

BINDURA UNIVERSITY OF SCIENCE EDUCATION
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SCIENCE AND MATHEMATICS EDUCATION DEPARTMENT



Standing Factors Why Few Female Learners in Rural Day High Schools Take Chemistry at Advanced level: A Case of Kambarami and Dombodzvuku High Schools in Murewa District, Mashonaland East Province.

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A Research Project submitted to Bindura University of Science Education in partial fulfillment of the requirements of the Bachelor of Science Education Honors Degree in Chemistry.

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RELEASE FORM

TITLE OF PROJECT: STANDING FACTORS WHY FEW FEMALE LEARNERS IN RURAL DAY SECONDARY SCHOOLS TAKE CHEMISTRY AT ADVANCED LEVEL: A CASE OF KAMBARAMI AND DOMBODZVUKU HIGH SCHOOLS IN MUREWA DISTRICT, MASHONALAND EAST PROVINCE.

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SIGNED..... Nyamandwe Pauline.C

DATE.....

APPROVAL FORM

The undersigned certify that they have read and recommended to Bindura University of Science Education for acceptance of research project titled, 'Standing factors why few female learners in rural day secondary schools take chemistry at ordinary level: A case of Kambarami and Dombodzvuku High Schools in Murewa District, Mashonaland East Province, submitted by Chipso, P. Nyamandwe, Registration Number: B212956B, in partial fulfilment of the requirements for a Bachelor of Science Education Honours Degree in Chemistry.

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DECLARATION

I declare that a project titled, **‘Standing factors why few female learners in rural day secondary schools take Chemistry at Ordinary level: A case of Kambarami and Dombodzvuku High schools in Murewa District’**, is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I declare that this work has not been submitted before for any other degree programme at any other institution.

Name: Nyamandwe Pauline.C

Signed: Date:.....

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DEDICATION

I dedicate this research project to my husband, Desire Chiseya, my daughter, Natalie and son, Tadisa.

ACRONYMS

FGDs	FOCUS GROUP DISCUSSIONS
GoZ	GOVERNMENT OF ZIMBABWE
MoPSE	MINISTRY OF PRIMARY AND SECONDARY EDUCATION
STEM	SCIENCE, TECHNOLOGY AND MATHEMETICS
ZIM-ASSET	ZIMBABWE AGENDA FOR SOCIAL AND ECONOMIC TRANSFORMATION

ABSTRACT

The study sought to examine standing factors why few learners take Chemistry at Advanced level, with reference to two day secondary schools in Murewa District. The study adopted a qualitative research design, and used unstructured in-depth interviews, key informant interviews and focus group discussions to collect data. The data generated from a sample of 2 school administrators, 2 heads of department, 2 science teachers and 10 Advanced level female learners who were purposively selected from the study population illuminated that the gendering of learners' career prospects, gendering of subjects, lack of female role models in science, particularly Chemistry related fields and careers at school and in the community, lack of material and human resources in schools, lack of career guidance, teachers' negative influence and peer pressure are the standing factors that promote the underrepresentation of female learners in Chemistry. Therefore, from the findings, was concluded that gender socialisation underpinnings have influenced the underrepresentation of female learners in Chemistry. To this end, it is therefore imperative for the government through the MoPSE and various schools to come with initiatives that promote the uptake of Chemistry by more female learners, especially in rural secondary schools.

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CHAPTER 1

1.1 INTRODUCTION TO THE STUDY

The chapter presents the background of the study, statement of the problem, assumptions of the study, research aim, objectives, research questions, significance of the study, delimitations of the area of study, limitations of the study, definition of key terms and summary of the chapter in view of standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level.

1.2 BACKGROUND OF THE STUDY

Female students are under-represented in science while Zimbabwe needs more scientists to meet its developmental agenda in a technological world (Gudyanga, 2016); hence the emphasis placed on STEM as the panacea for the economic challenges facing the country (Chitate, 2016). The Curriculum Framework for Primary and Secondary Education (2015-2022), which evolved from the economic blue print, namely, the Zimbabwe Agenda for Sustainable Economic Transformation (ZIM-ASSET) saw greater focus being placed on the teaching of science, technology, engineering and mathematics (Mukomana, Mangozhe & Gasva, 2017). Therefore, Chemistry is not an exception since it constitutes a science subject. While some rural day secondary school curricular have been sorely focusing on Arts and Commercial subjects. In conformity to the new curriculum which encourages the uptake of STEM subjects, such schools have introduced Chemistry at Advanced level. However, the obtaining situation is that few female learners in rural day high schools take Chemistry at Advanced level.

Although Seni (2017) avers that Zimbabwe as a country has an educational policy which does not isolate the national policies for the education of girls from other socio-economic policies and the political status of women in general, the obtaining situation is that there are few female learners taking Chemistry at Advanced level in rural day schools. This unfortunate situation is not consistent with the totality of inclusive education as the majority of female learners in rural day schools do not take the subject, thereby limiting their contribution to national development. Thus, it is important to have a gender sensitive curriculum, especially in respect to science subjects. Gender sensitivity refers to the provision of equal access to quality education for all learners regardless of their gender. It means equal and fair treatment of boys, girls and adults alike taking into account their gender needs (Curriculum Framework for Primary and Secondary Education 2015-2022). However, studies by Bhukuvhani (2018) indicate that the uptake of STEM subjects like Chemistry among secondary school students in Zimbabwe was

very low as compared to other disciplines in the curriculum such as the arts, humanities and commercial subjects at ‘A’ levels. It can be argued that the underrepresentation of female learners in Chemistry adversely affects their career prospects. The table below illustrates trends for female enrolments for Advanced level Chemistry classes at Kambarami and Dombodzvuku High Schools for the period 2017-2022.

TABLE 1.1: A LEVEL CHEMISTRY ENROLMENT STATISTICS FOR KAMBARAMI AND DOMBODZVUKU HIGH SCHOOLS FOR THE PERIOD 2017-2022

SCHOOL	Kambarami		Dombodzvuku	
	Male	Female	Male	Female
2017	8	2	7	0
2018	9	2	8	2
2019	5	1	8	1
2020	6	0	4	0
2021	6	1	5	1
2022	7	0	7	1

The obtaining situation in rural day high schools is that there are very few female learners taking up Chemistry in the science combinations at Advanced level. It is therefore, imperative to interrogate why this is happening with reference to two rural day secondary schools in Murewa District, Mashonaland East Province.

1.3 PURPOSE OF THE STUDY

The purpose of the study is to investigate the reasons why there is a low enrolment of female learners in Advanced level Chemistry at rural day secondary schools in Murewa District.

1.4 STATEMENT OF THE PROBLEM

Prior researches have focused on the contribution of STEM, particularly science to national development. Many female learners study sciences at Ordinary level but there is a noticeable decline in their enrolment at Advanced level Chemistry. There are gender disparities with regards to the uptake of Chemistry at Advanced level. It is very often reported that boys tend to dominate the classroom in Advanced level Chemistry lessons in coeducational settings (Sorensen, 2006). This creates a research gap which serves as inspiration to the present study.

The study which is particular to rural day secondary schools in Murewa District stems from the desire to examine standing factors why few learners take Chemistry at Advanced level.

1.5 RESEARCH AIM

The study aims to interrogate standing factors why few female learners in rural day secondary schools in Murewa District take Chemistry at Advanced level.

1.6 RESEARCH OBJECTIVES

The study seeks to;

1. Examine rural day secondary school female learners' perceptions of Advanced level Chemistry in Murewa District.
2. Identify factors that promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District.
3. Suggest possible ways of improving the enrolment of female learners who take Chemistry at Advanced level in rural day schools.

1.7 RESEARCH QUESTIONS

1. What are female learners' perceptions of Advanced level Chemistry?
2. What factors promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District day schools?
3. How can the Advanced level Chemistry enrolment of female learners be improved in rural day schools?

1.8 ASSUMPTIONS OF THE STUDY

The researcher assumes that participants will show a high level of cooperation and give her true information about their experiences pertaining to this study. The other assumption is that the researcher will be granted permission to interact with respondents by the relevant authorities.

1.9 SIGNIFICANCE OF THE STUDY

The findings can be used as a foundation on which future researches on the same phenomenon build and develop. The findings will inform the Ministry of Primary and Secondary Education to come up with strategies for fostering and cultivating in female learners a positive attitude towards Chemistry in the interest of national development. More so, the findings will be of

significance to school heads and teachers so that they make an effort to deconstruct gender stereotypical perceptions that characterise school curricular, thereby motivating female learners to pursue science oriented careers by accepting Chemistry and other science subjects at Advanced level. The findings also guide teachers to encourage female learners to take Chemistry at Advanced level. Thus, the study becomes the basis for interventions at school level. The findings will also serve to inculcate in female learners a positive attitude towards Chemistry and other STEM subjects.

1.10 DELIMITATIONS

The study will be confined to Dombodzvuku and Kambarami High Schools in Murewa District from which the research findings will be generalised to other schools in the district. The two schools are easily accessible to the researcher in that she does not have to incur high transport expenses when visiting them for data collection. More so, the number of participants to be purposively selected from the population will be quite manageable to allow the researcher to complete research in a reasonable period of time.

1.11 LIMITATIONS

It will not be possible to interview all female learners doing Advanced level so the findings will be generated from learners purposively selected from the study population. The other potential limitation will be of some participants' unwillingness to participate in the study, and in worst cases other participants may not tell the truth thereby affecting the trustworthiness of the research findings.

1.12 DEFINITION OF KEY TERMS

Chemistry

Chemistry is a branch of science that deals with the study of matter including its composition, structure, and properties and the transformations that they undergo (Rosly, Hamid & Rahman, 2021).

Female learners

In the context of this study, female learners can be defined as girls attending school at secondary level.

Secondary school

Secondary school refers to a learning institution intermediate between elementary school and college and usually offering general, technical, and vocational or college preparatory courses.

Advanced level

Advanced level refers to the final half part of the General Certificate of Education; the basic level of the General Certificate of Education.

Gender socialisation

Gender socialisation is the process through which a culture's gender-related rules, norms and expectations are taught (Guy-Evan, 2022).

Identity

Identity can be defined as a personal conception of oneself as male or female (Shuvo, 2020).

Perceptions

A perception refers to constructing an understanding of the social world from the data we get through our senses" (Michener, DeLamater & Myers, 2004: 106). In the context of this study the concept of perception refers to the process by which female learners form impressions of Chemistry.

1.13 ORGANISATION OF THE STUDY

The study is organized into five chapters. Chapter 1 focuses on the problem and its setting, presentation of the background to the study, statement of the problem, research objectives and research questions. It also gives significance of the study, assumptions of the study, limitations, delimitations, definition of key terms and finally, the chapter summary. Chapter 2 presents a review of literature related to the study topic, which forms the infrastructural basis for the research findings to be discussed in Chapter 4 of the study. Chapter 3 presents a description and overview of the methodology used in the study, with focus on the research paradigm, research design, research instruments, sampling, data presentation way and analysis procedure used in the study and ethical considerations. Chapter 4 presents the research findings which are analysed and discussed under emerging themes. Chapter 5, which is a summary of the whole research process also presents conclusions drawn from the findings of the study and recommendations thereof.

1.14 CHAPTER SUMMARY

This chapter has explored the problem and its setting, taking into account the background of the study, statement of the problem, major research aim, objectives, research questions, significance of the study, delimitations, limitations of the study, definition of key terms and organisation of the study. The next chapter focuses on the conceptual framework that informs the study and review of literature related to the area under study.

CHAPTER 2: REVIEW OF RELATED LITERATUR

2.1 INTRODUCTION

The chapter focuses on the conceptual framework that informs the study. The theory of gender socialisation theory underpins this study though any theoretical gaps that arise from the findings will be appreciated. It also explores literature related to the study. In view of the research objectives, the literature hinges on examining female learners' general perceptions of Chemistry and identifying factors why few of them take the subject thereof. The literature will serve as the basis for the research gap with reference to selected schools in Murewa District.

2.2 CONCEPTUAL FRAMEWORK

GENDER SOCIALISATION THEORY

The proponents of gender socialisation theory agree that one of the main goals of socialisation is the institutionalisation of the values, the beliefs, and standards of the society for all members of a given group (Hoominfar, 2019). Thus, gender socialisation traverses all social institutions. The gender socialisation theory is critical for this study in serving as the lenses through which an analysis of the standing factors into why female learners take Chemistry at Advanced level will be done. Gender roles are sets of behaviours, attitudes, and personality characteristics expected and encouraged of a person based on his or her sex; hence the stereotypes of STEM professions might influence or discourage females from entering the STEM field (Reinking & Martin, 2018). Basing on this concept, the theory implies that gender stereotypical perceptions and roles into which an individual is socialised have an influence on the choice of subjects. This has an allusion to gender-typing of certain subjects, and in the context of this study, the underrepresentation of female learners in Chemistry reflects the influence of gender socialisation which shapes identity.

Socialisation becomes highly instrumental in the building of one's identity. The organisations in which young girls spend their time, such as schools play a role in constructing their identity (Chikuvadze & Matswetu, 2013). Identity can fundamentally shape individuals' life experiences, how they are treated, who they meet and become friends with, what kind of education and jobs they get, the opportunities they are afforded, and the kind of inequities they may face (Gouws, Kruger, & Burger, 2008). Thus, the identity construction which mirror the learners' career has a bearing on attitudes towards a subject, and particularly Chemistry in the context of this study.

2.3 FEMALE LEARNERS' GENERAL PERCEPTIONS OF CHEMISTRY

Studies by Shindi (2016) draw a connection and association between the complexity of Chemistry and enrolment across the gender divide. There are prior studies which reveal the influence of attitudes and perceptions in shaping and determining learners' interest and choice of subjects. A number of learners who shun science subjects like Chemistry and Physics perceive them as difficult resulting in low enrolments, so they would rather choose Biology, which they regard to be a bit easy (Shindi, 2016). In the context of this study, it can be noted that the majority of female learners in rural day schools are not comfortable with taking Chemistry at Advanced level. Mbirianjau (2009) as cited in Akuaku (2015) postulates that the lack of female participation in mainstream science and technology disciplines means that many countries currently realize only a portion of their potential in these areas. Findings from research studies carried out in Pakistan by Hassan and Murtaza (2020) indicate that male learners have better attitudes towards Chemistry as compared to female learners. Male and female students show a significant difference in their attitudes towards learning Chemistry (Osborne & Dillon, 2008). This resonates well with Musengimana, Kampire and Ntawiha (2020) who aver that boys have more positive attitudes toward Chemistry than girls, and they tend to participate more in the subject activities than female students.

According to studies by Akala (2010) on gender differences in students' achievement in Chemistry in secondary schools of Kakamega district, Kenya, more male students enrolled in upper secondary Chemistry courses; hence being a boy rather than a girl led to the expression of a greater interest in Chemistry taught in schools and classrooms across the schools. Thus, these research studies portray attitudinal inclinations and institutional issues as general determinants of the uptake of Chemistry by female learners in schools. These studies are similar

to the situation of female learners in Murewa District though the researcher is yet to find out factors that account for such gender disparities in enrolment for Advanced level Chemistry.

2.3.1 NEGATIVITY

Robins (2005) postulates that negative stereotypes and labels attached to subjects have the impact of repelling learners. Lin and Fawzi (2006) further that belief by learners, intentions and attitudes largely influence their choices of subjects. However, the validity of these assertions is yet to be confirmed with regards to the underrepresentation of female learners in Chemistry. According to a survey done by Gadzirayi, Bongo, Ruyimbe and Bhukuvhani et al (2016) it emerged that some students have negative attitude towards science education, so they do not enrol in STEM programmes. Although, the study does not give the gender patterns on this, it remains opaque as to why there is underrepresentation of female learners in STEM disciplines, particularly Chemistry.

Studies by Kenni (2019) on learners' perceptions of Chemistry in Nigeria reveal that the male students showed much more positive attitudes towards the subject than their female counterparts. Valenti, Masnick, Cox and Osman (2016) further that female students have less inclination to science than male students. There should be some sticky issues behind these differential inclinations to science. There is a general perception which arises from socialisation that boys are better suited for some subjects than others, for example mathematics, and science and technology (Kapungu, 2007). It is from this socially constructed notion that female learners' perceptions of the subjects are shaped. Given that teachers have some negative attitudes towards students especially the girls in Chemistry, there is a misconception that the subject is difficult; hence girls believe it and tend to hate the subject (Mlekenyi, 2009).

Hassan and Murtaza (2020) affirm findings from studies by various researchers who investigated secondary school students' attitudes towards Biology, Chemistry, Physics, Science and School, and reported that male students have more attitudes as compared to female students towards learning Chemistry. It was revealed in studies carried out in Kenya by Busolo (2010) that males outperform females on nearly all tasks related to mathematical ability; hence Mathematics is a factor in the learning of science as most topics entail the use of Mathematics, which girls avoid. The perception that chemistry is a difficult subject to learn and teach is common among students and it results in a high number of students pulling away from taking Chemistry courses either at high school or university levels in many countries (Rosly, Hamid & Rahman, 2021).

Studies by Ogunyemi and Bamidele (2019) on gender influence on students' perception in learning Chemistry in Nigerian secondary schools indicate that gender is a major factor that influences career choice and subject interest of students. Females represent a very small percentage of physical sciences professionals, including physics and chemistry (Ceci & Williams, 2007). There is a general perception which arises from socialisation that boys are better suited for some subjects than others, for example mathematics, and science and technology (Kapungu, 2007). Therefore, it is imperative to note that the under-representation of females in science related programmes and careers mirrors what is obtaining in secondary schools. Thus, the representation of boys in science subjects like Chemistry is higher than that of girls. Makwinya and Hofman (2015) are of the standpoint that parents' perceptions in sciences that were communicated at home affected the development of the students' gender-based self-perceptions in sciences. This resonates well with gender socialisation underpinnings that characterise the society in which the learners are situated. It implies that in some cases perceptions that learners hold cascade from the parents, thereby shaping their attitudes and choices.

2.4 FACTORS THAT PROMOTE THE UNDERREPRESENTATION OF FEMALE LEARNERS IN CHEMISTRY

It is even more worrying in the case of girls whose uptake in STEM is very low and the performance of the few is not as good as that of the boys in particular in Zimbabwe (Mashavave, 2017). This explains the underrepresentation of females in many occupational sectors of the economy; especially in the public sphere in areas such as engineering or science and technology in general (Jansen, 2008 as cited in Mutekwe & Modiba, 2013).

2.4.1 CULTURAL PERCEPTIONS

Girls who have very strong stereotyped cultural beliefs believe that they cannot perform well in natural sciences because it is a male designated area (Mashavave, 2017). Teachers and students carry into the school the cultural values that are dominant outside of school thereby replicating the gendered assumptions of parents and society at large (Bedard & Cho, 2007). There are studies which reveal that the underrepresentation of female learners in Chemistry is cultural and attitudinal. Research studies by Mlekenyi (2009) on male and female learners' perceptions of Chemistry in selected secondary schools of Central Division, Mombasa District, Kenya, indicate that some cultural norms discourage female students from taking Chemistry as

they regard boys to be superior to girls in all the aspects of life; and as such, boys perform better than girls because some girls think that Chemistry is only for boys, thereby discouraging girls from taking the subject. Basing on these findings, it can be inferred that the same cultural beliefs are reproduced within the school environment; hence few female learners are found taking Chemistry at Advanced level.

2.4.2 GENDER-TYPING OF SUBJECTS AND CAREERS

Female students in the schools tend to opt for subjects like Home Economics and Biology, as Chemistry is among male-dominated zones (Graham, 2001). Murphy and Whitelegg (2006) subscribe to the notion that science education is a male domain and a masculine culture. However, this is subject to criticism. Basing on studies carried out in central and western senatorial districts of Kogi State, Nigeria by Kenni (2019) psychological factors, motivational factors, teachers' teaching techniques and parental background significantly influenced students on gender basis. The findings of the study by Magwa and Chingombe (2016) revealed that despite high performances, girls do not identify with science subjects since some subjects are viewed as masculine and others as feminine, and nevertheless, some teachers discourage girls from pursuing Science subjects and have them concentrate on subjects like Food and Nutrition, Fashion and Fabrics. Dorsey (1996) as cited in Mutekwe and Modiba (2013) notes that, in Zimbabwe, the general perception among educators on the nature and power of subjects is that Mathematics and Science subjects are a preserve for boys, whereas Languages and Humanities are a female domain. It echoes studies by Akintade (2012) that learners' personal actions towards the subject have impacts on their interests in their lives. Thus, attitudes which are entrenched in gender are determined by learners' career aspirations.

Socialisation by parents, peers, teachers and society at large is responsible and critical for underrepresentation of female learners in secondary schools. One of the socialisation aspects for generations is the fact that women have not been encouraged to pursue STEM interests (Reinking & Martin, 2018). This brings in gender socialisation as an important factor in determining learners' choice of subjects, and for the purpose of this study, Chemistry in particular. Studies by Bowman (2007) it is through socialisation of female learners that the image of scientists is predominantly an image of men, making it difficult for girls to picture themselves in that role and therefore, young children tend to believe that scientists should be male.

Girls are presented with little in the way of role models. Chiromo (2015) argues that negative social interactions may be from socialisation in communities where there are no role models in science based professions. Studies by Kapungu (2007) reveal that secondary school children in Zimbabwe found that school subjects were gender-typed on the basis of perceived ability to master them as well as the occupations that they led to. Boys have higher learning interest in sustainability issues and scientific topics than girls (Chang, Yeung & Cheng, 2009). Chemistry prepares students for professional careers in various areas, especially in medicine, biotechnology, agriculture, and pharmacy (Mihindo, Wachanga, & Anditi, 2017). Russo (2016) furthers that what influences the uptake of science subjects is that more men than women are depicted with a science profession and that more women than men are depicted as teachers. The depiction of women in school environments and textbooks has an influence on female learners' world view of Chemistry. Lack of role models and the pictures that portray boys actively engaged in laboratory work whilst girls are portrayed as passive observers affect female learners' participation in science (Akuaku, 2015). Studies by Sinnes (2005) affirm the same standpoint by furthering that in sub-Saharan Africa, most of the books are not gender responsive leading to negative attitudes towards girls in science. Thus, gendered learning resources, particularly textbooks and the gendered school environment contribute in no little measure in perpetuating gender disparities in Chemistry.

2.4.3 SCHOOL CURRICULUM AND GENDER DISCRIMINATION

Gender bias has been reported to be reinforced in science textbooks and curriculum materials; for example, depiction of masculine images of science, lack of gender-inclusive language and absence of female models in course content and images (Hoffman-Barthes, 2000). In the context of this study, that has created a perception and impression that Chemistry is a preserve for males. Despite the fact that one of the strategies of The National Gender Policy (2004) as cited in Chikuvadze and Matswetu (2013) underscores that education has to incorporate gender issues in all curricula at all levels, thereby eliminating all forms of discrimination against boys and girls in education and skills training, which include science and technology, there is rampant underrepresentation of female learners in science subjects.

The low enrolment of females in science related disciplines could be attributed to the fact that fewer females opt for science subjects at secondary school due to various reasons (Kapungu, 2007). In explaining the underrepresentation of female learners in Chemistry, Cheryan, Ziegler, Montoya and Jiang (2017) aver that female learners experience discrimination from some teachers more than their male counterparts in STEM related disciplines like Chemistry.

Mlekenyi (2009) avers that teachers discourage female students in Chemistry as they compare boys to be superior to girls in all the aspects of life. It implies that teachers and schools are responsible for gender discrimination with regards to curriculum. This degenerates to the formulation of gendered curriculum, which in the purpose of this study may explain the underrepresentation of female learners in Chemistry. Furthermore, in a study on male and female participation in secondary school Chemistry, Cousins (2007) found out that Chemistry was not totally gender inclusive. It implies that the uptake of the subject in schools remains gendered. Thus, female learners remain underrepresented in enrolment for Advanced level Chemistry classes.

2.4.4 PARENTAL INFLUENCE

Parents exert some influence in the enrolment of students in science classes (Reid & Skryabina, 2003). Therefore, there seems to be an association between parental influence and socialisation in influencing learners' choice of subjects. Pfingst (2016) concurs with Okonkwo (2014) that most parents have subject areas which they perceive as being important in their children's future careers. In this regard, the contribution of socialisation cannot be ruled out. According to William and Jones (2015) parents discourage their female children from studying science subjects such as physics, Chemistry and Biology; subjects which they stereotype as masculine and instead encourage them to enrol for the arts subjects and the humanities. Boys and girls are exposed to many influences regarding gender roles and tend to adopt gender-stereotyped behaviours and attitudes which are initially passed on from parents to children during the early years in the home (Naugah, 2011). Thus, socialisation at family level has a powerful influence on female learners' attitudes towards Chemistry. From these submissions, it can be argued that gendering of subjects and careers is reinforced by parental influence in explaining the underrepresentation of female learners in Chemistry. However, such a situation seems to be particular to parents and guardians of learners in rural day schools.

2.4.5 HISTORY OF GENDER DIFFERENTIALS IN ACHIEVEMENT

Studies by Hailemariam and Dadi (2017) on assessment on female students' achievement in Chemistry subject at Merti Secondary School revealed that female students have achieved poor results in Chemistry relative to male students in the same class. It resonates well with studies carried out in Kenya by Mochire (2010) which revealed that there was a difference in gender attitude towards Chemistry and male students performed better than female students. Therefore, such history of male learners outperforming female learners can be one of the standing

factors which account for gender differentials in learners' attitudes towards Advance level Chemistry. In that regard, male learners' positive attitude towards Chemistry enables them to perform better than female learners. Students' attitude and interest could play a substantial role in students' decision to study science (Olawale, 2009). In this regard, the gender differentials in performance can be attitudinal. Many studies have generally concluded that girls have low self-efficacy than boys in STEM (Mashavave, 2017). This explains the contribution of gender in determining differential achievements in the subject. Thus, females are underrepresented in these science oriented careers as substantiated by Busolo (2010) that the difference in representation of males and females in the scientific community is linked to achievement patterns at secondary school level.

2.4.6 NEGATIVE ATTITUDE

Studies carried out by Mlekenyi (2009) in Kenya reveal that some students especially the girls believe that the subject is difficult so they do not put in any effort to improve; hence poor performance. It can be deduced that such irrational thoughts contribute to low uptake of the subject by female learners. Therefore, negative attitudes stem from female learners' perceptions. Attitude towards chemistry is essential; it denotes interests or feelings towards studying chemistry (Hailemariam & Dadi, 2017). According to Brotman and Moore (2008) girls often perceive science as difficult, uninteresting or leading to an unattractive life-style. By implication, it explains why female learners avoid Chemistry at Advanced level. Chikuvadze and Muswetu (2013) note that one of the negative attitudes of girls appears to be the acceptance of the myth that boys are better in sciences than girls, which could result in girls' lack of confidence to participate in sciences at Advanced level. It should be noted that these perceptions are entrenched in gender. Gender is among the several factors related to students' attitude toward chemistry (Adesoji, 2008).

2.4.7 INTERVENTION STRATEGIES FOR FOSTERING THE UPTAKE OF CHEMISTRY BY FEMALE LEARNERS

Bowman (2007) postulates that role models in science careers are very important for girls, as they help shape their career identity. This implies that role models serve to inspire female learners to choose Advanced level science combinations which include Chemistry so that they can also get inspired and motivated to pursue science related careers. Studies by Hughes, Nzekwe and Molyneaux (2013) as cited in Reinking and Martin (2018) found that the girls' interest increased, along with an improved self-concept related to STEM fields when they were exposed to positive STEM role models that looked like them. Thus, exposing female learners

to role models may foster the learners' interest in Chemistry. Another commendable intervention strategy was the NUST Academic Women Researchers initiative, which was founded to encourage women and girls to study science subjects. They visited girls to encourage them to pursue careers in science disciplines, by sharing their own success stories but the initiatives have been halted due to the covid-19 pandemic.

The Government of Zimbabwe (GoZ) launched the science project by sending science kits to schools which were complete with basic science equipment; a project that provided children in rural secondary schools with a meaningful science curriculum and ensured sustainable participation in the science education for the majority of the country's secondary schools (Gudyanga, Gudyanga & Mutemeri, 2013). This was a positive trajectory to fostering the uptake of science subjects like Chemistry. However, there are still challenges in ensuring that more girls in rural day secondary schools take Chemistry.

Studies carried out at 5 A level schools in Gwanda Central by Dube and Mulaudzi (2022) reveal that laws and policies have been crafted to harness every possibility that ensures that girls access and succeed in education like their male counterparts but lack of science resource centres and low self-confidence among girls fostered low uptake of STEM education path.

2.5 CHAPTER SUMMARY

The chapter gave an overview of the conceptual framework and reviewed literature related to female learners' perceptions of Chemistry and factors that promote the underrepresentation of the learners in the subject. The next chapter will focus on the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter focused on the research methodology used in examining standing factors why few female learners in rural day high schools take Chemistry at Advanced Level, with reference to two day secondary schools in Murewa District. This study, which is qualitative in nature outlines the research paradigm, research design, population and sampling technique, data collection methods, data presentation and analysis procedure, ethical considerations and trustworthiness issues in order to satisfy and meet the research objectives.

3.2 RESEARCH DESIGN

While Orodho (2003) as cited in Kombo and Tromp (2006) defines research design as the scheme, outline or plan that is used to generate answers to research problems, Kothari (2011) defines it as the conceptual structure within which research is conducted; for the collection, measurement and analysis of data. Therefore, in the context of this study, a research design describes the procedures, processes and plan that guided the conduct of the study in an effort to generate data that satisfy and meet the research objectives.

One of the justifications for employing qualitative research design is championed by Gaille (2018) who avers that qualitative research uses a smaller sample size than other research methods and more information is collected from each participant; hence it equates to lower research costs and the production of faster results; hence the research adopted a case study. A case study is a qualitative analysis of data collection involving a careful and complete observation of a social unit, an institution or cultural group (Kothari, 2011). Therefore, given the nature of the research which is confined to two rural day secondary schools, a qualitative case study as a research design is very appropriate.

Since qualitative research can help researchers to access the thoughts and feelings of research participants, which can enable development of an understanding of the meaning that people ascribe to their experiences (Sutton & Austin, 2015), it was critical for illuminating detailed data on standing factors why few female learners take Chemistry at Advanced level but within rural day secondary school contexts. In this regard, the detailed findings will be specific to the two schools in Murewa District, thereby sufficing for the argument by Baxter and Jack (2008) that a case study approach bases on the claim that truth is relative and that it is dependent on one's perspective and context. This puts the researcher's subjective views at the core in terms of data interpretation. Although the findings of a case study in this particular research cannot be generalised to other contexts, it yields deeper insights (Punch, 2011) into the phenomenon under study. Given that a case study investigates a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident as alluded by Yin (2018), there is a greater likelihood of generating rich information pertaining to standing factors why in the learners who choose science combinations few female ones take Chemistry at Advanced level.

3.2.1 QUALITATIVE RESEARCH

Qualitative research is a systematic and interactive approach used to interpret and describe the meanings that research participants attach to their social reality; an emergent, inductive, interpretive and naturalistic approach to the study of people, cases, phenomena, social situations and processes in their natural settings in order to reveal in descriptive terms the meanings that people attach to their experiences of the world (Cohen, Manion & Morrison, 2010; Yilmaz, 2013). Thus, with qualitative research meaning from the participants' point of view and perspective is the most essential concern. Qualitative research emphasises the emic perspective and collecting data from natural settings (Gall, Borg and Gall, 2007) and as such, it is critical for the nature of this research as data is interpreted from the participant perspectives. Wilson (2013) describes such interpretation of data as the insider's view of reality (Wilson, 2013). By learning the participant perspectives, qualitative research illuminates the inner dynamics of situations that are often invisible to the outsider (Best & Khan, 2010). With qualitative research, the pitfall of subjectivity in the interpretation of the findings cannot be ruled out, and the findings cannot be universally generalised. Therefore, the research findings will mirror new and rich insights that characterise and explain perspectives of the participants in view of standing factors why few female learners at selected schools in Murewa District take Chemistry at Advanced level.

3.2.2 RESEARCH PARADIGM

Neuman (2011) defines a paradigm as, “a general organizing framework for theory and research that includes basic assumptions, key issues, and models of quality research and methods for seeking answers”. In other words, it is the researcher’s philosophy and approach to the study. The study was informed by interpretivism as a research paradigm. Interpretivism is an in-depth understanding of social phenomena in order to interpret how the people concerned make meaning of their experiences (Addae & Quan-Baffour, 2015). Thus, in the context of this study, the responses from participants from the two schools served as the basis for the researcher’s interpretation of data with regards to standing factors why few female learners take Chemistry at Advanced level. The justification for interpretivism in this study lies in its quality of having diversifying views which look into phenomena, where the researcher cannot only describe objects, human or events, but also deeply understand them in social their context (Pham, 2018). It was during the research process that the researcher could decipher the behaviour, feelings, attitudes, perceptions and actions of female learners and their teachers in the two day secondary schools in view of the topic under study. Thus, interpretivism was effective in enabling the researcher to generate and interpret information critical for this study from the perspective of the participants.

3.3 RESEARCH METHODS

3.3.1 POPULATION

Population is defined as a group of which the results of the study are to be generalised (Best & Khan, 2010). Therefore, it refers to the larger group from which the sample is taken. In other words, population entails the total number of people from which respondents are going to be taken from. Thus, in this study, parents/guardians, school administrators, heads of department, Science teachers and Advanced level female learners from the selected two secondary schools in Murewa District constituted the target population for this study in interrogating standing factors why few female learners take Chemistry at Advanced level.

3.3.2 SAMPLE AND SAMPLING TECHNIQUE

A sample can be defined as a set of respondents or a group of respondents who are representative of the population by virtue of containing the most characteristic or typical attributes of the population being studied; a subset of the population under investigation (Leedy, 2006; Muchengetwa, 2005). Thus, a sample entails the particular number of

individuals drawn from the population by virtue of possessing common qualities that suit the researcher's interests with regards to research objectives. The study utilised purposive sampling; a technique where participants are selected for a study because of some desirable characteristics (Beins & McCarthy, 2012). While a sample of 10 parents/guardians were purposively selected on the basis of their experience in living with the learners and in somehow influencing their decisions with regards to choosing subject combinations, 2 school administrators, 2 heads of department, 2 science teachers based on the fact that they were the curriculum implementers. More so, 10 Advanced level female learners who have science combinations were also purposively selected from the study population on the basis of their knowledge and experience about science subjects in general and as such, they were fairly to describe their situation. .

3.4 DATA COLLECTION PROCEDURES

Prior to collection of data, the researcher collected an introduction letter from the university and sought permission from the Ministry of Primary and Secondary Education to visit schools in order to do data collection. The researcher booked for appointments with the participants. In the process of administering research instruments, the researcher took some notes and did audio-recording of responses from the participants, capturing salient issues that satisfied the research objectives.

3.5 DATA PRESENTATION AND ANALYSIS METHODS

The study employed the Thematic Data Approach in the presentation and analysis of the findings. While Creswell (2009) avers that thematic data analysis emphasises on pinpointing, examining, and recording patterns or themes within data, Braun and Clarke (2006) furthers that with the thematic data approach, a theme captures important ideas about the data in relation to the research questions and represents some level of meaning within a data. In other words, themes are formulated from patterns of data generated from the study. Thus, in this research, as common issues arose from the different research instruments, they were presented, discussed and analysed under common themes that were in line with the research objectives.

3.6 DATA COLLECTION INSTRUMENTS

The study employed unstructured in-depth interviews, key informant interviews and focus group discussions (FGDs) as research instruments. These research instruments were accompanied by their respective guides, which the researcher followed in an effort to solicit information that answers the research questions. In some cases, the researcher tailored her

research instruments, and in some cases used Chishona vernacular for the benefit of participants who were not comfortable with communicating and expressing their responses in English language.

3.6.1 KEY INFORMANT INTERVIEWS (KII)

Key informant interviews (KII), also called in-depth interviews are a research method used to gather specific qualitative information, from “informants” who are usually experts and decision-makers, about a topic or a community’s views (Ali & Maya, 2014). A key informant interview is one where an individual with prior knowledge of the affected community is questioned to gather key information on a phenomenon. The crucial element of a key informant interview is that the informant is well versed in information about his/her community, its inhabitants (Better Assessments Technical Brief, 2011). More so, with KII, the researcher has plenty of time to clarify the questions because there are various questions which are unclear to key informants and need to be explained to them clearly (Ali & Maya, 2014). In the best interests of this study, science teachers, heads of department and female learners constituted key informants.

3.6.2 UNSTRUCTURED IN-DEPTH INTERVIEWS

While Smith (2008) defines an interview as an oral or verbal questionnaires that can be done verbally, face to face or over the telephone. This study used unstructured in-depth interviews. Creswell (2009) defines unstructured interviews as a form of interview in which neither the question nor the answer categories are predetermined. In-depth interviews are used as a qualitative research technique, to conduct individual interviews to explore experiences, ideas, perspectives, views and situations with a small number of respondents (Esch, 2013). Thus, in this research, interview data were generated from Advanced level female learners, Chemistry teachers, and heads of science department, school administrators and parents/guardians to illuminate standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level. Thus, Learners’ Interview Guide (Appendix 1), Chemistry teachers/Heads of Science department/School administrators’ Interview Guide (Appendix 11) and Parents/Guardians’ Interview Guide (Appendix 111) with open-ended questions in line with the research objectives were used by the researcher to gather data from the research participants. The interviews were conducted using Chishona vernacular where necessary. During interviews, the researcher engaged in note taking and recording audios using a mobile

phone to capture salient issues which addressed research objectives. The recorded audios were then transcribed and translated to English language.

The researcher's justification for using unstructured in-depth interviews is its important feature of having guidelines on pertinent issues to be discussed rather than structured questions asked every respondent. Given that the researcher wanted to generate as much information as possible, she had the advantage of flexibility through asking open-ended questions in line with the research objectives, and at the same time without stifling participants' responses. Krueger and Casey (2015) argued that this type of interview enables the interviewer to add a clarifying remark to difficult questions. Thus, the researcher was able to rephrase questions in order to make them clearer to the respondents. This was effectively harnessed to yield rich and detailed information on standing factors why few female learners take Chemistry at Advanced level. According to Tuckman and Monette (2011) this type of interview allows the ease of yielding the richest data details and new insights. Thus, the researcher managed to generate enough information that suited her needs in terms of meeting research objectives.

3.6.3 FOCUS GROUP DISCUSSIONS (FGDs)

Focus group discussions (FGDs), also known as focus group interviews were used in capturing data pertaining to the study. Focus group interviews (discussions) consist of 6 to 12 participants who are interviewed together at the same time (Creswell, 2009). In this study, the researcher organised Advanced level female learners into FGDs, where a guide formulated from the research objectives was used to illuminate standing factors why few female learners take Chemistry at Advanced level, with selected schools in Murewa District serving as a case of reference. The researcher facilitated discussions with learners using a FGD Guide referred to in Appendix 1V. The researcher was taking some notes and doing audio-recording while discussions were in progress. The justification for using this research instrument lies in its advantage of fostering active participation of all the respondents and even foster interaction among the research participants in a more relaxed atmosphere (Kitzinger, 2006). Given that conducting focus group interviews has the advantage of allowing the researcher to obtain a variety of opinions on the issue under study (Magwa & Magwa, 2015) the researcher had access to adequate information about the phenomenon under study. Ritchie and Lewis (2014) aver that the major advantages of focus group discussions lie in their quality of providing a more natural setting than other methods and the group members influence one another during the

discussions. This was effective in promoting interaction among learners, thereby yielding rich information and new insights about the phenomenon under study.

3.7 RESEARCH TRUSTWORTHINESS

While quantitative research is concerned with validity and reliability issues, qualitative research hinges on trustworthiness. Trustworthiness of a research refers to the degree of confidence in data, interpretation, and methods used to ensure the quality of a study (Pilot & Beck, 2014). Connelly (2016) identifies the criteria for research trustworthiness in view of Guba's constructs, which include credibility, dependability, confirmability, and transferability. These are the pillars for fairly judging the trustworthiness of research findings. Credibility establishes whether the research findings represent plausible information drawn from the participants' original data and is a correct interpretation of the participants' original views (Korstjens & Moser, 2018). Subjecting research instruments to pilot study in order to test their feasibility was another way of ensuring trustworthiness so that improvements were done where necessary. Haralambos, Holborn, Chapman and Moore (2008) posits that a pilot study is a small scale preliminary study conducted before the feasibility of research instruments. More so, in the best interests of this study, the researcher conducted a respondent check in order to realise credibility of the findings. Bromley and Helene (2003:16) aver that "conducting a respondent check is a useful first step towards validating the results." It requires presenting the findings to the discussion participants or to the community." By so doing, the researcher was able to validate data generated from unstructured in-depth interviews by presenting it to participants during FGDs in an effort to find out the extent to which it accurately reflects the same issues raised in the findings. This was also achieved through triangulation of research instruments. Triangulation entails the use of multiple methods in one study so that the weaknesses of one method are compensated other methods (Cohen, Manion & Morrison, 2010). For this study, unstructured interviews, key informant interviews and focus group interviews were triangulated.

Thus, using two research instruments would fill the gap left by a single instrument in unearthing and illuminating detailed data on the research topic; hence data would be trustworthy. Transferability is the degree to which the results of qualitative research can be transferred to other contexts or settings with other respondents (Korstjens & Moser, 2018). It implies that if the research is conducted in a different setting, it is expected to yield almost the same findings.

Confirmability refers to the degree to which the findings of the research study could be confirmed by other researchers. It is concerned with establishing that data and interpretations of the findings are not figments of the inquirer's imagination, but clearly derived from the data (Korstjens & Moser, 2018).

3.8 ETHICAL CONSIDERATIONS

Research ethics may be referred to as doing what is morally and legally right in research; they are principles of right and wrong that govern the operation of the researchers during the process (Parveen & Showkat, 2017; Punch, 2011). Therefore, it was imperative for the researcher to adhere to such principles. Researchers are expected to obtain permission before carrying out a study (Magwa & Magwa, 2015). After getting an introduction letter from the university, the researcher applied for permission from the Ministry of Primary and Secondary Education to conduct the research in schools.

The other ethical principles adhered to in this research were that of informed consent and voluntary participation of the informants. Informed consent implies that subjects are made adequately aware of the type of information the researcher wants from them, why the information is being sought, what purpose it will be put to, how they are expected to participate in the study, and how it will directly and indirectly affect them (Cohen, Manion & Morrison, 2010). The researcher sought consent from the participants and made it known to them that the study was for academic purposes and as such, participation was voluntary. The researcher asked the participants who were willing to participate in the study to sign consent forms.

The issues of anonymity and confidentiality were also taken into account. Anonymity and confidentiality imply that personal information about the participant would not be disclosed (Showkat & Parveen, 2017). Therefore, in this research, pseudonyms were used for participants' real names and identities in consistent with Tuckman and Monette (2011) who aver that anonymity requires that names or identities of the respondents should not be divulged.

3.9 CHAPTER SUMMARY

The chapter generally focused on the research methodology in terms of research paradigm, research design, population, sample and sampling procedure, ethical considerations, data collection methods which are qualitative and data presentation and analysis procedure. The next chapter will focus on data presentation and analysis.

CHAPTER 4: PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 INTRODUCTION

The focus of this chapter is on the presentation, analysis and discussion of research findings on the standing factors why few female learners take Chemistry at Advanced level, with reference to two schools rural day secondary schools in Murewa District, Mashonaland East Province. The findings which are in line with the research objectives hinge on identifying female learners perceptions of Chemistry, examining factors that promote the underrepresentation of the female learners in the subject and intervention strategies for improving female learners' enrolment in the subject thereof. More so, the research findings will be supported with some related literature reviewed in Chapter 2 and findings from other studies on the same phenomenon. The gender socialisation theory will serve as the lenses through which analysis and discussion of the findings will be done.

4.2 FEMALE LEARNERS' PERCEPTIONS OF ADVANCED LEVEL CHEMISTRY

4.2.1 NEGATIVE PERCEPTIONS

Data generated from FGDs revealed that among learners who choose Advanced level science combinations, female ones expressed that they have a negative perception of Chemistry as they regarded it as more difficult and challenging than Biology. The following are interview excerpts confirm this;

“I always make an effort to convince girls to take Chemistry at Advanced level, but what I have received are negative reactions, which suggest that they dislike the subject. But with boys, the reaction is positive” (Respondent Science Teacher 1).

“Of course, at this school science subjects are not popular, but I have noted that most girls lack interest in including Chemistry in their subject combinations. I find girls not willing to take Chemistry at Advanced level simply because they perceive that it’s a no go area for female learners” (Respondent Head of Department 2).

“Ndakaona zvisingabatsire kuti ndisarudze kuita Chemistry ini ndichiziva angu kuti ndinozofaira” (I found it useless for me to take Chemistry, knowing that I would fail the subject) [Respondent learner A1].

“Semusikana, zvekuita Chemistry handingambozvigone. Chokwadi chaicho ndechekuti Chemistry yakandiomera zvangu” (As a girl, I don’t see myself able to do Chemistry. The truth of the matter is that the subject is difficult for me) [Respondent Learner A4].

“Kushomeka kwevasikana vanoita Chemistry kunoratidza kuti vakawanda vacho havatodi kuita subject iyoyi. Saka ndakasarudza hangu kuita Biology, Mathematics neGeography. Hameno vakomana ndivo vandinoona vaine shungu dzekuita Chemistry” (The fact that girls who choose to do Chemistry are few shows that the majority of them dislike the subject. I chose to do Biology, Mathematics and Geography) [Respondent Learner A2].

“Ndakambosarudza kuita Chemistry ndichitanga ‘A’ level, asi ndakazofunga kuiregedza ndikachinja subject pacombination yangu nekuti ndakanga ndaona kuti ndini ndega ndaiva musikana muclass ine vakomana 7 vanoita subject yacho” (I once chose to take Chemistry when I began Advanced level, but I decided to drop the subject from my combination upon noticing that I was the only female learner among 7 boys who take the subject) [Respondent Learner A3].

The findings presented above point to the fact that female learners from the two secondary schools have a negative attitude towards the uptake of Chemistry, which stems from negative perceptions on the basis of the notion that the subject is difficult. This confirms submissions by Robins (2005) that negative stereotypes and labels attached to subjects have the impact of repelling learners.

Respondent Learner A10 emphatically said, “*Ini handina kubvira ndafarira Chemistry kubva pandakaita pa ‘O’ level. Ndakanzwa kuti vasikana vanoomerwa neChemistry?*” (As girls, can we also make it in Chemistry since it is perceived to be a difficult subject as ‘A’ level?). This concurs with what was raised by a head of department who said, “In my history of teaching, I have noted that unlike boys who have great interest in Chemistry, quite a number of girls perceive Chemistry as difficult but this is just a misconception.”

These findings resonate well with studies carried out in Kenya by Mlekenyi (2009) which point out that there is a misconception that Chemistry is a difficult subject; hence girls believe it and tend to hate the subject. Thus, while there could be various explanations which foster such negative perceptions in rural secondary school contexts, the findings from this study mirror a standpoint by Elginda and Ikhsan (2012) who concluded that the significant gender differences in attitudes towards Chemistry among male students and female students affect students' perceptions of the subject. This implies that learners' perceptions of Chemistry are gendered. Thus, in the context of this study, it is clear that female learners have a limited inclination to Chemistry.

However, the findings from this study tend to differ from studies carried out in Kenya by Majere, Role and Makewa (2012) which indicated that female learners had more positive attitude towards Chemistry than males and studies carried out in Rwanda, which maintain that both boys and girls had positive attitudes towards Chemistry education (Irakoze, Gakuba & Karegeya, 2021). It can therefore be inferred that differentials in gender perceptions of Chemistry are context specific.

4.3 STANDING FACTORS THAT PROMOTE THE UNDERREPRESENTATION OF FEMALE LEARNERS AT ADVANCED LEVEL CHEMISTRY IN MUREWA DISTRICT DAY SCHOOLS

Findings from interviews and FGDs concurred that enrolment of female learners in rural day secondary Chemistry classes was very low. Studies by Kapungu (2007) confirm that fewer females opt for science subjects at secondary school. In this regard, Chemistry is one of the science disciplines that female learners have tended to avoid more as they choose subject combinations in science.

4.3.1 GENDER STEREOTYPES AND CULTURAL PERCEPTIONS IN RURAL CONTEXTS

Focus group discussions (FGDs) brought out that female learners some female learners are not comfortable with taking Chemistry as part of their subject combination on the pretext that they their performance at Ordinary level was average and in worst cases below average, as compared to their male counterparts. This has become the basis for perpetuating gender stereotypical perceptions with regards to female learners' low uptake of the subject in rural contexts. The obtaining situation in rural day secondary schools in Murewa District where the uptake of Chemistry by female learners is lower than that of boys justify studies by Seba, Ndunguru, & Mkoma (2013) which found out that male students had more confidence, excellent performance, and enjoyment in Physics and Chemistry than their girls' counterparts, and as a result, boys had more positive attitudes towards the subject than girls as they tended to participate more in Chemistry and Physics activities than female students. In this regard, their eligibility for taking Chemistry is determined by good or better grades at Ordinary level. The following interview excerpts complement these findings;

“Vakomana ndivo vanzwisisa nekugona Chemistry zviri nani kudarika isu vasikana.” (Boys are the ones who master concepts in Chemistry better than us girls) [Respondent Learner A8].

“Ini ndakafungisisa, ndikazviudza kuti handiite Chemistry. Ndakagara ndatoisiya paOrdinary level nekuti semusikana ndakaona ichindiremera” (I made up my mind and told myself that I would never take Chemistry. I had since dropped the subject at Ordinary level because as a girl, I found it highly challenging) [Respondent Learner A5].

Respondent Learner A7 respondent said, *“Ndakaona Biology isina kunyanya kuoma sezvakaite Chemistry. Mukaona musikana anosarudza kuita Chemistry achiigona, moziva kuti murume chaiye”*, implying that Biology is not as challenging as Chemistry and as such, it suggests that a girl who chooses to take Chemistry is equally good as a man in terms of abilities. This is actually a gendered description of the description of a female learner who takes the subject.

“Chemistry has become a ‘no go area’ for the majority of girls as they tend to doubt their abilities by continually holding onto the notion that it is a difficult subject, which is nevertheless, meant for boys” [Science Teacher 1].

From the interview and FGDs data above, the researcher can decipher that the language that the responses carry some gender connotations, which have ramifications on female learners' uptake of Chemistry. These findings justify research studies which reveal that the number of learners who shun science subjects like Chemistry and Physics perceive them as difficult resulting in low enrolments, so they would rather choose Biology, which they regard to be a bit easy (Shindi, 2016). The question that arises now is if differentials in boys' and girls' interests, attitudes and performance in Chemistry biological or there are other underlying factors which contribute to this situation obtaining in rural day secondary schools, in Murewa District? In light of the data presented above, there are gender underpinnings that have influenced female learners' low uptake of Chemistry. This problem becomes cultural as confirmed with studies by Mashavave (2017) which found out that girls who have very strong stereotyped cultural beliefs believe that they cannot perform well in sciences because it is a male designated area (Mashavave, 2017). Therefore, the findings imply that as long as female learners see themselves as having less potential and limited ability than male learners in understanding concepts in Chemistry, then it undermines their interest in taking it; hence they remain underrepresented in the subject. The work of Shelley Correll, a sociologist at Stanford University, sheds light on how girls' and women's seemingly voluntary decisions to avoid STEM careers are influenced by the cultural belief that science and math are male domains.

As alluded to earlier on by one Chemistry teacher that his call to encourage girls to take Advanced level Chemistry is met with a negative reaction, it means the problem is attitudinal. Basing on studies carried out in Kenya by The Forum for African Women Educationists (FAWE) (1999), as cited in Keter and Ronoh (2016) which reveal that science achievement for girls was lower than for boys partly due to their poor attitudes.

Despite submissions by Mashavave (2017) that it is even more worrying in the case of girls whose uptake in STEM is very low and the performance of the few is not as good as that of the boys in particular, in Zimbabwe, the validity of this is subject to criticism. Studies by Lumphala (2017) tend to differ from the above findings as they present evidence which shows that girls can perform equally well as boys in STEM related subjects but some of the reasons for the gender gap in STEM related subjects include fear of failing STEM subjects. Thus, Chemistry is one of the STEM subjects that female learners are not at liberty to take at Advanced level.

Therefore, basing on the findings, it can be argued that the girls' fear of taking the subject is entrenched in their above discussed negative perceptions, which are gender shaped. In this

regard, the difficulty of the subject has become gendered. Although it cannot be wholly disputed that Chemistry is a challenging subject, the issue of gender stereotypical perceptions in promoting and perpetuating the existence of the problem.

4.3.3 GENDERING OF SUBJECTS IN SCHOOLS

It emerged from FGDs that Chemistry has become a gendered subject, which some female learners perceive as the preserve for male ones. During an interview, Respondent Learner A3 echoed the same findings and said, “*Kubvira pandakauya kusecondary ndakangonzwa kuti Chemistry isubject inoitwa nevakomana. Kana ikozvino, ndizvo zvinogara zvichitaurwa kuti vakomana ndivo vanoinzwisisa zviru nani*” (Since I came to secondary school I just heard some learners saying that Chemistry is a subject meant for boys. Even now, it’s the talk of this school that boys are the ones who master concepts of the subject better).

Respondent Learner A9 emphatically said, “*Musikana wese anoita Chemistry murume nekuti subject iyoyi yakaoma hayo*”, implying that every girl who takes Chemistry is regarded as a man because the subject is very difficult, as if to suggest that the ability to manage difficult things defines a man.

“*Zvino kana vakomana chaivo vachitotyawo kuita Chemistry, ko kuzoti isuwo zvedu vasikana tingazozvigonawo here?*” (If boys themselves are afraid to take Chemistry, then what more with us mere girls?) [Respondent Learner A6].

Interview data generated from a Chemistry teacher during an interview was consistent with interview data from interviews with female learners that most female learners are not comfortable with Chemistry on the basis of the mentality that the subject is a preserve for male learners. One of the Respondent Science Teacher 2 said;

Quite a number of girls never wanted to take Chemistry, even during my high school years sometime in the 90s, and that’s the same situation that is found in schools today though the problem is not as bad as it used to be years back. These years, it’s getting better as some female learners are not beginning to appreciate the subject though their number doesn’t match that of boys

These findings confirm studies by Kapungu (2007) which reveal that there is a general perception which arises from socialisation that boys are better suited for some subjects than

others, for example mathematics, and science and technology. In this regard, female learners are relegated outside a STEM curriculum. This then brings in the issue of gendering of subjects in these rural schools under study. In this regard, the gendering of subjects which becomes cultural would be a determinant of learners' choices of subjects in rural contexts. In other words, the findings suffice for the gender socialisation theory.

4.3.4 THE EFFECT OF GENDER PERCEPTIONS ON LEARNERS' CAREER PROSPECTS

During interviews with female learners, the researcher could draw an inextricable relationship between the gendering of Chemistry and learners' career aspirations. The career aspirations that female learners have were in line with perceived gender roles. Among the female learners' career aspirations, the common ones were nursing, hotel and catering, and clothing and textiles though others professed to have ignorance of their career aspirations. The following interview data attest to this;

“Zvandinozoda kuita ndapedza secondary hazvinei neChemistry (What I want to do after finishing secondary education is not related to Chemistry. I intend to pursue a course in Hotel and Catering) [Respondent Learner A7].

“Ini ndinoda kuita Tourism and Hospitality saka ndisina kumboita chido nekuita Chemistry” (I want to do Tourism and Hospitality, so that's why I have not developed interest in doing Chemistry) [Respondent Learner A1].

From the findings, it can be noted that female learners opt for subjects that are in line with gendered professions and careers. This mirrors studies by Lupahla (2017) which reveal that there is stereotyping that characterise STEM related jobs. The findings indicate that the low enrolment of female learners in Chemistry mirrors the gender exit profiles for learners, which channels female learners into the private sphere. Researchers also believe that stereotypes can lower girls' aspirations for science and engineering careers over time (Hill, Corbett & Rose, 2010). In this regard, female learners tend to shun Chemistry oriented careers, which are known for being male-dominated. In other words, the subject is in tandem with careers dominated by men in the public sphere but rather, female learners are comfortable with pursuing careers that replicate their socially constructed gender roles which confine them to the domestic sphere. This is substantiated by Bowman (2007) who highlighted that the social context for science learning may send messages that most of the notable accomplishments in science are

attributable to men, thereby making the image of scientists as predominantly an image of men, making it difficult for girls to picture themselves in that role.

This points to cultural reproduction, in terms of gender dynamics that characterise society. This is supported with studies by Gordon (1995), as cited in Mutekwe (2013) that girls in Zimbabwean schools were educated for domesticity, whereas boys were amply prepared for employment and the role of family head and breadwinner. This accounts for the underrepresentation of female learners in Chemistry. While some respondents said made it clear that they have no interest in taking Chemistry, Respondent Learner A2 said, “*Vamwe vasikana havadi Chemistry but ini ndinofarira kuidzidza ndigozotawo mabasa anogonekwa nevarume vanenge vakaita Chemistry*”, suggesting that unlike some girls who dislike Chemistry, she has interest in the subjects so that she can also be eligible to pursue careers presumed to be a preserve for men. Therefore, this has an allusion to gendering of careers, and as such, it influences the gendering of subjects. These findings resonate well with studies prior to this one. Studies by schools indicate that gender is a major factor that influences career choice and subject interest of students. Females represent a very small percentage of physical sciences professionals, including physics and chemistry (Ogunyemi & Bamidele, 2019; Ceci & Williams, 2007). This is the situation obtaining in secondary schools, particularly rural day ones. Therefore, the gender socialisation theory suffices for the underrepresentation of female learners in Chemistry.

Therefore, it can be deduced that some female learners view Chemistry related careers as the preserve for male learners; hence their underrepresentation in the subject. It can be inferred that the gendering of careers is one of the determinants of the underrepresentation of female learners in Chemistry. This resonates well with studies by Jansen (2008) which indicate that girls are thus still underrepresented in many occupational sectors of the economy; especially in the public sphere in areas such as engineering or science and technology in general. The findings suffice for the concept of identity formation, which is encapsulated in the gender socialisation theory as Gouws, Kruger and Burger (2008) put it that identity can fundamentally shape individuals’ life experiences, the kind of education and jobs they get, the opportunities they are afforded. Thus, few female learners take Chemistry on the basis that the subject on the basis of choosing subjects which are in line with their perceived gender roles, thereby conforming to the gender identity.

Basing on studies carried out in Kenya by The Forum for African Women Educationists (FAWE) (1999), as cited in Keter and Ronoh (2016) which reveal that science achievement for girls was lower than for boys partly due to their poor attitudes towards science and discouragement by their teachers, it can then be argued that girls can be equally good as boys in Chemistry. Thus, female learners' dismal performance, which has led to their underrepresentation in taking the subject becomes attitudinal. In this regard, such a negative attitude ensues gender notions that characterise society.

4.3.4 LACK OF RESOURCES

It was raised by school heads, HODs and Chemistry teachers that lack of resources is one of the standing factors why female learners take the subject at Advanced level. They concurred that science laboratories in their schools are not well equipped with ample resources that support the teaching of Chemistry though they offer the subject in an effort to conform to the new curriculum in terms of promoting STEM education. One of the school heads lamented a high staff turn-over of Chemistry teachers as having an adverse impact on the uptake of the subject by learners. One head of science department explained that unlike boys, generally female learners are not that prepared to improvise in situations where they have to improvise in place of apparatus when carrying out experiments. In a study that establishes an association between the learning of science and the environment, Mandina (2012) found out that most rural schools are deprived and lack resources, facilities and teachers and they do not have financial resources to purchase chemicals and consumables to conduct practical investigations as the laboratories are not adequately equipped. Furthermore, studies by Kazembe and Nyanhi (2010) reveal that lack of appropriate teaching resources to be able to give quality and relevant chemistry education in schools is a common concern of many teachers, particularly in the third world countries. Thus, lack of both material and human resources impacts negatively on learners' attitude towards the subject, with girls being the hardest hit against the backdrop that their uptake of the subject been generally low.

4.3.5 TEACHERS' NEGATIVE INFLUENCE

It emerged from interviews with the school head and one science teacher from one school that Chemistry was introduced in the school but after stiff resistance from other teachers who were very sceptical about rural day school learners' abilities, and let alone lack of resources to support teaching of the subject. During FGDs, female learners raised that some teachers for other subjects always discourage them from taking Chemistry on the grounds that it is a

difficult subject, especially for girls. Therefore, such negative remarks discourage learners, especially when they are coming from teachers. It should be noted that the discouraging remarks by some teachers are laden with gender stereotypical perceptions. Mutekwe and Modiba (2013) revealed that teachers' negative perceptions of girls' abilities and the discouraging remarks thereof contribute to perceived gender-based challenges endured by Zimbabwean secondary school girls in their academic and occupational prospects. In other words, teachers are responsible for gendering the school curriculum, thereby fostering gender socialisation, and reproducing it.

During FGDs with respondents (female learners) from the other school, it was revealed that the Chemistry male teacher's engagement with girls in his class is limited as he seems to focus much on boys. Studies carried out in Kenya by The Forum for African Women Educationists (FAWE) (1999), as cited in Keter and Ronoh (2016) which reveal that science achievement for girls was lower than for boys partly due to discouragement by their teachers. However, these findings are at variance with studies by Irakoze, Gakuba & Karegeya (2021) which revealed that in Rwanda, teachers have good attitude towards girls and science education. If these findings are valid and true, then the role of teachers serve as a barrier to attract female learners to the subject. These findings are in resonance with studies by Omar (2008) which indicate that teachers may contribute to girls' problems by giving them less attention or a lower quality of attention during class; therefore, teachers must be careful not to limit girls' potential in science subjects by using gender-biased practices. It therefore entails that if teachers interact with their learners on the basis of gender, then it explains why there are female learners in Chemistry classes in Murewa district.

4.3.6 LACK OF ROLE MODELS IN THE SCHOOL AND COMMUNITY

An interview with one school head revealed that the underrepresentation of female learners in Chemistry can be attributed to lack of role models within the school and even in the community at large. He said, "At this school, the Science Department is male dominated. The Chemistry teacher is male. There is no Advance level Chemistry class. Had it been that there is an Advanced level Chemistry class with girls, maybe the female learners in lower forms could be inspired."

"My other assumption is that even in communities where learners come from, there might be few known individuals who have science related careers which the female learners can take as role models and emulate" (School Head 1).

These findings are critical in explaining and justifying the problem. The implication here is that female learners lack role models that can inspire and motivate them to appreciate Chemistry and embrace it at Advanced level. These findings confirm that girls are not exposed to a lot of role models, so they do not really see themselves in that role. Exposing girls to successful female role models can help counter negative stereotypes because girls see that people like them can be successful and stereotype threat can be managed and overcome; exposing girls to successful female role models can help counter negative stereotypes because girls see that people like them can be successful and stereotype threat can be managed and overcome (Bowman, 2007; Hill, Corbett & Rose, 2010). When they are exposed to female role models, they start thinking about it. Thus, the boys and girls perceive science subjects as masculine as they learn that the great ‘scientists’ were men. Therefore, it entails that learners in rural communities and day schools have limited exposure to role models, such that they cannot easily let go the imprint of gender socialisation engrained in them.

4.3.7 PEER INFLUENCE

School head 2 attributed the underrepresentation of female learners in Chemistry to peer pressure through socialisation. Thus, girls influence each other not to take Chemistry and it is this shared attitude that contributes to the problem of their underrepresentation in Chemistry. This confirms studies by Chikuvadze and Matswetu (2013) which indicate that the organisations in which young girls spend their time, such as schools play a role in constructing their identity. Therefore, gender socialisation suffices for explaining the prevalence of the problem. This affirms how strong peers can be in influencing one’s decision as Mead, cited in Haralambos, Holborn, Chapman and Moore (2013) puts it that peer groups can also serve as a venue for teaching members gender roles which is gender socialisation. Through gender role socialisation, group members learn about sex differences and cultural expectations by interacting with each other thereby learning to appreciate others’ views that will lead to cooperation and oneness.

4.3.8 GENDER ROLES IN THE FAMILY

Data generated from interviews with teachers indicated that Chemistry is highly demanding as some of its concepts are taxing, and therefore, it calls for serious commitment on the part of the learner. There was concern that some female learners may not have ample time to devote and fully commit themselves to study the subject in their home environment due to the burden of household chores in line with gender roles. The findings were augmented by the female

learners who raised that domestic chores always interfered with their studies in the home environment. This is consistent with studies by Omar (2012) which reveal that some students are overburdened by household chores leaving little time to study science. However, this is subject to criticism in view of girls' underrepresentation in the subject.

4.3.9 NEGATIVE PERCEPTIONS AND ATTITUDINAL FACTORS

Data generated from interviews with Chemistry teachers revealed that some female learners in both secondary schools revealed that the underrepresentation of female learners in Chemistry was attitudinal. Science Teacher 2 said;

In my teaching experience, I have noted that generally, the majority of female learners dislike Chemistry. It is actually a challenge even in boarding schools. What I have seen is that rural schools are the hardest hit with this challenge

The findings resonate well with studies by Brotman and Moore (2008) which reveal that girls often perceive science as difficult, uninteresting or leading to an unattractive life-style. An interview with Science Teacher 1 further affirmed the position that some female learners have a negative attitude towards the subject. He said, "When the school introduced Chemistry, unlike the majority of boys, even those of low ability who were eager to take the subject, many female learners showed strong resistance. The majority drop Chemistry at Ordinary level."

These research findings imply that a negative attitude that the majority of female learners have is central to low enrolments for Chemistry classes in rural day schools. These findings are consistent with observations from studies carried out in Kenya by The Forum for African Women Educationists (FAWE) (1999), as cited in Keter and Ronoh (2016) which reveal that science achievement for girls was lower than for boys partly due to their poor attitudes towards science. This places attitudes and perceptions as determinants of female learners' low uptake of Chemistry.

The findings point to the fact that the female learners under study have a socio-cultural background which is different from that of female learners in urban and boarding schools where the uptake of Chemistry is marginally better. Usman and Memah (2007) in Hassan and Murtaza (2020) explored that male students have better attitudes towards learning chemistry as compared to female students. Male students have more concentration towards laboratory work and show better performance in laboratory activities. In this regard, the negative attitude becomes a cultural and gendered such that deconstructing it is a big challenge. However,

contrary to these findings, studies by Musengimana, Kampire and Ntawiha (2020) which were carried out in an urban setting revealed that boys' and girls' attitudes in the level of interest, usefulness, and importance given to Chemistry were identical. Therefore, it implies that learners in rural areas embrace the subject in different way from those in urban areas.

4.3.10 LACK OF CAREER GUIDANCE IN SCHOOLS

It emerged from FGDs and interviews that the two schools have never organised career guidance programmes for the learners. Drawing from the findings, it can be inferred that female learners in rural communities are not exposed to career guidance and as such, they remain confined to the understanding and appreciation of careers that are in with the gender roles which they were socialised into. While some parents concurred that they had no influence over the learners' choice of Advanced level subject combinations, it emerged that female learners taking Chemistry were teachers' children who somehow got some guidance. While Ndungu (2007) posits that there is a need to focus on the status of career guidance and counselling at secondary school level with a view of assessing how students make subjects choices and career choices, research studies by Mandina (2012) echoes these findings by attributing the problem to lack of career guidance. Studies (Jegade, 2007) related to probing students' attitudes toward chemistry, indicated a, a fact which could be related to low awareness of career opportunities as one of the factors low level of student motivation to engage in chemistry learning.

4.3.11 LOW PASS RATES FOR FEMALE LEARNERS

Interviews with school heads and heads of department revealed data which concurred that low pass in sciences that characterise the schools has become a challenge which demotivates learners, particularly girls from taking Chemistry at Advanced level. During FGDs, learners lamented that they have seen many failing science subjects so they are afraid of taking Chemistry. These findings resonate well with studies carried out in Kenya by Mochire (2010) which revealed that there was a difference in gender attitude towards Chemistry and male students performed better than female students.

4.4 INTERVENTION STRATEGIES

Interview data revealed that there was nothing significant done at school level to improve female learners' enrolment for Advanced level Chemistry. However, the Government of Zimbabwe (GoZ) launched the science project by sending science kits to schools which were complete with basic science equipment; a project that provided children in rural secondary

schools with a meaningful science curriculum and ensured sustainable participation in the science education for the majority of the country's secondary schools (Gudyanga, Gudyanga & Mutemeri, 2013). Since this initiative was meant to promote the uptake of science subjects in rural areas which have been marginalized for long. Despite this development, the problem still exists in rural day secondary schools as few girls enroll for Advanced level Chemistry classes. Data generated from interviews with school heads and teachers concurred that the influence of gender stereotype is still deep-seated in rural communities. In this regard, it can be inferred that rural secondary school settings perpetuate such gender stereotypical perceptions. These findings are consistent with studies by Hill, Corbett and Rose (2010) which reveal that two prevalent stereotypes are that girls are not as good as boys in maths, and scientific work is better suited to boys and men; negative stereotypes about girls' and women's abilities in mathematics and science persist despite girls' and women's considerable gains in participation and performance in these areas during the last few decades.

In an interview, School head 1 revealed that guidance and counselling sessions in schools are effective in encouraging female learners to take Chemistry at Advanced level, but one science teacher doubted the effectiveness of this strategy as such sessions are not taken seriously in schools. More so, another respondent teacher raised that he had made efforts to organise seminars for Chemistry with other schools as a way of attracting more female learners to the subject. This is substantiated with recommendations by Hassan and Murtaza (2020) that female secondary school teachers need to organize classroom activities to arouse female students' interest towards learning chemistry. However, school heads commended the strides made by the Ministry of education in introducing STEM in a way that is not discriminate female learners. The other school head lamented that despite this policy initiative, the message of a gender inclusive curriculum is yet to be embraced by learners in rural communities with regards to the importance of STEM education. According to Nziramasanga (1999) the teenage girl in Zimbabwe has of late received considerable attention from government and nongovernmental organisations covering virtually all facets of life economically, politically and socially but more so in education. The National Gender Policy (2004) on education has strategies such as incorporating gender issues in all curricula at all levels and eliminating all forms of discrimination against boys and girls in education and skills training, which include science and technology.

4.5 CHAPTER SUMMARY

The chapter identified negative attitude propagated by the perceived difficulty of Chemistry as underpinning the perceptions that female learners have about the subject. All the standing factors that account for the problem are rooted in gender stereotyping that was engrained in the learners through the socialisation process. The next chapter focuses on the summary of the research, conclusions and recommendations.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter is a summary of the whole research process with particular focus on the research problem, review of related literature hinging on standing factors why few female learners take Chemistry at Advanced level, with reference to two day secondary schools in Murewa District, Mashonaland East. It also presents a brief overview of the research design and the research findings. The chapter further gives conclusions drawn from the analysis and discussion of the research findings. It also articulates and outlines recommendations in view of the pertinent issues raised in the discussion of research findings.

5.2 SUMMARY OF THE RESEARCH

Chapter 1 focused on the problem and its setting from which research objectives were formulated. In Chapter 2, dwelt on exploring literature related to the topic but in line with the research objectives. More so, the chapter unpacked the conceptual framework that informed

the study. Chapter 3 outlined the research methodology that guided the study. Chapter 4 focused on the presentation, analysis and discussion of the research findings.

5.3 CONCLUSIONS

From this study, the researcher was able to draw the following conclusions;

5.3.1 FEMALE LEARNERS' PERCEPTIONS OF ADVANCED LEVEL CHEMISTRY IN MUREWA DISTRICT DAY SCHOOLS

The study indicated that few female learners at two secondary schools in Murewa District had the perception that Chemistry is a difficult subject and as such, they have developed a negative attitude towards the subject. It is such a negative attitude that even cause them to fail. The female learner's inclination to the subject was lower than that of male learners. These perceptions were entrenched in gender socialisation. These perceptions have made girls to believe that Chemistry is a preserve for boys.

5.3.2 STANDING FACTORS THAT PROMOTE THE UNDERREPRESENTATION OF FEMALE LEARNERS AT ADVANCED LEVEL CHEMISTRY IN MUREWA DISTRICT DAY SCHOOLS

Data generated for the study illuminated that the gendering of learners' career prospects, gendering of subjects, lack of female role models in science, particularly Chemistry related fields and careers at school and in the community, lack of material and human resources in schools, lack of career guidance, teachers' negative influence and peer pressure are the standing factors that promote the underrepresentation of female learners in Chemistry. It is imperative to not that gender socialisation underpinnings that characterise society have found a place in this problem. Thus, the school system perpetuates gender stereotypical perceptions that are common in the society.

5.3.3 INTERVENTION STRATEGIES ADOPTED BY SCHOOLS

Although guidance and counselling sessions and organisation of seminars for Chemistry with other schools have been done, the results are not significant. There is not much done by the schools to effectively foster the uptake of Chemistry at Advanced level by female learners though the government introduced STEM but in a way that is gender inclusive.

5.3.4 RECOMMENDATIONS

The study makes the following recommendations based on the research findings;

- Schools should make initiatives for organising career days.
- Teachers should develop a pro-active role in encouraging female learners to take Chemistry at Advanced level.
- There is need for the Ministry of Primary and Secondary Education to equip rural day secondary schools with ample material and human resources as that might go a long way in attracting more female learners to take Chemistry at Advanced level, and supporting them thereof.
- Schools should make efforts to generate gender inclusive curricular in consistency with the national curriculum.
- It is imperative for the government and some NGOs to organise awareness campaigns and educate rural communities to appreciate gender inclusivity in education, thereby helping to deconstruct gender stereotypical perceptions.
- The government should find other ways of enforcing, if not effectively implementing STEM education in all schools as this is critical for national development.

REFERENCES

- Adesoji, F. A. (2008). *Managing Students' Attitude towards Science through Problem – Solving Instructional Strategy. Anthropologist, 10(1): 21-24.*
- Akuaku, J. R. (2015). *Gender and Science: Girls Low Participation In Science: A Comparative Study Of Four Selected Senior High Schools In Greater Accra Region, Ghana.*
- Bedard, K. & Cho, I. (2018). *The Gender Test Score Gap across OECD Countries.*
- Beins, B. C. & McCarthy, M. A. (2012). *Research Methods and Statistics. Pearson Education.*
www.scholar.google.com.

- Berg, B. L. (2009). *Qualitative Research Methods: for the Social Sciences 7th ed.* Boston: Pearson.
- Best, J. N. & Khan, J. V. (2010). *Research in Education.* Boston: Allyn and Bacon.
- Busolo, A. J. (2010). *Gender Differences in Students' Achievement in Chemistry in Secondary Schools of Kakamega District, Kenya Kenyatta University.*
- Braun, V. & Clarke, V. (2006). *Using Thematic Analysis in Psychology: Qualitative Research In Psychology 3:77-101.*
- Brotman, J. S. & Moore, F. M. (2008). *Girls and Science: A Review of Four Themes in the Science Education Literature.* Journal of Research in Science Teaching, 45(9), 971-1002. doi:10.1002/tea.20241.
- Chang, S. N. Yeung, Y. Y. & Cheng, M. H. (2009). *Ninth Graders' Learning Interests, Life Experiences And Attitudes Towards Science & Technology, Sci Educ Technol , Vol 18:pp 447-457.*
- Ceci, S. J. & Williams, W. M. (2009). *Women's Underrepresentation in Science: Sociocultural And Biological Considerations. Psychological Bulletin, 135, 218-261.*
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). *Why Are Some STEM Fields More Gender-Balanced Than Others? Psychological Bulletin, 143(1), 1-35.* doi:http://dx.doi.org.ezproxylocal.library.nova.edu/10.1037/bul0000052.
- Chikuvadze, P. & Matswetu, V. S. (2013). *Gender Stereotyping and Female Pupils' Perception Of Studying Advanced Level Sciences.* www.buse.ac.zw.
- Chitate, H. (2016). *Science, Technology, Engineering and Mathematics (STEM): A Case of Zimbabwe's Educational Approach to Industrialisation.* Journal of Education, v6. No.5. pp27 – 35.
- Connelly, L. M. (2016). *Trustworthiness in Qualitative Research.* www.researchgate.net.
- Creswell, J. W. (2009). *Qualitative Inquiry and Research Design; Choosing Among Five Approaches.* Thousand Oaks: SAGE Publications.
- Elginda, A. & Ikhsan, J. (2012). *Students' Attitudes towards Chemistry: On the Gender and Grades Perspective. Advances in Social Science, Education and Humanities Research, volume 541. Proceedings of the 6th International Seminar on Science Education (ISSE 2020).*
- Gadzirayi C.T., Bongo P. P., Ruyimbe B., Bhukuvhani C. (2016). *Diagnostic Study on STEM In Zimbabwe.* www.researchgate.net.
- Gaille, B. (2018). *Advantages and Disadvantages of Qualitative Research.* www.brandongaille.com.

- Gall, M. D., Borg, W.R., Gall, J. P. (2007). *Educational Research and Introduction*. New York: Longman.
- Gudyanga, A., Gudyanga, E. & Mutemeri, J. (2013). *Innovative Science Trends That Have Occurred in Zimbabwe*. *Asian Social Science*; Vol. 9, No. 11; 2013 ISSN 1911-2017 E-ISSN 1911-2025.
- Hailemariam, A. G. S. & Dadi, G. (2017). *Assessment on Female Students Achievement in Chemistry Subject at Merti Secondary School*. *Education Journal*. Vol. 6, No. 6, 2017, pp. 200-206. doi: 10.11648/j.edu.20170606.16.
- Haralambos, M. Holborn, M. Chapman, S. & Moore, S. (2013). *Sociology: Themes and Perspective*. London: Harper Collins.
- Hassan, M. Ul., & Murtaza, A. (2020). *Secondary School Students' Attitudes Towards Learning Chemistry: Comparison By Gender, Age And Educational Stream*. *Gamtamokslinis ugdymas / Natural Science Education*, 17(1), 7-23. <https://doi.org/10.48127/gu-nse/20.17.07>.
- Hill, C., Corbett, C., & St Rose, A. (2010). *Why So Few? Women in Science, Technology, Engineering and Mathematics*. American Association of University Women. 1111 Sixteenth Street NW, Washington, DC 20036. <https://files.eric.ed.gov/fulltext/ED509653.pdf>
- Hoominfar, E. (2019). *Gender Socialization*. Department of Sociology, Social Work and Anthropology. Utah State University, USA.
- Jansen, J. (2008). *What Education Scholars Write About Curriculum In Namibia & Zimbabwe*. International Handbook of Curriculum Research. New Jersey: Lawrence Erlbaum.
- Irakoze, E., Gakuba, E. & Karegeya, C. (2021). *Effect of Gender Perspective towards Performance of Chemistry Education in Secondary Schools: Case Study of Three Selected Schools of Gicumbi District in North-East of Rwanda*. *Journal of Research Innovation and Implications in Education* 5(3), 15 – 25.
- Jegede, S. A. (2007). *Students' Anxiety towards the Learning of Chemistry in Some Nigerian Secondary Schools*, *Educational Study and Review* Vol. 2 (7), pp. 193-197, July 2007.
- Kapungu, R. S. (2007). *The Pursuit of Higher Education in Zimbabwe: A Futile Effort? A Paper Prepared for the Centre for International Private Enterprise (CIPE) 2007 International Essay Competition on 'Educational Reform and Employment Opportunities'*.
- Kenni, A. M. (2019). *Attitude and Achievement of First Year Chemistry Undergraduate Students at the University of the South Pacific*. www.researchgate.net.
- Kazembe, T. C. & Nyanhi, G. M. (2010). *Effect of Teachers' and Students' Worldviews On Learning of O-Level Chemistry at a School in Harare, Zimbabwe*. *Eurasian Journal of Anthropology*. 1(2):79–98, 2010.

Keter J. K. & Ronoh, P. K. (2016). *Impact of Cooperative Mastery Learning Approach on Students' Academic Achievement in Chemistry by Gender in Bomet County, Kenya*. American Journal of Education and Practice (Paper) ISSN 2520-3991 (Online) Vol.1, Issue 1 No.1, pp 49-58, 2016. www.ajpojournals.org.

Kitzinger, J. (2006). *The Methodology of Focus Groups: The Importance of Interaction Between Research Participants*. *Sociology of Health and Illness*, 16, 103–121.

Kothari, C. R. (2011). *Research Methodology, Methods and Techniques*. New Delhi: New Age International Limited Publishers.

Kombo, D. K. & Tromp, D. L. A. (2009). *Proposal and Thesis Writing*. Nairobi: Pauline Public Africa.

Korstjens, I. & Moser, A. (2018). *Series: Practical Guidance to Qualitative Research. Part 4: Trustworthiness and Publishing*. *European Journal of General Practice*, 24:1, 120-124. www.tandfonline.com.

Leedy, P. D. & Ormrod, J. E. (2012). *Practical Research: Planning and Design*. New Jersey: 6TH ED Upper Saddle River.

Levine, M., Serio, N., Radaram, B., Chaudhuri, S., & Talbert, W. (2015). *Addressing the STEM Gender Gap by Designing and Implementing an Educational Outreach Chemistry Camp for Middle School Girls*. *Journal of Chemical Education*, 92(10), 1639-1644. DOI: 10.1021/ed500945g.

Luphahla, S. (2017). *An Assessment of the Reasons for the Gender Gap in the Choice of Stem Subjects. A Case of 2 Selected Schools of Matabeleland South Province of Zimbabwe*.

Magwa, S. & Chingome, S. (2016). *Girls' Education: Persistence of Gender Inequalities in Schools*. *International Journal of Social Science and Economics Invention* 2(01). www.researchgate.net.

Makwinya, N. & Hofman, R. (2015). *Gender Disparities in Sciences: The Question of Parental Influence on Children's Self Concept and Utility Value*. *Journal of Education and Practice*. www.academia.edu.co.

Mandina, S. (2012). *Zimbabwean Science Students' Perceptions of Their Classroom Learning Environments and Attitude towards Science*. *Mediterranean Journal of Social Sciences* Vol. 3 (11) November 2012. ISSN 2039-9340.

Mashavave, W. (2017). *Why Do Girls Perform Less Well than Boys in Natural Sciences In Zimbabwe? A Case Study of Makonde District*. www.researchgate.net.

Mihindo, W. J., Wachanga, S. W., & Anditi, Z. O. (2017). *Effects of Computer-Based Simulation Teaching Approach on Students' Achievement in the Learning of Chemistry among*

Secondary School Students in Nakuru Sub County, Kenya. Journal of Education and Practice, 8(5), 65-75.

Mlekenyi, D. N. (2009). *Gender Chemistry Concepts' Perception and Its Effects on Students Academic Performance in Selected Secondary Schools of Central Division, Mombasa District, Kenya.*

Mochire, S. (2010). *The Relationship between Attitude and Academic Performance in Chemistry among Secondary School Students. A Case of Central Kisii District, Kenya.*

Murphy, P. & Whitelegg, E. (2006). *Girls and Physics: Continuing Barriers to Belonging.* Curriculum Journal, 17(3) pp 281 – 305.

Musengimana, J., Kampire, E. & Ntawiha, P. (2020). *Factors Affecting Secondary Schools Students' Attitudes toward Learning Chemistry: A Review of Literature.* EURASIA Journal of Mathematics, Science and Technology Education, 2021, 17(1), em1931.

Mutekwe, E. & Modiba, M. (2016). *Perceived Gender-based Challenges Endured by Zimbabwean Secondary School Girls in their Academic and Occupational Prospects.*

National Gender Policy. (2004). *A Critical Evaluation.* www.researchgate.net.

Naugah, J. (2011). *Factors Affecting the Choice of Science Subjects among Girls at Secondary Level in Mauritius.*

Neuman, L (2011). *Social Research Methods: Qualitative and Quantitative Approaches 7th ed.*

Nziramasanga Commission of Inquiry (1999). *Report of the Presidential Commission of Inquiry into Education and Training (In Zimbabwe).* Harare: Government Printers.

Ogunyemi, T. C. & Bamidele, E. O. (2019). *Gender Influence on Students' Perception in Learning Chemistry Using Multiple Representations in Learning Chemistry in Nigerian Secondary Schools.* Asian Journal of Education and Social Studies 5(1): 1-7, 2019; Article no.AJESS.50307 ISSN: 2581-6268.

Olawale, A. (2009). *Students' Attitudes towards Chemistry in Some Selected Secondary Schools In Akure Southlocal Government Area, Ondo State, unpublished dissertation, Affiliate of the Usman Dan Fodio University Sokoto.*

Omar, A. H. (2008). *Attitudes of Girls in Secondary School towards the Performance of Science Subjects in Kenya: A Case Study of North Eastern Girls' Secondary School in North Eastern Province.*

Osborne, J. & Dillon, J. (2008): *Science education in Europe: Critical reflections.* London: The Nuffield Foundation.

Parveen, H. & Showkat, N. (2017). *Research Ethics.* www.researchgate.net.

- Pham, Q. (2018). *Interpretivist Approach to Qualitative Research*. www.researchgate.net.
- Punch, K. F. (2011). *Introduction to Social Research: Quantitative and Qualitative Approaches*
- Reinking, A. & Martin, B. (2018). *The Gender Gap in Stem Fields: Theories, Movements and Ideas to Engage Girls in Stem*. Journal of New Approaches in Educational Research Vol. 7. No. 2. July 2018. Pp. 148–153 Issn: 2254-7339 Doi: 10.7821/Naer.2018.7.271.
- Sinnes, A. (2005). *Approaches to Gender Equity in Science Education: Two Initiatives in Sub-Saharan Africa Seen Through A Lens Derived From Feminist Critique of Science*.
- Tuckman, B. W. & Monneti, D. M. (2011). *Educational Psychology*. New York: Wadsworth Publishing Company.
- Valenti, S. S., Masnick, A. M., Cox, B. D. & Osman, C. J. (2016). *Adolescents' and Emerging Adults' Implicit Attitudes about STEM Careers: Science is not Creative*". *Science Education International*, Vol. 27. No. 1. P40 -58.
- Van Esch, P. & Van Esch, L. J. (2013). *Justification of a Qualitative Methodology to Investigate the Emerging Concept: The Dimensions of Religion as Underpinning Constructs for Mass Media Social Marketing Campaigns*. *Journal of Business Theory and Practice* ISSN 2329-2644 Vol. 1, No. 2, 2013. www.scholink.org/ojs/index.php/jbtp.
- Wilson, J. (2013). *Essentials of Business Research: A Guide to Doing Research Project*. London: Sage.
- Yilmaz, K. (2013). *Comparison of Quantitative and Qualitative Research Traditions: Epistemological, Theoretical, and Methodological Differences*. *European Journal of Education*, 48(2), 311-325. <https://doi.org/10.1111/ejed.12014>.
- Yin, R. K. (2009). *Case Study Research; Design and Methods 4th ed*. London: SAGE Publication.

APPENDICES

APPENDIX 1

INTERVIEW GUIDE FOR LEARNERS

NB: *To be administered in Chishona vernacular where necessary*

Topic: Standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level: A case of two schools in Murewa District.

OBJECTIVE 1. Examine female learners' perceptions of Advanced level Chemistry in Murewa District day schools.

1. What are your perceptions of Advanced level Chemistry?
2. What do you like and dislike about Chemistry? Give reasons.

OBJECTIVE 2. Examine factors that promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District day schools.

1. What career do you want to pursue after leaving school? Give reasons?
2. What really influenced you in choosing your subject combination at Advanced level?
3. Give me reasons why in your subject combination, you did not choose Chemistry.
4. How do you compare your abilities and that of boys in science subjects, particularly Chemistry?

APPENDIX 11

INTERVIEW GUIDE FOR CHEMISTRY TEACHERS/HEADS OF SCIENCE DEPARTMENT/SCHOOL HEADS

Topic: Standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level: A case of two schools in Murewa District.

OBJECTIVE 1. Examine female learners' perceptions of Advanced level Chemistry in Murewa District day schools.

1. How do you view your female learners' perceptions of Chemistry?
2. How do you explain female learners' perceptions of Advanced level Chemistry in this school?

OBJECTIVE 2. Examine factors that promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District day schools.

1. How do you account for low female enrolment patterns in Chemistry at Advanced level in this school?
2. What have you observed as being reasons why most female learners who choose science combinations in this school shun Chemistry?
3. How do you explain the role of gender in influencing learners' uptake of Chemistry and how do you explain gender as a determinant for performance in the subject?
4. How have female learners in this school been performing in Chemistry as compared to male learners?

OBJECTIVE 3. Identify intervention strategies that the secondary schools in Murewa District have developed to foster the uptake of Advanced level Chemistry by female learners.

1. What have you done in order to promote the uptake of Advanced level Chemistry by female learners in this school?
2. How is the school promoting female learners' uptake of Advanced level Chemistry?
3. How effective are the intervention strategies?
4. What challenges are you facing in your efforts to encourage and foster the uptake of Advanced level Chemistry by female learners?

APPENDIX 111

INTERVIEW GUIDE FOR PARENTS/GUARDIANS

NB: *To be administered in Chishona vernacular where necessary*

Topic: Standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level: A case of two schools in Murewa District.

OBJECTIVE 2. Examine factors that promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District day schools.

1. How have you influenced your child's choice of Advanced level subject combination?

2. What career aspirations do you have for your female child? Give reasons.

APPENDIX 1V

FOCUS GROUP DISCUSSIONS GUIDE FOR LEARNERS

NB: *To be administered in Chishona vernacular*

Topic: Standing factors why few female learners in rural day secondary schools take Chemistry at Advanced level: A case of two schools in Murewa District.

OBJECTIVE 1. Examine female learners' perceptions of Advanced level Chemistry in Murewa District day schools.

1. What are your perceptions of Chemistry?
2. What do you like and dislike about Chemistry? Give reasons.

OBJECTIVE 2. Examine factors that promote the underrepresentation of female learners at Advanced level Chemistry in Murewa District day schools.