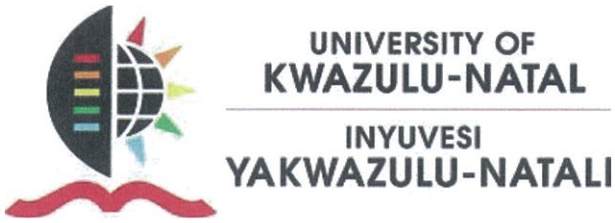
- The researcher will make all the arrangements concerning the research and interviews.
- The researcher must ensure that Educator and learning programmes are not interrupted.
- Interviews are not conducted during the time of writing examinations in schools.
- Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
- A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
- The period of investigation is limited to the period from 01 June 2018 to 09 July 2020.
- Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators,

Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.

- Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
- Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
- Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Dr. EV Nzama
Head of Department (Education)
Date: 01 June 2018

Appendix C



University of KwaZulu-Natal
Edgewood Campus
Private Bag x 03
ASHWOOD
3605
4 June 2018

The Superintendent-General
Department of Education
Province of KwaZulu-Natal
Private Bag x 9137
Pietermaritzburg
3201

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT HIGH SCHOOL -X

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct a research and to interview grade 10 physical science teachers on **their understanding of multiple intelligences in teaching physical science.** This is a case study involving schools in Umlazi district. I humbly request permission to conduct research at High School-X.

The study aims to explore grade 10 teachers' understanding of multiple intelligences in teaching Physical Science. It is hoped that the insight gained will assist teachers in trying new ways of teaching. It will also help teachers in planning according to the classroom's abilities.

The planned study will focus on grade 10 physical science teachers. The study will use semi-structured interviews and classroom observations with physical science teachers. Participants will be interviewed for approximately 45-60 minutes at the times convenient to them which will not disturb teaching and learning. This research process will take place in August 2018. Each semi-structured interview will be voice-recorded. It will be conducted when the participants are free or after school.

You may contact my supervisor, Dr B. Ndlovu, her contact details are: Tel: 031 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za as well as the University of KwaZulu-Natal Research Office Mariette Snayman on 031 260 8350 for any queries or questions. My contact details are as follows; Cell: 0745575181, Email:ncane.blose@yahoo.co.za

Your positive response in this regard will be highly appreciated. Thanking you in advance.

Yours faithfully.
Pearl Blose
(218086443)

Appendix D

University of KwaZulu-Natal
Edgewood Campus
Private Bag x 03
ASHWOOD
3605
04 June 2018

The Principal
High School-X
UMLAZI
4066

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT HIGH SCHOOL-X

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct a research and to interview grade 10 physical science teachers on **their understanding of multiple intelligences in teaching physical science.** I humbly request permission to conduct research in your school.

The study aims to explore grade 10 teachers' understanding of multiple intelligences in teaching Physical Science. It is hoped that the insight gained will assist teachers in trying new ways of teaching. It will also help teachers in planning according to their classrooms' abilities. The planned study will focus on grade 10 physical science teachers. The study will use semi-structured

interviews and classroom observations with physical science teachers. Participants will be interviewed for approximately 40-60 minutes at the times convenient to them which will not disturb teaching and learning. This research process will take place in August 2018.

Each semi-structured interview will be voice-recorded. It will be conducted when the participants are free or after school.

You may contact my supervisor, Dr B. Ndlovu, her contact details are: Tel: 031 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za as well as the University of KwaZulu-Natal Research Office Mariette Snayman on 031 260 8350 for any queries or questions. My contact details are as follows; Cell: 0745575181, Email: ncane.blose@yahoo.co.za

As an indication of your positive response to my request, please fill in the informed consent declaration attached to this letter.

Thanking you in advance.

Yours faithfully.
Pearl Blose
(218086443)

Informed consent declaration

I, ...the principal of High School-X, hereby confirm that I understand the contents of this document and the nature of this research project. I fully give consent to the school's participation in this research study. I also understand that I am at liberty to withdraw the schools' participation at any point without penalty.

....

Signature Date

Appendix E

University of KwaZulu-Natal
Edgewood Campus
Private Bag x 03
ASHWOOD
3605
04 June 2018

Dear Sir/Madam

RE: REQUEST FOR YOUR PARTICIPATION IN MY RESEARCH

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct a research and to interview grade 10 physical science teachers on **their understanding of multiple intelligences in teaching physical science.** I humbly request you to participate in this research.

The study aims to explore grade 10 teachers' understanding of multiple intelligences in teaching Physical Science. It is hoped that the insight gained will assist teachers in trying new ways of teaching. It will also help teachers in planning according to their classrooms' abilities.

If you agree to participate in this study, I will come to your school at a time convenient to you. I will visit you three times in August this year, 2018. Two of the visits will be informal interview sessions, of about forty five minutes to an hour each. Each interview will be voice-recorded and will be conducted when you are free or after school. The third visit will be classroom observation.

Please note that you are free to withdraw your consent and discontinue participation at any time without penalty.

For more information, you may contact me at; Cell: 0745575181 email: ncane.blose@yahoo.co.za. You may also contact my supervisor, Dr B. Ndlovu, her contact details are: Tel: 031 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za or contact the University of KwaZulu-Natal Research Office through Mariette Snyman on 031 260 8350

As an indication of your positive response to my request, please fill in the informed consent declaration attached to this letter.

I will greatly appreciate your help and I am looking forward to meeting you.

Yours Sincerely.
Pearl Blose
(218086443)

Informed consent declaration

I, ...the Grade 10 physical science teacher of High School-X hereby confirms that I understand the contents of this letter and the nature of this research project. I fully give consent to my participation in this research study. I also understand that I am at liberty to withdraw my participation at any point without penalty.

Preferred method of contact (please circle): home / cell / office phone / e-mail

Contact info:

_____
(number)

_____
(e-mail)

....

Signature Date

Appendix F

University of KwaZulu-Natal
Edgewood Campus
Private Bag X03
ASHWOOD
3605
21 May 2018

Dear Sir/Madam

RE: REQUEST FOR YOUR CHILD'S PARTICIPATION IN MY RESEARCH

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the Faculty of Education. As part of the requirements for the degree of Master of Education, I am required to conduct a research and to observe the Grade 10 physical science teachers while teaching in class, on **their understanding of multiple intelligences in teaching physical science.** Your child is in the class of one of the teachers I will be observing. I humbly request your child to be in the classroom during data generation (Classroom Observations) research.

The study aims to explore Grade 10 teachers' understanding of multiple intelligences in teaching Physical Science. It is hoped that the insight gained *will assist teachers in trying new ways of teaching, which will be beneficial to learners. It will also help teachers in planning according to their classrooms' abilities.*

Please note that you are free to withdraw your consent and discontinue your child's participation in the classroom if you feel the need at any time without penalty.

For more information, you may contact me at; Cell: 0745575181 email: ncane.blose@yahoo.co.za. You may also contact my supervisor, Dr B. Ndlovu, her contact details

are: Tel: 031 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za or contact the University of KwaZulu-Natal Research Office through Mariette Snayman on 031 260 8350

As an indication of your positive response to my request, please fill in the informed consent declaration attached to this letter.

I will greatly appreciate your help.

Yours Sincerely

Pearl Blose

(218086443)

.....

PARENTAL CONSENT (CLASSROOM OBSERVATION- SCHOOL X)

Informed consent declaration

I hereby give permission for my son/ daughter to be part of the class where their physical science teacher will be observed while teaching. The classroom observation will be for research study purposes only. My signature below confirms my understanding and my agreement to the above terms.

NAME OF MY SON/DAUGHTER: .....

PARENT OR GUARDIAN'S NAME: .....

Preferred method of contact (please circle):

Home / Cell / Office phone / E-mail

Contact info:

Number _____

E-mail _____

....

Signature Date

Appendix G

University of KwaZulu-Natal
Edgewood Campus
Private Bag X03
ASHWOOD
3605
21 May 2018

Dear Grade 10 Learner

RE: REQUEST FOR YOUR PARTICIPATION IN MY RESEARCH

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct a research and to interview grade 10 physical science teachers on **their understanding of multiple intelligences in teaching physical science.** I humbly request you to participate in this research because your physical science teacher will be one of the teachers I will be observing.

The study aims to explore grade 10 teachers' understanding of multiple intelligences in teaching Physical Science. It is hoped that the insight gained *will assist teachers in trying new ways of teaching which will be beneficial to you. It will also help teachers in planning according to their classrooms' abilities.*

If you agree to participate in this study, you will be in the classroom when I observe the teacher while teaching you as usual. Nothing more will be expected from you.

Please note that you are free to withdraw your consent and discontinue participation at any time without penalty.

For more information, you may contact your physical science teacher or the head of the science department in your school.

As an indication of your positive response to my request, please fill in assent form attached to this letter.

I will greatly appreciate your help.

Yours Sincerely

Mrs N.P. Blose

.....

ASSENT DECLARATION

Do you understand this research study and are you willing to take part in it?

YES	NO

Has the researcher/teacher answered all your questions?

YES	NO

Do you understand that you can STOP being in the study at any time?

YES	NO

_____ _____

Signature of Learner Date

Appendix H

The study was guided by two critical research questions but hence this was qualitative research, the researcher used the following research question to probe.

- ✓ What is your understanding of multiple intelligences?
- ✓ Why do you understand multiple intelligences in that particular way?
- ✓ How do you deal with multiple intelligences in teaching Physical Science?
- ✓ Is it easy to recognise multiple intelligences in grade ten Physical Science learners?
- ✓ How do you assess using multiple intelligences techniques?
- ✓ Do you know any of the multiple intelligences in your class?
- ✓ How do you accommodate all learners with different learning abilities in your teaching?
- ✓ What are these eight intelligences that are possessed by each person/ learner?
- ✓ Do you think all eight intelligences can be catered for in a physical science class?
- ✓ In your opinion, what can be done to assist Physical Science teachers to use multiple intelligences techniques in their teaching?

Appendix I

TEACHER NARRATIVES

NARRATIVES

Name: MAIDI

What is your understanding of multiple intelligences in teaching Physical Science in Grade ten?

I think and believe multiple intelligences teaching is that because every student is special and unique; the teacher needs to teach in such a way that all learners benefit from his/her teaching. The physical science teacher has to involve all learners when teaching. There are learners that are active in answering verbally in class and there are those that will surprise you during a test or the exam. It is important to make different tases like multiple-choice, one word and also long questions that will require learners to describe or tobliscuss. It is important at times to teach one another in groups or in pairs because some learners are shy, they are afraid to ask in class even if they don't understand. Such learners might find it easy to ask other learners.
The other important thing when teaching physical science is that the teacher has to be knowledgable of his/her subject so that it can he/she is able to explain to every learners' satisfaction. The teacher should give extra work to fast learners while repeating or answering questions from those that are not as fast. Multiple intelligence teaching should be done in all classes not only

NARRATIVES

Name: MAYA

What is your understanding of multiple intelligences in teaching Physical Science in Grade ten?

It is that learners have different ways of understanding what they are taught due their different intelligences which vary from learner to learner. From what I know learners may be visual, auditory or kinesthetic.
These three types of learners happen to be in one class which makes it difficult to reach out to all of them at the same time. For physical sciences in grade 10 we ~~are~~ as teachers are guided by the Annual teaching Plan (ATP) as a result due to trying to keep up with the ATP we end up focusing to one or two types of learners and also not incorporating these different types of intelligences. We as teachers also fall amongst certain type of intelligence so we tend to make our lessons focus more on that intelligence esp. in subjects like physical sciences. For instance, if a teacher is more kinestetic he/she will make his/her lessons more practicall without noticing that learners who are auditory are sacrificed in that process.
In conclusion, I think incorporating ~~no~~different multiple intelligences in our teaching of physical sciences can make learners understand physical sciences conveniently however if the curriculum can also be shaped in a manner that will allow teachers to do so.

NARRATIVES

Name: HALOVU

What is your understanding of multiple intelligences in teaching Physical Science in Grade ten?

I am not very familiar with multiple intelligences in teaching physical science. I understand that this kind of teaching is for languages and Life orientation. Physical Science is a formal subject, you can not go to the sportsfield for a physical science lesson. Multiple intelligences is about using all intelligences in a child to make sure they understand what is being taught.

Multiple intelligences are verbal-linguistic, Mathematical-logical, musical, bodily, spatial, interpersonal, intrapersonal naturalistic and existential. Only Mathematical and logical is applicable to Physical Science. What I understand there are students in class who are gifted in music and sport but they can not use their intelligence in class because it is irrelevent in physical Science. My understanding is that physical Science can not be done by all learners because it demands a lot of scientific reasoning which can not be taught. Students have to know themselves and know their abilities before they choose subjects. It is important that Grade 9 get proper guidance on career choices.

NARRATIVES

Name: AWUSE

What is your understanding of multiple intelligences in teaching Physical Science in Grade ten?

MY UNDERSTANDING OF MULTIPLE INTELLIGENCES IN TEACHING PHYSICAL SCIENCES IS THAT TO TEACH PHYSICAL SCIENCES, ONE HAS TO DEAL WITH DIVERSE CLASS OF LEARNERS. THESE LEARNERS ARE FROM DIFFERENT BACKGROUNDS, SOME FROM HOMES WHERE PARENTS CAN AFFORD TO BUY EVETHING THE LEARNERS NEED FOR THE SCHOOL, UNLIKE SOME HOMES WHERE PARENTS ARE NOT WORKING SO THEY DONT HAVE MUCH, AS A RESULT THEIR CHILDREN DO NOT HAVE SCHOOL REQUIREMENTS. WHEN THE PHYSICAL SCIENCE TEACHERS TEACH THEY HAVE TO MAKE IT A POINT THAT LEARNERS FEEL LIKE THEY ARE EQUAL. HERE AT SCHOOL WE HELP LEARNERS BY TEAMING UP WITH MENZI HIGH SO THAT IF THE TEACHER IS NOT COMFORTABLE WITH THE TOPIC, HE IS FREE TO ASK ANOTHER FROM MENZI TO COME AND TEACH THAT TOPIC WE ALSO DO TEAM TEACHING WITH MY COLEGUES HERE AT SCHOOL, FOR EXAMPLE WHEN THE GRADE 10 TEACHER WANTS HELP WITH ELECTRICITY, HE CAN EXCHANGE WITH GRADE 11 TEACHER TO COME AND TEACH ELECTRICITY IN GRADE 10 WHILE HE MAYBE TEACHING REDOX REACTIONS IN GRADE 11

Appendix J

Classroom Observations schedule for Multiple Intelligences in teaching Physical Science in Grade 10 classrooms

Dates	Topic	Classroom arrangement	Pedagogical Style	Resources available	Tasks for Learners	Assignments/ Activities	Multiple Intelligences
	Calculating velocity	Formal setting	Experimental approach	Textbooks 2trolleys Ticker timer Tape	Classwork and Homework given	Involved in performing an experiment classwork	MI strategies were used
	Equations of motion	Formal setting	Lecture method and question and answer	Textbooks only	Classwork and Homework given	calculations	MI strategies were used
	Motion in one dimension	Formal setting	Presentation method	Textbooks only	Homework was given	None	Not used
	Vectors	Peer grouping	Discussion, lecture and question and answer. Interactive.	Textbooks only	Classwork and Homework given	Tug of war and calculations	MI strategies were used

(Post classroom observations and data confirmation phase)

OBSERVATION SCHEDULE GRADE-10: PHYSICAL SCIENCE

Date and time: 21/08/2018

Teacher- teaching content/ : Maidi / Average Velocity

Focus of observation: Teachers' understanding of Multiple Intelligence

Classroom interaction: Any Multiple Intelligence Encouragement

Comments: As a researcher I was able to explain what Multiple Intelligences are to teachers who confused them with different types of learning styles.

Objectives	Are objectives of the lesson clearly set?
Lesson plan	Is the lesson planned? How is its organisation?
	Questions asked for learners to interact with in order to see the understanding of Multiple Intelligence.
Content covered	What content is being covered in this lesson?
	How is it taught?