Low uptake of mathematics by female students at Advanced level. A case of Bere and Temeraire High Schools of Masvingo District in Masvingo Province

By

Dube Nyasha

R 976804 B

A DISSERTATION SUBMITTED TO BINDURA UNIVERSITY OF SCIENCE EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF MASTERS OF SCIENCE EDUCATION DEGREE IN MATHEMATICS

OCTOBER 2017

SUPERVISOR: MR BASIRA. K.
# CONTENTS PAGE

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vii</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>viii</td>
</tr>
<tr>
<td>RELEASE FORM</td>
<td>ix</td>
</tr>
<tr>
<td><strong>CHAPTER 1</strong></td>
<td></td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Statement of the problem</td>
<td></td>
</tr>
<tr>
<td>1.3 Objectives</td>
<td>6</td>
</tr>
<tr>
<td>1.4 Research question</td>
<td>6</td>
</tr>
<tr>
<td>1.4.1 Sub-questions / Problems</td>
<td>6</td>
</tr>
<tr>
<td>1.5 Significance of the study</td>
<td>7</td>
</tr>
<tr>
<td>1.6 Assumptions of the study</td>
<td>7</td>
</tr>
<tr>
<td>1.6.1 Delimitation (scope) of the study</td>
<td>8</td>
</tr>
<tr>
<td>1.6.2 Limitations</td>
<td>8</td>
</tr>
<tr>
<td>1.6.3 Definition of terms</td>
<td>9</td>
</tr>
<tr>
<td>1.6.4 Abbreviations in the research</td>
<td>9</td>
</tr>
<tr>
<td>1.6.5 Organisation of the study</td>
<td>10</td>
</tr>
<tr>
<td>1.6.6 Chapter summary</td>
<td>11</td>
</tr>
<tr>
<td><strong>CHAPTER TWO</strong></td>
<td></td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td></td>
</tr>
<tr>
<td>2.0 Introduction</td>
<td>13</td>
</tr>
<tr>
<td>2.1 Theoretical Framework and Review of Related Literature</td>
<td></td>
</tr>
<tr>
<td>2.2 Attitude of students towards mathematics</td>
<td>13</td>
</tr>
<tr>
<td>2.3 Teachers’ attitudes towards female students taking up mathematics</td>
<td>17</td>
</tr>
<tr>
<td>2.4 Parents’ attitude towards female learners taking up mathematics</td>
<td>20</td>
</tr>
<tr>
<td>2.5 Summary of literature review</td>
<td>24</td>
</tr>
<tr>
<td><strong>CHAPTER THREE</strong></td>
<td></td>
</tr>
<tr>
<td>RESEARCH METHODOLOGY AND DESIGN</td>
<td></td>
</tr>
<tr>
<td>3.0 Introduction</td>
<td>29</td>
</tr>
<tr>
<td>3.1 The research</td>
<td>29</td>
</tr>
<tr>
<td>3.2 Case study design</td>
<td></td>
</tr>
<tr>
<td>3.3 Research context and sampling strategy</td>
<td>30</td>
</tr>
<tr>
<td>3.4 Data collection procedure and instruments</td>
<td>31</td>
</tr>
<tr>
<td>3.4.1 Questionnaires</td>
<td>32</td>
</tr>
<tr>
<td>3.4.2 Interviews</td>
<td>33</td>
</tr>
<tr>
<td>3.4.3 Document analysis</td>
<td>34</td>
</tr>
<tr>
<td>3.5 Data analysis procedures</td>
<td>34</td>
</tr>
<tr>
<td>3.6 Chapter summary</td>
<td>35</td>
</tr>
<tr>
<td><strong>Page</strong></td>
<td></td>
</tr>
</tbody>
</table>
DEDICATION

My sincere and special dedication goes to the Almighty God for having given me the opportunity to go this far in my academics. Lastly I dedicate this research project to all my family members for their total support, prayers and love they gave me throughout the course.
ABSTRACT

This qualitative case study aims to investigate the low uptake of female students in mathematics at advanced level. The main goal is to find out the reasons for the low uptake examining the attitudes of learners, teachers and parents towards female students taking up mathematics. The research design adopted by this research was the descriptive survey method. The research instrument used was the questionnaire coupled with an interview for teacher respondents. A total of two main questionnaires were designed. The first questionnaire was responded to by 30 ‘A’ Level student respondents and the second by 8 ‘A’ Level teachers. Two documents mainly class registers and result analysis were scrutinised. The collected data was then subjected to descriptive analysis and the results showed that girls taking up mathematics are very few.

Reasons which came up from the research findings are that girls fear taking up mathematics, stereotypes affect female learners, teachers and parents are not helpful in encouraging female learners to take up advanced level mathematics and females have an inherent negative attitude towards mathematics. From the findings, it was however clear that uptake can be improved through a number of interventions. Firstly, girls can have their attitude towards mathematics improved by fostering positive and encouraging comments instead of portraying mathematics as a masculine subject. Secondly career benefits from studying advanced level mathematics should be highlighted to female learners and lastly, uptake can be greatly improved if schools employ female mathematics teachers, thereby exposing female learners to female role models.

In view of the findings, further studies can also be carried out on the roles of peers and siblings in shaping interest in mathematics and also on the link between mathematics and careers with reference to female learners
ACKNOWLEDGEMENTS

I would like to begin by thanking members of my family for the encouragement and financial support they gave me throughout my entire study of this Master’s degree programme in
mathematics. Secondly I wish to extend my sincere thanks to the learners, heads and the
teachers of the two schools who responded to my questionnaires. Without their cooperation my
research would not have materialised.

I also wish to acknowledge the guidance and direction I got from my supervisor, Mr Basira. K
who encouraged and guided me to the final end. His assistance was salient and invaluable, that
without it, I would not have proceeded. I also wish to thank my work mates Mr Nhengu. J, Mr
Shumba. T, Mr Shumba. M. F and Mr Chirira .M for encouraging me throughout.

Lastly I would also like to acknowledge the assistance I got from Mr Tagwirei Douglas, who
took his time typing and producing the research questions and the research project report.

DECLARATION

I, Dube Nyasha, declare herewith that the research entitled:
“Low uptake of female students at advanced level in Masvingo District of Masvingo Province”

Which I herewith submit to the Bindura University of Science Education, in partial compliance with the requirements set for the Masters’ of Science Education degree in mathematics is my own work, has been text edited and has not been submitted to any other university.

Researcher’s Signature………………………………………… Date…………………..

Supervisor’s Signature………………………………………… Date…………………..

RELEASE FORM

NAME OF AUTHOR : DUBE NYASHA
DISSETRATION TITLE: Low uptake of mathematics by female students at Advance Level. A case of Bere and Temeraire High Schools of Masvingo District in Masvingo Province

DEGREE TITLE: MASTERS OF SCIENCE EDUCATION DEGREE IN MATHEMATICS

YEAR SUBMITTED : 2017

Permission is hereby granted to Bindura University library to produce single copies of this dissertation and to lend or sell such copies for private, scholarly or scientific research purposes. Only the author reserves other publication rights and, neither the dissertation nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

SIGNED

DATE

PERMANENT ADDRESS: 32 EGRET CRESCENT, EASTVALE TEMERAIRE MASHIVA
CHAPTER ONE

INTRODUCTION

1.1 Background

This research study focuses on the investigation into the causes of low uptake of mathematics by female students at advanced level. Mathematics is a very useful subject in our lives. The teaching and learning of Advanced Level Mathematics is therefore salient to the students in a number of ways.

Firstly, teaching and learning of mathematics helps students to understand, interpret and communicate mathematical information in everyday life. Learning mathematics also helps students to acquire a firm mathematical foundation for further studies and/or vocational training. It gives students the opportunity to acquire mathematical skills for use in their everyday lives and also enhances participation in National development programs. Learning of advanced level mathematics helps students to appreciate the process of discovery and the historical development of the subject as an integral part of the human culture.

Having been a high school teacher for the past 25 years, the researcher noted with concern that irrespective of the many positive advantages of studying mathematics at advanced level, the number of female students, has been worryingly much less than that of their male counterparts. As noted by the researcher, the small numbers of female students taking mathematics at advanced level, the researcher became concerned as today’s world, leans more and more heavily on Science, Technology and Mathematics.
The successfulness and effectiveness of the teaching and learning of Mathematics is measured by the uptake of the subject at higher levels. Low uptake of the subject by female students at advanced level shows that there are problems that are negatively affecting the teaching and learning of the subject.

I have also noted that even in my Masters class at BUSE, there are more male students than female students. With the Zimbabwean government now putting more emphasis on STEM (Science, Technology, Engineering and Mathematics), it quickly triggered my interest to work out why there are so few female students benefitting from STEM programs due to their not studying Mathematics at advanced level. At my present work station, there are four Mathematics teachers. All four are male. Is this a good indicator to the female student who wants to pursue Mathematics at advanced level? In 2012, in Zimbabwe male Mathematics and Science teachers were 89% as compared to 11% who were female teachers (ZimStat, 2012).

It is important to note that many African governments, the Zimbabwean government included are aware of the benefits of Mathematics education to the girl child. It has been discovered that well educated females play a very crucial role in National Development. Provision of good education to females is linked to sound health, low mortality rates in children, good family nutrition, high life expectancy and sound sanitation. The uptake of advanced level Mathematics by female students thus cannot be over-emphasised as it has a very strong socio-economic advantage.
According to the CDU Evaluation Report on the advanced level Mathematics syllabus (9164/1) and the quality of Mathematics teaching in Zimbabwean High Schools (2014), the following were cited as some of the causes of students (females included) negative attitudes towards Mathematics:

i) The way Mathematics is taught

ii) Poor foundation of concepts at Ordinary Level

iii) Influence of pass rates obtained by previous students

The drop or low numbers of female students taking up Mathematics is not unique to Zimbabwe alone. Several studies (including Owen, Dickson, Stanisstreet and Boyes, 2008) have shown that females are greatly under-represented in Mathematics in a number of countries. According to the National Gender Policy, 2013, 52% of the Zimbabwean population are female and it is therefore disturbing when we only see a few female students take up Mathematics at Advanced level. In 2014 the national statistics showed that 42.87% of the students taking up Advanced Level Mathematics were female (Zimbabwe Schools Examination Statistics, 2014).

Although many Western studies (Coyle, 2006; Murphy and Whiteless, 2006; Olorode, 2005) have researched on the reasons of the low uptake of Advanced Level Mathematics by female students, very few studies have been carried out in developing countries like Zimbabwe. In Masvingo province of Zimbabwe in particular where cultural and gender role patterns are distinct, resources are scarce, teaching force has inadequate skills to cope with the mathematical problems faced by students. Since Mathematics is a STEM initiative subject key to the socio-economic development of the Zimbabwean nation, the researcher
has seen it fit to embark on a research to unlock the barriers to equal participation at Advanced Level Mathematics.

The study of Mathematics at High School level by both male and female students is necessary for the foundation stage of higher education. It is important to note that today’s world which leans more and more towards STEM subjects demands more mathematical knowledge, thus the need of more uptake of the subject by both sexes.

It is also crucial to note that mathematics lays the foundation for all the other subjects. You need mathematics concepts for you to study Physics and Chemistry, for instance when calculating molarity of liquids, technology and even in Geography and Biology. Mathematics is therefore a vital subject for socio-economic growth in any country, Zimbabwe included. The subject is a tool which can be used to solve any daily life problems. Due to this, mathematics is considered by many scholars to be the bedrock of high school curriculum. Mathematics forms the base of all sciences and arts. Because of the salient features of studying Mathematics, the researcher has seen it fit to look at why such an important subject with unlimited benefits to both individuals and the society at large has a very low female uptake at Advanced Level in Masvingo province.

According to the Zimbabwean national gender policy 2013 – 2017 and the equity is to be promoted and therefore for equality to both sexes should be one of the key thrusts. Zimbabwe constitution adopted in 2013 gender equality and took over the uptake of Mathematics at Advanced Level by female students.
According to a report compiled by Masvingo district heads available at Masvingo district education offices, the uptake of Mathematics by female students at Advanced Level has been a cause for concern in the district and the province at large. The uptake of the subject at Advanced Level for Temeraire High School and its sister school Bere High School by female students have been low as shown in the table below for the past 5 years.

Mathematics uptake from 2013 to 2017 in the Mashava Urban circuit.

*Table 1: Figures are given as*

<table>
<thead>
<tr>
<th>Year</th>
<th>Temeraire High School</th>
<th>Bere High School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>2013</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>2014</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>2015</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

It can be established from the table that the number of girls participating in advanced level mathematics at the two high schools, has been much lower than that of boys in the last five years. The highest recruitment for girls was 25% for Bere High School in 2016 and 18% for Temeraire High School in 2013. The 25% and 18% recruitments are very low and therefore the researcher felt that there was need to investigate the causes of such low uptake of advanced level mathematics by girls. It is the researchers’ hope that if the problems impacting on female participation in mathematics are established, everyone involved in the teaching and learning of the subject would make an effort to address the problems and hopefully increase the uptake of advanced level mathematics by female students.
Also internationally, according to the Statistic Report Series No. 109, Cambridge (2009) which looks at the uptake of Advanced Level subjects in England in 2015, Mathematics had the highest level of uptake, being taken by 27.9% of all subjects, 38% being males and 19.8% being females. Again the number of females is much lower than the number of males taking up the subject.

1.2 Statement of the problem

The researcher worked in High Schools for the past twenty-five years teaching Mathematics from form 1 up to Advanced Level. Over the last few years the researcher has noted with concern how female students are shunning Mathematics at advanced level. Therefore, the investigator had planned the Statement of the problem “Low uptake of Advanced Level Mathematics by female students.”

1.3 Objectives

The following objectives have been formulated related to the study:

i) To find out the attitude of female students towards Mathematics at advanced level

ii) To find out the orientation of parents towards female students studying mathematics at advanced level

iii) To find out the attitude of teachers towards mathematics and towards students taking up mathematics at advanced level

1.4 Research question

What are the causes of the low uptake of mathematics by female students at advanced level in the Masvingo district of Masvingo province?
1.4.1 Sub-questions / Problems

1. How qualified are the teachers teaching advanced level mathematics?
2. Are teachers teaching advanced level mathematics male or female?
3. What is the attitude of learners towards mathematics?
4. What is the attitude of parent towards learners, especially females taking up mathematics at advanced level?
5. What is the attitude of teachers, taking advanced level mathematics towards female students taking the subject?

1.5 Significance of the study

In this study my aim was to determine if there were any factors influencing the choice of mathematics by female learners and male learners at advanced level. The main purpose of this study is to help and promote gender parity in the uptake of advanced level mathematics so that female learners can also benefit from the current STEM initiatives where the government of Zimbabwe is currently paying full fees for students at advanced level. The researcher tried to get a clearer understanding of why female learners who show much enthusiasm for mathematics at low levels do not take up the subject at higher levels. To achieve this, this study attempted to get the answers as to the state of mathematics enrolment at Temeraire and Bere High Schools and how they differentiate with respect to gender and investigate why girls who demonstrate an interest or ability in mathematics choose not to take up the subject at advanced level.

This study also aims to improve the parity of uptake of advanced level mathematics by both girls and boys. Based on the current Zimbabwean policies i.e. the National Gender policy of 2013 to 2017 and the Zimbabwean constitution adopted in 2013, on gender equity, this
study will provide decision and policy makers with useful insights into the main issues and factors ensuring the provision of equal opportunities in the uptake of advanced level mathematics by both boys and girls.

School administrators and mathematics subject teachers will also benefit from this study through employing necessary strategies to promote parity among the sexes in the learning of mathematics in schools. The findings may also be used as relevant literature by subject teachers and other independent researchers for coming up with other vital research papers or critique to create further debates on this topic.

Lastly as a practicing teacher, I also hope to learn more on the uptake of students and to play a role in the promotion of equality in the study of advanced level mathematics. I also hope to gain more knowledge and insights which will help me to become an unbiased and stereotype free educator.

1.6 Assumptions of the study

The study was based on the following assumptions:

i) The two high schools recruit advanced level students giving equal opportunities to all.

ii) Respondents would answer questions as honestly as possible and give accurate and genuine responses.

1.6.1 Delimitation (scope) of the study

The limit of issues the researcher covered is highlighted in this section. The study was carried out at Temeraire and Bere High schools of the Masvingo province. The two high schools were therefore used for the purpose of data collection. Temeraire High School is a government school while Bere High School is a council school. As such
government and non-government schools were part of the study. Teachers and students involved in advanced level Mathematics are to be the respondents. Only current advanced level students studying mathematics and those who passed mathematics at ordinary level but not studying the subject at advanced level were used as respondents.

1.6.2 Limitations

The following factors weakened the research study:

i) Time, to some extent may not have been enough to allow the researcher to adequately prepare the research instruments as he is also a practicing educator who had other work commitments at his work station.

ii) Some respondents did not complete the questionnaires and so the information obtained may not be representative of the possible reasons for the low uptake of advanced level Mathematics in Masvingo province.

1.6.3 Definition of terms

The following terms are going to be defined as they are used in this study:

1. **Attitude**

   Refers to having inclined interest and emotion towards Mathematics (Eccles, 2012). Attitude in this study refers to the thinking and feelings the students have towards mathematics. Attitude towards mathematics is therefore seen as the pattern of beliefs and emotions associated with mathematics. It is the tendency to react favourably or unfavourably towards learning of mathematics.

2. **High School**

   This is a learning institution which goes up to advanced level.

3. **Mathematics**
This is a study which uses symbols and notation to describe numeric, geometric and graphical relationships. It helps to develop mental processes that enhances logical and critical thinking, accuracy and problem solving that is handy in decision making and national development (South Africa Curriculum and Assessment Policy, Grade 9; 2013). Mathematics is a learning area with four fundamental operations of addition, subtraction, multiplication and division. In this study mathematics refers to pure mathematics, applied mathematics and statistics with the main syllabus code being 9164.

4. **Equity**

   Refers to fairness or justice in relationships. It is a situation where every student has equal opportunities and benefits equally from existing conditions.

5. **Mathematics stereotype**

   Attitudes, beliefs and perceptions of how people (male and female) should behave in a given society and are handed down from generation to generation (Ifegbesan, 2010).

6. **Learning**

   Refers to the acquisition of skills that result in change of attitudes and behaviours in learners.

7. **Performance**

   In this study refers to how best set objectives have been achieved. If objectives have not been adequately achieved there is poor performance and if objectives have been adequately covered, there is high performance.

8. **Gender**
Refers to feminine and masculine characteristic and culture dependent traits attributed by society to men and women.

1.6.4 Abbreviations in the research

1. ZIMASSET – Zimbabwe Agenda for Sustainable Socio-economic Transformation
2. STEM – Science, Technology, Engineering and Mathematics

1.6.5 Organisation of the study

This study is organized into five main chapters. Chapter one provides the background to the research, the context and focus and an overview of the entire research. Chapter two expands upon what has been called the context or the background of the study. In this study, the chapter discusses about the related studies and focuses on the concepts of theory of gender and education paying particular attention to mathematics uptake by both male and female students. Chapter three presents the explanation about the methodology used in this research. Chapter four presents the findings. In chapter five, a discussion of the findings is carried out and the chapter also summarises the findings, giving a conclusion of the study and suggest recommendations for further researches.

1.6.6 Chapter summary

In this chapter the researcher has presented the background of the study on the gender differences in the uptake of Advanced Level mathematics. The researcher has also outlined the research problem as a pre-requisite for conducting the study. Lastly, the chapter has highlighted the importance of exposing mathematics to both boys and girls at higher levels such as advanced level, thus giving the impetus for a study which may
help improve participation between sexes. The next chapter discusses the related literature to the study.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter presents a summary of relevant literature that enables the researcher to build a conceptual framework for the study on the uptake of advanced level mathematics by male and female students in Masvingo province. The chapter begins with theories on gender and mathematics participation. The chapter also examines, the attitude of learners (male and female) towards mathematics at advanced level, teacher’s perceptions, views and beliefs on gender and mathematics and lastly the challenges teachers teaching mathematics face.

2.1 Theoretical Framework and Review of Related Literature

This study is grounded and guided by theories of gender role stratification and identification. The social cognitive career theory and the expectancy value theoretical model are also used in relation to gender role orientations and stereotype beliefs. Equality for educational opportunities for both males and females in general and in education in particular has been a concern of societies for some time now, but until the seventies the uptake of mathematics by female learners did not feature prominently in the scientific literature (Hanna, 1989).

Research on gender stereotypes have discovered that females are believed to be weaker than males in every aspect. Studies have further shown that these beliefs if left to grow, it affects the uptake of mathematics (Else-Quest, Hyde and Linn 2010). In Zimbabwe, while there are no meaningful differences between boys’ and girls’ achievements in results (Zimsec, 2015) the gender gaps in the uptake of Advanced Level Mathematics remain. In Africa, education of girls has been eroded by poverty, where boys are preferred for educational enhancement than girls (International Mathematics Union, 2014). Globally,
according to the UNESCO Institute for Statistics (2013), in sub-Saharan Africa, 71.6% of males are mathematically literate while 53.6% females are also literate. In North Africa, the percentages are 76.7% and 58.1% for males and females respectively.

It was also observed that though the number of girls in primary schools is more than that of boys, at secondary school level and high school, due to socio-economic reasons such as early marriages and financial reasons only about 17% of students enrolled in sub-Saharan high schools are girls (IMU, 2014). Some of the reasons for low uptake of mathematics are due to the sociological thoughts which portray girls/women as being less intelligent, courageous, competent, strong and brave than their male/boys counterparts (Ifegbesan, 2010).

In patriarchal societies such as Zimbabwe, due to gender stratification assumptions, male learners link the uptake of advanced level mathematics to future careers such as engineering, banking and technology while girls do not recognise such a link due to cultural roles (CASE, 2012: Equality Challenge Unit, 2014). Zimbabwean education authorities have of late put more emphasis on STEM study, opening opportunities to both boys and girls.

The social market foundation in England identified a shortage of up to 40 000 workers with STEM skills and considering developing countries like Zimbabwe, more STEM jobs will be required (Broughton, 2013). The economic case for increased participation of boys and girls in STEM study will therefore in the long run have much benefits to economies and individuals. It has been seen that learners studying STEM subjects such as advanced level mathematics earn higher salaries later in life (Harrison and Vignoles, 2011). However,
despite all the advantages associated with uptake of mathematics, the problem of female learners seems largely a concern in the UK (OECD, 2012). While there is a growing literature on access to higher education and students’ background (Anders, 2012), the question of subject choices, that is uptake of subjects at advanced level remain relatively under-researched. The Social Cognitive Career Theory (SCCT) developed by Hackett et al (1987) is another relevant psychological theory which guides and gives direction to this research. Albert Bandura’s (1986) social cognitive theory paved way to the SCCT. According to the theory career patterns are shaped mostly through observation and imitation. Marrying the theory to my research, the relationship between gender stereotyping and mathematics uptake or participation is examined.

The low uptake of mathematics by female learners is therefore actually rooted in societal perceptions. Zimbabwe being a gendered society where male and female roles are shaped from birth (Mwamwenda, 2005), gender traits are therefore passed on from generation to generation. Costell (2007), asserts that the commonly held perception is that studying mathematics is basically a male domain. These gender stereotypes result in female learners wrongly assuming that males are innately better than female learners in mathematics. This results in male learners taking high school mathematics, placing them at an advantage over females in almost all highly rated career opportunities.

Codiroli, (2015) emphasises that social processes have much influence on gender behaviour, ensuring more re-enforcements on student cognitive processes. Studies have revealed that socializing role models such as parents and teachers’ perceptions of gender roles have a strong influence on one’s academic preference and career pathways. The theory suggests replication of behaviour of significant others by boys and girls. It has been
seen that there is a large gender gap in the uptake of mathematics throughout students’ academic careers and the gap seems to grow larger over time with only 19% of jobs in STEM careers in the UK being held by women (Kirk et al, 2010).

In the UK, for advanced level qualification, female learners were less likely to study mathematics than males and were more likely to study other subjects (Joint Council for Qualifications, 2014). Also in the UK, girls are said to produce better grades than boys in most subjects, mathematics included. However low uptake in mathematics is seen as due to girls shunning the subject in preference for other subjects where they believed they could get higher grades (Codiroli, 2015). In the US, Eccles and Kenny (2013), observed that students with high mathematics and verbal test scores especially females were less likely to choose STEM careers as they tend to drop advanced level mathematics at high school.

However, according to Hyde and Linn (2010), cited by Ngware et al (2012), the belief that boys are better than girls has been there for years, but is just a stereotypical ideology. In support of this view, Asimeng-Boahene cited by Gudyanga et al (2016), added that male and female students, mostly in Africa and Asia are brought up under different environmental setups. Due to the difference in the way boys and girls are socialised, boys tend to be self-confident and independent while girls are withdrawn and affectionate. Literature asserts that this kind of socialization makes males to adapt more to STEM subjects, like mathematics.

Lastly, this study is grounded in Eccles’ (1994) expectancy-value theoretical model. The model explains differences in mathematical uptake, interest and attitude in boys and girls. Gudyanga et al (2016) asserted that girls seem to have a negative attitude towards
mathematics as compared to boys. This literature assumes that maybe due to their socio-cultural beliefs blended with stereotypes on female inferiority in mathematics.

In the expectancy-value theoretical model learners consider the uptake and participation in a subject when they see its value and expectation when making meaningful scores. However, in Zimbabwe mathematics is a core subject which is compulsory in lower secondary. It is also a pre-requisite for entry into tertiary courses in teaching and other fields. Irrespective of all this, uptake at advanced level is still very low for girls.

2.2 Attitude of students towards mathematics

Attitude according to Reid (2006) is an expression which summarises an evaluation of something or someone. Attitudes are based on prior knowledge, feelings and behaviour. They in most cases have a great influence on our future behaviour and choices. Therefore, examining the causes of gender difference in learning mathematics might help find the solutions to the reasons why females are under-represented in mathematics. Attitudes towards mathematics have a bearing towards learners passing the subject or failing it. Positive attitude towards the subject results in students passing Senthilkumar et al (2015). This is because a positive attitude towards the uptake of mathematics is a reflection of a correct disposition towards the subject. Also a negative attitude towards advanced level mathematics is a reflection of a poor emotional disposition. The two dispositions have a bearing towards the learner participating in the subject or not.

Mathematics is often considered to be a difficult subject and a subject in which boys achieve more than girls. However, contrary to these beliefs, research has shown that mathematics scores and results do not differ significantly between boys and girls (Peixoto
et al, 2012). However, noticeable differences in the beliefs held by boys and girls do exist. Research has shown that results concerning gender differences in attitudes are less conclusive than those in self-concept of learners.

In Zimbabwe, mathematics is considered to be a masculine subject, and thus not a very good choice for women/girls (Gudyanga, 2013). According to Peixoto et al (2012), studies have also shown that gender differences in learners’ attitudes towards mathematics uptake do exist but the differences are not much. Recent researches have also confirmed that girls have more negative attitudes towards mathematics than boys. Asante (2012), for example states that when compared to boys, “girls lacked confidence, had dilapidating causal attribution patterns, perceived mathematics as a male domain and were anxious about mathematics.”

Asante’s research was carried out in Ghana and it showed that boys had more positive attitudes towards uptake of mathematics than girls. Gudyanga (2013), also concluded the same in Zimbabwe. Though these gender differences in learners’ attitudes towards mathematics are there, some researchers still say the differences are small. Snetzler quoted by Peixoto (2012) is one of the researchers who concluded that the differences in the attitudes of learners towards mathematics is very small.

Other researchers conclude that gender does not affect attitudes towards mathematics (Kalavana et al, 2007; Waheed, 2011). The studies of the above investigators concluded that gender has no significant effect on relationships between attitudes of learners towards mathematics and also on performance in the subject. Also Georgiou et al quoted in Peixoto (2012) showed there was no difference in attitudes towards mathematics between male and
female learners. Other similar studies conducted on this topic suggests that negative attitudes towards mathematics do exist and they are a result of frequent or repeated failures in mathematics tasks.

According to Nicolaidou et al (2003) repeated failures may reinforce negative attitudes in learners towards dropping mathematics. Failing mathematics tasks results in negative attitudes becoming relatively permanent. According to the researchers quoted above, children first go to school with a positive attitude towards mathematics. However, through interaction with mathematical tasks which they deem difficult, they slowly develop a negative attitude towards the subject. Kogce et al (2009) attributed negative attitude towards participation in mathematics to attainment of poor grades especially at high school. In Zimbabwe this seems to be the case.

In form one students, according to this researcher are very eager to learn. They are highly motivated and participate well in mathematical tasks. However, as learners get to ordinary level, most of them especially girls have fully developed a negative attitude towards mathematics. Quite a number of girls drop the subject and do not attempt it at ordinary level. Boys also drop the subject but the number of girls is usually more than that of the boys. Vurayai (2012) claimed that female learners do not take up mathematics mainly due to lack of confidence in their ability to tackle mathematical tasks.

Gudyanga (2016) also concluded that mathematical anxiety caused by lack of confidence mostly amongst female learners limit their participation in mathematics. Madina et al (2013) are of the same view when they observed that student beliefs and perceptions of their own performance in mathematics is a salient factor, especially for female students who are likely to underestimate their mathematical capability and as a result less likely to
take up mathematics. According to Mubeen et al (2013), learners’ attitude towards mathematics are more likely to be positive in classrooms where learners saw greater direction and helping in their teachers and are more negative in their classrooms where learners saw their teachers enforcing strict and unfriendly behaviours.

Studies have shown that even when the mathematical achievement of both the boys and girls are similar, girls still lack self confidence in mathematics. Vermeer et al (2000), further showed that in application problems, girls tended to be less confident than in problems involving mere competition. However, according to Mubeen (2013), girls would still take up mathematics, enjoy the subject and increase the time they take to do the mathematical tasks and have positive emotional perceptions towards mathematics, if mathematics was to be taught in a co-operative setting.

This is where this researcher is seeing a big gap, where at his school, Temeraire High School and at neighbouring Bere High School very few girls are still taking up the subject. This researcher wants to find out the reasons and also come up with ways in which participation of female learners in mathematics can be increased.

2.3 **Teachers’ attitudes towards female students taking up mathematics**

Teachers are the most important part in any learning process. They play a very crucial role in making sure that learning tasks are carried out and are understood. As a result, teachers ought to be very supportive to learners, for learning objectives to be achieved and for given tasks to be successfully completed.
According to Costello (1991), most literature on this topic, showed that mathematics is seen as associated with male self-image and is less consistent with female self-image. The self-image is due to the significant other pressure, usually peers or teachers. Males therefore, become more inclined towards mathematics more than females because the subject is being seen as a male dominated domain. Therefore, it is the role of the teacher to demystify this wrong notion and perception.

According to Mubeen (2013) many teachers, especially female, actively and consciously encourage male learners to take up mathematics than female learners. Also according to Amelink (2012), negative views held by influential people such as teachers diminish female learners’ pursuit of mathematics at high school. Ifegbesan (2010), saw teachers’ personal beliefs, attitudes and stereotypical perceptions playing a very major role in their teaching and learning process. The researcher concluded that teachers’ different and unequal treatment of learners may discourage female students in taking up mathematics.

Since teachers’ gendered perceptions have great influence in teaching and learning mathematics, there is therefore need to create awareness on how these perceptions consciously or unconsciously manifest themselves in teachers’ classroom practices. According to studies done in African countries such as Malawi, Ghana, South Africa and Kenya (International Mathematics Union Report, 2014), teachers believed that girls are less gifted than boys in mathematics. As a result of their gendered perceptions, their talk opens up on avenues of uptake of mathematics by boys rather than girls. Teachers play an important role in building interest in mathematics as well as in tackling negative societal influences that negate female interest in the uptake of mathematics.
Teachers can help learners to take up mathematics, improving their interest and performance by encouraging learners and helping them build an attitude in which mathematical competencies are seen as something that can be improved through consistent practice. Amelink’s (2012), research thus underscores the need for mathematic teachers to make mathematics more interesting for female students. It has been seen by researchers that strategies that enhances female interest in mathematics also increase the motivational levels of boys. As a result, this can go a long way in enhancing a more balanced gender parity among people taking up careers that require adequate mathematics preparation, such as those in STEM fields.

It is now common knowledge that students who participate in STEM subjects such as mathematics at advanced level usually end up earning higher salaries later in life (Codiroli, 2015). Despite this, the problem of low uptake seems to be a particularly large concern in Zimbabwe and also in the UK (Codiroli, 2015). Therefore, national and international concerns regarding low uptake of female students at higher levels in mathematics were the impetus for this study. Of great interest was the gendered patterns of advanced level enrolment in favour of male learners reported in earlier studies and my desire to observe whether these patterns were still evident and whether or not they have gone down or the status quo continued.

Findings in Australia showed that there were more males enrolled in mathematics than females. These findings as a result contradicted the trend of closing the gender gap in mathematical participation observed during the 1990s (Forgasz et al, 2000). Forgasz (2006:220) claimed that the findings or data indicate that females are continuing to limit
their career options and suggests the need to find ways in which girls’ participation in mathematics can be enhanced.

To close the gap, research has observed that teachers needed to play a more neutral role in their classroom interactions. Mathematics practitioners have been accused of favouring boys at the expense of girls. Teachers are said to interact more with boys than girls, calling on and praising boys more than girls (Eccles, 2007). By so doing teachers therefore, encouraged gender differences to manifest in their classroom activities. They thereby in a way influence learners’ participation rates in mathematics.

As a result, Connelly and Clandinin (1990) concluded that there is a very close link between the personal gender identity and the professional practices of a teacher. The two also concluded that teachers’ gendered beliefs and perceptions have great influence on teaching and learning activities, thereby playing a very big role in learners’ participation in the subject. Malama et al (2005) also argued that in many learning activities, teachers employ teaching approaches that do not give male and female learners equal opportunities to participate in learning, thus perpetuating gender stereotypes.

Measures and programs designed for improving females’ attitudes towards mathematics (Mulryan, 1992), have been put forward. However, researchers have shown that females are still found in greater numbers taking up social sciences with very few pursuing pure sciences. Ainley and Fordham (1991), investigated student/teacher relationship and attitudes of students towards mathematics. They concluded that the teaching/learning process of mathematics is dependent on the positive attitude towards the subject.
Therefore, they concluded that serious efforts needed to be developed in order to improve the uptake of the subject. They saw students’ confidence as being key to uptake of the subject. However other studies in developing economies suggested that the gender of the teacher has a great influence towards the participation of female students in mathematics. These studies argued that females would participate more in classes taught by one of their own. Crawford and Macleod (1990), however argued that having female teachers taking mathematics classes may not be the answer to the low uptake of the subject by female students.

The other problem however, may be that it may be very difficult to have many female teachers taking advanced level classes when the uptake of the subject by female students is very low. In developing countries such as Zimbabwe, Zambia, Tanzania and Kenya, a number of mathematics classes are manned by unqualified teachers (International Mathematics Union, 2014). These unqualified teachers are seen as being incapable of motivating students to take up mathematics. The teachers impact negatively on the learners’ attitudes towards mathematics as they do not have the necessary pedagogical skills required to motivate the learners.

2.4 Parents’ attitude towards female learners taking up mathematics

Parents are the key elements in improving learners’ interest towards mathematics and thereby increasing the uptake of the subject (Catherine, 2012). Many researches carried out on gender differences seemed to reveal that some parents view mathematics as a male domain thereby limiting the pursuit of the subject by female learners (Hanna, 1996). Female
learners were said to be good in arts subjects while the belief by the parents were that males are good in sciences and mathematics. The above researches seem to be in line with the perceptions of the Zimbabwean society.

Masanja (2010), in a paper, presented to the United Nations division for the advancement of women, concluded that in many African societies, women are marginalized and discriminated upon resulting in their low participation in sciences and mathematics. In this investigation the researcher saw it fit to furthermore scrutinize the issues of perception and attitudes of parents towards their girl children taking up mathematics at advanced level. Researchers such as Guiso et al (2008) have established a relationship between gender mathematics gap and the way the girls are socialised. They established that the way parents socialise girls has a strong influence on their participation or no participating in mathematics.

As mentioned briefly above, in Zimbabwe mathematics is taken to be a masculine subject, and therefore is not suitable for female learners (Gudyanga, 2013). Culture and the way children are socialised by parents results in learners being gender stereotyped. Boys and girls are in a way brought up differently from each other resulting in the shaping of their future choices (Hofstede, 2011). Female learners are therefore socialised against participating in mathematics. The discouragement of female students to embark on mathematics studies seems to be culturally centred. Zimbabwe, therefore being a gendered society, has parents passing their gendered beliefs to their children, leading to females not taking up high-level mathematics.
Other researchers such as Gudyanga (2013), have shown that parental expectations are not helpful in the studying of mathematics. Females are seen as being disadvantaged by being given time consuming domestic chores which leave them with little time for study and are also weary. Female learners are thus affected negatively causing them to lose interest in studying mathematics which is challenging by nature. Madina et al (2013), concludes that female learners tend to internalize parents’ negative perceptions towards mathematics which became evident by them not taking up the subject.

Gudyanga (2014), also found out a correlation between parents’ educational background and their children’s attitude towards sciences and mathematics. In Zimbabwe mathematics is one of the core subjects. As a core subject, it becomes a requirement for entry into the many fields after school and thus its importance cannot be under-estimated. The unsettling factor however is that, irrespective of all the benefits associated with studying mathematics, very few female students are seen taking up the subject especially at advanced level. Tshabalala and Ncube (2012), attributed the low participation to mathematics phobia. They were however not sure whether the phobia is natural or a result of other factors such as cultural influences.

The rationale and research question of this study is based on the fact that advanced level mathematics is seen as a key development element in the STEM thrust the country has recently embarked on. STEM studies is seen as a way to go if Zimbabwe is to gain the developed nation status, through exploits in science and engineering. STEM subjects determine the future employment prospects of learners (Ndlela, 2012).
In Zimbabwe, policies to improve participation are in place, for instance teaching of mathematics and science subjects is compulsory up to advanced level (Herald, 2011). However, Gudyanga et al (2015) agrees that policies on their own may not be enough to help improve gender participation at high level mathematics. The researcher is thus going to have a re-look at the reasons why after all the researches carried out on the subject, participation of females in mathematics are still very low as evidenced by the enrolment figures.

2.5 **Summary of literature review**

The main purpose of this study is to investigate the gender differences in male and female student’s participation in mathematics. The literature reviewed has shown that there is a gap in mathematics participation especially at higher levels. Female students have been found to have negative attitude towards the subject. Research has also revealed low confidence towards tackling the subject in females. In addition, the literature also indicates that socio-cultural factors such as gender roles also played a role in limiting the number of females taking up mathematics at higher levels. Gender stereotypes, teachers’ perceptions and parents’ unhelpful attitudes are also seen as some of the causes of poor participation of girls in mathematics.

Lee at al (2008), revealed that female tutors in Eastern African countries such as Kenya, preferred teaching males than females. Research also carried out in some parts of Zimbabwe recently also showed that teachers preferred working with males than females at higher levels (Gudyanga, 2015). However, Wambua et al (2010) conducted that boys and girls have no distinct differences in their learning of mathematics. With the variations in the reviewed literature coupled with the continued low uptake of the subject at advanced
level. The researcher has seen it fit to have a re-look at the causes of the low uptake of the subject in his area.

CHAPTER THREE

RESEARCH METHODOLOGY AND DESIGN
3.0 Introduction

This chapter describes the research method and design used by the researcher. The chapter gives an overview of the methods used and procedures followed in the study. Qualitative research paradigm and the rationale for using qualitative approach and a case study are going to be outlined. The chapter further gives details about, the sample, the instruments to be used, and how data is going to be analysed.

3.1 The research

In this study, a qualitative research methodology was used. Creswell (2014) defines qualitative research as an exploratory approach emphasizing the use of words rather than the use of figure (quantification) in coming up the data and also analysing the data. The main question this study sought to address is based on the causes of low uptake of advanced level mathematics by female learners. Since the needed data requires the investigator to collect information involving feelings, at times the study lent itself to a qualitative approach (Creswell, 2009).

The researcher opted for this research methodology as it has a number of advantages. Firstly, this method involves examining phenomena in their natural setting (the classroom). The researcher as a participant has the primary aim of describing phenomena and not to conclude. Secondly the researcher needs to derive or construct meanings from the learners themselves. These meanings could be individual perceptions, assumptions, beliefs and conceptions of reality. The researcher thus preferred qualitative paradigm as it gives significant, rich and detailed data using words. Qualitative methodology also has a variety of tools for data collection. In qualitative research, data is collected through observation,
interviewing, audio and participant observation (Gay, 2003). In this study, interviewing and the use of a questionnaire are used as tools of data collection.

Lastly the use of qualitative methodology gives the opportunity to understand practices, perceptions, opinions and attitudes of parents and mathematics teachers on gender and higher level mathematics uptake. This study thus used qualitative approach and is a case of Temeraire High and Bere High Schools in Masvingo province.

3.2 Case study design

A case study refers to both method of analysis and a specific research design for investigating a problem. The two are used to generalize results across populations. A case study examines a person, event or phenomena and results are the extrapolated so that they help predict future events or give clarity to previously hidden issues, thereby adding to society’s knowledge body (Mills et al, 2010). This study took place in two public high schools in Masvingo province. It researched on experiences of real cases of pupils and teachers, operating in real situations, where the uptake of subjects at advanced level was analysed over a period of five years. The case study seeks to come up with a comprehensive model describing reasons for the low uptake and giving reasons for the low uptake and giving the necessary recommendations needed to improve parity.

3.3 Research context and sampling strategy

The research being a case study, resulted in purposive sampling. Purposive sampling is an appropriate approach for qualitative research as it allows the investigator to choose
respondents with relevant data and experience to meet the demands of the research questions (Gay and Airasian, 2009). The investigation was conducted at two high schools in Masvingo province of Zimbabwe. The two schools have a combined enrolment of 1200 students from form one to six. They also have a combined teaching staff of 46 teachers of which 8 teach mathematics.

These two schools were sampled as they are close to the researchers’ work station. Other reasons why these schools were chosen are that they offer mathematics up to advanced level. The advanced level classes are also manageable as they average around 20 learners per class. There is also availability of mixed gender in the classes coupled with a mix of male and female teachers taking up the subject up to advanced level. The first school Temeraire High is the researchers’ work station and the other high school, Bere, is located along the main road enabling easy movement to and from when carrying out the research.

The two high schools have an advantage of also having a cosmopolitan population. Cosmopolitan population is one composed of people with various cultural backgrounds. These people live together very easily because of their broadmindedness. Delanty (2006) defined a cosmopolitan population as one involving a group of people, working together and living together peacefully irrespective of their ethnicity, tribe, religion and culture. The people are bound together by given rules and regulation, which is a case of the two schools. The two schools are located in a mining town composed of individuals of various cultural backgrounds. There are learners from the surrounding rural areas as well as urban learners. This mixture gives the researcher fertile ground for data related to his area of study.

The researcher employed purposive sampling and 20 learners taking up mathematics at advanced level and another 10 learners not doing the subject but having passed it at ordinary
level were targeted for the research. All the mathematics teachers at the two schools (8 of them) were targeted for the study. The teachers were used as respondents because the investigator believed that they hold first-hand information concerning issues of gender and mathematics uptake. The research mainly used purposive sampling as a way of focusing on particular characteristics of a population that were of interest and could help in the gathering of data. For example, a student who failed the subject would not be a good sample on a topic requiring uptake at a higher level.

3.4 Data collection procedure and instruments

The researcher first obtained an ethical clearance from his institution. A clearance from the Ministry of Primary and Secondary Education to allow the researcher to interview the teachers and students was also obtained. Anonymity and confidentiality were granted to all the respondents. The nature and purpose of the study was explained openly and honestly to the respondents. Respondents were re-assured that the information they supply were to be used solely for the purpose of the study after which the information was to be destroyed. The participants were also assured they were free to take part or not to participate in the study, withdrawing anytime if they feel they were unable to continue.

Data collection was done using three main methods i.e. interviews, questionnaire and document analysis. The use of these variety of research instruments for data gathering was used to enhance the validity and the reliability of the findings. Validity and reliability are important concepts in the judgement of instruments. Validity refers to the extent to which an instrument is able to solicit for the required data (Wallen, 2001). Reliability on the other hand measures consistence of collected results. The use of questionnaires, interviews and document analysis ensures data is collected from different points of view (Creswell, 2013).
This triangulation and corroboration of information gathering enables the researcher to improve validity and reliability of the data. Collected data also underwent member check procedure, where transcription was counter checked by the researchers’ colleagues for validation.

3.4.1 Questionnaires

These were the main research instrument. The questionnaire was chosen as it allows data to be collected even in the absence of the researcher. To ensure validity and reliability, seasoned and experienced mathematics teachers were consulted in the construction of the questionnaires. The researcher tested for validity and reliability of the research instrument by administering the instruments to ten respondents. On the basis of their responses, the researcher was able to make corrections and other changes to improve the final instrument which was later used in the study.

Beside the pilot study, the researcher also seeks help from the research supervisor to get approval on the questions that were presented to the respondents through the questionnaire. The questionnaire contained both closed-ended and open-ended questions to give respondents a wide scope of expressing their views on gender participation in mathematics. I wanted to collect data on a short period of time, therefore the use of questionnaires (Dowling and Brown, 2010). The investigator administered the questionnaires personally. In order to increase response rate, the researcher delivered the questionnaire personally. This was proper as he also needed to interview the mathematics teachers at the two schools. As a result, a 100% response rate was guaranteed.

3.4.2 Interviews
In this study the researcher also used interviews. The interviews were held to gather information concerning the teachers’ perceptions, beliefs and attitudes towards gender and mathematics participation at advanced level. Only teachers were interviewed to save time as their numbers were manageable. One interview for each participant teacher was carried out. An interview guide was designed in order to help researcher to ask questions from the particular to the general minimizing abstract questions (Dowling and Brown, 2010). The main focus of the questions featured in the interview guides related to gender participation in mathematics. For example, the question of which gender has been taking up the subject more than the other as far as the respondent can remember, audio recordings were carried out to enable easier retrieval of the data in the transcription process.

3.4.3 Document analysis

The following important documents are also going to be looked at and analysed ordinary level mathematics results, list of advanced level students and their preferred choices and lastly attendance registers of students at advanced level. These documents are important in highlighting students participating in mathematics and those who passed mathematics at ordinary level but preferred no to take up mathematics at advanced level.

3.5 Data analysis procedures

Tuckman (1994) says data analysis procedures are important in that they help the researcher to organize the research data collected. Data analysis is therefore a way of processing data systematically, so that what has been observed from the respondents can be of help to
others. Analysis involves organizing and interrogating data in ways that enable investigation to come with patterns or to discover relationships, generating theories as well as critiquing works from other researchers. In short as claimed by Creswell (2013), data analysis involves organizing the data.

In this study, the data was analysed as soon as it was collected. This was in accordance with Lodico et al. (2010) claim that analysis of collected data in qualitative research can take place concurrently to guide the researcher as the collection process progresses. Frequency tables were mainly used to clean the data. Collected data was also analysed using the mathematical approach. Mathematical approach is a process involving working across all generated data to come up with common issues that recur (Charmaz, 2006). The main themes are identified and developed into theories where possible. From the analysis, conclusions were drawn and findings were generalized. Recommendations were then made.

3.6 Chapter summary

In this chapter, descriptive methods in which questionnaires and interviews were used as instruments for data collection were outlined. Description of the research context and an account of how the data was to be analysed was also given. Validity, reliability and some ethical considerations were also highlighted. Qualitative research design was employed in this research. Collected data is going to be presented in the form of tables, graphs and pie-charts. The next chapter looks at data presentation, analysis and discussion.
CHAPTER FOUR

ANALYSIS, RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the study findings, data analysis, interpretation and discussion. The collected data is going to be presented in the form of tables, graphs and pie-charts. The
data was organized and analysed based on the objectives of the study and the five subsidiary questions outlined below:

1. How qualified are the teachers teaching advanced level mathematics?
2. Are teachers teaching advanced level mathematics male or female?
3. What is the attitude of learners towards mathematics?
4. What is the attitude of parents towards learners, especially females taking up mathematics at advanced level?
5. What is the attitude of teachers taking advanced level mathematics towards female students taking the subject?

4.1 Data presentation and analysis

4.4.1 Document analysis: Mathematics uptake from 2017, Bere and Temeraire High

Table 2: Distribution of learners by gender

<table>
<thead>
<tr>
<th>Year</th>
<th>Temeraire High School</th>
<th>Bere High School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>%</td>
</tr>
<tr>
<td>2013</td>
<td>14</td>
<td>82</td>
</tr>
<tr>
<td>2014</td>
<td>12</td>
<td>85</td>
</tr>
<tr>
<td>2015</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>2016</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>2017</td>
<td>9</td>
<td>90</td>
</tr>
</tbody>
</table>

4.4.2 Graphical distributions of learners by gender

Graph 1: Temeraire High School
From the table and graphs shown above it can be seen that the number of girls taking part in advanced level mathematics are fewer at the two high schools for the past five years. Bere’s female enrolment had a high of 25% in 2015 and Temeraire High had a high of
25% in 2013. Both percentages at the two schools are very low and below the researcher looked at the probable reasons for the low figures in female learners at advanced level.

4.1.3 Questionnaire return rate

Table 3

<table>
<thead>
<tr>
<th>Questionnaire group</th>
<th>Distributed</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Learners</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

The questionnaires were physically distributed by the researcher. The response rate to the questionnaires was 100% for both teachers teaching mathematics and the targeted respondents.

4.1.4 Distribution of teachers and learners by gender

Table 4

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>Male</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>1</td>
</tr>
<tr>
<td>Learners</td>
<td>Male</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>12</td>
</tr>
</tbody>
</table>

From the table above 87.5% male teachers responded to the questionnaire. Only one female teacher responded to the questionnaire. Of the 8 teachers teaching advanced level mathematics, research reveals that 87.5% are male while 12.5% are female.

The above figures seem to suggest that males dominate in the teaching of advanced level mathematics. This gender imbalance in the teaching of mathematics may probably contribute to female learners not liking to take up the subject thinking it is male dominated.
This is in line with Costello (1991) who said that mathematics is seen as associated with male self-image.

Thirty learners responded to the questionnaires. 17 are taking up the subject at advanced level while 13 passed mathematics at ordinary level but are not doing the subject at advanced level.

4.1.5 Distribution of teachers according to experience and qualifications

Table 5

<table>
<thead>
<tr>
<th>Question No.</th>
<th>E.P.Q.E</th>
<th>N</th>
<th>Frequency</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5 – 9 years</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10 – 14 years</td>
<td>8</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>15+ years</td>
<td>8</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>‘O’ Level</td>
<td>8</td>
<td>3</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>‘A’ Level</td>
<td>8</td>
<td>5</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>BSc / Ba</td>
<td>8</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>C.E / DIP ED</td>
<td>8</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>GRAD CE</td>
<td>8</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>BED</td>
<td>8</td>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

Key
N = Total number of respondents
Freq = Frequency i.e. number of choosing alternative
The above table shows that 63% of the teachers studied mathematics up to ‘A’ Level. However, 50% of the teachers have a degree in mathematics while some have degrees in Chemistry, Physics and Geography but are taking advanced level classes in Mathematics. The only female teacher has a degree in mathematics and this may be a positive indicator in increasing the number of females taking up the subject.

4.2 **Attitudes of learners towards mathematics**

4.2.1 Do you view mathematics as a difficult subject?

![Attitude distribution](image)

*Figure 4.1*

The above distribution shows that 54% of the learners’ view mathematics as a difficult subject while only 33% think it is not difficult. 13% of the respondents were neutral. From the 30 respondents all the 12 girls who responded viewed mathematics as a difficult
subject. The view by the female respondents is in line with Asante’s (2012) assertion that girls lacked confidence in mathematics and view the subject as being difficult.

4.2.2 Do you like learning mathematics?

![Pie chart showing percentages of students who like or dislike mathematics]

Figure 4.2

From the results above, 87% of the respondents said they liked the subject while the remaining 13% indicated that they did not like learning mathematics. Again the smaller group (13%) who indicated they did not like learning mathematics were all girls, concurring with Snetzler (1998) who concluded that gender differences in learner's attitudes towards mathematics do exist but are small. Since most of the respondents (60%) who said they liked mathematics are male, results may suggest that males have a more positive attitude towards taking up mathematics.

4.2.3 What are the general views of parents towards learners of advanced level mathematics?

Respondents gave views such as:

i. “Parents view mathematics as a difficult subject” (60%)
ii. “Parents think mathematics should be taken up by geniuses or very intelligent learners” (20%)

iii. “They view mathematics as a subject for male learners” (20%)

From the above results it is clear that parents view mathematics as a difficult subject which should be done by a chosen few. All the above results concur with previous literature. Hanna (1996), revealed that some parents view mathematics as a male domain. 20% of the current researcher’s respondents also said parents view mathematics as a subject for male learners. Madina et al (2013) who suggested that female learners internalized parent’s negative perceptions towards mathematics concurs with the researcher’s current results where 60% of the respondents indicated that parents view mathematics as a difficult subject and also 20% whose parents feel it’s a subject for the few intelligent ones.

4.2.4 What do you think should be done to increase the number of learners taking up advanced level mathematics?

The following were some of the views by the respondents.

i. “Holding seminars and motivate learners, especially girls about the subject”

ii. “Provision of more textbooks and guiding learners and giving scholarships to those who have passed the subject”

iii. “Having mathematics competitions and giving prizes that motivate learners”

iv. “Learners should be encouraged and be told that mathematics is not a difficult subject but mere hard work will be required at advanced level”

v. “Educate them about the importance of mathematics”

vi. “Honestly I don’t know but I think it is a subject that needs self-motivation”

vii. “Advertising a variety of jobs with ‘A’ Level mathematics as an added advantage”
“introduction of programs like STEM which pay school fees for mathematics students and scholarships”

Above are the main responses obtained from the respondents on the above question. Some of the responses came from female learners most whom (37%) are not doing mathematics at advanced level but have passed it at ordinary level. Their responses seem to suggest that with enough motivation, increase in text books, education on the importance of mathematics, more female students may be able to take up the subject. The results above seem to contradict most researchers e.g. Tshabalala and Ncube (2012) who attributed low participation to fear of the subject.

4.3 Attitudes of teachers towards female students taking up the subject

4.3.1 Below are the views of mathematics teachers towards female learners taking up the subject:

100% of respondents believed that learners’ attitude towards mathematics can be improved at advanced level. However, on being asked to respond to the question.

4.3.2 Do you think both boys and girls have the same feelings towards mathematics?

They all (100%) said it is mostly boys who have the courage to take up advanced level mathematics. This seems to suggest that they view female learners as not being capable of participating in the subject. This view is also held by Mubeen (2013) who said many teachers actively and consciously encourage male learners to take up mathematics than female learners.
4.4 Teacher Interview Results

All the teachers (100%) who took part in the research said mathematics should be taught to both boys and girls. However, all said in their current classes boys are more than girls, with some classes having boys only taking up mathematics. This gender gap was attributed to a number of reasons. Two teachers (25%) attributed this gap to girls’ lack of interest in mathematics. Four teachers (50%) said girls fear mathematics and as a result they avoid the subject at higher levels. Two teachers (25%), said though some of the girls pass ‘O’ Levels mathematics very well, they shun doing the subject at advanced level. On being asked the gender they preferred teaching at advanced level, 37% of the teachers said they preferred teaching boys only as they don’t give up easily. 63% of the respondents however said that they preferred teaching both sexes to encourage gender balance.

On the question on ability all the eight teachers (100%) said boys and girls have the same ability. They said that, however girls generally lack interest in mathematics. On the question of enthusiasm towards mathematics, 1 teacher (13%) said the few female learners who take up mathematics show high levels of commitment. On the other hand, 4 of the teachers (50%) said boys are more motivated. The remaining 3 teachers (37%) said both boys and girls show enthusiasm in the subject. When asked for the reasons for gender disparities in mathematics uptake, 4 teachers (50%) believe domestic chores affect female learners, resulting in few of them passing the subject at ‘O’ Level, thereby limiting their participation at advanced level. The other 4 teachers (50%), said girls shun mathematics as they feel that it is a difficult subject.
On being asked ways in which gender parity can be improved, 5 teachers (63%) called for lowering the recruitment grades for girls. They said girls with B and C grades at ‘O’ Level should be encouraged to take up advanced level mathematics. The remaining 3 teachers (37%) said it was the duty of teachers and parents to encourage girls to take up advanced level mathematics.

The results of the teacher interview, support the results obtained from the questionnaires and from the documents such as registers in which generally boys are more than girls in advanced level classes. 100% of those teachers interviewed believe mathematics at advanced level should be taught to both boys and girls equally. On being asked on the reasons for the gender gap in their classes, 25% said that girls lack interest in the subject. 50% of the respondents said girls fear mathematics. This is in line with other researchers such as Vurayai (2012) who claimed that female learners do not take up mathematics mainly due to lack of confidence in their ability to tackle mathematical tasks. 25% said even after passing mathematics well at ‘O’ Level, female learners are shunning away from the subject at advanced level. This may seem to suggest that female learners lack confidence in themselves. This observation was also shown by Gudyanga (2016) who said female learners’ lack of confidence limit their participation in mathematics.

37% of the teachers said that they preferred teaching boys only because they do not give up easily. While 63% said they preferred teaching both boys and girls. All the teachers (100%) interviewed in this study believe that both boys and girls have the same ability in tackling mathematical tasks. This is unlike what other researchers (International Mathematics Union, 2014) have said that teachers believed that girls are less gifted than boys in mathematics. On equal ability between boys and girls, 100% of the respondents
believe that both sexes show no significant differences. The results are similar to results from previous studies, for example Sadker (1994); Kalavara et al (2007); Waheed (2011) found out that girls perform equally or better than boys in mathematics. On enthusiasm and eagerness to learn mathematics, 13% of the teachers said the few girls who take up the subject show high levels of commitment. This view was also observed by Peixoto (2012) whose study showed no difference in attitudes towards mathematics between male and female learners.

50% of the teachers said boys are more motivated than girls in participating in mathematical tasks. This belief seems to indicate that the teacher’s responses are influenced by gender stereotyped beliefs since all of them are also male. It is important to note that this may be the main reason why there are very few girls willing to take up mathematics at advanced level. Amelink (2012) supports this view when he concluded that influential people such as teachers’ negative views diminish female learners’ pursuit of mathematics at high school. Ifegbesan (2012) also concluded the same. 37% of the teachers however said both boys and girls show the same enthusiasm in taking up mathematics.

Of the possible reasons for the low numbers of female learners taking up mathematics, 4 out of the 8 teachers interviewed (50%) said female students are mainly affected by domestic chores which results in them not having enough time to study and do their homework. As a result, the girls are said to perform badly in the ‘O’ Level exams resulting in them not being able to take up advanced level mathematics. In support of these findings Gudyanga (2013) said female are seen to be disadvantaged by being given time consuming domestic chores which leave them with little time to study.
The other 4 respondents (50%) said girls fear mathematics, no wonder even those who passed it at ‘O’ Level do not like to pursue it at advanced level. Tshabalala and Ncube (2012) also attributed to low participation of female learners in advanced level mathematics due to phobia. On ways to improve gender parity in mathematics, 5 of the 8 teachers i.e. 63% said girls should be considered for advanced level classes even if they have C grades. 3 of the 8 teachers (37%) said teachers and parents should encourage girls to take up the subject.

4.5 Document analysis

The following important documents were looked at and analysed, attendance registers and result analysis reports.

4.5.1 Attendance registers

The attendance registers of ‘A’ Level classes at the two high schools were looked at – 16 boys (89%) are taking mathematics while only 1 girl (11%) is taking the subject. This seems to suggest that girls do not like taking up mathematics at advanced.

4.5.2 Result analysis

Table 6

<table>
<thead>
<tr>
<th>Grade ‘O’ Level</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
</tr>
</tbody>
</table>

From the table above 13 respondents (43%) passed mathematics at ‘O’ Level but are not doing the subject. 11 of the 13 respondents are female students who opted not to do
mathematics. This may be due to fear of the subject as concluded also by Tshabalala and Ncube (2012).

Of the documents analysed, it is clear that though a number of girls are passing mathematics at ‘O’ Level, only a few choose to do the subject at advanced level. This may be due to a number of reasons, some of which were highlighted from the responses that were given by both the learners themselves and their teachers in their questionnaire responses. Among the factors cited for poor participation of girls as evidenced by the documents analysed are negative socio-cultural attitudes where girls are seen as not being capable of taking up supposedly difficult subjects like mathematics.

Household tasks and parents’ attitudes towards girls’ performance in mathematics also featured prominently in responses from both learners and teachers. Therefore, the low figures of girls taking up mathematics as evident in the documents analysed was explained in responses given by the respondents who were interviewed and who responded to the questionnaires. The students and teachers thus seemed to suggest that parents play a major role in student subject choices at advanced level. This is consistent with findings by Madina et al (2013) who concluded that female learners tend to internalize parents’ negative perceptions towards mathematics which became evident by their low participation in the subject.

4.6 Chapter Summary

In this chapter, the researcher presented the findings on low uptake of advanced level mathematics by female learners. The learners, teachers and parents seem to believe that advanced level mathematics is a male dominated subject. Teachers however believe that
both boys and girls have the same ability in tackling mathematics tasks. Learners especially females also believed that with enough incentives uptake of the subject by girls can be improved. Chapter five presents the summary of the key findings, the conclusions and recommendations for further study.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the main findings, conclusions and recommendations. The findings are presented according to the objectives of the research and also according to research questions formulated from the objectives.

5.2 Summary of the findings and conclusions

This study examined the low uptake of advanced level mathematics by female students. Research findings showed that teachers teaching advanced level mathematics are highly qualified and most of them have a bachelor of education degree in mathematics. The teachers are also very experienced with the minimum being 12 years. Three of the teachers however have degrees in other areas such as Geography, Chemistry and Physics.

The research revealed that learners especially girls view mathematics as a challenging subject especially after performing household chores. However, the respondents gave meaningful views on what can be done to increase number of female learners in advanced level classes. They cited provision of support such as textbooks, seminars, competitions with prizes, scholarships, guidance on the importance of mathematics and highlighting careers with ‘A’ Level mathematics as an added advantage as some of the ways which can be used to increase female participation in mathematics.
The research also revealed that most parents think mathematics is a difficult subject. They think it should be done by geniuses most of whom should be male students. The parents’ views are in line with what is happening at the two schools where mostly boys are the ones taking up advanced level mathematics. Therefore, the parents’ views seem to be one of the main reasons why there are few girls taking up advanced level mathematics. Amongst the teachers who took part in the research only one is female. As a result, most female students may view mathematics as a masculine subject. In Zimbabwe, in 2011, male teachers in science and mathematics stood at 89% and female staff stood at 11% at national level (ZimStat, 2012). Therefore, lack of enough female role models in mathematics may be one of the reasons why there are few female learners participating in mathematics at advanced level.

The findings have shown that teachers believe boys and girls have the same ability to do well in the subject as long as they have the right attitude. The research also established that though most females appear to have negative attitudes towards mathematics, uptake may be improved through a number of interventions. These are improvement in textbook availability, incentives for female learners and encouragement from both parents and teachers. Previous research has indicated that lack of confidence is one of the major reasons for low uptake of the subject. This was also evident in this research in which quite a number of female students had good passes at ordinary level but were unwilling to take up the subject at advanced level.
5.3 Conclusions

Based on the above findings the following conclusions emerged:

1. Girls fear taking up mathematics but have the same ability as boys. Therefore, if encouraged by both parents and teachers, uptake can improve.

2. Female learners feel not enough is being done to encourage them to take up advanced level mathematics. Therefore, if seminars, incentives and value of taking up mathematics at advanced level are put in place, many girls may end up doing the subject.

3. Role models such as teachers and parents need to be positive and treat girls in the same way as boys. This is because parental and teacher support is important for fostering female learners’ interest in advanced level mathematics. Parents and teachers can expose female learners to a range of careers, demonstrate how such occupations are relevant to their communities and encourage interest in the mathematical preparation necessary for mathematical uptake. Parents and teachers should also de-emphasize the idea that advanced level mathematics is for genius learners. Instead they should emphasize the relevant study skills required to tackle mathematics tasks.

4. Parents should give girls enough time to study when they are still fresh as some of them claimed that house chores disturb their studies, especially in mathematics which is viewed as a difficult subject.

5.4 Recommendations for further research

In view of the above research findings and conclusions, the following recommendations for further research are put forward:

1. Examining the role of peers and siblings in shaping interest in mathematics.
2. Examining how teacher practices, pedagogy and peer interactions establish a classroom climate that leads to lack of interest in advanced level mathematics.

3. Future research can also look at the mathematics anxiety, its link to mathematics interest as well as what can be done by teachers and parents to counteract negative experiences among female learners, and lastly

4. Examine more closely the link that female learners see between mathematics and careers in related fields such as science, engineering and technology (STEM). This will help teachers consider how to make advanced level more interesting and relevant and thereby increase interest in these mathematics related careers.
REFERENCES


Anders. J. (2012): ‘The link between household income, University applications and University attendance’ Fiscal studies, 33(2), 185-210


Codiroli. N. (2015): Inequalities in students’ choice of STEM subjects; An exploration of intersectional relationships, London, Centre for longitudinal studies


Tshabalala. T. and Ncube. A. (2012): causes of poor performance of ordinary level pupils in mathematics in rural secondary schools in Nkayi District; Learner’s attributions, Nova Journal of Medical and Biological Sciences 1(1), 1-6


Veemer. H., Boekaerts and Segeers. G. (2000): Motivational and gender difference; Sixth grade students’ mathematical problem solving behaviour, journal of educational psychology, 92(2), 308-315

Vurayai. S. (2012): Equity principle in mathematics education; Focus on ordinary mathematics, London; Lambert Academic


APPENDIX 1

Sample Questionnaire for Students

The researcher is a Master’s of Science, Education (Mathematics) final year student at Bindura University of Science Education. I am carrying out a research on the low uptake of Advanced Level mathematics by female learners. May you kindly answer the following questions as honestly as possible by placing a tick in the box or by filling in.
the spaces provided. You do not have to identify yourself. Your responses will be treated with confidentiality and will be used for educational purposes only.

1. Gender
   - M
   - F

2. Age: ........................................
   - A
   - B
   - C

3. Ordinary Level mathematics symbol
   - YES
   - NO

4. Advanced Level choice mathematics
   - YES
   - NO

5. Do you view mathematics as a difficult subject?
   - YES
   - NO
   - NEUTRAL

6. What is the gender of your mathematics teacher?
   - M
   - F

7. Do you like learning mathematics?
   - YES
   - NO

8. Do mathematics teachers encourage you to take up the subject at advanced level?
   - YES
   - NO

9. Do parents encourage you to participate in mathematics at higher levels?
   - YES
   - NO
10. What are your friend’s attitude towards advanced level mathematics?

………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

11. What do you think are the general views of parents towards learners of advanced level mathematics? …………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

12. Briefly think what makes you like or dislike mathematics?

………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

13. What do you think should be done to increase the number of learners taking up advanced level mathematics? …………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………

THANK YOU FOR YOUR TIME AND CO-OPERATION
APPENDIX 2

Sample Questionnaire for Teachers

The researcher is a Master’s of Science, Education (Mathematics) final year student at Bindura University of Science Education. I am carrying out a research on the low uptake of Advanced Level mathematics by female learners. May you kindly answer the following questions as honestly as possible by placing a tick in the box or by filling in the spaces provided. You do not have to identify yourself. Your responses will be treated with confidentiality and will be used for educational purposes only.

1. Gender

   M  F

      YES  NO  DON'T KNOW

2. Teaching experience (yrs)

   0-4  5-9  10-14  15+

3. Highest academic qualifications?

   ……………………………………………………………………………………………………………………………………………………………

4. Highest professional qualifications?

   ……………………………………………………………………………………………………………………………………………………………

5. What is the major subject you studied?

   ……………………………………………………………………………………………………………………………………………………………

   YES  NO  DON'T KNOW
6. Do you think learners' learners' attitudes towards mathematics can be improved after ordinary level?

7. If yes, how? If no, why?

8. Do you ever find yourself attributing a pupil’s difficulties in mathematics to his/her attitude towards the subject?

9. What is negative attitude towards mathematics?

10. Do you think both boys and girls have the same feelings towards mathematics?

11. Are parents helpful in changing life attitudes of learners towards mathematics?

12. If yes, how are they helpful? If no, what are the common beliefs?

13. What is the general policy of recruiting learners who take up mathematics at your school?
14. Does your school encourage both male and female students to take up mathematics at advanced level?  

15. If yes, how? If no, why?  

16. Do you think both boys and girls have the same ability to participate in advanced level mathematics?  

17. What has been your experience on gender and mathematics uptake at your school?  

THANK YOU FOR YOUR TIME AND CO-OPERATION

APPENDIX 3
Interview for mathematics teachers

1. Tell me about your teaching experience.

2. What is your general opinion in teaching mathematics to both male and female learners?

3. Do you have gender balance in your class? If no, which gender is more than the other?

4. What are the reasons for the gender gap in students doing your subject?

5. Which gender would you prefer to teach especially at advanced level? Why?

6. Which group (female or male) would you encourage most to do well in mathematics?

7. Do you consider male and female learners to have the same ability to participate in advanced level mathematics?

8. In your particular class, do female and male students show the same enthusiasm to the subject?

9. Name all possible disparities that you may experience in male and female learners as they learn mathematics.

10. What do you think should be done to improve gender parity in mathematics learning?

THANK YOU FOR YOUR TIME AND CO-OPERATION

APPENDIX 4
Date: 30 October 2017

TO WHOM IT MAY CONCERN

RE: NAME: Dube Nyasha

PROGRAMME: MScEd Mathematics

REGISTRATION NUMBER: R976804B

PART: 2.2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Thesis in partial fulfillment of the Masters of Science Education Degree programme. The research topic is:

Low uptake of Mathematics by female students at Advanced Level.

In this regard, the department kindly requests your permission to allow the student to carry out his research in your institutions.

Your co-operation and assistance is greatly appreciated.

Thank you

Dr. E Mandoga
PROGRAMME COORDINATOR

APPENDIX 5
All communications should be addressed to
"The Provincial Education Director for Education Sport and Culture"
Telephone: 63585/63542
Fax: 039-63261

Reference: ..................................................
Ministry of Primary and Secondary Education
Masvingo District
P.O Box 89
MASVINGO

NYAHU DUBE
TEMPERANCE HIGH

BOX 180
MASHABANA

MASVINGO

RE: PERMISSION TO CARRY OUT AN EDUCATIONAL RESEARCH AT
TEMPERANCE AND BEREA HIGH SCHOOLS

SCHOOLS: MASVINGO DISTRICT: MASVINGO PROVINCE

Reference is made to your application to carry out a research at the above mentioned schools in Masvingo District.

Please be advised that the Provincial Education Director has granted you permission to carry out your research on;

LOW UPTAKE OF MATHEMATICS AT ADVANCED LEVEL

You are also advised to liaise with the Heads responsible for the schools which are part of the samples for your research.

L. CHIGABA
DISTRICT SCHOOLS INSPECTOR- MASVINGO DISTRICT

APPENDIX 6
ALL communications should be addressed to “The Provincial Education Director for Primary and Secondary Education”

**Telephone:** 263585/264331
**Fax:** 039-263261

**Ref:** C/426/3

Ministry of Primary and Secondary Education
P. O Box 89
Masvingo

04 October 2017

Dube Nyasha
Temeraire High School
Box 180
Mashava

**RE: PERMISSION TO CARRY OUT RESEARCH AT TEMERAIRE AND BERE HIGH SCHOOLS: MASVINGO DISTRICT: MASVINGO PROVINCE**

Reference is made to your application to carry out a research at the above mentioned secondary Schools in Masvingo District on the research title:

**"LOW UPTAKE OF MATHEMATICS BY FEMALE STUDENTS AT ADVANCED LEVEL"**

Please be advised that the Secretary for Primary and Secondary Education has granted permission to carry out your research.

You are also advised to liaise with the District Schools Inspector who is responsible for the schools which are part of the sample for your research.


Z. M. Chitiga
Provincial Education Director
**MASVINGO PROVINCE**
Dube Nyasha  
Temeraire High School  
Box 180  
Mashava

Re: PERMISSION TO CARRY OUT RESEARCH IN MASVINGO PROVINCE: MASVINGO DISTRICT: TEMERAIRE AND BERE HIGH SCHOOLS

Reference is made to your application to carry out research at the above mentioned schools in Masvingo Province on the research title:

"LOW UPTAKE OF MATHEMATICS BY FEMALE STUDENTS AT ADVANCED LEVEL"

Permission is hereby granted. However, you are required to liaise with the Provincial Education Director Masvingo Province, who is responsible for the schools which you want to involve in your research. You should ensure that your research work does not disrupt the normal operations of the school. Where students are involved, parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education.

E.Chinyowa
Acting Director: Planning, Research and Statistics
For: SECRETARY FOR PRIMARY AND SECONDARY EDUCATION
cc: PED – Masvingo Province

APPENDIX 8
INFORMED CONSENT FOR PARENTS

REQUEST FOR YOUR CHILD TO TAKE PART IN A STUDY

My name is Nyasha Dube of Bindura University of Science Education. I want to investigate the causes for the low uptake of Advanced Level mathematics by female learners. I am therefore requesting you to allow me, to have your children answer questions which may be helpful in this research project.

During the study I will have learners respond to questionnaires in which your child will be involved. I will make sure that your child’s identity is concealed by use of pseudonyms and that the information I collect is kept strictly confidential and is used strictly for the purpose of the study. Your child is free to withdraw from the research activities at any time if he/she feels uncomfortable to continue.

Parent’s consent

I have read and understood the purpose of this study and I hereby I agree to have my child taking part in this study.

Signature ……………………………………                       Date …………………………

Parent’s name ……………………………………………………………………

For more information, contact me on 0776 987 488 / 0716 205 422
APPENDIX 9

Nyasha Dube
Bindura University of Science Education

01 September 2017

The Headmaster

Dear Sir/Madam

Re: ASSENT FOR THE CHILDREN

On behalf of the parents of the learners doing Advanced Level mathematics. I kindly request their assent through your office to allow me to conduct my research, by having them to respond to my questionnaire. The collected information and findings shall be used purposely for the research only and confidentiality will be highly maintained. Their names and identities will also not be disclosed at any time.

The research topic is entitled: The causes for the low uptake of Advanced Level mathematics by female learners.

For more information, contact me on 0776 987 488 / 0716 205

Thank you

AUTHORISATION

I have read and understood this assent letter, and allow the researcher to use ‘A’ Level students as participants in his research study. I understand that my consent does not take away any legal rights in the case of negligence or other legal fault of anyone who is involved in this research. I further understand that nothing in this consent is intended to replace any government regulations and rights of children shall be maintained throughout.

Name of school head …………………………………………………………………………...

Signature …………………………………………   Date …………………………………….