

UNIVERSITY OF KWAZULU-NATAL

**GENDER STEREOTYPING IN THE TEACHING AND LEARNING OF PHYSICAL
SCIENCES**

BY

BONGINKOSI SANELE NSUNTSHA

STUDENT NO: 207529371

**DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE MASTER OF EDUCATION IN TEACHER
DEVELOPMENT STUDIES**

SCHOOL OF EDUCATION

COLLEGE OF HUMANITIES DEPARTMENT

SUPERVISOR: DR N. MTHIYANE

2016

ABSTRACT

The purpose of this research was to explore Physical Sciences teachers' views and experiences of gender stereotypes in the teaching and learning of sciences, and how such experiences shaped their beliefs and actions, in relation to gender in science education.

The research answered three critical research questions: What are Physical Science teachers' experiences of gender stereotyping/ discrimination? What are Physical Science teachers' views of gender stereotypes and teaching? How do Physical Science teachers' experiences of gender stereotyping shape their professional lives and beliefs?

The study is qualitative in nature and is located within an interpretive paradigm. Purposive sampling was employed by interviewing three females and three male teachers who were at the time teaching Physical Sciences to grades 10, 11 and 12. The participating teachers had more than ten years of teaching experience. Semi-structured interviews were used for data collection.

The study draws from the social learning theory in seeking to understand the teachers' views and experiences. Findings of study reveal that the participating Physical Sciences teachers understood gender stereotyping, and that they had experienced it in their personal and professional lives. Furthermore, the findings suggest that teachers believed that gender stereotypes were much stronger in subjects such as Mathematics, Physical Sciences, Engineering compared to other fields. Discrimination amongst learners based on cultural norms, beliefs, and practices were viewed as the main sources gender stereotypes in the teaching and learning in schools in general.

Findings of the study also revealed that girl learners are still discriminated against in schools and in their families. Physical science teachers were identified as the main perpetrators of gender discrimination in science classrooms by ignoring girls, and/or giving boys undue attention, among other things. This discrimination in the learning environment was reported to have a negative impact on girls' learning experiences. Teachers indicated that some girls internalized their subordination and became silent when boys dominated them during practical experiments in the laboratory. Teachers reported that this might contribute to girls dropping out of Physical Sciences as a subject. However, teachers also reported that there were girls who continued to excel in Physical Sciences, despite the fact they were fewer in numbers compared to boys, and in spite of the sometimes harsh classroom and laboratory environments. The study points to the need to

sensitise and educate Physical Sciences teachers about issues of gender discrimination and stereotyping in Physical Sciences classrooms. The study recommends that teacher professional development programs must incorporate gender issues, and that pre-service training of Physical Sciences teachers must also address gender issues. It also recommends a focus on strategies to attract more girls to study Physical Sciences, and for teachers to use collaborative and gender inclusive teaching strategies where girls and boys interact and work together. Classroom materials used must also be gender inclusive.

DECLARATION

Submitted in fulfilment / partial fulfilment of the requirements for the degree of Masters in Education, in the Graduate Programme in the College of Humanities, University of KwaZulu-Natal, Pietermaritzburg, South Africa.

I, Bonginkosi Sanele Nsuntsha, student number: 207529371, declare that:

1. The research reported in this thesis, except where otherwise indicated, is my original research.
2. This thesis has not been submitted for any degree or examination at any other university.
3. This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
4. This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
 - a. Their words have been re-written but the general information attributed to them has been referenced.
 - b. Where their exact words have been used, then their writing has been placed in italics and inside quotation marks, and referenced.

This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Mr: Bonginkosi Sanele Nsuntsha _____

Student Name

Date

Signature

Dr: NonhlanhlaMthiyane _____

Name of Supervisor

Date

Signature

ACKNOWLEDGEMENTS

To Dr: Nonhlanhla Mthiyane, no words can describe my gratitude for everything you have done for me. You went beyond your role as a supervisor and you became a good councillor. Thank you for all your encouraging words.

To the participants for this study, UThukela District, Estcourt Circuit, Physical Sciences teachers for the grades 10, 11 and 12. Thank you ladies and gentlemen for everything you have done to me.

To my family, my wife and all my children, thank you for support and encouragement.

LIST OF ABBREVIATIONS

AAWSE	Association of Africa Women in Science and Engineering
AAUW	American Association of University Women
DP	Deputy principal
DoE	Department of Education
EC	Eastern Cape
FET	Further Education and Training
HOD	Head of Department
IUPAP	International Union of Pure and Applied Physics
KZN	KwaZulu-Natal
NCS	National Curriculum Statement
NSF	National Science Foundation
SADC	South African Development Community
SAASTE	South African Association for Science and Technology Educators
SMT	Senior Management Team
STEMA	Science, Technology, Engineering and Mathematics Association
STEM	Science, Technology, Engineering and Mathematic Association
TIMMS	Trends in International Mathematics and Science Study
USA	United States of America

TABLE OF CONTENTS

ABSTRACT.....	i
DECLARATION	iii
ACKNOWLEDGEMENTS	iv
LIST OF ABBREVIATIONS.....	v
CHAPTER 1: INTRODUCTION	1
1.1. INTRODUCTION	1
1.2. BACKGROUND AND CONTEXT	1
1.3. PROBLEM STATEMENT AND RATIONALE.....	2
1.4. AIMS AND OBJECTIVES OF THE STUDY	4
1.4.1. Objectives of the study.....	4
1.4.2 Research questions.....	4
1.5. SIGNIFICANCE OF THE STUDY	5
1.6. METHODOLOGY	5
1.7. THEORETICAL FRAMEWORK	5
1.8. DEFINITIONS OF KEY CONCEPTS	6
1.9. OUTLINE OF THE STUDY	6
CHAPTER 2: LITERATURE REVIEW	8
2.1. INTRODUCTION	8
2.2. DEFINING GENDER STEREOTYPES	8
2.3. FACTORS PROMOTING GENDER STEREOTYPES IN SCIENCE EDUCATION	8
2.3.1. School- Related Factors	9
2.3.2. Social Factors.....	15
2.3.3. Cultural beliefs.....	18
2.3.4. The state of Science Education in South Africa.....	20
2.4. THEORETICAL FRAMEWORK	21
2.5. SUMMARY	23
CHAPTER 3: RESEARCH METHODOLOGY	24
3.1. INTRODUCTION	24
3.2. RESEARCH DESIGN	24
3.3. LOCATION OF THE STUDY	25

3.4. SAMPLING	26
3.4.1. Gaining access to schools	28
3.5. DATA COLLECTION METHOD	29
3.5.1. Semi - structured interviews	29
3.6. DATA ANALYSIS.....	31
3.7. ETHICAL ISSUES	32
3.8. TRUSTWORTHINESS AND DEPENDABILITY OF DATA.....	33
3.9. LIMITATION OF STUDY.....	33
3.10. SUMMARY	34
CHAPTER 4: DATA PRESENTATION AND DISCUSSION	35
4.1. INTRODUCTION	35
4.2. RESPONSES FROM SCIENCE TEACHERS VIEWS OF GENDER STEREOTYPES.....	35
4.2.1. Research Question 1: What are the science teachers’ views of gender stereotypes and teaching?.....	35
4.2.3. Causes of gender stereotypes	37
4.3. RESPONSES ON TEACHERS’ EXPERIENCES OF GENDER STEREOTYPES.....	43
4.3.1. Research question 2: What are Physical Science teachers’ experiences of gender stereotyping/ discrimination?.....	43
4.4. RESPONSES ON TEACHER’S PROFESSIONAL LIVES AND PRACTICES OF GENDER STEREOTYPES	47
4.4.1. Research Question 3: How do Physical Science teachers’ experiences of gender stereotyping shape their professional lives and beliefs?	47
4.5. SUMMARY	50
5.1. INTRODUCTION	51
5.2. SUMMARY OF THE STUDY.....	51
5.3. RECOMMENDATIONS	54
5.3.1. Keeping girls and attracting more girls to study physical sciences.....	55
5.3.2. Collaborating.....	55
5.3.3. Classrooms should be well organised and well equipped with science equipment	56
5.4. LIMITATIONS OF THE STUDY	56
5.5. AREAS FOR FURTHER RESEARCH.....	57
5.6. CONCLUSIONS.....	57
REFERENCES	58

ANNEXTURES	66
ANNEXURE A: INTERVIEW QUESTIONS	66
ANNEXURE B: INFORMED CONSENT.....	70
ANNEXTURE C: GATEKEEPER’S LETTER	73
ANNEXTURE D: ETHICAL CLEARANCE CERTIFICATE.....	75
ANNEXTURE E: TURNITIN REPORT.....	76
ANNEXTURE F: EDITOR'S NOTE.....	77

CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

This chapter introduces the purpose of this study, which is to explore Physical Sciences teachers' views and experiences of gender stereotypes in the teaching and learning of Sciences. It also highlights the background of the study and context, rationale for the study and problem statement, objectives of study, research questions and methodology, theoretical framework, as well as the outline of the study.

1.2. BACKGROUND AND CONTEXT

Gender stereotypes refer to the over-generalization of beliefs, attitudes, practices and behaviours that are considered normal and appropriate for a person in a particular culture, based on his/ her biological sex (Chikuvadze & Matswetu, 2013). Delemere and Shaw (2010) also state that whether boys or girls can do well or not, and how they ought to think and behave, purely depends on the grounds of their gender. In countries such as Britain and United States, the issue of gender stereotypes has been a topic of extensive research (Delamere & Shaw, 2010) while on the other hand, this has not been the case in African countries, including South Africa (Sumsion & Roberts, 2005).

The topic of gender stereotypes and differences between boys and girls studying Physical Sciences is a concern for researchers (Ivie & Ray, 2005). According to Holdsworth (2007), gender stereotypes occur early in grade 10-12 amongst adolescents in South Africa. The study also showed how stereotypes impact on the students in grades 10, 11 and 12 during teaching and learning. This is where more chances to study Physical Sciences are presented to male than female learners. In most cases, female students are being oppressed by their teachers in schools, due to their gender. In the Eastern Cape, Roberts (2005) discovered that workshops for learners are held as early as they reach adolescence stage. It is important for such information to be available for guidance, not only for school work and performance, but also in career choices, in terms of learner-rearing practices. Gender stereotypes are also observed in South Africa and in other cultures in early adolescence. Ivie & Ray (2005) noted that females are regarded as being passive, emotional, intuitive, need approval from male dominance and nurturing. In contrast, males are perceived to be competitive, rational, independent, assertive and curious. Ivie & Ray (2005) suggest that

although gender stereotypes have been diminished, in Physical Sciences, girls in secondary schools continue to lag considerably in terms of achievement. Gender stereotypes of adolescents prevail in some provinces of South Africa such as Eastern Cape, where it impacts the learners in their school work, decision making in terms of subject choice and careers to be pursued (Delemere & Shaw, 2010). Gender stereotypes also implicate parents, teachers' educational institute, students and the society at large.

Dee (2006) argues that the root causes of gender stereotypes and discrimination are that there is no fairness and equal opportunities to motivate females to continue with Mathematics and Science. Khilji and Bhutta (2012) point out that the larger differences about gender stereotypes start in junior secondary schools and gradually accelerate to high schools. Gender stereotypes in Mathematics and Physical Sciences have been existed for many decades and even today, they are still present in most schools (Martin, 2005). Gender stereotypes also highlight how men and women relate to between each other. Even in higher education institutions in South Africa, student enrolment indicates gender stereotypes in the field of Sciences. There are more men who are studying in the field of Sciences like Engineering and Technology, than there are women (Council on Higher Education, 2012, p. 26). In South Africa, school going learners aged between 15 and 17 years argues that gender stereotypes start early in life and is subjected to socialisation processes leading to internalisation and integration in one's personality (Gaganakis, 2003). It is from this background that the researcher shows an interest in this area of study.

1.3. PROBLEM STATEMENT AND RATIONALE

The interest into pursuing this study emanated from the researcher's memories of doing Physical Sciences, as well as his experiences as a Physical Sciences teacher. During those days as a learner, the researcher noticed that more boys tended to be encouraged to take Physical Sciences than girls by our teachers. Currently as a teacher, the researcher has also noticed that there are more boys taking Physical Sciences than girls. Also, few female educators who were also in the field of Physical Sciences in secondary schools are less than their male counterparts. Even when the researcher was studying Physical Sciences in grades 10, 11 and 12, he was never taught by a female educator. Currently, the researcher is a cluster coordinator for Physical Sciences; he has noticed a serious underrepresentation of female Physical Science teachers in the cluster. Based on these

observations, the researcher began to wonder if this has anything to do with teachers' views and beliefs on who should be in and out of the Physical Sciences.

The researcher started to participate in the examination of matriculation scripts in 2003. During this period, he has observed that there are few female educators who were also being appointed as examiners and different position in the examination centre. Others served as chief markers for a year and the following year, they do not avail themselves, the reason being that females are associated with being passive in decision making, needing approval from male markers and became emotionally, if they are always corrected in Physical Sciences.

In South Africa and Western countries, there is still underrepresentation of girls in Physical Sciences (Adya & Kasser, 2005). Butter (2004) highlighted that limited attention in schools is paid to females than males, in the science on the continent as a whole. Jobs that are related to this subject such as science, Mathematics and Technology are still dominated by males in most countries Africa and in Europe (Kessels, 2005). Positions that are held by women scientists in South Africa are at an average of 30% in the field with of as Science, Technology, Engineering and Mathematics Association (STEMA, 2010). Even in our school clusters, there are fewer numbers of female educators teaching Mathematics and Physical Sciences. The Association of Africa Women in Science and Engineering (AAWSE) (2005) suggests that only 40% of women are academics under Engineering and Science. In South Africa, about 40% of women are Engineers and Technologists in the job market, while 60% of males are dominating the field and higher positions (AAWSE, 2005). Kessels (2005) pointed out that girls have a lack of Science confidence and dissatisfaction about science education. This is allegedly caused by the way girls are treated by some male teachers, which makes them lose confidence in themselves and therefore, do not do the Physical Sciences and Mathematics subjects.

In South Africa and Western countries such as USA and Britain, people have age old stereotypes (Kahle, 2004). This stereotype is that girls are not as good as boys in Mathematics and Physical Sciences. Furthermore, they pointed out that girls are good at reading comprehension and in music. This has been along feminist critics of girls in Science in South African schools and communities (Langer, 2006). The majority of the researchers believe that females' performance in Physical Sciences has dominated and improved but boys still dominating them (Dekker 2011). It is because of the influences and high expectations of society from girls compared to boys' performance. On

the other hand, some researchers Dekker & Kahle (2012) argue that these differences no longer apply. Dekker (2012) suggests that some girls obtained good results compared to boys. Although data are available for women, they do not paint a positive picture (Kahle, 2005). In contradiction, there are women who are in higher positions in Physical Sciences, even though they are few, it took over 100 years to offer those positions (Kahle, 2012).

Given the problems highlighted above, it is believed that this study would shed more light, while at the same time deepen and provide more understanding on the subject matter, which would be useful to Physical Science, Mathematics and Technology teachers (STEM, 2012). It would further assist female learners to engage themselves in large numbers and pursue the Science studies. In that view, the study has the following aims and objectives.

1.4. AIMS AND OBJECTIVES OF THE STUDY

The overall aim of this study is to assess the gender stereotypes from the educators' perspectives. The study seeks to establish the teachers' perceptions on gender stereotypes in the teaching and learning of Physical Sciences. In view of that, the study has the following objectives.

1.4.1. Objectives of the study

The study aims to achieve the following objectives:

- (1) To explore the Physical Science teachers' views of gender stereotyping, with particular reference to the science teaching.
- (2) To explore Physical Science teachers' experiences of gender stereotyping/discrimination, with particular regard to the teaching and learning of physical sciences.
- (3) To understand how these experiences shape the Physical Sciences teachers' professional lives and beliefs.

1.4.2 Research questions

The study attempts to answer the following broad questions:

What are the Physical Science teachers' views and experiences of gender stereotypes in the teaching and learning of physical sciences?

In answering this question, the following critical questions will be answered:

- (1) What are Physical Science teachers' views of gender stereotypes and teaching?
- (2) What are Physical Science teacher's experiences of gender stereotyping/ discrimination?
- (3) How do Physical Science teachers' experiences of gender stereotyping shape their professional lives and beliefs?

1.5. SIGNIFICANCE OF THE STUDY

This study also tried to make policy makers to be aware of the issue of gender stereotypes in schools. Policy makers should be aware that girls should not be discriminated in Physical Science classrooms. Even teachers themselves in this study agree that gender stereotypes do exist in schools and communities. It is very significant for all the stakeholders in education and communities to fight against gender stereotypes. Workshops in schools and communities should be held at least once per term to fight against about gender stereotypes and how they are going to eradicate it.

1.6. METHODOLOGY

This is a qualitative study which is located within the interpretive paradigm. The data for this study were collected through the following research methods: semi-structured, individual in-depth interviews. Purposive sampling was done to select six Physical Science teachers from both rural and urban areas.

1.7. THEORETICAL FRAMEWORK

Bandura (2007) differentiates four types of theories that are based on gender stereotypes role development which are social learning theory, cognitive development theory, gender schematic processing theory and psycho-analytic theory. The social learning theory is the one applicable to this study. The theory involves an integrated behaviour and mind theories of teaching and learning. It provides a comprehensive model that could account for the wide range of learning views and experiences that occur in the real world (Bandura, 2007). The social learning theory is based on

gender-typed behaviours that are related to punishment, reinforcement and generalization to different contexts. Behaviours that is appropriate in different contexts.

1.8. DEFINITIONS OF KEY CONCEPTS

1.8.1. Gender refers to a set of qualities and the kind of behaviours, beliefs expected from a man or a woman by a society (Mutongi, 2005). On the other hand, Oxford Dictionary (2005) defines gender as attitudes, beliefs and practices, feelings and behaviours that are given culture based with a person's biological sex.

1.8.2. Stereotypes are associations between men and women that are shaped by several interacts including socio-cultural factors that include messages in mass media, opinions of peers, teachers, family members and experience of learning (Eagly & Wood, 2012).

1.9. OUTLINE OF THE STUDY

Chapter 1 has outlined the introduction, background and context, rationale for the study and problem statement, objectives of the study, research questions and methodology, theoretical framework and the outline of the study.

Chapter 2 reviews the literature relevant to the study. The chapter describes the following: the factors that promote gender stereotypes: such as teachers' beliefs and practices, hidden curriculum, lack of female role models, early teenage pregnancy and socio economic status of the family, cultural beliefs, the state of Science Education in South Africa. The theoretical framework is also discussed in this chapter.

In Chapter 3, the research strategy is presented. The qualitative research, the research design, research context, choice of participants, data collection methods, limitations of study, data analysis, trustworthiness and credibility, ethical consideration and conclusion are described in this

chapter. In Chapter 4, the findings and data analysis are presented. Chapter 5 provides the conclusions and recommendation, based on the findings of the study.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

The previous chapter provided an overview of the study. This chapter presents the literature that is relevant for the study. The literature is drawn from both the national and international landscape. The focus of the chapter is on the following aspects: the factors that promote gender stereotypes which include school- related factors based on teachers' beliefs and practices, hidden curriculum (school and classroom discourse), social factors such as lack of female role models and early teenage pregnancies. Furthermore, the literature covers content such as the socio-economic status of the family, cultural beliefs, the state of Science Education in South Africa. Finally, the theoretical framework is also described in this chapter.

2.2. DEFINING GENDER STEREOTYPES

Gender stereotypes refers to the social differences between males and females that have been learned over time and may differ within and between cultures rather than the biological characteristic which differentiate people as men and women (Commonwealth Secretarial, 2008, p. 2). Furthermore, Mwamweda (2011) defines gender stereotypes as the traditional perception of males and females regarding themselves and each other what: men and women can do or cannot do or whether they are capable enough of doing well.

2.3. FACTORS PROMOTING GENDER STEREOTYPES IN SCIENCE EDUCATION

There are key factors that promote gender stereotypes in Sciences and Mathematics in South Africa, and these include the following: hidden curriculum (school and classroom discourse) and lack of female role models (Ballenden, Davison & Newell, 2003). Linda (2001) suggests that women in Science are regarded as people who lacking the qualities needed to be successful scientists. This further contributes to discrimination and prejudice against women scientists. They are expected to perform well in looking after their family members such as children and husbands. Ellaine (2014) points out that the extra-curricular activities in schools shape the gender stereotypes in schools, for instance, activities such as boxing, karate and soccer are regarded as men sports. These kinds of sports require more energy that is more prominent in males than in females. In

addition, women are regarded as good at household work, gardening, washing dishes, ironing and cooking, which require less energy. Men are regarded as good in washing the car, changing light bulbs and fixing plugs. Linda & Ellaine (2013) demonstrate that Science subjects require more effort than washing and cooking, the areas in which females are good at.

2.3.1. School- Related Factors

2.3.1.1. Teacher's beliefs and practices

Teachers' beliefs and practices cause gender stereotypes in the classroom environment, gender roles and perception of leisure stereotypes (Delamere & Shaw, 2010). Teacher beliefs and practices depend on the past experiences and views of the teachers (Pajares, 2010). Similarly, Pajares (2010) suggests that 'teacher' beliefs cannot be measured, but depends on what people say and the views of the community members. The ways in which teachers interact with their students is one of the causes that promote gender stereotypes in the classroom environment. According to Gilbert (2008) gender discrimination happens in the classroom environment during teaching and learning. Gender discrimination is observed and teachers are not aware that their beliefs and practices are based on segregated classes, gender bias, instructional material and discriminatory teaching (Gilbert & Pajares, 2010).

The study about gender stereotypes is not an end in itself. Gender stereotypes also influences on their interest beyond the social implication, on the lives and decisions people are making of those affected by the gender stereotypes (Mwamweda, 2011). Ifegbesan (2010) suggests that gender stereotypes have an impact in the shaping and questioning, promoting the reinforcement, when it comes to the development in the lives of both males and females. This happens especially to girls as they pursue their educational careers and their everyday behaviour, as they interact with their physical and physiological environment (Bosire, et al, 2008). In terms of education and jobs, gender stereotypes occur more frequently than in other sectors (Sansome and White, 2007).

Gender discrimination is also promoted by the attitude of the teachers, even in the school context (Stake, 2006). Teacher's beliefs that some parents have an influence in their children's choices in high school level also contribute to gender discrimination. Parents have a tendency that girls should study the subjects that would help them even in the home background such as Home

Economics, which deals with cooking and cleaning. Eccles (1994) suggests that teachers never determine the performance and the interest of the child. Eccles (1994) studied the psychological and social factors that influence gender differences in education and vocational choices. In some schools and certain communities affected by psychological and social factors that cause gender discrimination and stereotypes in schools affect the performance of girls who studied Physical Sciences (Darbyshire, 2009). Learners observe teachers and parents performing different social roles where cooking is females and gardening as males. Teachers suggest that physical differences between men and women still contribute to differences in behaviours (Kane, 2009). Kane (2009) proposes several factors that impact on gender stereotypes and discrimination, such as societal, parents, schools and teachers influence. The above factors are the ones that inform girls directly or indirectly, that boys are good and capable of dealing with Physical Science and Mathematics (Vedantam, 2006). These factors affect the field of Physical Sciences, Mathematics and Engineering.

Teachers' views, according to Gilbert (2008), suggest that it is very vital for educators to observe other teachers' gender beliefs and how beliefs influence their pedagogical practices. Kane (2009) suggests that teachers in schools engage in reinforcing gender stereotypes without their conscious knowledge. They set stereotypes where children are judged in terms of their behaviour and previous performance by certain gender. The way children behave is allegedly determined by the way they are stereotyped (Martin, 1995). Gender Bias in the Classroom (2009) suggests that unknowingly, teachers perpetuate the male stereotypes by paying more attention to boys than girls. Research indicates that during teaching and learning in the classroom situation, boys are treated better than girls (How teachers Influence Gender Roles, 2007). Male students are given more contact times with the teachers than their female counterparts. More time is also given to males by having more time to answer the questions, as well as challenging questions are given to boys.

Siraj (2002) suggests that the choice of teaching methods has implications for boys and girls and their interest in Physical Sciences. Girls tend to have negative attitudes towards Physical Sciences and in some studies; this is linked to performance in the subject and has been found to be influenced by different teaching approaches. Roberts (2002) agrees with Rasekoala (2001) that the causes of gender stereotypes in science and engineering education are the causes of low numbers of female educators as well as female students.

Masland (1999) & Flemings (2000) noted that negative treatment done by teachers on both boys and girls, which is, is one of the causes that promote gender stereotypes, where boys explain the difficult concepts during corrections are done. Gender stereotypes exist in structural material such as newspapers, discriminatory and teaching style. Educators give boys more praise than girls in the classroom. Even when assessment is done in the classroom Martin & Ruble, (2008) noted that more examples are based on boys than girls. For example, in most question papers, more examples favour boys than girls, more sports examples are used such as cricket, soccer and rugby, than is being played by males as the majority (Martin & Ruble, 2008). That bad behaviour of gender stereotypes is also practiced during teaching and learning. When boys answered questions, more chances are given to them, as compared to girls. The above example is done especially by male educators as well as female educators (Martin & Ruble, 2008). On the other hand, boys are given difficult problems than girls so that they can show that they have a better understanding of the Physical Sciences subject. These kinds of behaviour contribute to gender stereotypes that give power to the boys and silence the girls (Garrahy, 2001 & Lerner, 2000). Examination papers and most books show boys are good in Physical Sciences and Mathematics. He argues that there is a decline in girl learners' self- esteem, caused by the absence of acknowledgment of the achievements of women and girls.

The other impact of gender stereotypes is the adult stereotype, where stereotype is being promoted by adult people within our homes and communities (Martin 1995). This adult stereotype has an impact on gender roles in a variety of ways, where children may be punished or rewarded by adults by applying any activity that shows stereotypes between boys and girls. For example, girls are being told that they cannot engage in certain activities on the ground, it is because of gender, which is a punishment. Adult biases, whether intentional or accidental, have an impact on learners as they form own perceptions about beliefs and practices (Frawley, 2005). They develop their social, emotional, intellectual and physical abilities.

When young children join school, the interaction, both in the classroom as well as outside the classroom, teachers reinforce gender stereotypes in education perspective (Mwamwenda, 2011). Wilhelm (2009) further suggests that "in a study of 48 teachers' perceptions of 300 grades 3 and 4 students' competence and effort in Mathematics and Physical Sciences, their responses agreed with gender stereotypes in which it is argued that boys are better than girls in their performance of

Mathematics”. Boys almost perform better than girls in the last ten years in Eastern Cape with 60% compared to girls (Mwamwenda, 2011). “Ifegbesan (2010) & Kane (2009) further suggest that in the context of school and learning, both the attitudes and actions of teachers have a bearing on children stereotypes”. Lee & Mushner (2008), suggest that there are other studies which have confirmed gender stereotypes between boys and girls in Mathematics and Physical Sciences in the middle and elementary school, girls and middle school boys concluded that girls were better than boys in Mathematics and Physical Sciences. In USA and Europe, girls are performing better than boys almost in a percentage of 45% compared to boys for only one year which was 2010 (Bosire, 2012). Concerning gender stereotypes and differences, Steele (2003) pointed out that the performance between girls and boys remain undetected till high school and university years, where boys dominate girls at that stage.

A study was conducted in three provinces; Gauteng, KwaZulu-Natal and Western Cape, as well as in Kenya, with the aim of realising the causes of gender inequality in schools. It also undertook the marginalization of girls in education and the gendered culture in our societies. Warrington (2010) report, three provinces and one country in Africa (Kenya) were affected by poverty. Poverty limits girls’ ability to continue with their schooling, especially in Mathematics and Physical Sciences. School uniforms, examination fees and the cost of books, are the major factors that causing a drain in the household budget in KwaZulu- and Natal which makes about 30% of girls leave school early in grade 10 (Huisman & Smith, 2009). Furthermore, in Gauteng, 5% and in the Western Cape, 6 % of the girls leave the school early due to poverty. In Kenya, it was also discovered that about 45% of girls leave school early and some of them are doing child labour. According to Warrington (2010), in agreement with Huisen & Smith (2009), females’ aspiration for a better life in Mathematics and Physical Sciences through education remains unmet.

2.3.1.2. Hidden Curriculum (school and classroom discourse)

Hidden curriculum is when students receive invisible lessons through sex role acquisition (Mwamwenda, 2011). Common forms of invisible lessons are subject time tabling, gender imbalance of textbook content and classroom contents. In subject timetabling, this is where Physical Sciences and Technical subjects are offered at the same time as Home Economics and more girls chose to do the latter, as is everyone’s expectations (Shakeshaft, 1995).

According to Ifegbesan (2010), Mwamweda (2011) and Greany (2008), not only South Africa observed the issue of gender stereotypes and the hidden curriculum, but also other African countries such as Nigeria, Namibia and Sudan experience it. Mwamweda (2011) also observed gender imbalance of textbook content and classroom contents. Both international and national countries books display boys as good in science, examples such as sports activity also shows boys as good in the fixing of cars. That sends the message that girls are not good in Physical Sciences, since more examples in books favoured males. On the other hand, in the examination question papers, Ifegbesan (2010) noted that more examples show boys as good learners in Mathematics and Physical Sciences and more examples favoured boys in the examination papers. Although girls are shown, they are more observable in books such as Home Economics where they are cooking and in biology books, where they are shown as good caring people. Fleming (2000) suggests from a feminist perspective that girls are stereotypically represented on the pages of structural material from grade R-12.

These are the kind of gender stereotypes observed in the school and classroom discourses. In the girls' minds, since they experienced this kind of behaviour shown by textbooks, they valued themselves as if they are not good in Mathematics and Physical Sciences (Greany, 2008). Western countries introduce formal schooling where they started running both co-education and single sex schools. Even today, both African and Western countries still have schools that accommodate males and females separately. In South Africa, Kasanda & Shaimemanya (2008) maintain that there are still schools for girls separated from boys; those schools are known as "boy's high schools" and "girls high schools". Feminists argue that this is one of the reasons why girls are discouraged from pursuing science subjects, especially physical sciences, even though they may be performing well. The reason is that when they reached tertiary level, they see more males as professors dominating in the science department; few females are in that field. Gender stereotypes associate male's with strength, braveness and intellectual identities. However, females are associated with being warm, passive, homely, lacking in competence and expressiveness (Greany, 2008). The literature shows that teachers tend to use teaching methods that favour boys and this has been linked to girls feeling inferior about their ability to do Science.

Also, Mwamweda (2011) argues that teachers are the main perpetrators being accused of fostering gender stereotypes in school subjects and academic achievement. Osborne (2003) pointed out that

teachers tend to use boys to explain difficult problems in class rather than girls. On the other hand, when boys ask questions, teachers are the ones who give a clear explanation to them. According to Mwamweda (2011), there are no similar changes against South African teachers, especially in the Eastern Cape. Teachers for Mathematics and Physical Science in South African schools are in favour of boys than girls. Bosire, Mandoh & Barmao (2008) suggest that the issue of gender stereotypes has been a part of education in Africa since long ago before the encounter of the Western civilization. In addition, traditional education was also gender stereotyped, in such a way that it was only based on the gender and sex of the learner. Learners were taught separated, based on their gender. Even today in South Africa, schools are separated where “boys high” and “girls high” are still separated, especially in independent schools Greany & Mwamweda (2008) also argued that gender stereotype is also transmitted in terms of knowledge, cultural values and skills. In most cases, it is transmitted by calling teachers of the same sex to provide such education (Bosire, 2008).

Although females are there, they are being dominated by males when practical experiments are done. That makes more females to leave this science faculty and join other fields where they observe females dominating (Jones, 2006). The other reasons include the lack of networking, role models, retention programs, boring content and no future relevance due to matric results (Osborne, 2003). Lee and Burkam, (1996) noted that beliefs are related to student’s experiences in science education. The kind of curricula and instructional strategies were used to promote equal access and equality for all learners. According to Bianchini (2000), bias against minorities and women still causes a problem in the teaching and learning of Physical Sciences and it needs more attention.

Renzagliet. al. (2007) suggests that the media and books depict women as people who are good in decoration. The message the media are carrying is print based material, advertisement and internet, which show girls as good decorators in the rooms. In the same way, boys are shown in confident poses using computers, fixing electrical appliances, while girls sitting at computers for decorating purpose. This is argued to be one of the causes and origins of gender stereotypes (Ranzaglia, 2007).

“Gender equality refers to females and women having equal learning opportunities with their male counterpart” (Moletsaneet.al, 2010). Boys and girls are affected by gender inequality differently. In the same way, the issues of gender inequality in South Africa serve as a compass for Engineering, gender equality by the Constitution of South Africa that was amended after 1994.

Moletsane et al. (2010) point out that the lack of gender socialisation between boys and girls is the major factor that causes gender stereotypes in education. Furthermore, they explain that since girls and boys have different life experiences within the school classroom and later in higher education institution, is also one of the factors that cause gender stereotypes and inequality in education.

Girls require more science education to reach equity (Mugaga, 2010). However, girls need more “priority assistance” or identify affirmative action for them to get more and equal opportunities with boys in terms of education. Specific needs such as more exposure for girls in Science facilities such as laboratory visit and let them use the apparatus (Akumu, 2010). Moletsane (2010, p. iv) suggests that the “poor quality of girls’ educational experiences and the consequent negative impacts on their learning outcomes, including performance in national and international examination, remain problematic especially in Mathematics and Physical Sciences”. The number of girls studying Physical Sciences and Mathematics in schools can be used in education to measure gender inequality and the quality of girls in learning experiences. Girls’ ability to perform well at school is affected by the negative stereotypical discourses and impacts on their learning opportunities (Huisman & Smith, 2009). This starts from daily school practices by the teachers that may discourage females from pursuing studies in Physical Sciences, Mathematics, Technology and Technical subjects. They regard girls as people who are good in domestic and physical labour such as cooking and keeping the classroom neat every time. Chabaya et al. (2009), as well as Mugaga & Akumi (2010) pointed out that gender stereotypes are a central property of exclusionary practices that result in females underachieving in, as well as leaving school early.

2.3.2. Social Factors

2.3.2.1. Lack of female role models

Most the boys and girls in Africa and the United States imagine scientists as a “white man who has unusual hair, wear glasses and laboratory coats” (Kahle et. al., 2000 p. 15). Thus, the females perceive Science subjects as masculine as they learn that the best scientists were men (Chikuvadze and Matswetu, 2013). This contributes to discouraging girls in South Africa to continue with science courses and complete their studies in Physical Sciences (Mwamweda (2011). This kind of stereotypes affects the Science career in most the girls. That also promotes racial gender

stereotypes. That also sends the message that good scientists are for white men. For girls to see themselves as scientist, there must be more women who are scientists (Roberts 2002).

According to Lee and Osborne (2003), most schools in the Southern African Countries (SADEC) region lack female role models. Especially in the African communities, there is a lack of female role model scientists and Mathematicians (Lee, 2003). Girls in South Africa need role models to collaborate with them (Chikuvadze, 2013). They need to meet face to face with successful women scientists (Buck 2000). The more they collaborate, the more girls will get encouraged. Female science teachers in schools can also act as their role models who can inspire young girls towards pursuing the sciences. Once girls in high schools observe that there are more female teachers who are offering the subject, they will wish to pursue the Science studies. This might make them wish to become science teachers. Therefore, the lack of female role models in Science and Engineering has been cited by different authors in the field as a potential problem, particularly regarding making classroom science relevant to pupils' everyday life experiences (Roberts, 2002; Rasekola, 2001).

2.3.2.2. Early teenage pregnancies and the socio- economic status of the family

Most the girls find themselves affected by early teenage pregnancies (Kasanda and Shaimemanya, 2008). Teenage pregnancy leads to fewer girls taking sciences in schools. Furthermore, in the deep rural areas, they do not allow girls to further enrol with their studies. They inform them directly that girls should get married and "ilobolo" (bride price) should be paid (Stake, 2006). They still have that stereotypic attitude that girls should look after their husbands and produce children. The less number of females in a school causes more boys to pursue science studies and attracts fewer females in science field. However, in African countries, they experienced the origins of stereotypes where a woman is viewed as someone who is supposed to be a mother and a future wife (Stake, 2006). Teenage pregnancy promotes gender stereotypes and hinders the provision of quality education for girls even in developing countries (Davidson, 1993).

According to Mwetulundila (2011), in African countries, gender stereotypes shape societies and girls' thinking and were forced by Western countries when they bring missionary education. Origins of stereotypes also include the socio-economic status of parents, especially fathers as the ones who decide who go to school (Mwetulundila, 2011). Some parents believe that girls should get married and be provided for by the husband. They believe that to take a girl child to school is a waste of resources like time and money (Flemming, 2000). This is because one day the girl will

get married and leave the family. According to Davidson (1993) & Osborne (2003), the socio-economic factors and teenage pregnancy, the traditional role of African women, have always been that of a future wife and mother producing children and cooking for the family. This shows the experiences and origins of gender stereotypes in African countries (Osborne, 2003).

Gender stereotypes begin early in life of children (Gender Bias in the Classroom, 2009) when children start to interact with the environment in different ways. As children grown up, there is some modification and adjustment of stereotypes and the other part of stereotype remain permanent in their lives (The Development of Gender, 2001). Gender stereotype is also promoted by parents, peers, siblings, adults, community, older children and teachers at schools, as children grow up and develop socially, physically, cognitively and emotionally (Gender Norms, 2012). There are several factors that promote gender stereotypes in society, which are physical differences and self- fulfilling prophecy (Kane 2009). Physical differences are observed between males and females, which make them to behave differently. The reason that makes girls not perform well (Vedantam, 2006) in Physical Sciences and Mathematics is that they have been told by their parents directly or indirectly that only boys are good and capable of dealing with Mathematics and Science. That makes the girls being less confident to handle Physical Sciences and Mathematics. Self- fulfilling is where stereotypical behaviour of males and females and their life experiences from their birth, childhood, adolescence and adulthood they accept that they are naturally born like that Kane and Mushi (1996) pointed out that boys are free when it comes to the world outside than girls; since they are not affected by the teenage pregnancy. They like to take risks to any kind of job they wish to do and become successful and they get hired very easily since they are also not affected by the maternity leave. Boys are likely to promote the development of significant skills in the teaching and learning of Physical Sciences by doing hands on work such as building car toys, fixing electrical appliances. Curiosity, confidence, investigation and observation are the skills that boys develop faster than girls. According to Mushi (1996), boys relate to Physical Science quicker than girls, since boys are having experience in everyday life than girls, who have slimmer chances. Furthermore, Harding (1996) suggests that in the classroom, boys and girls have not had equal opportunities in Physical Sciences and Mathematics activities, and this could lead to gender stereotypes in Physical Sciences achievement. The above explanation shows boys as having good experience than girls, since boys have more role models than girls (Murphy, 2002).

Children from households with few economic and social resources, compared to those who came from affluent households, are better than those from with few economic social resources in terms of enrolling in primary schools (Huisen, et al, 2009). On the other hand, due to the gendered division of roles in the household and the community at large, that will cause gender stereotypes, where more boys continue to dominate in schools in terms of numbers. The study also found out that girls continue to enrol less, number in schools and more likely to drop out early in lower grades, as compared to boys and end up illiterate.

Moletsane (2010) further pointed out that the way in which schools are located has an impact on the schooling experiences of learners. In KwaZulu-Natal, most parents are scared to take girls in schools which are not closer to their places. They suggest that most girls become the victims of rape, where they send boys into schools. That makes more boys dominate with education in schools, even in Mathematics and Physical Sciences. In South Africa, gender inequality filters into the classroom in multiple and interrelated ways which include the teacher's attitude about gender, curricula, gender and sexual violence against girls, learner vulnerability to unplanned parenthood (Commission for employment Equity Annual Report, 2013). The study recommends six factors that are aimed at keeping girls in schools and continue to enrol in Mathematics and Physical Sciences. The first factor is that schools should develop explicit specific gender policy and goals. The second factor is that schools should establish more meaningful and enhanced engagement between schools and local societies. The third factor is that schools should identify teacher development programmes dealing with gender issues in education. The fourth factor is that schools should identify leadership development programmes that cultivate school leaders. The fifth factor is that schools should improve coordination between the government departments dealing with girls and females' well-being development and the last factor is that schools should monitor the set targets at all levels of education, with consistency and concerted effort.

2.3.3. Cultural beliefs

In most communities, the basis of gender stereotypes is controlled by cultural beliefs (Mwamwenda, 2004). Cultural beliefs refer to the different ways in which boys and girls, as well as males and females, are expected to conduct themselves in our societies (Kinoti, 2012). These

cultural beliefs only oppressed females and place males on the better advantage than girls. For a women failure to follow cultural beliefs, is followed by reinforcement based only on females. Based on gender stereotype, some people expect females to be stigmatised, valued, despised, devalued and respected (Wilde, 2009).

Gender discrimination and beliefs are based on cultural norms, experiences, personal beliefs and attitude that assume that some people would not succeed, especially girls, at high schools (Eccles, 2006). That is suggested by teachers when they discourage girls. On the other hand, Lane & Rosser (2002) pointed out two barriers faced by female educators and the causes of gender discrimination and stereotypes. The first barrier is the low numbers that are caused by teachers themselves in high school. The second barrier is that it is very hard to balance career and family. Teachers themselves are always discouraging girls, by saying work outside is for men who studied Science.

Mothers have an influence on choosing careers for their children, while fathers rank as second most influential (Thompson & Rogers, 2006). According to Bernard (2000), schools and teachers are the main perpetrators of stereotype that harm girls. Examples of such stereotypical perception is where boys are excelling in Physical Sciences, Mathematics and Computer Sciences, girls are regarded as good in office work. According to Jovanovic (2006), most parents and teachers still have the tendency that boys are more capable in Mathematics and Physical Sciences than girls, which forms gender discrimination. Jovanovic (2006) presents the argument concluding that in the middle school years, there is a drop in girls' confidence. They do not imagine themselves succeeding in studying Mathematics and Physical Sciences.

On the other hand, girls are then motivated, based on stereotypes, to continue to follow cultural norms instead of Physical Sciences and Mathematics. In some other schools, they give aptitude test if students are interested to study. The noticeable idea is that boys always score higher marks than girls. The above claim is supported by a proof from a survey of the 1st grade educators (Fennema & La France 1998). The bottom line about these stereotypes is the discrimination against women in most public schools caused by educators.

According to Lee & Osborne (2003), gender stereotype is also caused by people's attitudes, the way we grew up from our families. On the other hand, Buck (2000) argues that friends, romantic partners, peer groups and counsellors of education can motivate or discourage the children, based

on Science subjects. For example, if a male partner studies Physical Sciences his partner too is likely to do the same. A male partner succeeds first at university, when a female asks him if she could pursue Science studies, she is highly likely to be discouraged (Buck, 2000). The weakness from a female partner would follow the man's idea (Davidson, 1993; Osborne, 2003). Eccles (1987) demonstrates four factors which need to be checked whether the child does have it or not namely: interest in the subject, utility, attainment value and cost. Cost, attainment and utility are the socialisation processes associated with gender. Financial constraint causes parents to pay for their sons' school fees than their daughters and disadvantage the girls from getting the chances of education, because they cannot afford to pay both especially to be scientists (Kasanda and Shaimemanya, 2008). According to Mwetulundila (2011), Malawi is in the same way with Namibia, where girls struggle to further their education until standard 8, which is grade 10. Parents have an attitude that it is unnecessary to educate girls in lower grades since they would not finish school and might become pregnant at an early stage, which forms cultural beliefs. These attitudes developed especially in the deep rural communities in Malawi and Namibia (Kasanda and Shaimemanya, 2008).

According to the National Science Foundation (NSF) (2008) there are low numbers even today, of women in the field of Physical Sciences, Computer Sciences and Mathematics. However, George (2000) discovered that students have an attitude towards Sciences, especially girls in tertiary institutions. According to Darbyshire & Flicker (2009), as well as George (2000), 23% of women reach the level of professors. The women or girls tend to be associated with people who need to work as domestic workers, not holding the status of education as part of gender discrimination. These gender discrimination and beliefs are cultural norms caused by our families and communities. However, Osbourne (2003) point out four factors influences gender stereotypes in science and attitudes towards Science, especially girls, namely: gender, personality, curriculum variables and structural variables.

2.3.4. The state of Science Education in South Africa

The underrepresentation of women in the Physical Sciences and Mathematics subjects is increasing rapidly in the Sciences faculties, even at higher education institutions and in the science career field (Hazarl & Potvin, 2005). Similarly, the influence of socialisation and culture play a

significant role in determining women's perceptions of decision making, attitudes towards Science and the interest in Mathematics and Sciences. In pre-tertiary, senior secondary schools and further education and training, learners are given the options to choose Physical Science careers. Girls in high school do very well in Science but they decline in numbers, especially when they reach tertiary level. Some of the girls do not enrol for Science studies as they choose to do degrees in Music, Social work and Law.

Ivie et al (2001) further explain that socialised differences must do with the cultural bias of Physical Sciences and the masculine image of science, which is transmitted socially, academically and pedagogically. The underrepresentation of women in Science is also influenced by socio-cultural influences on girls and the impact of the masculine image on Mathematics and Sciences (Hazarl, 2005). On the other hand, Potvin (2005) suggests that feminists have different beliefs and practices perspective about Science. Stereotyped social expectations of girls, as well as nurtures and caregivers, impact on the girls' choices to the study the sciences (Ivie, 2005). However, the state of Science Education in South Africa is affected by three factors which are gender science and the social context, family and home environment. The three factors above contribute to the lower number of girls in Physical Sciences and Mathematics. This study reflects the situation in this district. The statistics extracted from the six Uthukela district schools which are offering Physical Science on an annual basis. The data indicate participation rates of boys and girls in Physical Sciences at the beginning of the FET band, which consist of grades 10, 11 and 12. The focus was on grade 10 enrolment between boys and girls. The data indicate clear average differences of 5.84% between the numbers of boys and girls enrolling in Physical Sciences. The data are comparing the number of boys and girls in Physical Sciences stream. Furthermore, the data favour boys in the five-year period, as the ones with have the highest number in Physical Sciences. This difference stood at 12.9% in favour of the boys in 2010.

2.4. THEORETICAL FRAMEWORK

The theoretical framework used in this study is the social learning theory in teaching and learning (Bandura, 2007). "Social learning refers to human behaviour as a dynamic, reciprocal interaction based on personal factors, behaviour and living environment" (Sharf, 2002). The theory further explains gender stereotypes as learned early in life of the people as they grow up in the society

(Atkinson, 1998). Bandura (2007) maintains that the social context is the primary site for learning. He suggests that people observe others on what they are doing and this in turn gives others a framework from which the action is taken. Social learning theory is based on behaviour of people in the society, observation, modelling and cognitive processes that depend on reinforcement or punishment. The societal expectations and norms influence gender stereotypes in social learning theory (Ellis, 1997). Societal expectations which include ethnicity, sexual orientation, race, norms and class play a major role in gender stereotypes. When some people make career choices, their decisions depend on others and they do not take personal actions. For instance, males may learn that boys do not become nurses and females may learn that girls do not usually become engineers. These are the impacts of stereotypes, which are called gender- based career identification. From families, that is the way girls and boys grow up in their home backgrounds. Boys and girls, when they select their careers they do not do this from their personal interest, but they seek the assistance of their parents or teachers, as well as the community expectations, which can be either reinforcement or punishment. They do not consider a child's talent, personality and opportunity from contributing to career decision (Bandura, 2007).

Cultural stereotypes also influence gender stereotypes (Ellis, 1997). According to the Zulu culture, a number of customs and practices give men more decision-making powers and more praise by the women, so females grow up observing this issue at school and even in the classroom situation (Kinoti 2012). Furthermore, Ellis (1997) pointed out that cultural stereotype is accepted by the girls without knowing of this acceptance. Stereotypical cultural behaviour may be observed in others, internal recognition of such behaviour is less common.

Furthermore, the study uses Bandura's concept of social role (Bandura, 2007). According to Bandura (2007), gender stereotypes form and change in response to people observing the social roles between men and women within a culture. He argues that gender stereotypes can be learnt directly or and indirectly. Social interaction involves direct learning; while on the other hand, mass media interpret social interaction in an indirect way. These stereotypes are based on cultural stereotypes (Koenig and Eagly, 2012) which are based on observations that are associated with social groups such as men and women with their typical role-linked activities. The example that is associated with typical role activity is that in high schools, girls are associated with Biology rather than Science, Technology, Engineering and Mathematics (STEM) (Galdi, Cadinu & Tomasetto,

2014). Gender stereotypes are formed by people and can be changed by people, through observing members of different social groups that is related to role-activities. Social role theory assists us to understand why gender stereotypes vary across nations. In different contexts, the observation of counter stereotypic is that science courses are related to men. However, television shows such as the soapies are related to the females.

Gender relations develop daily through socialization in schools, as well as in society. This is where teachers and people from society point out that certain kinds of sports are for boys only. Modelling plays a major role where it is common to find a child stating that they never saw a boy or girl participating in a certain sport. For instance, certain sports codes are gender balanced but rugby is the only sport that has no females participating in it (Bandura, 2014). These will be the result of the actions and ideas of the individual groups. Local and global powers are related to gender and how gender is constructed (Kethusegile, 2000: 26).

2.5. SUMMARY

This chapter has addressed the factors responsible for gender stereotypes in the teaching and learning of physical sciences. This section also described the theoretical framework used to map out the research, which is the social learning theory and other theories that are related to it. The theoretical framework is based on international context and extended to other African countries, as well as Western countries. Theoretical framework will thus be examining how such knowledge can be transferred in combating the prevalence of gender stereotyping in the South African context.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. INTRODUCTION

The purpose of this research is to explore Physical Sciences teachers' views and experiences of gender stereotypes in the teaching and learning of Sciences. In that view, the qualitative research method was employed to answer the research questions. The semi-structured interviews were used in data collection. This chapter therefore presents the following issues: the qualitative methodology, and sampling, data collection tools, data analysis, ethical considerations, as well as the limitations of the study.

It is thus essential to revisit the research questions. The study is thus guided by the following research questions:

- (1) What are Physical Science teachers' views of gender stereotypes and teaching?
- (2) What are Physical Science teachers' experiences of gender stereotyping/ discrimination?
- (3) How does Physical Science teachers' experience of gender stereotyping shape their professional lives and beliefs?

3.2. RESEARCH DESIGN

Research design refers to a systematic plan used by the researcher to collect and analyse data that is needed to answer the research question (Bertram and Christiansen, 2014). Research design describes the methods for conducting the study, including the when, from whom, under what conditions the data is to be obtained (McMillan and Schumacher, 1993, p.31).

This is a qualitative study within an interpretive paradigm. A paradigm, according to Guba cited in (Cresswell, 2008: 10) refers to "the basic set of beliefs that guide actions" that guide the epistemological beliefs, perceptions and assumption a researcher has about particular phenomena. This study adopts the interpretive paradigm. The study focuses on teachers' views and experiences; this paradigm includes teacher circumstances, context and people response in each situation (Bertram and Christiansen, 2014). This paradigm includes teacher circumstances cannot be used to change the social world. People behave and respond differently and respond in complex ways than plants and animals (Bertram and Christiansen, 2014).

According to Bertram and Christiansen (2014), the interpretive paradigm aims to develop an understanding of how people make sense of the contexts in which they live and work. In this instance, the study aims to describe and understand how Physical Sciences teachers make sense of their worlds, especially in gender stereotyping in the teaching and learning of physical sciences.

3.3. LOCATION OF THE STUDY

The study was located in the Estcourt circuit, Uthukela district, in KwaZulu-Natal (KZN). The research involved three secondary schools which are offering Physical Sciences at grades 10, 11 and 12. The schools are in both rural and urban areas of the province. Two rural and one ex-Model C schools were used in this research. The two rural schools are far away from the town, which is 30 km away from town. In addition, the schools accommodate one race, which is Africans only. Both rural schools are under-resourced. The researcher chose these two rural schools as they have issues to do with human resources, poor educational facilities, water and electricity. Furthermore, it was also the researcher's interest to find out whether these factors have an influence on gender stereotypes.

In the same way, the researcher wanted to establish if these factors affect gender in terms of teaching and learning? These are the types of schools which are offering Physical Science subjects without science laboratories. The schools are affected by poor socio-economic background of the surrounding residents. In fact, both the teachers and the learners in the schools come from previously disadvantaged backgrounds. The teachers are the people from the same area who went to tertiary institutions and come back as teachers to act as role models to their learners. The learners experienced social dilemmas such as alcoholism and drugs abuse. These are the kinds of learners whom the educators interact with daily. The people around the area, especially the adults in the community, still believed in cultural issues. They belong to a society of oppression and exploitation. On the other hand, the ex-Model C school is a well-resourced school in which the teachers and learners are staying within the school premises. However, the problem of drugs is also experienced in the ex-model C school. Some other learners have a background of being abused. The school accommodates different races, where the teachers must observe multicultural classes. The school has two laboratories, one for Science and one for Life Sciences which is also known as Biology. The community around the school is the people who were educated and not affected by poor socio-economic background. They are culturally diverse.

3.4. SAMPLING

Dawson (2007, p. 49) describes sampling as the process of “choosing a smaller, or more manageable number of people to take part in the research”. I used purposive sampling since “it is used to access those who have in depth-knowledge about particular issue” (Cohen, et al. 2007, p. 115). Hill (2012) suggests that the main consideration in choosing a sample, in a qualitative research, is to select a sample that adequately answers the research questions. In a qualitative study which uses narrative inquiry as a research design, the main aim is to enrich the understanding of an experience. Those kinds of studies require “the collection of full and saturated descriptions” of these experiences (Polkinghorne, 2005, p.138), which in turn adds to the quality of data collected.

According to Cohen et al (2007, p. 113) the selection of the respondents for the research is informed by the strategy of convenience and it involves choosing the nearest individuals to serve as participants. In choosing the schools described above, the idea was that these schools were situated close to the place where the researcher works and resides. The effective cost in terms of travelling, time, petrol money and effort was less and reasonable.

The selection of respondents should be those participants that have lived through the experience and thus provided important accounts of the experience under investigation (Polkinghorne, 2005). This could provide substantial contributions to the investigation and enrich the understanding of the experience. Furthermore, Polkinghorne (2005) argued that the selection of the research sample should be guided by a set of principles. In this research, the purposive selection of respondents was guided by three vital and related factors. Firstly, the respondents have experiences and seen all the different changes that have taken place in the physical sciences curriculum. The group of physical sciences educators chosen for this study has been in the profession since 1996. Through these years, they have taught Physical Sciences to the different grades in the FET band and they are currently teaching Physical Sciences in grades 10, 11 and 12.

Secondly, Cresswell (2008) suggests that it is very significant to choose participants who were willing to reflect on their emotions and can verbally describe it. Hill (2012) crystallizes this by emphasizing that talk is a crucial ingredient in qualitative study, since the stories that participants relate are a means of shedding light on the phenomenon being investigated and a means of action. Regarding this research, teachers were required to divulge deep emotions and cognizance had to be taken of the sensitivity of the issue being studied. It is because emotions are not directly

observable; the researcher had to depend on the respondent's ability to reflect on their experiences and to be able to effectively communicate these experiences. It has been argued that recruiting for qualitative studies can be difficult since the researchers would be asking potential participants for a lot of time, investment of energy and disclosure of personal feelings (Hill, 2012). Carefully planning is essential, thought and consideration had to be given to strategies to successfully acquire the respondents who would enable me to accomplish the purpose of this study. Initially, the researcher compiled a list of ten educators who have experienced the various changes to the science curriculum and who would be available for the interviews. The researcher had frequently met these teachers at the cluster meetings, moderations and the marking of senior certificate examination marking centre. They formed the participant's pool from where I could choose my sample. After negotiating with these teachers via e mail, cluster meetings and workshops organized by the Department of Education (DoE), the researcher was successful in acquiring the research sample of participants who were willing to articulate their thoughts and feelings about the curriculum changes.

Thirdly, researchers should be aware that the sample should be small, that will give an understanding of responded stories is intense and in depth, and not superficial. Polkinghorne (2005) further suggested that the unit of analysis in qualitative research is experience and not individual or groups. The study is not interested in how much data are collected and from how many sources, but rather to collect data that would be rich enough to provide clarity and understanding of the teachers' views, experiences and beliefs about gender stereotypes. According to Polkinghorne (2005), qualitative research uses a small number of participants.

The researcher finally decided to select a sample of six participants, from each school which adds to three schools and six educators. The participants included two Deputy Principals (DP) two Head of Departments (HOD) and two post level one from different schools. All the three schools selected displayed differences and similarities. They are different in terms of resources, while rural schools are similar in terms of facilities. The class sizes in the rural schools ranged from 45-70, while in the urban school they ranged from 20-25. The staff consists of one principal, two deputy principals, six senior management team and teachers for various subjects in the rural areas. However, in the urban school, the staff consists of one principal, one deputy principal, two SMT members and various Physical Science teachers who were willing to teach different subjects. The

enrolment of one school in the rural area was 1718, with 320 learners studying Physical Sciences, while in the urban school; the learner population was 710, with 60 learners studying Physical Sciences³⁰, 65 and 51 per grade from grade 10-12. These three schools offered physical sciences from grade 10-12 and had one teacher per grade teaching this learning area.

The six participants of Physical Sciences were willing to take part in the study were Pretty, Asavela, Thobeka (females), Thabo, Lulama and Lethokuhle (males). The names of participants were changed to protect their identity; the above names are shown as changed already. Correspondingly, these participants form a heterogeneous group and share similarities that are critical to obtaining data for this research. These educators have been in the profession since 1996 and are presently teaching Physical Sciences in three secondary schools. The researcher did not base his choice of study participants on the age, but rather on their experience as Physical Sciences educators. It was felt that this group of educators would be able contribute the best valuable information about the topic of gender stereotypes and towards the topic researched and that most learning could take place from them.

3.4.1. Gaining access to schools

After identifying the schools to use for this study, I then carefully planned how I would contact and secure the operation from the relevant educational officials and respondents.

I started the process by consulting the principals of the schools face to face, where I made an appointment with each school principal. The appointments were set up at the convenience of the school principals. Letters asking for permission to conduct this study at their schools were hand delivered to the school principals. In the letter, the purpose of the study, the identity of the researcher and his associations with the University of KwaZulu-Natal, as well as the contact details of the supervisor, were included. Arrangements were then made for the convenient place to meet with the Physical Science educators who were to participate in the study. The initial meetings were arranged via e-mails and telephonically at the teachers' convenient time and I briefly outlined the purpose of the study and requested their permission to participate.

3.5. DATA COLLECTION METHOD

3.5.1. Semi - structured interviews

Data refers to “the evidence that the researcher collects to shed light on the particular questions they are asking” (Bertram and Christiansen, 2014, p. 71). In this study, the researcher used the interview method, which is semi – structured interviews. Semi-structured interviews are an interchange of views on a topic of mutual interest, between a researcher and the respondent (Cohen, et al, 2007). Semi- structured interviews will be open-ended questions. Semi- structured interview questions will be used to gather data on a biographical information, background, academic background, and family, information about choice of career and personal views, practices and in science education. Teachers from grades 10, 11 and 12 will be humbly requested to participate, in the study and all ethical considerations will be strictly adhered to. In qualitative research, Cresswell (2008) pointed out that an inquirer asks participants broad, general questions, collects detailed views of the participants in the form of words and analyses the information for description and themes. Through the semi-structured interviews, the researcher sought to understand Physical Sciences educators’ views, experiences, beliefs, and practices in relation to gender stereotypes professional lives. In this way, the researcher could get first-hand information from the educators.

The six participants were interviewed, with the aim of establishing how they dealt with the challenges of gender stereotypes in the teaching and learning of Physical Sciences in grades 10, 11 and 12. The researcher allowed the participants to speak freely without interfering. Participants could use the language of their choice, which were both IsiZulu and English to them. They were also free to express their feelings and emotions. Cohen, et.al (2007) demonstrated that in feminist research, there must be a process of conscientisation, not research solely by experts for experts, but research that empowers the oppressed participants. In that view, the semi - structured interview questions were designed to conscientise the participants about the current situations about gender stereotypes in schools and communities.

According to Oakley (1981, p.41), “the goal of finding out about people through interviewing is best achieved when the relationship of interviewer and interviewee is non- hierarchical and when

the interviewer is prepared to invest his/her own personal identity in the relationship”. Based on that, the semi- structured interviews were employed to structure the interview and as a way of assisting the researcher to control and direct the conversation. The non-hierarchical type of a relation was achieved, since the researcher had a common experience in the teaching and learning of Physical Sciences in grades 10, 11 and 12. Four semi- structured interviews were done in the principals’ offices at the rural schools. The reason is that the schools do not have extra classrooms. At the ex – Model C School, two semi-structured interviews were conducted in the Physical Science laboratory. The reason why they were conducted in the school laboratory was because the laboratory is situated far away from the classes. The environment was acceptable at both rural and ex-model C school.

The types of questions asked were open-ended because they “enable the interviewer to test the limits of respondent’s knowledge and allow the interviewer to take a truer assessment of what the respondent really believes” (Cohen, et al. 2000, p. 275). Probing is one of the methods used by the researcher to gain a deeper understanding and clear up misunderstandings between the interviewer and the participants. Participants were also given a chance to ask questions in return and they could show their emotions. Similarly, (Cohen, et al. 2000) caution researchers about closed-ended questions. Cohen, et al (2000, p. 275) noted that “closed-ended questions can result in the unexpected answers which may suggest unthought-of relationship or hypotheses”. In view of that, the researcher only used closed-ended questions in the biographical or background information. The researcher was also cautious about issues of ambiguity and less formal interview hence, he made all efforts to make the participants stick to the points without rhetoric.

The interviews were all face-to face between participants and the interviewer. The researcher also tape-recorded the interviews, which were later transcribed. In this study, the researcher was not only interested what the interviewees had to say, but also kept an eye on their emotions. The researcher thus noted voice inflection and the emphasis placed by the speakers.

As a Head of Department (HOD) in his school, the researcher was careful not to include teachers from his department, since he thought this might compromise the quality of the research. That is why the researcher invited teachers who belonged to different clusters, although we are on the same region. According to Bhopal (2000, p.74) it is important to take this into consideration. Bhopal argued that “when the interviewer and the interviewee operate from shared realities, there

may be the tendency of undermining one another”. Cohen and Manion (1980, p. 270) noted that “the unstructured interview is open situation, having greater flexibility and freedom”. In the same way, they further point out that “less formal interview is free to modify the sequence of questions, change wording, explain terms or add to them” (Miles and Huberman, 1980, p. 271). In this study, the interview process was done in such a way that would allow participants to speak freely.

One of the participants was very soft spoken and there was a lot of noise in the background. The researcher had a difficult time transcribing his interview. He listened to it more than five times in order to make sense of what he was saying. The fourth participant did not clearly understand some of the questions. The researcher had to ask by himself in a polite manner to do another interview on the next day. He thus requested the researcher to ask some of the questions in his mother tongue of which the researcher agreed and was satisfied at the second time. The researcher must admit that it really helped a lot to conduct interviews by him because he could recall some of the conversations he had had with the different educators. This helped a lot during the transcription.

3.6. DATA ANALYSIS

Data need to be simplified before analysing it. Miles and Huberman (1994, p. 10) define data analysis as the analysis that is made by three flows of activity which are data reduction, data display, conclusion, drawing and verification. The recorded semi- structured interviews were transcribed and hard copies of these were made. Cohen, Manion and Morrison (2007, p. 368) suggested that when interviews are recorded, data are likely to be lost, distorted and then further reduced during transcription. They pointed out that when doing transcribing, the following should be taken into consideration by recorded: “what is being said by the participant, the fluctuation of the voice, the tone of the voice of the speaker, emphasis placed by the speaker, interruptions and any other events that were taking place at the same time that the researcher can remember”.

The process of transcribing took long but it was convenient to do, rather than asking research assistants. Moreover, the researcher then identified the different themes in which data could be categorised. The next step was listing all the six teachers’ responses for each question in one category. The researcher realised that it took a long time and hence, identified themes to code transcripts. He used different marking pens to code different concepts. For instance, by highlighting teachers’ views, experiences and beliefs with different colours using a marking pen. While analyzing the data, it was realised that some of the teachers’ responses fell into more than

one theme, meaning that another theme would then be written next to the first one in a different colour, using marking pen. It was difficult to categorise some of the teachers' responses and the researcher had to look at the questions that led to such responses, or the questions that followed. Some of the themes identified could be combined into one bigger theme and this was done when writing up the analysis and presenting the findings of the study.

After categorizing, data were analysed using the method called content analysis. Content analysis refers to a process by which the “many words of texts are classified into much fewer categories (Weber, 1990:15)”. The major feature of qualitative data analysis is coding. Coding is “when the researcher views a set of piled field notes transcribe and be able to dissect them meaningfully while keeping the relations between the parts intact” (Miles, & Huberman 1994, p. 56). Furthermore, Miles & Huberman (1994, p. 56) explain that codes are attached to chunks of varying size, words, phrases, sentences connected or not connected to a setting. When doing coding, the researcher must bear in mind that codes can either be straight forward or they can be used in the form of a metaphor.

In this study, the data were analysed by paying attention to the responses per three research questions. This method was helpful as it draws together all the data pertaining to the same research question. It makes the data to be conveniently available to the researcher and easy to analyse the data. In data analysis, Huberman and Miles (1994: p. 56) describe that “it is not the words themselves, but the meaning of words that matters”. In the same way, the researcher then identified the themes that emerged from the data collected. The next step entailed interpreting the themes and these themes were then presented in chapter four as the findings.

3.7. ETHICAL ISSUES

The behaviour that is considered as right or wrong is known as ethics (Bertram and Christiansen, 2013, p. 65). In this study, the researcher considered ethics as vital. The University of KwaZulu-Natal's Ethics committee granted the researcher an ethical clearance certificate for the study: Ethical Clearance Approval Number or Protocol reference number: HSS/0402/015M (Annexure C).

The key issue of consent by all six educators who participated in the study was also considered. Consent refers to the participants agreeing to voluntarily take part in the study. Consent forms

were signed by the participants to show that they agreed to be interviewed. The other issue which was explained to participants is that they had the right to withdraw if they wanted to do so, or they had the right not to answer question which they felt could harm them or they were not comfortable answering. Non-maleficence entails that the research should not harm any participant or any other people who are involved in the study (Cohen et al., 2007). The study dealt with teachers' views and experiences of gender stereotypes, questions which harm people were therefore avoided. The participants were asked if they are satisfied, if they needed their information to be published to the public or not. Confidentiality was maintained to protect the participants. The names of participants were changed to protect their identity as well as their schools. Beneficence refers to the study research that is of benefit. Participants, researchers and community should benefit about from the study. In that view, participating in this study might hopefully sensitize teachers to avoid reinforcing gender stereotypes in their classrooms. All physical sciences teachers from the three schools received clear explanation of what the research study expected of them. Participants were requested in advance if the interviews could be tape recorded, and they all agreed.

3.8. TRUSTWORTHINESS AND DEPENDABILITY OF DATA

Trustworthiness, dependability and transferability are the basic epistemological standards for any qualitative research. "Trustworthiness refers to the standards of truth and value, as well as the neutrality of the researcher" (Bertram, 2004). The consistency of research findings and transferability to the applicability of the research findings is known as dependability. Firstly, to ensure trustworthiness of the findings of the study, the researcher employed the use of one data collection method namely semi structured, in- depth interviews. This could be verified and obtained from the other. It was also found that interviewing male teachers alone was not enough, because they might provide biased views. In the same way, female teachers were also interviewed. The aim of employing the in-depth interviews was to enhance trustworthiness.

3.9. LIMITATION OF STUDY

This research was limited by the availability of the participants for the interviews. All the Physical Sciences teachers, three females and males from two rural and one ex - Model C school were currently teachers within Uthukela district, Estcourt circuit teaching grade 10,11 and 12. The major limitation of this study is that data were generated from a small sample of teachers who are also

from a restricted geographical area. The results of the study might therefore not be representative of most other Physical Sciences teachers from other areas. However, it is not the intention of this study to generalize findings to other contexts, but to reveal certain patterns regarding the different ways in which Physical Sciences teachers position themselves within socially constructed discourses of gender and education. Moreover, due to the number of educators who participated in the study? Due to the number of interviewees which are teachers, the research findings cannot be generalized for Uthukela district in the Estcourt circuit as well as the province of KZN.

3.10. SUMMARY

This chapter discussed the on methodology employed in answering the research questions: the research design and sampling were described alongside the data collection methods. Data analysis was also described. The researcher also described the limitation of study, trustworthiness and credibility, as well as the ethical consideration.

CHAPTER 4: DATA PRESENTATION AND DISCUSSION

4.1. INTRODUCTION

This chapter presents and discusses the data generated from the three male and three female secondary school teachers in Estcourt KwaZulu-Natal. Data presented here include all six teachers' recorded semi-structured interviews from each teacher. Teachers expressed their views and experiences of gender stereotypes in the teaching and learning. Furthermore, teachers also discussed their experiences of gender stereotypes in education and how these shape their professional lives and beliefs. Data will be presented according to research question in this chapter.

It is thus essential to revisit the research questions. The study is thus guided by the following research questions:

- (1) What are Physical Science teachers' views of gender stereotypes and teaching?
- (2) What are Physical Science teachers' experiences of gender stereotyping/ discrimination?
- (3) How does Physical Science teachers' experience of gender stereotyping shape their professional lives and beliefs?

The semi-structural interviews were coded using pseudonyms for all six teachers. The participants will be referred to as Zukiswa, Thobeka, Asavela, Thabo, Lulama, and Lethokuhle.

4.2. RESPONSES FROM SCIENCE TEACHERS VIEWS OF GENDER STEREOTYPES

4.2.1. Research Question 1: What are the science teachers' views of gender stereotypes and teaching?

4.2.1.1. Different understanding of gender stereotypes

One of the questions posed to the teachers on their views about gender stereotyping was their understanding of gender stereotypes and the causes of gender stereotypes. They started by

explaining what stereotypes mean and they also explained the causes of gender stereotypes, according to their views. All six teachers explained gender stereotypes and gave examples of how this manifests itself either in the community or at school. Furthermore, they also explained causes of stereotypes in the following ways.

Zukiswa, for example describe gender stereotypes as:

The behaviour of the individual based upon their sex.

Thobeka defined gender stereotypes as:

The responses to observe males and females in different social roles, based on masculine and feminists in schools and community.

Asavela viewed gender stereotypes as:

The social interaction that exists and that associate social groups such as women and men with their typical roles in schools as well as the community.

The findings of study suggest teacher's views on gender stereotypes as differing from one educator to the other. Bandura (2007) viewed gender stereotypes as learned in early life of the people as they grow up in the society. He further explains gender stereotypes as people who are observing others of what they are doing and this in turn gives others a framework from which action is taken. The relationship between gender stereotypes and social roles suggested by Bandura & Sharf (2002) is that both are based on the behaviour of people in the society, observation, modelling and cognitive processes that depend on reinforcement or punishment. According to Commonwealth Secretarial, (2008, p. 2) gender stereotypes are the social differences between males and females, that have been learned over time and may differ within and between cultures, rather than the biological characteristics.

Thobeka and Asavela shared similar views that gender stereotypes have to do with social roles between males and females. For example, that fathers when they do mechanical work in their cars, they call the boys to assist them, even in gardening. In the same way, mothers they like to call their daughters to watch them and teaching them how to cook as well as sewing.

On the other hand, Zukiswa differed with the other two participants as she viewed gender stereotypes as the behaviour of the individual, based upon their sex, which is based on biological explanation. It means that is the way males and females are expected to behave in our society and schools, as if they are born like that. Furthermore, Du Plooy-Cilliers and Louw (2003, p. 52) define “stereotypes as a perceptual generalisation about a group of people or things. It applies the presumed characteristics of the group to an individual member of the group, without considering the unique characteristics of the individual member”.

4.2.3. Causes of gender stereotypes

Furthermore, the teachers were asked about gender stereotypes: what are their causes and their origins, to which participants mentioned a variety of things. One of the key sources they mentioned was the behaviour of the teachers, almost all the participants agreed that the behaviour of the teachers, communities and schools in which the learners grew up played a major role in the development of gender stereotypes. Behavioural norm is the way people show a certain kind of behaviour which favours certain groups which might be females or males.

4.2.3.1. Teachers as causes of stereotypes

Zukiswa stated that:

The behavioral norm of the teachers in the classroom is the main cause that divides gender role stereotypes between males and females in schools, as well as societies. The way males and females behave in our communities and the influence within societies promotes gender stereotypes...As an educator, from my own view, the behavioral norms of educators are the main causes that divide gender roles through males and females in the classroom situation. Some teachers used to compare the performance between boys and girls in class. In their mind, learners see it is important to divide them. It is because even teachers have that attitude.

Thobeka viewed that:

Teachers are the ones who are the main perpetrators for this kind of gender stereotypes. Division starts from the classroom situation, where our teachers say no girl will share a desk with a boy. The majority of boys and girls don't share a desk with the same sex, although others do so but they are few.

Lulama suggest that:

The stereotypes of teachers continue in lower and higher grades, where girls remained unnoticed and unrecognized in their work in physical sciences by teachers. This was evident during reporting time in the SASTE (South African Association for Science and Technology Educators), (2005) and during internship. Female teachers were not taken into serious consideration or rewarded for the effort they put in the teaching and learning in physical sciences.

This has been witnessed by Lethokuhle:

Physical sciences are the field that suffers the greatest lack of females compared to other disciplines. Boys in high schools, especially science classes, always rated female teachers significantly lower than male teachers in all three disciplines, additionally girls underrate female teachers only in physical sciences than other fields.

According to Young (2000), women as a group undergo specific forms of gender exploitation in which their energies and power are expended. Furthermore, findings suggest that participants viewed that the interpretation of gender stereotypes about gender differences in Physical Sciences, Technology, Mathematics and Engineering is stronger in Physical Sciences than in other subjects. Students rate female teachers as they are good in Chemistry and Biology, while male teachers are good in Physics, Mathematics and Technology. Gilbert (2008) suggests that the way teachers interact with their students is one of the causes of gender stereotypes in the classroom environment. Masland (1999) & Flemings (2000) noted that treatment of teachers on both boys and girls which is negative on the girls is one of the causes of gender stereotypes. Bandura (2007) also pointed out that gender stereotypes are formed by people and can be changed by people, by observing members of different social groups. This is related to role-activities.

Lulama observed that:

Boys received a lot of positive praise and attention from their physical sciences teachers, alternatively girls are neglected and received a negative attention.

Findings also suggest that teachers tend to give more attention to boys in Physical Sciences classes than any other discipline and more esteem building motivation to boys. The praising of boys by our teachers is much higher, especially when the correct answer is suggested by a boy. Similarly, when girls suggest correct answers, the response from the male educators will be saying “OK” or “OH” with a lower voice. Participants said educators give boys more praise than girls in the classroom. Even when assessment is done in the classroom (Ruble & Martin, 2008) more examples are based on boys than girls. For example, in most question papers, more examples favour boys than girls, more sports examples are used such as cricket, soccer and rugby as being played by males as the majority (Martin & Ruble, 2008). By receiving this kind of response from teachers, the girls’ behaviour sends a negative message about their value in physical science class. Teachers also experienced that gender stereotype is much stronger in Physical Sciences, Technology, and Mathematics than any other subjects such as Biology, History, Tourism and Business Studies.

Thobeka suggested that:

Difficult problems are given to boys and more attention is given to boys, while easier problems are given to girls and less attention is given to girls.

According to Sadker & Sadker (1994), educators accept more calling of answers from males than from females. Boys used to shout the answers but girls are called into order to remember and follow class rules. On the other hand, females received more attention than boys through their physical appearance. Girls used to receive compliments from their physical science teachers more often than boys, on their overall performance such as clothing, hairstyle and the way they dressed.

Overall, the teachers felt that the disrespect of girls by boys during teaching and learning in physical sciences is a direct result of these discourses that inculcate and reinforce male superiority while denigrating females. That also affects the results of physical sciences, where you find that boys will perform better than girls. Girls are also disrupted during the year by pregnancies. These are one of the consequences that make the performance of girls to decline in physical sciences, technology and mathematics. Teachers can minimize the impact of gender stereotypes in schools.

This has been witnessed by Lethokuhle:

One of the reasons why I left science in grade 10, is because one of my physical sciences teachers tried to harass me in the laboratory after practical's after all students left the class. He used to ask me to remain behind as if I didn't understand while he was teaching.

However, according to Dweck, Davidson, Nelson & Enna (1978), girls are praised more for neatness while boys received praise for recognition of academic achievement. Findings suggest that these are the consequences of exploitation that were implemented by our teachers in our schools. They were choosing careers for the learners, where they channel boys in the physical sciences classes and girls in biology classes. Lulama reported that girls felt pressured that they are treated differently from boys.

Thabo also suggested that:

Male teachers used to spend more time with boys in the classroom and give them challenging problems, while they spent less time with girls and give them unchallenging problems.

According to Boatwright & Egidio (2003), a gender stereotype is one of the main factors that contribute to the lack of inspiration and female role models. Gender role model expectation for females may decrease aspirations for young girls at high school, invested in maintaining their socially feminine gender identity. Other findings were that girls left Physical Sciences because they do not believe in themselves and they felt that they are discriminated against. Gilbert (2008) argued that lack of aspiration is the main cause of gender stereotypes in classrooms, communities, schools and even in churches. Gender is observed and learnt at a younger age and people grow up with it. The majority of the teachers are not aware that they are promoting gender stereotypes, that their beliefs and practices are based on segregated classes, gender biased instructional material.

4.2.3.2. Behaviour of males and females in schools and communities

Participants further suggested that:

Some women perceived their husbands to be their owner and rule their lives and children. In fact, we as females are made from men. We are here to serve their needs no matter how hard the situation is.

Lulama pointed out that:

My father pressurized everyone at home. I was pressurized to study mathematics and physical science. The main reason why he pressured me is that he was studying science without laboratory. Furthermore, my father informed me by saying that in the industry where he is working, there are no females who are in the laboratory. There is no support that was provided by teachers to fight against this kind of stereotype.

Findings also suggest that gender stereotypes examine a variety of teacher's beliefs which are in line with improvement and effectiveness of the schools. Findings also point out that in some communities; parents are not promoting gender stereotypes. Instead, they tried to encourage their daughters to study physical sciences. Stake (2006) argued that teacher's beliefs that some parents also have an influence on their children's choices in high school level causes gender discrimination which is either positive or negative. Lulama's father showed a positive stereotype about physical sciences, unlike Thabo and Lethokuhle, who indicated negative stereotypes about girls.

Lulama reported that:

Girls are active in the cleaning up of the apparatus and I even ask them to become my laboratory assistants, they like to help in the cleaning and washing apparatus, while boys are not treated like girls and vice versa.

Thabo suggested that: Lulama added that:

The influence comes from their parents that cleaning is a girl's work from their homes, even society takes cleaning as a labour division that is associated with women.

The girls have tried to live up to societal demands by colluding with their subordination.

There are those girls who have never seen women teaching Physical Sciences and mathematics. These are the myths about who does and who doesn't. Girls have accepted that there are very few females who are offering the subject such as physical sciences and mathematics.

Asavela reported that:

Later in grade 11, I joined Physical Sciences, because we were having a new female teacher...Some teachers used to take advantage of young girls if they know that they come from a poor female background.

Origins of stereotypes are also caused by the socio-economic status of parents, especially fathers since they are the ones who decide who goes to school (Mwetulundila, 2011). Most girls also find themselves affected by early teenage pregnancies (Kasanda and Shaimemanya, 2008). Findings of this study suggest that the lack of female role models especially females is the cause of lack of aspiration and gender stereotypes and in the teaching and learning of physical sciences.

Asavela reported that:

From my own experience, sex is not a good predictor of academic skills, emotions and interest of a human being.

However, Thabo disagrees with Asavela:

The majority of the girls think that physical sciences are “a male thing” and are performing well in sciences. The only thing that we can use to close the gap is to have the same sex role model that will motivate our learners in a different way. Male teachers feel that girls avoid to be taught by them; on the other hand, female teachers feel that being a woman is enough to motivate girls and taught by them, even some of us as males.

The findings from this study suggest that in schools and communities, learners are not treated equally. According to Lee and Osborne (2003), most schools in Southern African Development Community (SADC) region lack female role models. Girls oppressed themselves; it is because they are quick to jump out during the laboratory cleaning, even some teachers promote oppression. Even when there is a practical demonstration, they are quick to stand in front and watch activities, but they do not want to be hands on when it is their turn. Some activities in Science classes are for boys, while others are expected to be done by girls.

4.3. RESPONSES ON TEACHERS' EXPERIENCES OF GENDER STEREOTYPES

4.3.1. Research question 2: What are Physical Science teachers' experiences of gender stereotyping/ discrimination?

4.3.1.1. Culture as a cause

Experiences of gender stereotypes are also observed in the social context such as homes and communities. The experiences of gender stereotypes are also influenced by schools and tertiary institutions as well as cultural norms. In answering the second research question of the study, Physical Sciences teachers suggested different cultural norms experienced in their homes and communities.

4.3.1.2. Cultural beliefs

Asavela suggested that:

This is not allowed in our village that the girl can share a bench with a boy even in our homes; this is how we grew up, since I'm from rural areas.

In most communities, the basis of gender stereotypes is controlled by cultural beliefs (Mwamwenda, 2004). Findings point out that even today, some teachers still believe in the experiences of that past which oppressed them and lack socialisation with other genders. Gibson and Hardison (2005) suggested that it is the teachers' tendency to view femininity and masculinity as unitary and static gender qualities, which are predetermined by the children's genitalia.

Thabo further suggested that:

The pressure on females to conform to mainly polarised gender stereotypes was practiced at home and reinforced in schools by the teachers.

Zukiswa suggests that:

In our home background, rituals such as funerals make girls and women to feel inferior and see themselves as not important in our societies.

Zukiswa and Thabo further point out that:

In the Zulu culture, a man is taken as the head of the house, whether capable or not. In some families, you realized that a woman is capable than a man. However, customs and norms of our nation affirm males as superior. For example, when someone passed away from Zulu family, males are the ones who pour the soil first in the grave. Women cannot be allowed to do that first since it is believed that it brings bad luck.

Thabo suggested that:

Communities are held by cultural values and knowledge systems and provided fewer opportunities for the construction of alternative versions of gender stereotypes, a number of customs and practices give men more decision-making powers and more praise by the women, so females grow up observing this issue at school and even in the classroom situation.

Furthermore, Lulama also suggested that:

Physical Sciences teachers show their different experiences about gender stereotypes in the teaching and learning. Certain cultural beliefs and practices were used to promote gender stereotypes in the home background and extended into schools.

Lethokuhle reported that:

We know that we cannot allow women to go to “umsamo” and speak with our ancestors...Only males are allowed to go to “umsamo” as a cultural perspective and it has nothing to do with gender discrimination. Even in Muslim, Quran is the one who just teaches people like that the women cannot take any responsibility in the presence of men. The other practice happened in the Bible when God created a man first and later a woman and takes all the responsibility to men.

4.3.1.3. Culture as oppression in our families

Zukiswa indicated that:

Even during mourning time, males cut their hairs before females and girls after the funeral.

Thobeka also indicated that:

When a wife passed away in a family, men wear a mourning cloth for one month, while women have to wear mourning clothes for a year when a man passed away.

Furthermore, Asavela pointed that:

When a woman wears a mourning cloth, she cannot sleep away from home and she must arrive at home before sunset.

Zukiswa further observed that:

If you are a woman you cook with your own pot and not allowed to share dishes, spoons and bath with other members of the same family. In the same way, you wash your body early in the morning with cold water, whether is winter or summer. This shows how widowed women are discriminated culturally.

Findings also point out that these practices oppressed women than men and send the message that a female is not equal to a man (gender inequality) (Boatwright and Krause, 2008). These kinds of beliefs are even applied in schools, where you find the separation of boys and girls. It becomes difficult for boys and girls at school that they must do things together. Findings also suggest that even in the classroom situation, boys do not like to share a desk with girls. It is suggested that culture make a barrier between these two opposite sexes, because they are values and norms. That raises expectations on what girls and boys can or cannot be able to do. These are some of the reasons that frame teachers' beliefs in schools. Some people in our own societies still have the attitude that a good woman is the one who is calm, tolerant, reliable, compromises and coordinates our families. In the same way, the Bible stated that men will be having power over women and the man should support the women. Even when people get married, this is one of the verses that the priest gives to men.

Lulama reported that:

Women should do household chores, and care for the family and children as a culture in other nations.

Participants also indicated that in our communities, a woman is expected to hide her emotions, compromise with her opinions and sacrifice her own dreams. Francis (2004) suggests that “women who have been socialised in an oppressive environment and who accept or absorb the dominant group’s ideology about their own group have learned to accept a definition of them that is hurting and limiting”. In this particular study, the teachers apply certain forces that make girls accept that boys and girls are treated differently by teachers in the teaching and learning of physical sciences. This kind of oppression makes female science teachers not to participate in workshops, which are part of teacher development. These workshops for Physical Sciences require a woman not to sleep over or come home after the sun set. Male teachers can attend workshops even he is in a stage of mourning and sleep over; they advise the man that he must behave. Conversely, these practices affect teaching and learning of Physical Sciences. This is where you find girls in the classroom situation always giving more respect to boys. Gender stereotypes are experienced by female teachers in the classroom and even in our families. According to Scheerens and Bosker (1997), the quality of learning environment in the teaching and learning of Physical Sciences is affected by our social, cultural beliefs and practices that are beyond teachers and school control.

Lulama agreed with Lethokuhle that:

Our culture cannot allow women to take over man in a cultural perspective. For example, women are not allowed to go to “umsamo” to speak to our ancestors.

Women in the Zulu culture have already accepted or absorb the idea, opinion and belief as a practice which is part of gender discrimination and gender stereotypes. The environment where the girls in schools learn and are treated causes a negative effect in the teaching and learning of physical sciences. Findings from this study suggest that girls leave schools at an early stage in grade 10 and 11, often caused by teenage pregnancies and harassment by male teachers. Ironically, some of the pregnancies are also caused by the male teachers in the schools (DoE, 2012).

The findings suggest that teachers exclude girls in Physical Sciences during teaching and learning. The exclusion does not start at school; it begins from our homes background whereby culture is being used as an excuse. Gender discrimination and beliefs are based on cultural norms, experiences, personal beliefs and attitude that are assumed that some people would not succeed in high school, especially girls (Eccles, 2006). On the other hand, our parents have an influence on

their children's subject choices. Parents tend to inform their children about their career and subject choices in high school level. In most of the times, girls do not take their own decisions, but there are in front of them in terms of subject choices. When girls suggest other fields, parents normally inform them that they deserve respect culturally. In the Zulu culture, a child is not allowed to act against the decision of an adult, meaning that the adult's decision is final.

4.4. RESPONSES ON TEACHER'S PROFESSIONAL LIVES AND PRACTICES OF GENDER STEREOTYPES

4.4.1. Research Question 3: How do Physical Science teachers' experiences of gender stereotyping shape their professional lives and beliefs?

In answering, the third question of the study, the researcher also drew from what the teachers told him in the semi-structured interviews which is based on their professional lives, beliefs and practices. The data also show experiences of gender stereotypes in education and how this shapes their professional lives, beliefs and practices.

4.4.1.1. Professional lives and beliefs

Asavela pointed out that:

Teachers still believe that the gap between males and females existed long ago, even today in our societies, and it affects teaching and learning as well as the professional lives of teachers.

Thabo agreed with Asavela that:

Even unequal treatment existed long ago, which affects females in the field of Physical Sciences and you find that females underestimate themselves in the field of science and society as a whole. Even females when they come across problems in Physical Science class, they don't ask each other

to find the solution. They invest trust in boys and always need approval from boys. I also observed even the female teachers in workshops they trust answers that come from male teachers rather than female teachers.

Findings suggest that teachers believe that gender stereotypes still exist in all human societies and in all human endeavours, professions, institutions, as well as careers. The practices in the homes, schools, and workplaces still promote gender stereotypes, where males are regarded as they are better than females in all aspects. According to Helgeson (2005), teachers still believe that gender stereotypes are also caused by the way we grew up and our cultural norms. Hall et al. (2008) noted that “they still believe that stereotypes are a subjective perception of how a man or woman should behave”. Societies expect men and women to behave and perform in certain ways that are different from each other. Communities’ belief is that men are strong and brave while women are homely warm and incompetent (Martin and Halverson, 2009).

4.4.1.2. Biasness in the classroom

Gender stereotypes shape professional lives of teachers in the classroom situation. Stereotypes exist in the classroom and shape the minds of both girls and boys differently (Jones and Powell, 2001). The performance of girls in physical sciences is still low, as compared to boys (Powell, 2002).

Lethokuhle noted that:

Out of three terms, when I record my Physical Sciences marks, boys perform better than girls. Highest marks and better symbols for three consecutive years are obtained by boys. The reason for that is that girls underestimate themselves by believing that boys are smarter than them in science by asking every science question to them.

Asavela agreed with Lulama:

When I’m teaching in class, you find that when more boys are absent or not contributing in my science lessons, I feel as if I never done my work properly, although girls can be active in class, they don’t want to reason further when I do a follow up question.

Findings further suggest that the way textbooks and curriculum are structured makes the performance and achievements of girls to be low. Jones and Dindia (2010) also found out that those teachers' perceptions were consistent with stereotypes of gender differences. Biasness is in the mind of teachers' perceptions about students' courses in Physical Science, where they label Physical Sciences talents between boys and girls (Dindia, 2010). They label girls as not good as boys in Mathematics and Physical Sciences. That affects girls' performance within and outside the classroom.

Zukiswa pointed out:

Negative stereotypes are based on girls, while more positive stereotypes are based on boys in the classrooms situation. Negative stereotypes show how women are good in cooking even in the media, as well as newspapers, while positive stereotypes show how boys are good at fixing cars, as well as electrical appliances.

Etim (2008) suggests that biasness sends a message to girls that although they like Physical Sciences, some teachers suggest that is not for them. Biasness also happens in schools and in societies (Etim & Jones, 2012). Findings also suggest that in schools, they ask girls to cook during school functions and boys fix and wash teachers' cars in the school yard. That sends a message of discrimination amongst genders, gender stereotypes and biasness towards certain gender.

Thobeka pointed out that:

Since I started to study science, all textbooks I read show males as physical science authors. That sends a message of biasness that girls are not good as boys in the classroom.

Findings suggest that teachers often group learners in different genders, where males and females are in equal numbers according to their groups, when teachers give them Physical Science activity. According to Jones (2012), this is one of the reasons they tried to address the issue against gender stereotypes. Furthermore, the findings also suggest that when you give girls the chance to present their homework for Physical Sciences in the classroom, they do not do it. They ask boys to give them their own books and use them to present their work, especially in calculations in Mathematics and Physical Sciences. They would fail to explain the concepts but the calculation is correct. This kind of behaviour depicts girls as incapable in Mathematics and Physical Sciences (Mbunda,

1992). George (2006) also stated that teachers still tend to give up when girls are not giving them the correct answers in physical sciences. Dede and Yaman (2007) noted that teachers do not motivate girls to do extra work by mentoring them for the second time, but boys are told to work it out and on the next day, they would present their answers. Participants also suggest that on the next day, when they asked learners to form their own groups, girls will form their own groups separately from boys. Teachers are the ones who will come with the instructions to balance the gender (Rua, 2000). Some teachers in schools develop the negative attitude about girls, where they expect girls to remain behind after school and sweep classrooms while boys leave earlier than girls. That is also extended in communities that girls are expected to sweep at their homes. Participants also pointed out that in most rural schools in KZN, girls are expected to clean their classrooms and is the way they grew up from home background. Findings point out that in most schools, boys are at an advantage since they leave school earlier than girls while girls are expected to follow school roster to perform cleaning duties, although in most schools there are non-teaching staff that performs the work. Participants also suggested that boys have more time to do their school work, as compared to girls who are expected to perform domestic duties such as cooking and cleaning when they reach their homes. Teachers claim that this is one of the reasons why other girls are not performing better than boys in Mathematics and Physical Sciences.

4.5. SUMMARY

This study found that cultural norms emphasise stereotypes in the community and extended into schools. Females in society are still oppressed due to culture although they spoke out and aware about gender stereotypes. The study further indicates that the society still looks down upon female's human being. Teachers who are causing stereotypes themselves, these kinds of teachers should be conscientised and careful of causing stereotypes in the classrooms.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1. INTRODUCTION

This chapter explores four areas in relation to the study. Firstly, it presents the summary of the study by highlighting significant issues raised in the chapters. Secondly, it uses findings of the study to draw conclusions. Thirdly, it suggests recommendations for further research and for action and lastly, it reports on the limitations of the study.

5.2. SUMMARY OF THE STUDY

The six physical sciences educators reported that participating in this study about gender stereotypes in the teaching and learning and of Physical Sciences benefited them, and it gave them a clear idea about stereotypic attitude that is applied by the teachers within the classroom situation in schools and in the society by the members of the community. There were many differences and similarities in what was reported by the participants. The researcher was however only interested in the similarities that were reported by the participants.

One of the findings from this study suggested that teachers understand gender stereotypes, and that they experienced gender stereotypes in their personal and professional lives. Regarding the origins of gender stereotypes, the teachers noted that gender stereotypes begin in the home and extend to the schools and the role based on masculinity and feminist also promote gender stereotypes, which are causes of gender stereotypes (Gibson & Harding, 2005). Furthermore, the teachers' views also showed that gender stereotypes are much stronger in subjects such as Mathematics and Physical Sciences and Engineering, as compared to other fields. Teachers suggested that this is caused by the behaviour of males and females in schools and communities. Bernard (2000) pointed out that schools and teachers are the main perpetrators of stereotypes that harm girls where they recommend boys as good in subjects such as Physical Sciences and Mathematics. Participants in this study confirmed this and agreed that teachers' experiences play an important role in perpetuating gender stereotypes in schools and in their classrooms. For example, all the teachers in the study agreed that more attention is given to boys than girls in the teaching and learning of Physical Sciences. Another finding suggests that the experiences of Physical Sciences teachers and

the quality of the learning environment in the teaching and learning of Physical Sciences is affected by the teachers' oppression, social, cultural norms, beliefs and practices that are beyond them and school control. That shapes professional lives and beliefs of teachers as well as the biasness in the classroom (Boatwright and Krause, 2008). In the same way, owing to socialisation, some teachers did not readily accept girls as good in Physical Sciences and at the same time, girls did not see other girls as good in mathematics and physical sciences. Furthermore, teacher's gender stereotypes affected their participation in the teaching and learning of physical sciences, as well as their professional lives and beliefs.

The female participants in this study indicated that they sometimes experienced hostile classroom environment during teaching and learning of physical sciences in grade 10, 11 and 12 (hidden curriculum). Another finding suggests that some teachers experienced and observed girls becoming pregnant at lower grades such as grade 10 and 11, even at primary level (Davidson, 1993). On the other hand, teachers experienced dropouts or fewer numbers of girls participating in the subject due to gender stereotypes. Participants in this study felt that teenage pregnancies decreased the pool from which girls doing sciences could be drawn. That has an impact and shapes their teaching and learning experiences, where more boys will dominate the science classroom in terms of performance, as well as in terms of numbers.

Another finding from this study was that science teachers noted other teachers taking advantage of those girls who are from poor socio-economic backgrounds, since they provide them with money and let them fall pregnant and then pay their families. Some females because of the oppressive environment, lost aspirations to their teachers and self-confidence (lack of female role models). Girls were disparaged and they were looked down upon by their physical science teachers, as well as by their classmates who are the boys (impact of stereotypes). Gender discrimination is also promoted by the attitude of the teachers even in the school context (Stake, 2006). This occurs during teaching and learning, where teachers viewed girls given less challenging problems and less time to show their skills on Mathematics and Physical Sciences (hidden curriculum). Girls who tried their best in the teaching and learning of Physical Sciences were not recognised. Moreover, the girls' traditional gender roles such as cooking, cleaning, decorating all domestic work in their homes affect them in the teaching and learning environment (causes of gender stereotypes).

Teachers observed that everything is prioritising women in our days and if there is a bursary it must cater for a certain number of women. If there is a job it must be given to a certain number of women and then more women must do Mathematics and Physical Sciences.

According to Hardiman and Jacksons (1997), Teachers point out that in other families, parents want their children to study Physical Sciences and Mathematics, despite whether they are performing well or not in the subjects, as long as the child have better opportunities in life. Correspondingly, parents and teachers do not want to find out from the learner whether he or she is interested in the subject or not. If the learner does not perform well, they often become aggressive about Physical Science and Mathematics through oppression. Parents use their positions as heads of the house; while on the other hand, teachers use their positions as the head of institution or school. Teachers suggest that the reason why most female teachers did not enjoy Physical Science subjects is that basically, they would study hard and still just get average results, whereas if they study and practice it more, the results will be average again. This is an indication of anger and demotivation on the part of the girl learners. Teachers also noted that cultural norms also cause oppression. In the Zulu culture, women are not allowed to go and speak at “umsamo” with the ancestors; only males from the family are allowed to do that process.

Teachers in this study suggested that some girls did not challenge their oppression against men because of their socialisation. Even men do not want to take anything from a woman since they under-estimate females. In the Zulu culture there is a saying that “Indoda inhloko yekhaya”, meaning that the head of the house is the man, where a woman would not suggest anything. That would make two genders not to socialise, but only instructions should be taken by the women from the men. This is an oppressive gesture towards females. Teachers also suggested that it seems as if it is natural where you find that males are treated better than women.

Teachers also indicated that even in the Bible, God created the man first and take all the responsibility upon the man, which the man should support and look after the woman. Similarly, women were given tasks that they look after and work for their husbands especially in the “*domestic work*” in the family. Teachers also said that in a class, boys have more resilience than girls. They admitted that they used to give them the very same kind of treatment during teaching

and learning. However, they stood firm that someone's gender does not have anything to do with being good at the Physical Sciences.

The teachers further mentioned that boys were socialized in environments where girls were not taken seriously during teaching and learning by some science teachers. Female teachers felt that being women is enough to motivate girls and taught by them, and boys will be good if they are taught by male teachers. The findings of this study suggest that one's beliefs on gender are not a good predictor of academic skills, emotions and interest of a human being. By sharing ideas between boys and girls, this could promote good socialisation that might close the gap during teaching and learning in Physical Sciences and Mathematics. Participants pointed out that the lack of socialisation between boys and girls is one of the barriers that hinder girl's participation during teaching and learning of Physical Sciences in grade 10, 11 and 12.

5.3. RECOMMENDATIONS

Evans (2002) suggests that teacher development is used to disseminate information on and ideas for improving teachers and schools' performance. Gender stereotypes in the teaching and learning of Physical Sciences can also be used to improve teachers' as well as schools' performance to act against stereotypes that exist amongst the schools, as suggested by the participants. The poor performance of girls in physical sciences, as indicated by the participants, can be eliminated by developing teachers using different methods. The kinds of methods such as workshops, inviting outside experts, doing follow up activities, as well as discussion of content in a wider perspective can be used to fight against gender stereotypes (Guskey,2002). Evans (2002) further suggests that science teachers could develop new theoretical ideas and new teaching methods that can be applied and act against gender stereotypes in schools. Guskey and Yoon (2009) point out that the most effective way to bring improvement in teacher development is to have the teachers in each school to meet regularly to explore common problems and seek solutions based on shared experiences and collective wisdom.

According to Peltz (1990), the following strategies could help teachers, parents, communities and schools to overcome the problems of gender stereotypes. Peltz (1990) called the following strategies to appeal to girls' talents, interest and needs called "feminine science.

Based on the findings of this study, the following recommendations are suggested:

5.3.1. Keeping girls and attracting more girls to study physical sciences

Teachers suggested that schools should invite a variety of role models, especially young females who have become successful in sciences, to motivate young girls in school assemblies and certain functions (AAUW, 1989). This could also perhaps make teachers have a good understanding of gender stereotypes, the causes of stereotypes, as well as the behaviour of males and females in schools and communities. Furthermore, teachers highlighted that parents should be invited to counselling programs at least once a term, to shed more light to them about the negative effects of gender stereotypes. Participants also argued that once these kinds of programmes are run throughout the country, we could be having more females or equal number of males and females studying or offering science courses. The findings also suggest that in other families, parents want their children to study Physical Sciences and Mathematics, no matter whether they are performing or not, as long as the child has better opportunities in their professional lives and they believe that they can do better. It has also been noted that parents and teachers do not want to find out from the learners whether is he or she interested on the subject or not, that is one of the reasons why the counseling programs in schools are being recommended. Similarly, Parsons-Chapman (1987) suggests that parents must encourage girls to be independent, to explore and to experiment.

5.3.2. Collaborating

Shulman (2004) define “collaboration as a marriage of insufficiencies, not exclusively.” Teachers viewed that collaboration is essential, where boys and girls and their teachers need to reflect positively on the teaching and learning of physical sciences (Shulman, 1997). During teaching and learning, boys and girls should be grouped equally in any science activity. Equal chances should be given during assessments, and there is the need to run away from a situation whereby boys are given more chances than girls. Findings experienced by science female teachers are that more chance is given to boys to solve difficult problems in class, while the r girls are given the easier problems. This kind of experiences of gender stereotypes shape the professional lives and beliefs of teachers about girls that do not perform well in Physical Sciences. Group work is recommended, where the teacher should group equal number of males and females and give them equal time during presentations, either easier problems or difficult ones. Furthermore, we need to encourage girls to build self-confidence and try to match them with the experience that the boys they have.

5.3.3. Classrooms should be well organised and well equipped with science equipment

One of the differences that were mentioned by the participants is that rural schools achieve lower results in Physical Sciences, as compared to the urban schools, while even girls from rural areas also perform lower than urban girls. Findings suggest that children from rural areas are not exposed to mechanical toys, use of electrical appliances, television, book from public libraries, cinemas and amusement parks. That would make the results of schools decline in Mathematics and Physical Sciences, thereby affecting the performance of the teachers who are offering these subjects. Learners from the urban areas are enriched in education, meaning that the location also plays a major role in student achievement in Physical Sciences and Mathematics (Berk, 2008, 2010). According to Berk (2008, 2010) all schools, either in rural or urban areas, should have access to new Technology which is significant in our school laboratories. Furthermore, teachers need to improve if there is no equipment in schools.

5.4. LIMITATIONS OF THE STUDY

Due to time constraints, the researcher interviewed only six teachers, of which this number could have been increased. The delayed issuing of the ethical clearance from the department of education affected the time frame that the researcher had planned to follow. The researcher feels that the study could have provided more insights if more teachers had participated. Again, interviewing teachers from each school somehow presented limited individual responses. Furthermore, this study provided insight into teachers' views and experiences about gender in science. It can be used as a basis to develop teacher development strategies to sensitize science teachers about gender issues in their classrooms. The research cannot not be generalized to other South African secondary schools and other provinces it only addresses the challenges faced by female and male educators in secondary schools. Moreover, due to the number of educators who participated in the study? Due to the number of interviewees which are teachers, the research findings cannot be generalized for Uthukela district in the Estcourt circuit as well as the province of KZN.

5.5. AREAS FOR FURTHER RESEARCH

This study only focused on gender stereotypes in schools, suggested by the teachers. The other studies may also focus on learners themselves whether there are more boys or girls who are studying physical sciences and look at the causes among learners. Furthermore, other studies will also point out whether there are any gender stereotypes applied by the learners amongst each other. Other studies may look at it from the perspective of human rights commission not happy about the number of females represented in different positions in private sector as well as government sector. Political other studies may look at that there are less number of females who are MEC'S and presidents of the countries compared to males in parliament.

5.6. CONCLUSIONS

This study explored physical sciences teachers' views and experiences of gender stereotypes in the teaching and learning of sciences three critical questions: What are Physical Science teachers' views of gender stereotypes and science teaching? What are Physical Science teacher's experiences of gender stereotyping/ discrimination in the teaching and learning of sciences? How do Physical science teacher's experiences of gender stereotyping shape their professional lives and beliefs?

Data for this qualitative research was generated through semi- structured interviews. Findings in my study point out those girls in high school experienced oppression. Alternatively, girls also had to have more role models who will encourage them in physical sciences.

I presented the series of recommendations which teachers, schools and parents could employ to change the current situation in the teaching and learning of physical sciences. I further recommend that there should be collaboration between teachers, schools and parents as a way of improving the role of girls in the teaching and learning and fight against gender stereotypes.

REFERENCES

American Association of University Women (1993). *Hostile hallways: The AAUW survey on sexual harassment in America's schools*. Washington, DC: Author.

Atkinson, R. (1998). *The life story interview*. Sage.

Akumu, C. E., & McLaughlin, J. W. (2014). Modeling peatland carbon stock in a delineated portion of the Nayshkootayaow river watershed in Far North, Ontario using an integrated GIS and remote sensing approach. *Catena*, 121, 297-306.

Anthias, F., & Yuval-Davis, N. (2005). *Racialized boundaries: Race, nation, gender, colour and class and the anti-racist struggle*. Rutledge. USA.

Bianchini, J. A., & Colburn, A. (2000). Teaching the nature of science through inquiry to prospective.

Baird, D. (1996a). The blowgun as a teaching tool. *The Physics Teacher*, 34(2), 98-100.

Baird, D. (1996b). The book of phyz (11th ed.). Unpublished manuscript.

Ballenden, C., Davidson, M and Newell, F., (1985). *Better chances for girls. A handbook of equal opportunity for use in schools*. Victoria Institute of Secondary education. Melbourne.

Bass, B. M. (2000). The future of leadership in learning organizations. *Journal of leadership & organizational studies*, 7(3), 18-40.

Ben-Elia, E., Boeije, H., & Ettema, D. (2010). Qualitative analysis of commuters' responses to rewards for rush-hour avoidance Britain

Bertram, C. (2004). *Understanding research: learning guide and readers*. Second edition. Pietermaritzburg: University of KwaZulu-Natal.

Bertram, C. & Christianson, I. (2014). *Understanding research, -: An introduction to reading research*. South Africa.

Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching*, 43, 485-499.

Boatwright, K.J. and Egidio, R.K. (2003). Psychological predictors of college women's

leadership aspirations. *Journal of College Student Development*. September/October 2003. Retrieved 5 May 2008, from <http://findarticles.com/p/articles/mi>.

Bosire, J., Mondoh, H. & Barmao, A. (2008) Effect of streaming by gender on student achievement in mathematics in secondary schools in Kenya' *South African Journal of Education* 28 pp.595-607.

Buck, G. M., Vena, J. E., Schisterman, E. F., Dmochowski, J., Mendola, P., Sever, L. E., ...& Olson, J. (2000). Parental consumption of contaminated sport fish from Lake Ontario and predicted fecundability. *Epidemiology*, 11(4), 388-393.

Buck, Martin, María-Trinidad Gallegos, David J. Studholme, Yuli Guo, and Jay D. Gralla. "The bacterial enhancer-dependent $\zeta 54$ (ζN) transcription factor." *Journal of bacteriology* 182, no. 15 (2000): 4129-4136.

Bhaya, D., Davison, M., & Barrangou, R. (2011). CRISPR-Cas systems in bacteria and archaea: versatile small RNAs for adaptive defense and regulation. *Annual review of genetics*, 45, 273-297.

Bhopal, K. (2000). Gender, race and power in research process: South Asian women in East London. In Truman, C., Mertens, D. M., & Humphries, B. (Eds.), *Research and Inequality*. (pp.67- 79). London: University College London.

Cohen, L. Manion, L. & Morrison, K. (2007). *Research methods in education. 6th edition*. London and New York: RoutledgeFalmer. Cohen, L., Manion, L. & Morrison, K. (2000). *Research methods in education. 5th edition*. London and New York: RoutledgeFalmer

Cohen, L. and Manion, L. (1980) *Research methods in Education 3rd edition*. London: RoutledgeFalmer

Chabaya, O., Rembe, S., & Wadesango, N. (2009). The persistence of gender inequality in Zimbabwe: factors that impede the advancement of women into leadership positions in primary schools. *South African Journal of Education*, 29(2), 235-251.

Chin, H. Y., & Bernard-Opitz, V. (2000). Teaching conversational skills to children with autism: Effect on the development of a theory of mind. *Journal of autism and developmental disorders*, 30(6), 569-583.

Chikuvadze, P., & Matswetu, V. S. (2013). Gender stereotyping and female pupils' perception of studying Advanced Level Sciences: a survey of one province in Zimbabwe. *Gender and Behaviour*, 11(1), 5285-5296.

Creswell, J. H. (2008). *Qualitative and mixed methods research*, presentation at the University of Kwazulu Natal, 15th October 2008.

Costa Jr, P., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: robust and surprising findings.

Darbyshire, J. (2009). *Lost in darkness and distance: Why girls don't want to be scientists – and how the classroom might fix it*. Retrieved November 21, 2009.

Darling-Hammond, L., Chung Wei, R. Andree, A., Richardson, N. and Ophanos, S. (2009) Effective teacher development: What does the research show? *In Professional learning in the learning profession: A status report on teacher development in the United States and Abroad*. National Staff Development Council.9-13.

Davison, J., (1993). School attainment and gender: Attitudes of Kenya and Malawian parents towards educating girls. *International Journal of Educational Development* 13 (4) 331-8.

Dawson, K., Jinks, S., & Di Pietro, M. (2007). Considering implementation and use in the adoption of an LMS in online and blended learning environments. *TechTrends*, 51(2), 35-53.

Department of Women's Affairs (1997), National Gender Policy, Republic of Namibia.

de Lange, N., Mitchell, C., Moletsane, R., Balfour, R., Wedekind, V., Pillay, D., & Buthelezi, T. (2010). Every voice counts: Towards a new agenda for schools in rural communities in the age of AIDS. *Education as Change*, 14(S1), S45-S55.

Duncan, W.A., (1989). Engendering school Learning: Science, Attitudes and Achievement Among girls and Boys in Botswana. *Studies in Comparative and International Education No 16*, Institute of Educational Education, University of Stockholm

Eccles, J.S...1994.... "Gender roles and Women's Achievement-Related Decisions." *Psychology of Women Quarterly*, 1987,11,135-172.

Eccles, J.S...2012.... "Understanding Women's not Educational and Occupational Choices: Applying the Eccles et.al. Model of Achievement-Related Choices "Psychology of Women Quarterly", 1994, 18, 585-609.

Evans, L. (2002) What is teacher development? *Oxford Review of Education*, 28 (1) 123-137.

Guba, E. G. & Lincoln., S. (1998). *Competing paradigms in qualitative research in*

landscape of qualitative research: Theories and issues. California: Sage Publications.

Guskey, T.R. AND Yoon, K.S. (2009) What works in professional development? *Phi Delta Kappan*. March 2009. 495-500.

Greany, K. (2008) 'Circles in the sand: challenge and reinforcement of gender stereotypes in a literacy programme in Sudan' *Gender and Education* 20(1) pp.51-61.

Greary, D. (1998) 'Research finds gender stereotypes to be accurate, part of nature' <http://www.apa.org/monitor/dec98/gender.html> (Accessed 15 May 2007).

Harding, J. R. (1996). The teaching of nonmarital sexual abstinence and members' sexual attitudes and behaviors: the case of Latter-Day Saints. *Review of Religious Research*, 51-60.

Hill, (2012). Risky Behaviors in Teenagers,? a Global Issue: Evaluation of an Evidence-Based Intervention to Reduce Risky Behaviors with Implications for Practice, Education and Research.

Jones, R. L. (Ed.). (2006). *The sports coach as educator: Re-conceptualising sports coaching*. Routledge.

Kahle, J. B. (2000). Will girls be left behind? Gender differences and accountability. *Journal of Research in Science Teaching*, 24, 961-969.

Lee-Osbourne, J., Worley, P. F., Malinow, R., & Cline, H. T. (2006). Increased expression of the immediate-early gene *arc/arg3.1* reduces AMPA receptor-mediated synaptic transmission. *Neuron*, 52(3), 461-474.

Handelsman, J., Cantor, N., Carnes, M., Denton, D., Fine, E., Grosz, B., ...& Sheridan, J. (2005). More women in science. *Science*, 309(5738), 1190-1191.

Ifegbesan, A. (2010) 'Gender stereotypes belief and practices in the classroom: The Nigerian postprimary school teachers' *Global Journal of Human Social Science* 10(4) pp.29-38.

Jovanovic, J. (2006) 'Stereotype threat in the science classroom' <http://www.reeis.usda.gov/web/crisproject/pages/190593.html> (Accessed 15 May 2007).

- Kahle, J. B. & Lakes, M. K. (1983). The myth of equality in science classrooms. *Journal of Research in Science Teaching*, 20 (2), 131-140.
- Kane, G. C., Fichman, R. G., Gallaughar, J., & Glaser, J. (2009). Community relations 2.0. *Harvard business review*, 87(11), 45-50.
- Kasanda, C.D. and Shaimemanya, C., (1998). *Factors hindering the provision of quality education for girls in Namibia*. In Otaala, B and Mostert, L (Eds.). *Issues in Education: An occasional Publication of the Faculty of Education. University of Namibia and the National Institute for Educational Development.*
- Kinoti, K. F. (2012). *The effects of grass strips on crop growth, yield and terrace development* (Doctoral dissertation).
- Kelly, A., (1987), Socialization in particular society. In Kelly, A (ed.), *The Missing Half* Manchester University Press.
- Knupfer, N. N., (1998). *Gender Divisions across Technology Advertisement and the WWW: Implications for Educational Equity*. *Theory Into Practice* 37(1) 54 - 63.
- Langen, A. V., Bosker, R. & Dekkers, H., (2006). Exploring cross-national differences in gender gaps in education. *Educational Research and Evaluation*, 12, 155-177.
- Layton, D. (1981). "The schooling of science in England, 1854–1939". In MacLeod, R.M.; Collins, P.D.B. *The parliament of science*. Northwood, England: Science Reviews. pp. 188–210. [ISBN 0905927664](#). [OCLC 8172024](#).
- Layton, D. (1981). "The schooling of science in England, 1854–1939". In MacLeod, R.M.; Collins, P.D.B. *The parliament of science*. Northwood, England: Science Reviews. pp. 188–210. ISBN 0905927664. OCLC 8172024.
- Lee, V. E., & Burkam, D. T. (2002). *Inequality at the starting gate: Social background* .
- Ministry of Basic Education and Culture (MBEC) (1997; 1998) *Annual Reports presented to the National Assembly of the Republic of Namibia*. Windhoek. Shakeshaft, C., (1995). Reforming Science Education to Include Girls. *Theory Into Practice* 34(1) 74 - 79.
- Mushi, S. L. P. (1996). Esl Student Teachers' Observed Abilities to Reflect on Practice Teaching in Tanzania an Experiment on Explicitly Taught and Spontaneous Reflection.

Murphy, J. J. (2002). A profile of teaching techniques used in the university classroom a descriptive profile of a US public university. *Active learning in higher education*, 3(1), 54-67.

McMillan, J. H. & Schumacher, S. (1993). *Research in education: a conceptual Introduction*(Third ed.). New York: Harper Collins College Publishers.

Mwetulundila, P. N. (2000). Why girls aren't fitfully participating in science and mathematics in Namibia. In *Reform forum* (Vol. 5, pp. 14-23).

Mwamwenda, T.S. (2011) ' Teachers' gender stereotypes in South Africa: A case study' *Journal of Psychology in Africa* 21 (4) pp.611-614.

National Gender Policies:

www.un.org/womenwatch/confer/beijing/national/natplans.htm

Audit of Legislation that Discriminates on the Basis of Sex/Gender, Republic of South Africa, <http://cge.org.za/publications.htm>

National Science Foundation. (1999). Women, minorities, and persons with disabilities in science and engineering: 1999 (Electronic version). Arlington, V.A.: U.S. Government Printing Office.

National Science Foundation. (2008). Female share of S&E postdoctoral fellows, by field: 1996 and 2006 (Electronic version). (Division of science Resources Statistics). Arlington, V.A: U.S.A.

Oakley, A. (1981). Interviewing women: a contradiction in terms. In H. Roberts (Ed.) *Doing feminist research* (pp.30- 61). London: Routledge.

Ornstein, A. (2005). The relationship between the frequency of hands – on experimentation and students attitude towards science. PhD dissertation. Central Connecticut State University, New Britan, Connecticut.

Osborne, J. (2003). Attitude towards science: a review of the literature and its implications. (Electronic Version) *International Journal of Science Education*, 25(9), 1049-1079.

Pollina, A. (1995, September 1). Gender balance: Lessons from girls in science and mathematics. *Educational Leadership*, 53, 30-33.

- Phipps, A. (2007). Re-inscribing gender binaries: Deconstructing the dominant discourse around women's equality in science, engineering, and technology. *The Sociological Review*, 55, 768-786.
- Prokop, P., Tuncer, G., & Chuda, J. (2007). Slovakian students' attitudes towards biology (Electronic version) *Eurasia Journal of Mathematics, Science & Technology Education*, 3 (4), 287-295.
- Rosser, S. V.; & Lane, E. O. (2002) Key barriers for academic institution seeking to retain female scientists and engineers: Family – unfriendly policies, low numbers, and harassment (Electronic version). *Journal of Women and Minorities in Sciences and Engineering*, 8(2), 163-191.
- Rosser, Sue V., and Eliesh O'Neil Lane. "Key barriers for academic institutions seeking to retain female scientists and engineers: Family-unfriendly policies. Low Numbers, stereotypes, and harassment." *Journal of Women and Minorities in Science and Engineering* 8, no. 2 (2002).
- Ruble, D., and Martin, C. "Gender Development." In W. Damon (series ed.) and N. Eisenberg (vol. ed.), *Handbook of Child Psychology: Vol.3 Social, Emotional; and Personality Development*. Hoboken, N.J.: Wiley, 1998.
- Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. *Developmental psychology*, 42(1), 70.
- Scalise, K., Timms, M., Moorjani, A., Clark, L., Holtermann, K., & Irvin, P. S. (2011). Student learning in science simulations: Design features that promote learning gains. *Journal of Research in Science Teaching*, 48(9), 1050-1078.
- Shakeshaft, C., (1995). *Reforming Science Education to Include Girls*. *Theory Into Practice* 34(1) 74 – 79.
- Shulman, L.S. (1997) Professional development. Learning from experience. In B.S. Kogan, ed) *Common schools uncommon futures: a Working consensus for school renewal*. New York: Teachers College Press. Reprinted in Shulman, L.S. (2004) *The wisdom of practice: Essays on teaching, learning and learning to teach*. California: Jossey Bass.
- Shulman (1987) Knowledge and teaching: Foundations of the new Reform. *Harvard Educational Review*, 57 (1), 1-22.

Stake, J. E. (2006). The Critical Mediating Role of Social Encouragement for Science Motivation and Confidence Among High School Girls and Boys. *Journal of Applied Social Psychology, 36*(4), 1017-1045.

Taber, K. S. (1991). Girl-friendly physics in the national curriculum. *Physics Education, 26*(7), 221-226.

Tenenbaum, H. R., Snow, C. E., Roach, K. A., & Kurland, B. (2005). Talking and reading science: Longitudinal data on sex differences in mother-child conversations in low-income families. *Applied*
Wolpe, A., Quinlan, O., & Martinez, L. (1997). *Gender equity in education: A report by the gender equity task team, department of education, South Africa.*

Thompson, K., & Rogers, M. J. (2009). Statins Prevent Bisphosphonate-Induced γ , δ -T-Cell Proliferation and Activation In Vitro. *Journal of Bone and Mineral Research, 19*(2), 278-288.

Vedantam, S. (2006). Male scientist writes of life as female scientist. *The Washington Post*, A10.

Weber, J. (1990). Measuring the impact of teaching ethics to future managers: A review, assessment, and recommendations. *Journal of Business Ethics, 9*(3), 183-190.

Wolpe, A., Quinlan, O., & Martinez, L. (1997). Gender equity in education: A report by the gender equity task team, department of education, South Africa.

Young, I.M. (2000). Five faces of oppression. In M. Adams, W.J. Blumenfield, R. Castaneda, W. H. Hackman, M.L. Peters and X. Zuniga (Eds), *Readings for diversity and social justice* (pp.34-49). New York: Routledge.

Young, A. (2000). *Gold into base metals: productivity growth in the People's Republic of China during the reform period* (No. w7856). National Bureau of Economic Research.

ANNEXTURES

ANNEXURE A: INTERVIEW QUESTIONS

Biographical questions (Background information)

Name of a teacher:

School Name:

(1) TYPE:

PRIM	SEC	COMBINED	OTHER
------	-----	----------	-------

(2) AGE:

20-25	30-35	40-45	OTHER
-------	-------	-------	-------

(3) NUMBER OF YEARS IN SERVICE:

1-10	10-20	20-30	OTHER
------	-------	-------	-------

(4) GRADE TAUGHT:

10	11	12	OTHER
----	----	----	-------

(5) SUBJECT TAUGHT:

PHY SCI	MATHS/ PHY SCI	LSC/ PHY SCI	OTHER
---------	----------------	--------------	-------

Critical questions:

(1) What are the science teacher's views of gender stereotypes and teaching?

- (1) What do you understand about the word gender?
- (2) What do you understand about the word stereotypes?
- (3) What is the difference between gender and stereotypes?
- (4) What are types of stereotypes do you know?
- (4) What kind of stereotypes does affect your school?
- (5) What are the causes of gender stereotypes?
- (6) Do you think boys and girls have their own favourite subjects?
- (7) Do you think culture has an influenced on gender stereotypes?
- (8) Do you think socialization affect gender stereotypes?
- (9) How does home background contribute to gender stereotypes?
- (10) How many were you at school in grade science class 10, 11 and 12 when you at school?
- (11) How many boys and girls were there?
- (12) Is there anyone in your family who studied physical sciences before at high school?
- (13) Who influenced you/ advised you to study physical sciences?
- (14) Why do you think they influenced you?
- (15) What are the main reasons taking you in physical sciences?
- (16) Do you think our communities are aware about gender stereotypes?
- (17) Do you think our parents are aware about gender stereotypes?

(2) What are science teacher's experiences of gender stereotyping/ discrimination in the teaching and learning of science?

- (1) Do you have a laboratory in your school?
- (2) How were duties divided in the laboratory amongst all of you?
- (3) Did your teachers treat boys and girls equally in grade 10, 11 and 12?
- (4) Who were the favourites group during teaching and learning?
- (5) Have you ever being discriminated in school or tertiary institution?
- (6) In what way you were discriminated?
- (7) Who were participating most during physical sciences lessons between boys and girls?
- (8) Why do you think boys or girls were not participating in the lessons?
- (9) What did your discover about boys and girls during teaching and learning in the classroom situation?
- (10) From your view now, what do you think are the reasons for lack of participation of boys or girls in the teaching and learning?
- (11) How does a cultural norm have an impact on gender stereotypes?
- (12) Do you think boys and girls lack aspiration?

(3) How do science teachers' experiences of gender stereotyping shape their teaching in education their professional lives, beliefs and practices?

- (1) How does a self concept affect gender stereotypes?
- (2) Do you think teachers have expectations about girls and boys?
- (3) What kind of expectations have you noticed?
- (4) Does gender role affect gender stereotypes?

(5) What do you think should be done to encourage girls or boys participation in physical sciences?

(6) Have you ever noticed any stereotypic comments amongst students?

(7) Do you think can we use sex to predict someone's intelligence?

(8) Do you think you deserve the same attention as boys and girls in the classroom?

(9) What are teacher's beliefs about girls or boys?

ANNEXURE B: INFORMED CONSENT

Dear participant

My name is Bonginkosi Sanele Nsuntsha, I am studying towards Masters Degree at the University of Kwazulu-Natal, Pietermaritzburg campus. Part of the requirement to complete my degree is conducting a research. The aim of my study is to explore physical sciences teacher's views and experiences of gender stereotypes in the teaching and learning of sciences and my long term objective is to see more teachers participating in the teaching of physical sciences especially females.

As an educator who participate in the teaching of physical sciences and a cluster coordinator in the ward. I am requesting you to participate in my study. I will conduct in depth interviews to find out yours views and experiences of participating in the teaching and learning of physical sciences. I am therefore requesting you to give as much in depth information as you can and to be honest in your responses. The research is not only for my qualification but its aim is to contribute to gender equity and underrepresentation of females in the teaching and learning of physical sciences. Your honest response will assist be highly appreciated.

All interviews will be tape recorded and be transcribed. I will take approximately an hour or a maximum of one and half hour of your time. As a participant you have a right to withdraw statements that you feel should not be included in the study. Participation in my study is voluntarily and therefore is not obligatory. For confidentiality your names will not be used during interviews or in the study. I will use a pseudonym. Interviews questions are not too personal. However, during the in reviews you have a right not to respond to a question that you feel uncomfortable with. You can also ask questions of clarity during the interviews. You are therefore requested to sign an informed consent form as an indication that you have agreed to participate in the study. The form is not a binding document as I have said you are free to withdraw your participation any time. You are free to contact my supervisors and ethics committee for more information.

INFORMED CONSENT DOCUMENT FOR PARTICIPANTS

I _____ (full name of participant) hereby confirm that I understand the contents of this documents and the nature of this study, and do consent to participate in the study.

I understand that I am free to withdraw from the study at any time if I want to withdraw without any negative undeniable consequences to myself. If you have any questions relating to the rights of research participants, you can contact Ms Phume Ximba and the contact details are below.

I am consenting to the following data collection:

	YES	NO
Audio recorded individuals interviews		

Signature of participant

Date

Signature of witness

Date

Thank you in advance

Bonginkosi Sanele Nsuntsha

House No 54
8th Avenue
Forderville
Estcourt
3310
E mail: 41999576@mylife.unisa.ac.za
Tel : 036 352 5965: Cell : 0766705053

SUPERVISOR'S DETAILS

Dr :Nonhlanhla Mthiyane
School of Education
College of Humanities
University of KwaZulu - Natal
Pietermaritzburg
3200
Tel : 033 260 6131
E mail: mthiyanen@ukzn.ac.za

ETHICS COMMITTEE DETAILS

University of KwaZulu-Natal
Research Ethics Offices: HSSREC
Private Bag x54001
Durban, 4000
Telephone +2731 260 3587
Email: ximbap@ukzn.ac.za
Email: HssrecHumanities@ukzn.ac.za

ANNEXTURE C: GATEKEEPER'S LETTER



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Nomangisi Ngubane Tel: 033 392 1004 Ref.:2/4/8/406

Mr B.S Nsuntsha

House No 54

8th Avenue

Fordeville

ESTCOURT

3310

Dear Mr. Nsuntsha

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **“GENDER STEREOTYPING IN THE TEACHING AND LEARNING OF PHYSICAL SCIENCES”**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the

intended research and interviews are to be conducted.

6. The period of investigation is limited to the period from 15 May 2015 to 15 June 2016.

7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.

8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below.

9. Upon completion of the research, a brief summary of the findings, recommendations or a full report / dissertation / thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.

10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu- Natal Department of Education.

UThukela District

ANNEXTURE D: ETHICAL CLEARANCE CERTIFICATE



01 June 2015

Mr BS Nsuntsha 207529371
School of Education
Pietermaritzburg Campus

Dear Mr Nsuntsha

Protocol reference number: HSS/0402/015M
Project title: Gender stereotyping in the teaching and learning of Physical sciences

Expedited Approval

In response to your application dated 21 April 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

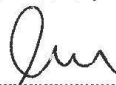
Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

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

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

Yours faithfully


.....
Dr Shenuka Singh (Chair)
/px

cc Supervisor: Dr N Mthiyane
cc Academic Leader Research: Professor P Morojele
cc School Administrator: Ms B Bhengu, Ms T Khumalo & Mr S Mthembu

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X54001, Durban 4000

Telephone: +27 (0) 31 260 3587/8350/4557 Facsimile: +27 (0) 31 260 4609 Email: ximhap@ukzn.ac.za / snvmanm@ukzn.ac.za / mohung@ukzn.ac.za

Website: www.ukzn.ac.za



Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville



Turnitin Originality Report

Gender stereotyping in science education
by Bonginkosi Nsuntsha

From M.Ed Thesis (Proposal Development)

Processed on 12-Dec-2016 6:49 PM
CAT
ID: 751952325
Word Count: 26755

Similarity Index	Similarity by Source
6%	Internet Sources: 4% Publications: 1% Student Papers: 2%

sources:

- 1 2% match (Internet from 04-Apr-2015)
<http://www.iie.ac.za/Documents/TheJournalVol82013.pdf>
- 2 1% match (student papers from 07-Dec-2015)
[Submitted to University of KwaZulu-Natal on 2015-12-07](#)
- 3 < 1% match (Internet from 04-Nov-2003)
<http://www.nied.edu.na/nied/Publications/journals/journal11/Journal%2011%20Article%204.pdf>
- 4 < 1% match (Internet from 21-Jul-2014)
<http://etd.uovs.ac.za/ETD-db/theses/available/etd-06042013-152406/unrestricted/MarumoMIM.pdf>
- 5 < 1% match (student papers from 22-Feb-2013)
[Submitted to University of KwaZulu-Natal on 2013-02-22](#)
- 6 < 1% match (Internet from 10-Jun-2014)
http://bib.convdocs.org/docs/7/6468/conv_1/file1.pdf
- 7 < 1% match (student papers from 07-Sep-2016)
[Submitted to University of KwaZulu-Natal on 2016-09-07](#)
- 8 < 1% match (Internet from 24-Sep-2015)
http://uir.unica.ac.za/bitstream/handle/10500/9469/thesis_tsvara_p.pdf.txt?sequence=3
- 9 < 1% match (publications)
[Deborah A. Garrahy. "Speaking Louder than Words: Teachers' Gender Beliefs and Practices in Third Grade Classrooms", Equity & Excellence in Education, 1/1/2003](#)
- 10 < 1% match (Internet from 08-Apr-2016)
http://uir.unisa.ac.za/bitstream/handle/10500/11823/dissertation_makeleni tn.pdf?isAllowed=y&sequence=1
- 11 < 1% match (Internet from 26-May-2016)

ANNEXTURE E: EDITOR'S NOTE

9 NOVEMBER 2016

Re: LANGUAGE EDITING STATEMENT

I, THE UNDERSIGNED, hereby confirm that I have edited the thesis titled **GENDER STEREOTYPING IN THE TEACHING AND LEARNING OF PHYSICAL SCIENCES**, by **BONGINKOSI SANELENSUNTSHA**, for the degree of **OF MASTER OF EDUCATION IN TEACHER DEVELOPMENT STUDIES**.

Regards

Dr. Hatikanganwi Mapudzi

PhD (Communications), M. A (Journalism & Media Studies), PG Dip (Media Management), B.Soc. Scie. (Hons) (Communications), B. Applied Communications Management.