AN INVESTIGATION INTO CAUSES OF POOR PERFORMANCE IN A-LEVEL CHEMISTRY IN EPWORTH MABVUKU TAFARA DISTRICT.

BY

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B1441591

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE POST GRADUATE DIPLOMA IN EDUCATION

2016
DECLARATION

I declare that the research project with the title; A critical analysis into the causes of poor performance and strategies to enhance the poor performance at A-Level chemistry in Epworth Mabvuku Tafara District, Harare Zimbabwe 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. This research was supervised by Doctor Zinyeka for the period September to 30 December 2016.

SIGNATURE OF SUPERVISEE………………………………..DATE………………………………

SIGNATURE OF SUPERVISOR………………………………..DATE…………………………...

DEDICATION

This research project is dedicated to my dear family and to Bindura University of Science Education for the immense support and encouragement they accorded me during the trying times as I endeavored make meaning of this work. To my dear husband Runesu, my daughter Anashe; those lonely moments spent in solitude due to my absence did not all go in vain. Your support and understanding were priceless. Thank you very much for the sacrifice.

ACKNOWLEDGEMENTS

I would wish to acknowledge the following people without whose contribution this work would not have made the light of the day. I am greatly indebted to Dr. Zinyeka my supervisor for his timely guidance, for his support and mentorship without which the long road trodden would have been almost impossible to surmount.

My heart also reaches out to my many friends and classmates for their constant encouragement, which made me brave most of the long nights. May the almighty God pay you greatly.
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Abstract

This study sought to investigate factors contributing to poor performance in the Zimbabwe Advanced Level Chemistry syllabus (9189) and finding strategies to rectify the ugly problem at three high schools in Epworth, Mabvuku Tafara District, Harare Province, Zimbabwe.

In this study, the sample was drawn from three secondary schools, one girls high, one boys high and one mixed school. The study used qualitative case study in collecting information from respondents, in which participant observation and interviews (structured and oral interviews) were done to 51 Advanced Level Chemistry pupils purposively selected and 3 Chemistry teachers purposively selected.

The study revealed that teachers and the students perceive factors such as the extensive nature of the chemistry syllabus, lack of teaching aids, inadequate time allocation for Chemistry lessons, lack of background knowledge for learners, poor teaching methodologies, inadequate resources, the nature of examination questions and the abstract nature of chemistry were the major causes of poor performance. This study seeks to investigate which of these factors are responsible for the causes of poor performance. Some students have an apprehension about the way chemistry is taught, lack of appropriate textbooks and the very limited access to practical work, attitude of some teachers towards work, some teachers whom fail to motivate students towards liking the subject and the quality of teachers.

Results obtained were presented using descriptive statistics such as mean, percentages and frequencies as well as inferential statistics.

The study recommends that the Ministry of Education through its various agents should, among other things, enhance supervision of curriculum implementation in schools, increase the amount allocated for tuition and release the funds in good time to enable prompt acquisition of learning materials. School managements, in conjunction with other stakeholders, should enhance teacher motivation and provide more and better teaching and learning facilities to enable a more conducive environment for learning. Finally, Chemistry teachers must enhance their teaching approaches by adopting a more practical approach to the teaching and learning practices that would motivate the students to perform better in the subject.
KEYWORDS:

Chemistry concepts, meaningful learning, constructivist method, education, learning, teaching, teaching methods in science, indigenous knowledge, nature of science
CHAPTER 1

1.1 INTRODUCTION
This chapter provides an introductory background to the study, which focuses upon identifying causes of poor performance in chemistry. The study investigates the causes of poor performance in advanced level chemistry as a strategy for improving learners’ performance in chemistry. The performance of Zimbabwean learners in chemistry in Epworth Mabvuku Tafara District has been abysmal for several years. Results for the Zimbabwe School Examination Council for the period 2011 to 2014 of Epworth Mabvuku Tafara District is shown in fig 1.1 below.

Table 1.1 ZIMSEC- science results analysis for the Years 2011-2014 IN EWORTH, MABVUKU TAFARA DISTRICT

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>SCHOOL X</th>
<th>SCHOOL Y</th>
<th>SCHOOL Z</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>BIOLOGY</td>
<td>27.30</td>
<td>29.23</td>
<td>32.44</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>33.5</td>
<td>35.7</td>
<td>37.6</td>
</tr>
<tr>
<td>CHEMISTRY</td>
<td>19.3</td>
<td>23.8</td>
<td>28.9</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>31.33</td>
<td>35.13</td>
<td>36.64</td>
</tr>
<tr>
<td>BIOLOGY</td>
<td>28.8</td>
<td>34.6</td>
<td>30.7</td>
</tr>
<tr>
<td>CHEMISTRY</td>
<td>23.4</td>
<td>29.4</td>
<td>27.4</td>
</tr>
<tr>
<td>CHEMISTRY</td>
<td>19.13</td>
<td>24.91</td>
<td>23.66</td>
</tr>
<tr>
<td>Subject</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>BIOLOGY</td>
<td>33.5</td>
<td>30.6</td>
<td>30.5</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>35.0</td>
<td>27.6</td>
<td>28.5</td>
</tr>
</tbody>
</table>


Table 1.1 shows that performance in Chemistry is the poorest among the three science subjects for consecutive years. The ZIMSEC examination in 2013 recorded a pass rate of 80% compared with 97.6% and 96.7% in Biology and Physics respectively. For 2014 examinations it recorded physics 85.79, biology 74.27 and chemistry 74.35.

Despite the prime position Chemistry occupies in our educational system and the efforts made by researchers to enhance performance, students’ performance in Chemistry is generally low as compared to other science subjects. This is clearly seen from candidates continued poor performance on sciences in national examinations as is clearly demonstrated in Epworth, Mabvuku, Tafara District science results for the years 2011 up to 2014 in table 1.1 above.

1.2 BACKGROUND TO THE STUDY

The performance of Zimbabwe learners in science subjects at Advanced level, particularly in chemistry has been horrible for the period 2011 to 2014 as shown in Table 1.1. The data displayed in Table 1.1 shows that majority of learners from Epworth Mabvuku Tafara underperform (ref 1.1).

The importance of chemistry in both national and global development cannot be overemphasized. Researchers such as Eke (2008) accepted that any nation aspiring to be scientifically and technologically developed must have adequate level of chemistry education reported (Adesoji F.A., Olatunbosun S., 2008, p 1, 2). Studying of chemistry offers one of the opportunities to develop an understanding of scientific method and the ability to understand the living world of which man himself is a part. This has contributed to its relative popularity among other school science subjects. Chemistry has been a pre-requisite subject for offering most science oriented courses in the tertiary institution and this calls for the need in teaching it effectively (Adesoji F.A., Olatunbosun S., 2008p 1 & 2). Chemistry is a core subject in the study of many biological science courses such as Medicine, Biochemistry, Microbiology, Pharmacy, and Engineering among others. Thus, a comprehensive knowledge of chemistry is of unlimited
importance to many pupils and the community at large (Baja, 1976. Therefore, it is important that chemistry of all science subjects should be given significance attention in our schools.

Failure in Chemistry may therefore affect upward social mobility for many a households with poor performers. That is why in Zimbabwe people introduced the new curriculum with new programmes such as Science and Technology Engineering and mathematics (STEM) which promote the pure sciences. This was initiated in an attempt to produce young scientist and technicians that would improve the developments in agriculture, health, Engineering, medicine and in order to revive all the industries. Therefore, this research study will help not only the educators and learners but it will help the industrialists as well.

It is against this background that researchers are interested in assessing the performance of students in chemistry.
1.2.1 LEARNERS PERFORMANCE IN CHEMISTRY, WHAT RESEARCH SAYS

There may be several reasons why the majority of students who sit for A-Level Zimbabwe School Examination Council do not perform well in chemistry in Epworth Mabvuku Tafara District, Harare Zimbabwe. These reasons may be derived from various sources. Studies have proposed various determinants of poor performance in sciences in Chemistry. According to available research findings these factors include; poor teaching methodologies (Friedman, 2000), poor capital investment in terms of provision of science resources (Agusiobo, 1998), low teacher morale, substandard internal evaluation, poor administration and leadership, inadequate supervision and inspection of schools (Chiriswa, 2002), lack of support from parents, insecure working relationship between head teachers and their staff and indiscipline (Yeya, 2002), lack of laboratories, laboratory equipment, abstract nature of chemistry, negative attitude towards the subject, nature of examination questions, examination malpractice, inadequate chemicals and reagents (UNICEF, 2000) among others. This study aims at finding which of these factors have relative effect on the poor performance of students.

For learning to be meaningful it depends on what the learner already knows (Ausubel, 1968; Novak, 1977; 2000). The several abstract chemistry concepts, which are dominant to further learning in both chemistry and other sciences (Taber, 2000; 2002) are important because further chemistry concepts or theories will be challenging to study if these underpinning concepts are not sufficiently grasped (Zoller, 1990; Nakhleh, 1992; Ayas & Demirbas, 1997; Coll & Treagust, 2001; Nicoll, 2001). The intellectual nature of chemistry along with other learning difficulties, for example due to the mathematical nature of chemistry, means that chemistry classes require a high-level set of skills (Fensham, 1988; Zoller, 1990). Regarding a subject as challenging prevents learners from continuing with studies in the subject, hence many countries have developed new syllabi for secondary schools to make subjects more learner-friendly (Sirhan, 2007). In Zimbabwe the chemistry syllabus has remained static for several years causing poor performance in chemistry.

The constant relationship between the macroscopic and microscopic levels of thought is an crucial characteristic of chemistry, which represents a substantial challenge to novices learning chemistry (Bradley & Brand, 1985). From the learner’s viewpoint, the problem areas of chemistry learning may endure to university education. A number of researchers have perceived
the following as the most challenging topics: Equilibria, Stoichiometry and the mole concept; reaction kinetics, chemical formulae and equations; condensation and hydrolysis; atomic structure; kinetic theory; thermodynamics; electrochemistry; and intermolecular forces. Chemistry is an abstract subject where actual understanding is only attainable through meaningful learning of concepts (Holbrook, 2005).

Though students seemingly show some indication of learning and understanding in examinations, researchers find evidence of misconceptions, rote learning and of certain areas of basic chemistry which are still not understood even at degree-level (Johnstone, 1984; Bodner, 1991; Kazembe, 2010) because what is taught is not always what is learned (Sirhan, 2007). Some students will neatly reproduce their notes during examinations but demonstrate lack of knowledge during projects, indicating that the level of understanding depicted during examinations is not always revealing what has been learned (personal observation). Therefore a study of this nature will help not only the chemistry A Level students but it will help even students at tertiary institutions. Most of these tertiary level students will encounter some problems when writing projects.

The poor performances in Chemistry, which is one of the most “popular” science subjects that have continued to register high student enrolment in secondary schools even in countries such as Kenya cannot be over emphasised. The perceived popularity of Chemistry, it was hoped, would translate into better performance. Nevertheless, the performance has continued on a downward trend (KNEC, 2010). Available statistics show that in the last decade, students’ achievement in Chemistry has remained low nationally and at the district level in Kwale County (KNEC, 1999; KNEC, 2010). Table 1:2 provides information on national performance of KCSE candidates in selected subjects for the period from 2006 to 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>Maths</th>
<th>Biology</th>
<th>Chemistry</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>19.01</td>
<td>27.45</td>
<td>24.91</td>
<td>40.32</td>
</tr>
</tbody>
</table>
In an attempt to check poor performance, the Government of Kenya through the Ministry of Education in collaboration with other stakeholders adopted a number of interventions. The measures included curriculum review and rationalisation to reduce the load both on students and teachers, on-the-job training of science teachers through SMASSE (Strengthening of Mathematics and Science in Secondary Education) to enhance subject mastery levels and strengthening of inspectorate department to improve curriculum implementation and supervision (KESSP, 2005). Therefore, a study of this nature is not only beneficial to Epworth Mabvuku Tafara District but to the whole world. There is general poor performance even in countries such as Kenya.

1.3 Problem of the study

Analysis of A-level chemistry results (2011-2014) in Epworth Mabvuku Tafara District exposes that chemistry has the lowest pass rate as compared to other science subjects that is biology, physics or mathematics(ref1.1). The low pass rate probably contributes to the drop in the numbers of students willing to study chemistry at A-level as the results cause students to regard chemistry as a difficult subject, an observation that at times keep away learners from the subject (Sirhan, 2007). The poor performance have led to low mean grades for most candidates and thus endangered their chances for upward social mobility. At the national level the poor performances has led to low uptake of careers in science and technology. Most students are enrolling for chemistry at university level ill equipped to study chemistry and this might be related to the way they are prepared at secondary schools, hence it is important to investigate how students are prepared for university work. Most students in all countries find chemistry a challenging and demanding subject and results are generally low. In Zimbabwe, the A-level chemistry pass rate has become a major source of concern. Universities are finding it difficult to enroll adequate numbers of candidates in chemistry departments because of declining numbers of students sustaining the entrance requirements. As a result, a study of this nature might make the study of chemistry more attractive.
1.4 Statement of the problem
Given the major factors that influence poor performance in section 1.2.1 of this chapter in Advanced level chemistry, the problem of this study was to find which of these factors are responsible for the persistent poor performance in chemistry among the several factors. With this in mind, one of the major aims of this research is to identify the gaps between students’ wishes and teachers’ teaching as observed by Rannikmae (2001) and help teachers map out more effective strategies to tackle the subject and promote meaningful chemistry learning (Holbrook, 2005) as well as unravel the many variables that affect student learning (Yücel, 2007). The statement of the problem gave rise to the following questions

1.5 Research questions
1. How do learners past performance influence their A-level performance?
2. What factors are contributing to A-Level learners poor performance in chemistry?
3. How could the learners poor performance be improved?

1.6 Purpose of the study
The aim of this study was to contribute to an improved chemistry teaching and learning environment at secondary school level (Advanced level). Its purpose was to identify from among the factors already stated in section 1.2.1 which contributed to poor achievement in Chemistry and suggest possible interventions for enhancing good performance. The research will also help the curriculum developers and planners to make the curriculum more relevant and sensitive to the needs and demands of the Zimbabwean society. Teacher educators will use the research findings to enhance development of more effective strategies and approaches for chemistry teacher training (UNICEF, 2000) active, practicable, more manageable and more meaningful to students. The careful designing of O-level and A-level chemistry curricula will enhance development of the scientific minds necessary for careers in the sciences that will be studied at tertiary levels that is Colleges and Universities.

1.7 OBJECTIVES OF THE STUDY
The objectives of the study were to:
• Establish challenges schools in the Epworth, Mabvuku Tafara district, Harare Province, Zimbabwe, faced in the teaching/learning of ’A Level chemistry Syllabus (9189) and

• Determine how these challenges contribute to poor performance by schools in Advanced level chemistry. This research also seeks to

• Explore the factors causing poor performance in chemistry by students,

• Remedy the fear of the subject experienced by the students, reveal the obstacles encountered by teachers and students in the teaching and learning of chemistry, and attempt to reverse the negative attitudes that have developed in learners.

• Identify intervention strategies that can help improve learners” performance in Chemistry.

1.8 SIGNIFICANCE OF THE STUDY

The significance of this study is to provide insights on how to achieve quality education in Advanced Level Chemistry in comparable schools in Epworth Mabvuku Tafara District Zimbabwe. The research will also the actual causes of poor performance in advanced level chemistry. The study is likely to provide science teachers with teaching approaches needed for improving learners’ performance in chemistry. This research will not only assist the Department of Education and School Management Teams of high schools, to improve their level of performance in A level Chemistry, but it also provide strategies to guide the schools that offer Advanced Level chemistry how to improve the performance of learners to a level that would allow them to pursue chemistry programme in higher and tertiary learning institutions. The research would also be helpful to the Ministry of Primary and Secondary Education, Zimbabwe, for determining which schools should offer A” Level Chemistry and to monitor their performance. School administrators will also be assisted in selecting students who qualify to take up the subject.

The findings of this study would also be beneficial to:

• Teachers- It would help them in selecting appropriate methods that would improve the quality of teaching and learning.
- School Heads- They would benefit from propositions on how to ensure a conducive learning environment for students and teachers to enhance performance in Chemistry.

- Students- Would benefit from suggestions on particular characteristics and study habits that enhance performance in Chemistry.

- Lecturers-Would get useful information on how teachers’” attitudes contribute to performance in Chemistry and how it could be enhanced.

- Policy formulators- Would gather useful information that would shed light on why the interventions so far implemented have not so far yielded required outcome. This would enable policy implementers adopt only those strategies that promotes good performance in Chemistry.

1.9 DELIMITATIONS
The research is only for three schools where the researcher resides and teaches. The target group is the advanced level pupils who are taking Chemistry. These classes are performing poorly in the previous years in chemistry examinations. The researcher is taking one of the classes for Chemistry hence will also be observing challenges encountered during the lesson. Cost and accessibility are also important factors considering that the researcher will not need to travel a long distance to collect data.

1.10 LIMITATIONS OF THE RESEARCH
The research was confined to one District that cannot represent all schools doing chemistry in Zimbabwe as a whole. Only the sampled pupils and teachers’ responses are used to generalize the findings of the study because of limited time allocated to complete this study course. The study was limited only to the selected respondents but for more conclusive findings, all pupils taking Chemistry at advanced level in Zimbabwe, teachers, head teachers, parents and other education stakeholders should have been studied. However, this was not possible due to financial and other logistical constraints like unavailability and inaccessibility. In this way population validity was threatened by cost-restricted sampling. Since the research made use of questionnaires, it was not free from wrong interpretation of questions by some pupils, unwillingness of some respondents to disclose the true information and the failure by some to be cooperative. The research may have also been affected by social desirability whereby
respondents answer questions in a direction that is most socially accepted in order to protect their teachers and school. The researcher needed to let known to the respondents that they were protected from any harm and that the results were solely for research purposes.

1.11 ASSUMPTIONS
During this study, it was assumed that:

• The teachers interviewed had been teaching Chemistry in the specific schools for a reasonable period to be able to be conversant with the dynamics of their learning environments.

• The syllabus coverage was uniform for all the schools.

• The students who participated in this study learn under similar conditions as those whose ZIMSEC results were analysed in the period ranging from 2011 to 2014.

• The respondents were honest in answering all questions

• All students who are studying chemistry at advanced level have attained a C or better at ordinary level chemistry or physical science.

• Every school that offers sciences at Advanced level has a laboratory and the resources and materials required for effective teaching and learning chemistry.

• Students are into sciences by their own personal choice not by compulsion.

• All pupils have equal opportunities and exposure to learning of Chemistry.

• All pupils were free to give their opinions concerning challenges they face in the teaching and learning of chemistry.

• All the respondents were cooperative and information given was true and accurate.

1.12 DEFINITION OF TERMS
Chemistry is a physical science, and it is the study of the properties of and interactions between matter and energy. In other words, chemistry is a way to study the properties, characteristics, and physical and chemical changes of matter (Merriam Webster.com 2007)
Learning

Mpofu (1994) defined learning as a relatively permanent change in behaviour potentially which occurs as a result of reinforced practice. It is defined in the Oxford dictionary as the acquisition of knowledge or skills through study or being taught. In this research, learning is acquiring skills for one to be capable of solving a problem.

Teaching

Gunter (1998) defined teaching as an activity that hinges on the teacher helping pupils acquire certain skills or abilities that the pupil was not capable of performing at the beginning of teaching. UGC NET online defines teaching as all activities of providing education to someone. Teaching according to the vocabulary.com dictionary refers to the activities of educating or instructing. In this research, teaching is referred to as imparting knowledge and skills on chemical bonding to learners.

Education means imparting knowledge, skills and judgment (oxford dictionary)

Learning is the process of acquiring knowledge (oxford dictionary)

Curriculum is the formal and informal content and process by which learners gain knowledge and understanding, develop skills and alter attitudes, appreciations, and values under the auspices of that school (Doll, 1989, p. 8); and Curriculum is defined as the sum of learning experiences offered by schools (Harris, 1991, p. 70). A curriculum is a three dimensional document and takes into account the needs of the students, the content and the instructional methodology while the syllabus is a uni-dimensional document, which lists the subjects, and contents outline with broad time allocation (Karisdappa and Sangam, 1994).

Poor achievement: a score of below 50% obtained in Chemistry by a student at Zimsec level.

Meaningful learning occurs when students build the knowledge and cognitive processes needed for successful problem solving. Problem solving involves devising a way of achieving a goal that one has never previously achieved; that is, figuring out how to change a situation from its given state into a goal state (Mayer, 1992). Two major components in problem solving are (a) problem
representation, in which a student builds a mental representation of the problem, and (b) problem solution, in which a student devises and carries out a plan for solving the problem (Mayer, 1992).

Lederman (1992:331, 2007:833) describes Nature Of Science as the “epistemology of science, science as a way of knowing, or the values and beliefs inherent to the development of scientific knowledge”. As given in Lederman’s three aspects above, it should then be taken that the nature of scientific knowledge (NOSK) is about the body of knowledge while the nature of scientific inquiry (NOSI) is about the method.

In constructivist learning, students engage in active cognitive processing, such as paying attention to relevant incoming information, mentally organizing incoming information into a coherent representation, and mentally integrating incoming information with existing knowledge (Mayer, 1999). Constructivism can be defined as a philosophy which enhances students' logical and conceptual growth (Dewey, 1952).

Teaching methods in science are methods such as experiments, observation, practicals, theory and projects used by teachers to teach science subjects (Zinyeka G, 2014)

According to Mosimege and Onwu (2004, pg. 2), indigenous knowledge is defined as “an all-inclusive knowledge that covers technologies and practices that have been and are still used by indigenous and local people for existence, survival and adaptation in a variety of environments”.

1.13 Summary
This chapter provides the rationale for the study. It contains introductory concepts such as study background, statement of the problem as well as the research objectives and questions. It also highlights the scope and limits for the study as well as the theory around which the study resonates. Finally, a basic definition of critical terms used in the study is undertaken within the chapter. It is upon this foundation that the rest of the work (literature review, research methodology for data collection and ultimately analysis) are based on.
CHAPTER 2: REVIEW OF RELATED LITERATURE

2:1 INTRODUCTION

This chapter presents a review of related literature on causes of poor performance in chemistry particularly in Epworth, Mabvuku, Tafara District, Harare, Zimbabwe, by looking at researches that have been carried out in the same field as well as to identify gaps left by previous researchers. It also seeks to illustrate the detailed explanation on the variables expected to be contributing to poor performance in chemistry by other researchers. This was done in an attempt to find strategies to enhance the poor performance. Thereafter, the chapter focuses on research on integration of indigenous knowledge systems, Scientific knowledge and using constructivist approach as a means through which the improvement of chemistry teaching and student chemistry achievement and motivation can be fostered.

Oladele et al (1993) in Medinat (2007) discovered that lack of qualified teachers, lack of well-equipped libraries, parental or guardian influence, attitude of students, poor teaching methodologies, uncooperation of administration, examination malpractice, abstract nature of chemistry, negative attitude towards the subject, nature of examination questions, lack instructional materials and time allocation were other important factors affecting students' performance in Chemistry. In Zimbabwe, most high schools specifically in rural areas do not even have a library such that the only textbook available would be for the teacher.

2.2 RESEARCH CONTEXT

The research will be carried out in Epworth, Mabvuku Tafara District. The researcher will do some of at her school since she is a chemistry teacher and some in the classroom since she is going to use observation as one of the research instruments. The complexity of classroom life is important to be considered because students and teachers are expected to collaborate on every aspect involving teachers relating to students and students relating to each other through various ways such as discussion, debating, and communicating ideas. The complex interaction between teachers and students and among students constitutes the social context of classroom environment where teachers and students are engaged in a collective process of learning that produces a shared understanding, generates new knowledge, and helps students take responsibility of their own learning (Brown & Campione, 1996; Tahir & Treagust, 1999). Researchers have well researched on the causes of poor performance in chemistry worldwide but
none have ever attempted to investigate the causes of poor performance in Epworth Mabvuku Tafara District.

2.3 GAPS IN PREVIOUS RESEARCHES

Irrespective of the key position that chemistry occupies in our educational system, students' performance in chemistry at internal and external examination has remained considerably poor (Saage 2009). Several factors have been advanced to affect students ‘poor performance. Korau (2006) reported that such include the student factor, teacher factor, societal factor, the governmental infrastructural problem, language problem examination body related variables, curriculum related variables, test related variables, textbook related variables and home related variables. Saage (2009) identified specific variables such as poor primary school background in science, lack of incentives for test, lack of interest on the part of students, students not interested in hard work, incompetent teachers in the primary school, large classes, fear of the subject psychologically etc. Several research has been done to find the general causes of poor performance in chemistry worldwide but no research has been done in Epworth Mabvuku Tafara District in Zimbabwe to find the actual causes of such a poor performance using a very small sample. Some researchers have looked into the effect of each variable mentioned above to find how it affects performance of students in chemistry but no research of that nature has been done in Epworth Mabvuku Tafara District. A large number of studies in international context such as Kenya have investigated students’ challenges and misconceptions around a wide range of concepts in advanced level Chemistry but no research has been done in Epworth Mabvuku Tafara District to assess the actual causes of poor performance in Chemistry.

2.4.0 FACTORS CONTRIBUTING TO POOR PERFORMANCE IN CHEMISTRY.

Oladele et al (1993) in Medinat (2007) discovered that lack of qualified teachers, lack of well-equipped libraries, parental or guardian influence, attitude of students, instructional materials and time allocation were other important factors affecting students' performance in Chemistry. In Zimbabwe, most high schools specifically in rural areas do not even have a library such that the only textbook available would be for the teacher.
2.4.1 Attitude and performance

Attitudes can alter the perception of information and affect the degree of their retention. Slee (1964) affirmed by saying that students’ attitudes and interest could play substantial role among pupils studying science. Rosemund (2006), opined that attitude implies a favorable or disfavourable evaluative reactions towards something, events, programmes, etc exhibited in an individual’s beliefs, feelings, emotions or intended behaviors. Mwamwenda (1995) argues that the achievement of students in a subject is determined by their attitudes rather than inability to study. Haimowitz (1998) in Mbugwa et al (2012) indicated that the cause of most failures in schools might not be due to insufficient or inadequate instruction but by active resistance by the learners. This argument suggests that favourable approaches towards a subject should be developed for improved achievement in the subject.

Teacher attitudes play a substantial role in shaping the classroom environment which has an impact on a student's self-efficacy which in turn influences a student's behaviour. All of these factors which can be loosely categorized as environment, personal factors, and behaviour interact and play off each other in a cyclical way (Woolfolk, 2007). In Zimbabwe most teachers are in the teaching profession not by choice, they consider it to be a waiting ground for better jobs. Such teachers have no passion teaching the subject.

Under students’ attitudes towards chemistry, some students have negative attitude towards chemistry because they consider it to be more abstract. In Zimbabwe, only a few students are studying sciences as compared to commercial and art subjects.

Papanastasiou (2001) reported that those who have positive attitude toward science tend to perform better in the subject. The affective behaviors in the classroom are strongly related to achievement, and science attitudes are learned (George & Kaplan, 1998). The teacher plays a significant role during the teaching and learning process and can directly or indirectly influence students’ attitudes toward chemistry which in consequence can influence students’ achievement. Teachers are, always, role models whose behaviors are easily imitated by students. What teachers like or dislike, appreciate or disapprove and how they feel about their learning or studies could have a significant effect on their students. By extension, how teachers teach, how they behave and how they interact with students can be more paramount than what they teach (Kwale SMASSE, 2004).
Student’s attitude toward the learning of Chemistry is a factor that has long attracted the attention of researchers. Ojo (1989) and Adesokan (2002) asserted that in spite of realization of the recognition given to Chemistry among the science subjects, it is evident that students still show negative attitude towards the subject, thereby leading to poor performance and low enrolment. According to Bassey, Umoren and Udida (2008), students’ academic performance in Chemistry is a function of their attitude.

This study therefore attempted to investigate the attendant contribution of student’s attitude towards Chemistry and the Chemistry teacher’s perception of their learners’ ability in Chemistry as a contributor towards poor performance in Chemistry in Epworth Mabvuku Tafara District.

2.4.2 Lack of background knowledge

Many secondary school students experience challenges with fundamental ideas in Chemistry (Carson & Watson, 2002). Despite the importance of Chemistry, most students emerge from junior secondary courses with very limited understanding of the very basic Chemistry concepts (Ochs, 1996). Misunderstanding of concepts in Chemistry has attracted attention over the last three decades (Carter & Brickhouse, 1989). In Zimbabwe chemistry concepts commences at ordinary level but in some countries like Kenya they emerge at junior secondary level. Learning chemistry at an earlier stage helps students to grasp concepts at an earlier level and enhances their understanding and performance. This has contributed to poor performance especially in Epworth Mabvuku Tafara District.

2.4.3 Persistent use of traditional approach to teaching

The aim of developing more effective strategies to teach high school students is motivated by many studies conducted worldwide that clearly revealed that the traditional approach to teaching is problematic and misconceived (Teichert & Stacy, 2002).

Kwale SMASSE (2004) found that some Chemistry teachers subjected learners to traditional” telling” or the narration marathon which leads to ineffective learning of knowledge, skills and concepts required in Chemistry as a practical subject. They therefore suggest that it be made imperative for Chemistry as well as other subjects to be handled by teachers who are technically qualified. Stigler & Hiebert (1999) proposes that teaching is the next frontier in the continuing struggle to improve schooling. Teacher’s qualification goes with their effectiveness in the
classroom. They play an important role in teaching and influence the students’ acquisition of knowledge, skills and concepts.

According to Tsuma (1998), science educators should ensure that learners get involved in the teaching and learning process always. This is because the study of Chemistry is a process of acquiring and generating knowledge and thought process based on accurate observation, thorough investigation, experimentation, logic, proof, explanation and validation. Gregg (1968) summed up the study of Chemistry as a direct result of one or more careful and unbiased experimental observation. Consequently, every teacher has the task of creating a teaching and learning environment that culminates into a rapport for meaningful and in-depth understanding of principles and concepts (Kwale SMASSE, 2006). This would enhance students’ attitude to Chemistry.

During the last two decades researchers have found that students commonly lack a deep conceptual understanding of the key ideas regarding chemistry and often fail to incorporate their mental models into a clear conceptual framework (Bodner & Domin, 1998; Taber, 2001). Most teachers in Zimbabwe often use rote learning when teaching chemistry topics for example inorganic chemistry, shapes of molecules, molecular orbital. These topics have no experimental backup (Madambi & Gudyanga, 2013).

2.4.4 Students’ characteristics and achievement

The purpose and programs of the educational system must be designed to meet the needs of each individual child (Eshiwani, 1983). The student characteristics include: entry behaviour, study time, peer group influence and aspiration. They vary from one individual student to the next. According to Kwale SMASSE (2004) baseline findings, there is a general feeling among students that Chemistry is a difficult subject. This feeling was found to be greater in girls than boys. The feelings were found to be due to; social cultural attitudes, teachers’ attitude or predisposition towards the students, school culture, teaching methodology and performance. In Zimbabwe few girls are studying Chemistry particularly in Epworth Mabvuku Tafara District. This study intends to further this work and determine to what extent the stated issues might be contributing to poor performance in Chemistry.
Twoli (2006) states that gender differences are particularly related to sciences interest in that boys were more interested in physical sciences while girls were more interested in the biological sciences. In Epworth Mabvuku Tafara District most girls prefer studying biology and most boys prefer physics at Advanced level. This indicates that there could be a relationship between gender and subject choice and probably performance. The study seeks to understand whether there is a significant relationship between gender, subject choice and performance of Chemistry. Gender imbalances among teachers could have a bearing on sex differentiation of subject choice. Statistics from Equal Opportunity Commission (1987) shows that teachers’ subject qualification tend to reinforce sex stereotyping in curriculum choice because of the absence of non-stereotypical role models as cited in Singh (1994). There are relatively less female teachers teaching Chemistry in secondary schools hence girls lack what would be their instant role models in Chemistry education (Kwale SMASSE, 2004). This influences the teaching and learning of chemistry in Zimbabwe to a greater extent because most girls feel inferior and think that they are not capable of studying sciences.

Peer relationships exert their influence through the attitudes, expectations and understanding of roles that they leave with the individuals (Erwin, 1993). Whyte (1986) while researching on girls in science and technology (GIST) found that boys persistently intimidate girls in the science laboratory and refused them access to equipments. They therefore recommend removing of the more dominant group. He further advocates for isolation of girls through single-sex school (girls’ schools) by saying that exclusion allows women to express and validate their own experiences to develop some autonomy, and to build some confidence. The question that this study intended to pursue was whether there existed variation in performance of girls in single sex schools (girls’ schools) to those in mixed schools of the same level in Chemistry.

The characteristics of the student and the educational objectives must both be employed as guides in the design of maximally effective environments for learning for better achievement. According to Driver (1989), the role of education in our society is to train children to be creative and self-reliant. This is basically through achieving education objectives. Africa lags behind the rest of the world in science and technology development: an indication of the relative failure of science education in Africa (UNESCO, 1986). For Zimbabwe to develop industrially improvements are necessary in the provisions for science education and in particular Chemistry
education at all levels in the country. Therefore a study of this nature is necessary not only in Epworth Mabvuku Tafara District but in Zimbabwe as a whole country.

2.4.5 Shortage of Textbooks

Importance of textbooks in the teaching and learning of chemistry has been widely recognised in the literature (Gichura, 2003). Textbooks offer structure and order in the teaching and learning process and in the classroom (Johansson, 2006; Triyoga, 2010). They are considered as useful and effective tools or instruments whose purpose is to facilitate the work of the teacher on a daily basis (Johansson, 2006). Poor performance in schools in Sub-Saharan Africa has been associated with shortage or lack of core textbooks (Mudulia, 2012). Eshiwani (2001) as cited in Musasia et al. (2012) argue that poor performance of Chemistry students in Kenya is attributed to poor teaching methods and acute shortage of textbooks. Shortage of textbooks may often result in students sharing textbooks. In some cases, one textbook is shared between six or more pupils or sometimes no textbook at all (Makotsi, 2011). Worse cases of Textbook: Pupil ratios in some schools in Macia were found to range from 1:40 to 1:100 (World Bank, 2008). In Cameroon, the ratio was 1:13 (UIS, 2011). In Fiji Islands, the textbooks were either outdated or not available in sufficient quantities in some rural schools (Lingam and Lingam, 2013). The whole situation of inadequate textbooks is intensified by the lack of supplementary instructional materials (Seniwoliba, 2013). Shortage of textbooks therefore put pressure on teachers and also affects the amount of homework they assign to pupils. In Zimbabwe most secondary schools do not have adequate textbooks due to lack of finances. Most of the secondary schools force students to buy their own textbooks. A few students can afford to buy the textbooks due to poor backgrounds especially in Epworth Mabvuku Tafara District. This factor on its own will cause a poor performance in schools.

2.4.6 Lack of experienced and qualified teachers

Teachers play an important role in determining the climate of their classroom (Trowbridge, 2004). According to Kwale SMASSE (2004), teachers are the most important agents that can influence change in students” attitude towards Chemistry. Teachers are in contact with the students most of the time. Through such contacts, they communicate their points of view and expectations to students and the students are likely to faithfully believe them. A study by Fuller (1985) on factors influencing performance indicates that about 80% of studies confirm that in-
servicing of teachers is positively correlated to achievement and 70% of the studies revealed a positive correlation between years of tertiary education and teacher training to achievement. This brings in the idea that the teacher themselves might be determinants of performance. In the discussion about students’ performance, teachers are especially likely targets of criticism. They would be better effective, it is charged, if they were better educated (Stevenson, & Stigler, 1992). (Stevenson, & Stigler, 1992) further asserts that standards set the course, assessment provide the benchmarks, but it is the teaching that must be improved to push us along the path to success.

This study revealed that in Zimbabwe, especially Epworth Mabvuku Tafara District, some teachers are teaching chemistry but they are not graduates of chemistry. Some are graduates of engineering but are teaching chemistry due to lack of jobs in the country. An exodus of experienced teachers in Zimbabwe in pursuit of greener pastures has resulted in schools being staffed by inexperienced, unqualified teachers and this has immensely contributed to poor performance by schoolchildren in chemistry.

As if responding to issues raised by Stevenson and Stigler, (1992) Kwale SMASSE (2004) in their baseline study’s findings suggests that when professional approach is embraced in teaching and learning process, the use of indirect verbal behaviour, for instance, acceptance of students feelings, praises or encouragement is enhanced, may be associated with a more positive attitude towards learning and higher achievement by students. Gachathi Report (1976: 106) intimates:

“No matter how education is viewed, the role and the quality of teachers must be given the most acute consideration.”

Studies on the effect of teacher experience on student learning have found a positive relationship between teacher effectiveness and their years of experience (Murnane & Phillips, 1981). The teachers' qualifications and their impact on student achievement findings from data in Israel suggested that inexperienced teachers are less effective than more senior teachers (TIMSS, 2003; Rivkin, Hanushek, & Kain, 2000). In Zimbabwe most chemistry teachers have less years of experience. Most experienced teachers have left the country in search of greener pastures.

In the areas of Chemistry, teachers seem to be in short supply in Israel (Rivkin et al, 2000). This challenge has become so severe that some districts are importing qualified teachers from other nations for example; schools in Wichita, KS are securing H1-B visas for Filipino teachers who
come for three-year assignments (Thornburg, 2009). The situation leaves a strain on students who will have to make do with foreign teachers and change teachers often. Thornburg’s research on the challenge of qualified teachers is shown in the table below.

Table 2.1 shows students taught by teachers with no major in the subject

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Grade 5-8</th>
<th>Grade 9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>58</td>
<td>30</td>
</tr>
<tr>
<td>Mathematics</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>Physical science</td>
<td>93</td>
<td>63</td>
</tr>
<tr>
<td>Biology</td>
<td>_</td>
<td>45</td>
</tr>
<tr>
<td>Chemistry</td>
<td>_</td>
<td>61</td>
</tr>
<tr>
<td>Physics</td>
<td>_</td>
<td>67</td>
</tr>
</tbody>
</table>

Thornburg Center for Space Exploration, 2009)

In Zimbabwe, results of the Nziramasanga commission of inquiry in 1999 revealed that a number of Science (Chemistry included) qualified teachers are not interested in providing their service at marginalized rural areas.

2.4.7 Inadequate written work

According to the Director’s circular number 36 of 2006 on guidelines of work coverage in Secondary School sciences, Chemistry, Biology and physics included, pupils should write one theoretical exercise and one practical exercise per week and one test per fortnight (Ministry of Education, Sport, Arts and Culture, 2006). However, most schools in Zimbabwe are failing to do this, and this may result in students’ failing to understand concepts of the topics fully as there is inadequate written work and not enough practice. In most cases, some topics are hurriedly done and this leads to students’ failure to understand most of the topics. Some of the topics will not be thoroughly taught Pupils therefore may carry their misconceptions and misunderstanding until
the time they write examinations and the consequence is low achievements (Gudyanga & Madambi, 2014).

2.4.8 Class size
Korau (2006) observed that the schools population counts in thousands today against the hundreds of the previous years. Nowadays schools are overcrowded in classrooms which make it impossible to talk of an ideal size of a classroom for effective teaching of chemistry. No effective teaching can take place under a chaotic situation where he cannot handle the large number of students effectively. Consciously quantity and quality cannot work together and this can affect the students’ learning of chemistry and thus perform poorly. In Zimbabwe especially Epworth Mabvuku Tafara District the chemistry students are many since Mabvuku and Tafara are high density areas and Epworth is a semi urban area. Most people in Harare can afford to rent in these high density areas since they are cheaper. This results in the area being densely populated. The resources available at a school will not sustain the number of pupils.

2.4.9 Parental attitude
Pupil’s home upbringing tends to affect their attitudes to authority. It is one of co-operation and passive submission. Children seen to have a natural tendency to explore, find out and collect objects. Too much restriction can have a lasting effect on the learner to the extent that he becomes afraid to experiment and explore in chemistry and later in life when encouraged to find out for him or make individual contribution he may be too inhibited to do so (Lawis, and Eddy 1967). Kahl (1961) has shown that parental attitudes were more important in predicting aspiration of pupils towards continuing their schooling and successes in school than status. Parents should not expect too little or too much from their children. Too much pressure can lead to failure and dislike of chemistry. Critical remarks can inspire unexcited attitude towards chemistry. They should therefore discuss the progress of their children with the teachers so as to assist the learners in their areas of difficulty. Parents that are too push-up can cause academic maladjustment for learners.

2.4.10 Teachers incentives
Teachers are catalysts of the expected changes in society. These demands that they should be well trained, have recourse to retraining and updating of their chemistry knowledge through in-service training, workshops, seminars and conferences (Tahir, 2006). Efficient and effective
teachers who are professionally and academically qualified must be produced to promote chemistry learning in schools. Teachers must be highly motivated with adequate incentives and the issues of teachers’ salaries and the government should address other fringe benefits. The low morale and status of Zimbabwean teachers have affected the quality of the intake and those already on the job. This has been attributed to poor incentives to improve performance, very poor equipped working environments and non-availability of working materials, inadequate social recognition powerlessness and lack of control over working condition.

2.4.11 Language of instruction
In another study on performance, Bonga (2010) indicated that family (e.g., parental education) and personal (e.g., nutritional history) factors, demographic factors (e.g., walking distance to school), in combination with social characteristics (e.g., age, sex and English proficiency), contribute to the academic progress of schoolchildren. Bonga (2010) also hypothesized that the language spoken at home would affect student learning. In most Zimbabwean families vernacular language is used yet the language of instruction at schools is English. Schools thus use the wrong language to talk about their culture resulting in poor grasping of concepts or ideas by students. Teaching/learning of chemistry is of no exception.

2.4.11 Lack of Motivation
Motivation is also a requirement for effective learning (Mullins, 2005). A study in England noted many factors that influence both the rate and enjoyment of learning (Mullins, 2005). Once an individual has experienced something, and has stored that experience, the individual is able to refer to and use it at a later stage. Intrinsically, learning and memory are intimately linked (Mullins, 2005). The reward and punishment levelled at learners in the past will affect their motivation and attitude towards learning in the present (Mullins, 2005). The expectations of others and the climate that surround learners will determine their readiness to learn, which in turn will affect their academic performance (Mullins, 2005). Another study suggests that maintenance of high motivation influences psychological and social functioning and facilitates academic performance as well as positive school perceptions (Gilman & Anderman, 2006). The learning environment therefore has an impact on performance by students.

Teacher’s attitude and motivation play a pivotal role in the teaching and learning process. Educationists and employers know that it is essential to motivate learners and employees so that
they can work hard to produce good results in whatever they do (Kithinji 2007, as cited in Twoli, Maundu, Muindi, Kiio, & Kithinji, 2007). According to Kwale SMASSE District INSET-2004, although Chemistry teachers may have positive attitude, they are beset with problems that frustrate their efforts to teach effectively and efficiently. The problems which they outlined include:

i. Poor performance in Chemistry: The fact that performance in national examination in Sciences is not as good as in humanities could be a source of frustration to the teachers

ii. A number of teachers are not in the profession by choice. Although many of them adjust and accept teaching as a profession, there are those who take too long while others do not accept the profession at all.

iii. Inadequate number of teachers. General findings in Zimbabwe indicated a lack of sufficient teachers particularly in Epworth Mabvuku Tafara District. It is possible to get one teacher per subject (Chemistry or Biology or Physics). In such a case, the teacher will be overworked and has no time for adequate preparation.

iv. Students’ attitude. When students have a negative attitude towards Chemistry, teachers will no doubt be discouraged.

v. Overloaded curriculum

vi. Lack of adequate facilities

vii. Uncooperative administration especially in provision of required facilities

viii. Poor remuneration.

2.4.12 Socio economic background

The socio-economic background of learners also affects their performance in school (Oladele et al 1993) in Medinat (2007). Poor parental background contributes to poor performance by their children. The learner’s background in link to availability of educational resources at home; like textbooks, electronic resources such as television, laptops, calculator, study desk and table for
their own use and general academic support at home are crucial (Ramala, 2009). Learners who have access to such resources, have a sound head start compared to those from poor families since they will be more informed about the latest developments around them thereby assisting them to improve their performance at school (Ramala, 2009). Thus, non-exposure to educational resources on learners from poor families affects their performance compared to their counterparts who have access to such resources. There is a lot of educational information that can be accessed through the Television and computers that are connected to the Internet to assist learners source information for school assignments and projects.

2.4.13 Location and financial status of school

The other factor contributing to poor performance is the location, ownership, academic and financial status of a school does count in making a school what it is, and in turn influences the academic performance of its students, because they set the parameters of a student’s learning experience. According to Saiduddin (2003), it is a convenient scapegoat to pass the blame and responsibility for the low academic performance to factors such as socio-economic status, family, culture and the learner being less intelligent than the others are. In Epworth Mabvuku Tafara District the most of the parents do not afford to pay the school fees.

2.5.0 REMEDY TO THE CHALLENGES

In an attempt to address these problems of students’ poor performance in chemistry, the following researches have been carried out; team teaching approach (Amiodoh, 1984); formative testing with remediation (Ugamadu, 1990); algorithms strategy in solving chemical arithmetic problems (Adeyegbe, 1994); concept mapping (Novak, 1990 and Okebukola, 1997). All these approaches gave a little improvement on the conventional lecture method, which is being used in our secondary schools.

This research therefore endeavors to present the effort being made to give resolution to the bad situation, that is, the poor performance in chemistry and to give a practically oriented teaching approach that had been tried and found to be feasible, practicable and adaptable to the Zimbabwean Secondary Schools.
2.5.1 Use of Constructivist approach in teaching and learning

Emphasis has moved from teaching science as a body of knowledge but towards students experiencing the processes and procedures of science. Learning science taking into account the prior conceptual framework of students and providing students with experiences that lead to conceptual change and development; teaching science as inquiry and teaching science by inquiry (Shumba, 1993).

Sound educational principles should involve continuity and interaction between the learner and what is learnt. Teachers should use the student centred approach in teaching chemistry. Science educators should give examples concrete examples and tasks that are relevant and found in the environment of the students (Shumba, 1993). Although the use of specific examples from the textbook is inevitable, students should be given a chance to generalise what is being learnt. The teachers must not always turn to the textbook but let students create their own situations this can be a solution to the problem of application (Harrison & Treagust, 2001). This can also be supported by constructivist teaching approach.

Constructivist views on teaching and learning (Gullberg, Kellner, Attorps, Thoren & Tarneberg, 2008; Treagust & Duit, 2008) “suggest that, “teachers should include knowledge of learners’ prior conceptions and alternative frameworks in the teaching of various science topics which could be used” as argued by Kazeni and Onwu (2013) to help learners appreciate the relevance of school science to their lives. Fakudze (2004) argues that “for learners to realize the link between what they learn and their day-to-day experiences, learning of science concepts should take place within a traditional socio-cultural environment”. Kyle (2006) points out that it is critical that students’ experience with science be, emancipatory, socially just, and self-involving. Kyle (2006) further points out that it is vital that science education be contextualized and linked to the life world experiences of learners.

According to Khatete (1995), constructivism brings about the desired outcome of conceptual change by creating a conflict between the students raw ideas and the accepted scientific (chemical) ideas. It is the role of the teacher to establish the students ideas in a given concept area then introduce analogies of accepted scientific concepts so that the student can compare their own conceptions with the chemically accepted concepts. This may lead to a better understanding of the scientific concepts hence greater achievement in Chemistry.
A teacher who exposes learners to a variety of experiences give them an opportunity to form, test and transfer concepts. It is by reflecting, exploring, testing, amending and revising our current concepts to meet new circumstances and experiences that we undertake meaningful learning (Twoli, 2006)

The role of teachers is very vital within the constructivism learning theory. Instead of giving a lecture the teachers in this theory function as facilitators whose role is to help student build their own knowledge. The teacher’s goal at this stage is to teach research skills and techniques, not subject matter. This type of learning is student centred and puts away focus from the teacher and lecture and puts it upon the student and their learning. Students are taught to discover on their own. Teachers act as a facilitator helping students to construct their own knowledge and to solve problems on their own. The methods used in teaching and learning in this approach include: role play, practicals, research, simulations, field trips, question and answers, presentations and projects, hands on activities (Cain, 2000), integrating theory with practical work (Abuseji 2007).

Teachers are frequently in dialogue with the students, creating the learning experience that is open to new directions dependent upon the needs of the student as the learning progresses. Teachers behind Piaget's theory of constructivism must challenge the student by making them effective critical thinkers and not being merely a "teacher" but also a mentor, a consultant, and a coach.

In sciences, learners are taught theories and concepts, which are abstract (Kwale SMASSE, 2007). The learners” thinking is taken concrete to abstract. In order for learners to concretize the abstract theories and concepts, they need to be taken through activities that provide evidence that can be used to explain the concepts/theories. Thus, the quantum of laboratory practical work, more explanatory methods and fieldwork must be substantially increased and incorporated in the curriculum. A large number of experiment kits and multimedia teaching aids should be created using as far as is possible locally available materials with accompanying do-it-yourself books (Twoli, 2006).

The net result of education is a trained mind and education is what is left after all that has been learnt in school has been forgotten (Harlen, 1999; & Parkinson, 1994). The quantity of practical work that students are exposed to, the teaching approaches that the teachers adopt especially in
the candidate class and other general teacher’s classroom approaches of the day-to-day teaching of Chemistry in Epworth Mabvuku Tafara District, Zimbabwe, was an important aspect of investigation in this study.

2.5.2 Integrating Indigenous Knowledge in the school curriculum

According to Mosimege and Onwu (2004, pg. 2), indigenous knowledge is defined as “an all-inclusive knowledge that covers technologies and practices that have been and are still used by indigenous and local people for existence, survival and adaptation in a variety of environments”. Indigenous knowledge is not static but progresses and varies as it develops, influences and is influenced by both internal and external circumstances and collaboration with other knowledge systems. It involves contents and contexts such as governance, architecture, mathematics, agriculture engineering, mathematics, governance and other social systems and activities, medicinal and indigenous plant varieties, among others. Indigenous knowledge therefore refers to the philosophies, indulgences and expertise developed by long resident societies in their interaction with their natural surroundings and other peoples.

Integration of IK into school science(chemistry in particular) curriculum is one form of context-based approaches to science teaching which is likely to provide learning situations that help learners’ to appreciate the relevance of school science to their day-to-day experiences. Kazeni and Onwu (2013) have defined context-based teaching in science(chemistry) as, “science teaching that attempts to develop science concepts and skills form situations of daily life experiences”. Types of contexts could be those that correlate to societal/community relevance (Sadler, 2009; Kazeni and Onwu, 2013) or those situations that take into consideration the learners’ personal circumstances (Anderson, 2006; Taasoobshirazi & Carr, 2008; Kazen & Onwu, 2013). Integrating IK into school science curriculum is likely to offer contexts that are useful, conversant and applicable to learners that could enhance learners’ performance in chemistry learning and the development of characteristics of scientific literacy such as higher order thinking skills.

Responding to the UNESCO (1999) call, a number of indigenous writers have argued for the importance of connecting school science education to the students’ cultural background (Cajete, 1995; Kawagley, 1995; Kawagley and Barnhardt, 1999; McKinley, 1997). McKinley (2005) divided this argument into two strategies. The first being “making science ‘relevant’ to the
Integration of IK with school science is essential in order to prevent a cultural clash whenever students attempt to learn meaningful school science (Aikenhead & Huntley, 1999). A science curriculum that is receptive to IK permits environmental responsibility, sustainable development, and cultural survival (Emeagwali, 2003). School science integrated with IK will “facilitate the easiness with which students cross cultural boarders into school (western) science”, (Ogunniyi, 1988). Jegede (1995) refers to this as “collateral learning, which according to Aikenhead (2002) encourages meaningful learning of science”.

2.5.3 Employing Nature of Science when teaching chemistry

As suggested by McErlean (2000) the philosophy of empiricism is so central to the philosophical consideration of logical positivism and its more moderate successor, logical empiricism, which is the philosophical base for the nature of science. The scientific method is understood as a four step process: observation, hypothesis formation, hypothesis testing and interpretation of the results. Scientific reasoning follows the hypothetico deductive method. Hypothetico- indicates that experiments test a hypothesis; deductive indicates that we deduce a consequence (make a prediction) that should hold if the hypothesis is correct and then design an experiment to see if it indeed holds.”

Understanding Nature of Science is viewed as receiving it as a critical component of scientific literacy (Dube and Lubben, 2011; Lederman, 2007; NSTA, 1982; Ogunniyi, 2011; Onwu and Kyle, 2011). Learners are expected to have a good understanding of the Nature of Science because, “it facilitates learning (content or subject matter mastery), development of critical thinking skills, helps them to realise the relevance of science (application), and is likely to develop in them willingness to apply acquired knowledge in everyday life as responsible informed decision makers (Scott, 1996, Lederman, 2007 and Onwu and Kyle, 2011). These
important and noble reasons for scientific literacy are the reason why science educators value understanding NOS as an instructional outcome. For example context-based approaches to science teaching and learning could be used to achieve scientific literacy which is one major goal of science. The integration of IK into school science curriculum as will be argued under the necessity for consideration for the learners’ background knowledge is also one form of context-based approaches to science teaching that could be used to achieve scientific literacy (Zinyeka et al, 2007). In summary, the consideration of students and societal needs has remained the chief driver presently, historically and in the future for advocacy of understanding NOS. “An important aim for science educators is to teach science content not only for students’ learning of science, but above all to empower them in their decision-making in their lives” (Simonneaux, 2008 pp. 180 in Zinyeka et al).

2.5.4 Use of experiments in teaching and learning chemistry

According to Gregg (1968), every bit of chemical knowledge is a direct result of one or more careful and unbiased experimental observations. Most of these observations are made by using at least one or more of the five senses. Students’ performance in practical work is determined by proper use of laboratory tools (glassware, and equipment,) and the correct execution of procedural techniques (filtration, titration, preparation of solutions) (Kwale SMASSE, 2005). Laboratory program is an integral part of chemistry teaching as it is used when (Owoeye and Yara 2011; Nwoye 2012):

- It is needed as a means of obtaining and learning scientific information
- Stimulates learners’ interests as they are made to personally engage in useful scientific activities and experimentation
- It is needed as means of verifying scientific principle, law or a theory that is already known to the students,
- It can be easily engaged with text books and other learning materials,
- Knowledge obtained through laboratory work promotes long term memory
2.6 Summary of literature review.

From the foregoing review, it is evident that appropriate effort has been expended by various researchers to address the poor performance in Chemistry. The efforts have attempted to isolate various factors that contribute to low achievement in Chemistry at the national level. In the course of the review it was realised that the factors considered tended to be more related to low achievement of Chemistry in particular. The factors therefore may not apply to achievement in Chemistry in Epworth, Mabvuku Tafara district, Zimbabwe Country. This is more so when it is considered that no empirical and systematic studies on factors that affect achievement in Chemistry in Epworth Mabvuku Tafara have so far been done. The researcher therefore sought to determine which factors among those advanced in the review are responsible for the persistent poor achievement of students in Advanced level Chemistry in Epworth Mabvuku Tafara District. An appropriate research methodology including instruments for data collection was therefore prepared for this task.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION
This chapter presents a discussion on the research procedures that was followed in the study. The chapter includes the research methodology and design, study sample and sampling procedures, data collection instruments, validation of research instruments and data analysis procedures. The ethical issues considered in the study are also discussed.

3.2 Research Approach and Design
The research used a qualitative research approach involving the case study method within a descriptive method to address the research questions. Qualitative research methods were used in this study because it focus on determining and understanding the practices, viewpoints, and thoughts of participants, i.e., qualitative research explores meaning, purpose, or reality (Hiatt, 1986). In this case, it offers in depth information and rich descriptions of the causes of poor performance in Epworth Mabvuku Tafara District. The qualitative nature of this research permits intensive, holistic description and analysis of factors affecting student performance and its flexible nature permits the employment of various methods of collecting data, such as observations and interviews. The reason for research from a descriptive viewpoint being that, it brings out intensive investigation into some specific aspects of an individual, a social unit or a small portion of the community in an effort to gain deeper insights about them (Best and Khan (1993)). The descriptive method was chosen because it is concerned with the description of phenomena in their natural settings without manipulation. It also brings prevailing practices, beliefs attitudes and perceptions that are held. Leedy (1985) describes the descriptive method as method of research that simply looks at the phenomena of the moment and precisely describes what the researcher sees.

The study adopted a descriptive research design (McMillan & Schume, 2010) using case study as the research method in which the researcher identified a problem (the poor chemistry results at A” Level) and embarked on the ways to alleviate the case (Bell, 1993).
Case studies, in their exact essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships. Yin (1984:23) defines the case study research method “as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used.” Case studies are restricted by time and activity and researchers collect detailed information using a variety of data collection procedures over a sustained period of time (Creswell, 2014 p 14, Slake, 1995). Case studies provide an opportunity for the identified trend (poor performance of chemistry students from 2011 to 2014) to be investigated using various methods in the data (Creswell, 2013, 2014 in Zinyeka 2014). The researcher used multiple case design type of case study. The researcher initially examined the students background, that is their performance in chemistry at Ordinary level. The researcher looked at how this background characteristic might affect their current performance and other factors that might be affecting their chemistry performance at Advanced level. Further the researcher looked for the various strategies to enhance the poor performance. In brief, there are three high schools which offer chemistry at A-level in Epworth Mabvuku Tafara District, Harare Province, Zimbabwe, involving form six chemistry students and their teachers that are performing poorly in chemistry for the period 2011 to 2015. The researcher seeks to find the actual cause of such a poor performance and strategies to enhance the poor performance.

In case studies the investigation of the data is most often conducted within the context of its use (Yin, 1984), that is, within the situation in which the activity occurred. A case study might be interested, for example, in the process by which a subject comprehends an authentic text.

Employing of case study in science education research had some criticism. Case studies offer very little basis for scientific generalization since they use a small number of subjects, some piloted with only one subject (Yin, 1984:21). The most common criticism of a case study method is its dependency on a single case investigation making it challenging to reach a generalizing conclusion (Tellis, 1997). Yin (1993) considered case methodology ‘microscopic’ because of the limited sampling cases. To Hamel et al. (1993) and Yin (1994), however, “parameter establishment and objective setting of the research are far more important in case study method than a big sample size”. Despite these criticisms, the researcher continued to
deploy the descriptive case study method for this study to find factors contributing to poor performance and the strategies to enhance the performance. Case studies allows the analysis of qualitative data.

3.3 Study Locale

The research was carried out at the three high schools that offer chemistry at A-level in Epworth Mabvuku Tafara District, Harare Province, Zimbabwe, involving form five and six chemistry students and their teachers(school x, y and z). The selection of this area is because chemistry performance by students of this district has been poor for repeated number of years (2011 to 2015) as reflected by ZIMSEC examination (See table 1.1). However since the district is very large and due to limited funds and time allocated for the study, the research will only sample three secondary schools of Epworth Mabvuku Tafara District out of ten secondary schools for the purpose of this study.

3.4 The Study Population

Population refers to the individual, unit objects or events that would be considered in a research project. It is very important to identify and describe the target population so as to specify the parameters that will determine who shall participate and who shall be excluded in the population. In this respect, the target population was fifty one Chemistry students in the said schools, four Chemistry teachers. The fifty one students consist of twenty one females and thirty males. Form five students were involved in the study due to their longer exposure to the Chemistry curriculum and the fact that they had chosen to specialise in the subject. They therefore could be relied on to give more accurate information required for this study in the absence of form six who were busy preparing for examinations and could not get time to participate in the study.

3.5 SAMPLE SIZE

Rummel (1985) describes a sample as part of the population, which contains all the characteristics of the whole population that will bring the valid results. Best and Khan (1993) observe that it is a small proportion of the population for observation and analysis. Thus, it is the smaller group that the researcher actually wants to study, which is the subset of the population. According to Leedy (1985), the sample should be carefully chosen so that throughout it the researcher will be able to discern the characteristics of the total population. Thus it is very important for the sample to be representative of the population.
Table 3:1 Participants

<table>
<thead>
<tr>
<th>participants</th>
<th>frequency</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heads</td>
<td>3</td>
<td>5.08</td>
</tr>
<tr>
<td>Teachers</td>
<td>4</td>
<td>6.78</td>
</tr>
<tr>
<td>Females</td>
<td>21</td>
<td>35.6</td>
</tr>
<tr>
<td>male</td>
<td>30</td>
<td>50.8</td>
</tr>
<tr>
<td>total pupils</td>
<td>51</td>
<td>86.4</td>
</tr>
<tr>
<td>total</td>
<td>59</td>
<td>100%</td>
</tr>
</tbody>
</table>

3.6 Sampling procedure

A sample is any number of cases less than the total number of cases in the population from which it is drawn (Ingule & Gatumu, 1996). Sampling saves time and expenses of studying an entire population (Robson, 2002). Form five students from stratified sampled government secondary schools were considered for this study. This is because in the absence of form six who were busy preparing for exams, they were found better placed to provide more concrete information required for this study than the remaining students.

The study adopted a purposive sampling approach to select respondents. This is because of its convenience and economy. This involves the researcher handpicking the cases to be included in the sample. The subject are selected on the basis of the researchers judgment of their typicality.

Gay (1992) recommends that when the target population is not very large, the sample should be at least 20% of the population. Consequently, the researcher selected 51 Chemistry pupils out of about 102 advanced level pupils who represent 50% of the target population and all Chemistry teachers at the school. The researcher purposively selected Chemistry and no other Science teachers on the basis that they are aware of what is taking place in the learning of all Chemistry concepts including difficulty topics and concepts that are difficult to teach since she is a
chemistry teacher. Purposive sampling method allowed the researcher to acquire information that would build up arguments of participants’ challenges in the teaching and learning of chemistry.

The researcher selected three schools that offer chemistry at A-level in Epworth Mabvuku Tafara District which are one Girls High school, one boys High school and one mixed boarding school. From the three schools selected, one of the head is female. Four chemistry teachers were selected, one from each school and two from the same school since they were two chemistry teachers at that particular school. Four teachers (one from each school), all male and degreed, with experience varying from 5 years to above 10 years participated.

The sample included all fifty one A-level chemistry students in the district, comprising of sixteen students from school X, twenty three from school Y, and twelve from school Z, totaling thirty boys and twenty one girls aged 17-19 years. The fact that one of the schools was a boarding school implied existence of constant variables that influenced reliability and validity of results.

3.7 RESEARCH INSTRUMENTS
- Observations
- Interviews

3.8 Interviews
The data from interviews will consist of direct quotations from participants about their experiences, opinions, feelings and knowledge (Best & Khan, 1993), consistent with the purpose of interviews being to find out or access the perspective of the person being interviewed. An interview guide ensured that all participants would be subjected to the same questions under similar conditions and covering the same topics systematically (Patton, 1990).

The researcher also used structured interview as another method of collecting data. A structured interview consists of a list of specific questions and the interviewer does not deviate or inject any extra remarks into the interview process. Leedy (1985) defines an interview as a data collection method in which the interviewer questions people to elicit self-report of their opinions, attitudes, beliefs and behaviors. Interviews are carried in a face to face situation. Borg and Gall (1999:279) sums it up as “an oral type of questioneer. It can either be telephone or face to face”.

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Selltiz et al. (1995), Chikoko and Mhloyi (1995) assert that the questioneer is inappropriate to illiterate population. Thus, researchers can collect much information from these respondents using the interview technique. The researcher used the interview method to accommodate the reluctance and evasiveness in respondents alluded to earlier on. Through the interview method the researcher was able to verify information gathered through the observations. The participants used the open-ended questions to lavishly demonstrate their knowledge of what they deemed relevant to the questions.

3.8.1 Advantages of interviews
Interviews elicit information through verbal interactions between the interviewer and interviewee. The interview will provide a high response rate and a high degree of flexibility as questions will either be rephrased or repeated to aid understanding. Interviews also give room for probing noting people’s feelings on a particular subject.

3.8.2 Disadvantages of interviews
The interviewer used both the structured interview questions as well as the face-to-face or oral questions. This was to cater for both the literate and illiterate group of people. Both had some disadvantages that are to be summarised. Interviews are more costly in terms of time and money to travel for each interview. Most people wrote false information since the questions were structured. Interviews also lack anonymity and some interviewees are not willing to participate and will cite busy schedules.

3.9 Observations

The data from observations will consist of detailed description of people’s activities, and the full range of interpersonal interactions and organizational processes that are part of observable human experience (Patton, 1990). It will also consist of details of behaviors, events, and the contexts surrounding the events and behaviors (Best & Khan, 1993). The observations were continuous over the whole data collection period (01 August to 30 December 2016) and were more objective than interviews because they was independent of participants’ self-report. These were made during theory lessons, practical sessions, and study or assignment sessions, in formal and informal discussions. Borg, Gall and Gall (1993) described direct observation as essentially a technique for gathering “live” data about the individuals and events being studied. The data are
“live” in that the behavior and events are recorded as they occur and are more reliable than paper and pencil reports. The researcher used the participant as observer type of observation. In this case the researcher fully participate in the activities of the group but the group is aware of the observer’s intention.

3.9.1 Advantages of observations
1. It is a direct method for collecting data or information.
2. Data collected is usually very accurate in nature and also very reliable.
3. Improves accuracy of the research results.
4. Problem of depending on respondents is reduced.
5. Assists in understanding the verbal response more efficiently.
6. By using good and modern devices – observations can be made continuously and for a greater period of time.
7. Observation is less demanding in nature, which makes it less bias in working abilities.
8. By observation, one can identify a problem by making an in depth analysis of the problems.

3.9.2 Disadvantages of observations
1. Past problem cannot be studied by means of observation.
2. One has to depend on the documents available.
3. Observations call for some especial instruments or tools for effective working, which are very much costly.
4. The actual presence of the observer is already unknown.
5. Observations are time consuming.

3.10 DATA COLLECTION
The researcher obtained permission to conduct research from the Heads of schools where she is conducting the research in Epworth, Mabvuku Tafara District. The first two weeks were spent familiarizing with the schools administrations, participating teachers and students and no data were collected. The Headmasters and teachers perceived the importance of the study and requested copies of the write-up. Students were excited about the opportunity to participate in a research. Upon obtaining consent, the study was undertaken in three phases:
Phase one involved the researcher visiting participating schools in order to be introduced, familiarize, and seek respondents permission to be involved in the study.

In phase two, the researcher administered the interview questionnaires to the students and Chemistry teachers. The researcher assured the respondents of the confidentiality of the given information. The researcher equally interviewed the school Heads; observed one theory and one practical lesson in progress per school as well as the teaching and learning resources and facilities in the participating schools using the observation checklist. Interview questionnaires were administered personally to three teachers and 51 selected pupils since it was difficult to give all form six classes questionnaires to complete. Interview questionnaires were distributed through the Head of Department, to the teacher and finally to pupils. Both boys and girls were chosen to participate to strike a balance between the responses of girls and boys. The teacher monitored pupils as they answered questionnaires and collected them just after completion. The Head of the Science Department distributed questionnaires to the teachers.

The third and final phase entailed the researcher interviewing the school heads to obtain factors considered by the teachers and students to be contributing to poor performance of Chemistry in Epworth, Mabvuku Tafara District. The researcher also observed the students during study time in this session. The researcher also sought any intervention measures that the school heads had put in place to remedy the situation.

3.11 PILOT STUDY

According to Orodho (2009), piloting is done by subjecting the data collection instruments to a small representative sample, identical to, but excluding the group to be surveyed. Piloting helped the researcher to improve the instruments by modifying the items found to be vague, ambiguous, unclear and irrelevant. Piloting was done to improve validity and reliability of research instruments.

The researcher conducted a pilot study in the district to two chemistry teachers and four chemistry pupils which were not part of the sample in an effort to uphold validity and reliability. These teachers and pupils were randomly selected and given questionnaires to complete. Selection of the school that took part in the pretesting of the instruments was based on its proximity to the researchers station.
The respondents sought clarification on questions that were not clear or ambiguous to them. They analysed the interview Questioneer critically without any fear or favour. The researcher rephrased some of the questions and all ambiguous questions were clarified. Questions that were vague, ambiguous, unclear or irrelevant were either modified or eliminated in readiness for actual data collection.

Throughout the pilot study, the quality of the Questioneer was improved. Validity was enhanced through consultative forums with the teachers and heads of schools. The responses were checked to see if they gave the required information.

3.12 VALIDITY
Validity is the measure of degree to which the research instrument measures what is supposed to be measured. Validity is established by an expert’s judgment (Gay, 1992). According to Mugenda and Mugenda (1999), the usual procedure in accessing content validity of a measure is to use a professional or expert in a particular field. To verify the validity of the instrument to be used in the study, the opinion of experts is sought. Instruments for this study were presented to an expert in the Faculty of Science Education at Bindura University who was the research supervisor and therefore conversant in the area of study.

3.13 RELIABILITY
Reliability is the consistency of a measuring device over time. Orodho (2009) defines reliability as the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. The test-retest method of assessing reliability of data involves administering the same instrument twice to the same group or subject (Mugenda. 2008). Test-retest reliability was used in the study to measure the reliability of the instruments. A test-retest method was applied by administering the interview questions to four chemistry pupils in the pilot study. When all other pupils in the sample completed their interview questions, those for the four who participated in the pilot study were taken and the results were compared for similarity or closeness.

The researcher also administered Chemistry teacher’s instruments, interviewed the school head, observed a theory and a practical Chemistry lesson session, evaluated level of availability of the Chemistry teaching and learning resources. Split half method of assessing reliability was used to
test for the reliability of the data. Split half technique, according to Kothari (1985), requires only one testing session hence eliminating the chance error due to differing conditions. Mugenda and Mugenda (2003) indicate that in research study a reliability coefficient can be computed to indicate how reliable data is.

3.14 DATA ANALYSIS
Miles and Huberman (1984) articulate that data analysis involves data reduction, data display and conclusion drawing or verification. Data becomes meaningful when interpreted.

At the end of data collection, data analysis was carried out to show how each variable contributed to performance in Chemistry. The data from the study was analysed qualitatively. Since data was descriptive, invariants such as means, frequencies and percentages were used to describe the findings of the study.

3.15 LOGISTICAL AND ETHICAL CONSIDERATIONS
According to Mugenda and Mugenda (2003), logistics in research refers to all those processes, activities or actions that a researcher must address or carry out to ensure successful completion of a research project. During the pre-field work, the researcher established a work plan, constructed the research instruments, obtained a research permit, carried out sampling, pre-tested and corrected the instruments. During the post-test, the researcher analyzed the data obtained and kept them for future reference. Ethical consideration for this study included communicating the aims of the investigation to the respondents, establishing rapport with the respondents and being honest at all times. The respondents were assured that their responses will be treated in the strictest confidence. They were assured that no one would have access to the data except the researcher and the data collected would be used for research purpose only. The researcher took necessary precautions for the confidentiality of both the data and the respondents (Cohen & Manion, 1994).

3.16 SUMMARY
This chapter outlined the process of data collection for the purposes of identifying the factors responsible for the persistent poor performance of Epworth Mabvuku Tafara District, Harare province in Zimbabwe, Chemistry students. This chapter outlined the research methodology for the study. The qualitative research approach allowed the researcher to access information that
pertained to challenges in teaching and learning of advanced level chemistry. Some of the issues that were not related to the research questions but were relevant to the challenges on chemistry in advanced level also cropped up. Data was also interpreted using descriptive statistical analysis and inferential statistics. The researcher was therefore satisfied that the necessary data collected through observations and interviews highlighted critical issues. The next chapter focused attention on data presentation, analysis and discussion as well as the interpretation of the findings.
CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION
This chapter presents the qualitative results of the study. Data analysis and report findings were done using descriptive statistics in the form of tables, bar graphs and pie charts. Data was analysed through description of the case. Results will be presented for each research question and analyzed and followed by discussion.

4.2.1 Analysing learners past performance

RESEARCH QUESTION 1
How do learners past performance influence their A ‘level performance?

Results from the interview questions have shown that all chemistry students enrolled for A-level have studied mathematics and biology, but they differ in how they studied physics and chemistry at O-level. One group did pure chemistry and pure physics whilst the other group did physical science -physics and chemistry combined. Table 4.1 below can illustrate this.

Table 4. 1. Distribution of the students’ performance at O-level

<table>
<thead>
<tr>
<th>Grade/subject</th>
<th>mathematics</th>
<th>Physical science</th>
<th>chemistry</th>
<th>physics</th>
<th>biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>44</td>
<td>20</td>
<td>23</td>
<td>9</td>
<td>49</td>
</tr>
<tr>
<td>B</td>
<td>06</td>
<td>8</td>
<td>0</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>01</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.1 shows the performance of students at Ordinary level for the 51 students from school x, y and z. The students who registered for science subjects were very intelligent as supported by their O-level passes in Table 4.1. Five had five or less A grades in their certificates; twelve had 5-6; twenty five had 7-8; eight had 9-10; and one had 10 A grade passes.
Table 4.2 Subject preference frequency distribution

<table>
<thead>
<tr>
<th>Preference/subject</th>
<th>mathematics</th>
<th>Physics</th>
<th>chemistry</th>
<th>biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>21</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>12</td>
<td>11</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>18</td>
<td>5</td>
<td>25</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.2 indicates that mathematics is the most preferred subject among the three science subjects, 41.2% having it as their first choice subject. Chemistry was the least favoured with 49% having it as their third choice subject, signifying the unwillingness of students to study chemistry. Students who preferred mathematics articulated their desire for calculations. A number of them had similar feelings for physics. They expressed that mathematics and physics were easier to study because these subjects demand understanding and grasp of a few concepts then apply equations with little or no explanation required.

45.1% of the students wrote negative comments about chemistry and (11.8%) complained about the extensive nature of chemistry syllabus, they expressed that it is too wide containing too much content, requiring extensive reading and memorization. The students complained that chemistry is complicated, unclear, confusing and involves complicated explanation of abstract concepts. Chemistry examination questions are difficult to understand, leading to answers that do not satisfy the examiner. Only 5.9% wrote positive comments about chemistry, they articulated that chemistry is their first preference because chemistry is a pre-requisite for their envisioned careers or because of their craving to face challenges.
Only 19.0% of the interviewees showed some confidence in chemistry. The majority of the students (64.3%) said that their performance was low because there was too much content to master and some of the concepts were very difficult to understand.

### 4.4 Distribution of topics students considered to be difficult

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stoichiometry</td>
<td>25</td>
</tr>
<tr>
<td>Chemical equilibrium</td>
<td>73.8</td>
</tr>
<tr>
<td>Inorganic chemistry</td>
<td>19.1</td>
</tr>
<tr>
<td>Organic chemistry</td>
<td>35.7</td>
</tr>
<tr>
<td>Reaction rates</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Students emphasised that the above topics were regarded as being difficult because they involve abstract concepts such as calculations, citing stoichiometry, ka, pkb, pH and pka in Chemical
Equilibria, which were bulky, and involving complex calculations which they cannot understand. In inorganic chemistry, students had problems explaining “acid base nature of period 3 chlorides, variation in melting points and electrical conductivity of period 3 elements, explaining solubilities of group II sulphates and hydroxides and acid base nature of group iv oxides variation of oxidation states of group IV elements.” Students found Organic chemistry as the easiest because there are no calculations, but there was too much content to master. The large number of reactions, reagents used, reaction conditions and mechanisms in Organic Chemistry confused students.

Students considered chemistry as a prerequisite subject to medicine and industry. 31% of the students felt that teachers needed to use the modern method in teaching chemistry, for instance, increase student presentations during lessons, as students do not forget what their colleague teaches them and what they will have presented on. Research says the pupil centered approach acknowledges the needs of children, their capabilities, their level of comprehension, their experiences, their motivations and their natural propensity for learning Wills (1995:39). Most teachers in Epworth Mabvuku Tafara District employed the lecture method. 57.1% of the students said that, “teachers should increase examination practice exercises and introduce e-learning to enhance the learning of chemistry”. 31% of the students gave suggestions that, teachers should give students more research work since students will understand and retain what they research on. Students were expectant about improving their performance: “I should change my attitude towards chemistry and start working towards passing” one student expressed her feelings. One student interviewed said, “I should also read widely and do more research in chemistry.” 76.2% of the students expressed that they enjoyed chemistry lessons and understood teachers as they taught, but said that they were not performing well because what they were taught differed from what appeared in examinations, suggesting a gap between the taught material and the examined content. As a result a research of this nature was necessary.
Fig 4.1. Favourable and unfavorable topics

The participating students indicated the topics that were either favourable or unfavorable to them giving reasons for each case, to enable researchers to establish interferences to student understanding of the topics. Teachers also listed the topics that they enjoyed and those they did
not enjoy teaching, so that researchers could get a deeper understanding and meaning to the lower than expected performance.

Table 4.5 Frequency distribution of favourable topics

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stoichiometry</td>
<td>15</td>
</tr>
<tr>
<td>States of matter</td>
<td>8</td>
</tr>
<tr>
<td>Periodic table</td>
<td>25</td>
</tr>
<tr>
<td>Bonding</td>
<td>12</td>
</tr>
<tr>
<td>Electrochemistry</td>
<td>16</td>
</tr>
<tr>
<td>Organic chemistry</td>
<td>25</td>
</tr>
<tr>
<td>Reaction kinetics</td>
<td>22</td>
</tr>
</tbody>
</table>

The participants gave varied and apparently contradictory explanation, due to the existence of two groups within the population. One group does a combination of Mathematics, Physics and Chemistry whilst the other does a combination of Mathematics, Biology and Chemistry. The students who does a combination of Mathematics, Physics and Chemistry reported Physical Chemistry topics as favourable. The group who does a combination mathematics, biology and mathematics reported inorganic chemistry and organic chemistry topics as favourable.
Physics students expressed that they enjoyed the topics from table 4.5 because of the following reasons:

- They involved calculations.
- The topics are very easy to comprehend, demanding short and precise answers.
- The topics comprise application of principles and have a lesser amount of content to memorise.
- These topics are nonconcrete, involve diagrams, and are interesting.
- The topics involve use of formulas and equations.
Students doing a combination of Mathematics, Biology and Chemistry did not like topics involving calculations. 85.2% being girls, chose topics from the Inorganic and Organic sections which don not involve calculations (Table 4.6) below.

**Fig 4.3. Frequency distribution of topics favoured by students who did Biology**

These topics were favourable to the students because of the following reasons:

- The topics were not loaded with calculations
- These topics are well expounded in many text books.
- The topics were well elucidated in lessons and applicable to real life phenomena.
- The topics are easy to read, understand and apply in examinations.
- The examination questions on these topics are clear.

The teachers’ responses were in agreement with students’ responses and concurred that although the percentage pass rate appeared high; the grades were usually low with very few As, a few Bs
and Cs more Ds and Es. Teachers gave the following reasons as being the major causes of low pass rate in chemistry:

- The intellectual or abstract nature of the subject.
- Too many papers, which make it difficult to average an A (6 examination papers).
- Inadequate examination time, for example Paper 1 (free response questions is only 2 hours).
- Problems in attempting questions that need application.
- Unfamiliarity with demands of questions.
- Students want to be spoon-fed.
- Students have a negative attitude towards the subject.
- Timetables too crowded/very little time for content coverage.
- Lack of chemistry practicals due to unavailability of resources

Teachers indicated that stoichiometry and equilibria were the most difficult topics to teach and coincided with students that the chapter on equilibria was complicated, too long and had too many formulae. Teachers highlighted that options were difficult to teach because teachers did not have adequate knowledge on the content, especially the use of E cell values and their interpretation. The construction of equations from the data booklet contributed to making electrochemistry a difficult topic to teach.

A teacher at a girls school emphasised that students had problems with topics involving calculations while a teacher for boys said that, “students had problems with topics which do not involve calculations, for example the organic section”. The third teacher gave Equilibria, Stoichiometry, Organic section and Options as areas in which students faced challenges. For Equilibria and Stoichiometry, the teacher stated that students easily got confused with the formulae and too many calculations. For the organic section, the teacher alleged there were too many reactions, reagents and students were required to know all their conditions and
mechanisms. Teachers also concurred that most students did not participate during the lessons and only a few actively engaged in knowledge construction.

4.2.2 Results of the causes of poor performance in chemistry

RESEARCH QUESTION 2

What factors are contributing to learners poor performance in chemistry?

4.2.2.1 The extensive nature of the chemistry syllabus

Interview questions have shown that 15.7% of the students expressed that they failed chemistry due to the following reasons: overloaded chemistry curriculum that make the subject very time demanding and more difficult to pass than any of their other subjects. Some students (frequencies in brackets) articulated that that their challenges in learning chemistry were due to the following factors: extensive nature of the syllabus (7.8%); unclear examination questions which are difficult to answer (19.6%); negative attitude towards the subject (5.9%); lack of relevant text books (2.0%); lack of interconnectivity between some concepts (7.8%).

Teachers and students agreed with Jegede (2007) that the subject was too wide, demanding, cumbersome and difficult to understand, with practices and failure in chemistry examinations scaring and putting students off chemistry. Students showed nervousness toward the abstract nature of chemistry and the way teachers, some of whom lacked interest, innovation, encouragement and resourcefulness, were teaching it. This can be supported by literature in chapter 2 which reports that there was a positive relationship between teachers’ quality and interest of students in science subjects Johnstone (1984). Literature also says lack of well-equipped chemistry laboratories, excursions and field trips prevented students linking chemistry and industry, the environment and everyday life (Jegede, 2007). Therefore a study of this nature was necessary to enable teachers, heads and curriculum planners to take a critical analysis into all these causes of poor performance.

4.2.2.2 Relevance of the chemistry curriculum

The results from both interview and observation have shown that Advanced-level chemistry syllabus which is still used in Zimbabwe was adopted from the Cambridge University syllabus in...
1998. Several alterations have happened in technological development and societal needs since then but the syllabus remains stationary. The Cambridge University syllabus itself has been altered, but the Zimbabwean syllabus has remained static and the curriculum must be reviewed so that it responds to the needs of Zimbabwean society and improve significance to the learners.

Literature says, the significance of what is taught and the way it is taught is critical for conceptual learning to take place and a subject that lacks relevance will be unpopular with students (Holbrook, 2005). Chemistry teaching that lacks relevance does not promote higher order cognitive skills, leaving gaps between student’s wishes and teachers teaching (Anderson et al., 1992; Zoller, 1993; Hofstein et al., 2000; Yager & Weld, 2000). As a result, the curriculum planners must do some alterations to their syllabus so that it meets the technological and societal needs. A study of this nature was not only relevant to Mabvuku Tafara District but to the Zimbabwe nation as a whole.

4.2.2.3 The nature of examination questions

15.7%) of the students claimed that they did not have difficulties in understanding the chemistry concepts during lesson delivery or when studying but they had difficulties in interpreting and answering examination questions. This was shown during lesson observation. The researcher observed a theory lesson and then a test lesson. The students failed to answer the examination questions but were participating during theory lessons. The researcher observed a theory lesson and a test lesson. Some of the students highlighted that one had to write a lot of stuff for just a few marks and it was difficult to know exactly what the examiner wanted, for example no marks were given when certain words were not included in the explanation. Some students felt that the marking schemes are unreasonably inflexible and some examination questions do not appear related to what is taught, thereby de-motivating students and terminating their confidence. Students will have great amounts of chemistry data, which they cannot use when answering the questions, and struggle to figure out what the questions require.

Both teachers and students felt that examiners seem to use examinations to assess teachers, schools, districts, instead of evaluating whether learning is taking place. Teachers are teaching with a visualization of having a very high pass rate so that they can get recognition. On the other hand students need to pass the national final examinations because the results greatly influence their future and so they want to pass by any means. Both teachers and students use any means to
achieve their goals. Under such circumstances, the lecture method (drilling, memorization of concepts, chalk and talk method) dominates the way the subject is taught and anything that may seem to result in the students passing is followed.

4.2.2.4 The way the subject is taught

Some of the interview questions responses suggest that the drive of teaching and learning is on passing examinations rather than real understanding of concepts. Student drive was on examination techniques. Students had a feeling that teachers are not teaching chemistry in an appropriate manner. 39.2% of the students felt that teachers need to improve or progress on the way they prepare students for examinations. 7.8% of the students urged teachers to improve the way they teach and use of models to illustrate some of the concepts so that the students can fully understand the concepts. Some students suggested that teaching media such as models and e-learning should be used to elucidate abstract concepts in chemistry. The three teachers observed teaching were using the lecture method with the demonstration, “chalk and talk” method prevailing. Frequently teachers would draw/sketch diagrams on the board to illustrate some complex structures and sometimes refer students to the textbooks. Students suggested that teachers should create a good teacher-student relationship to create conducive environments to learning and influence students to like the subject. 9.8% of the students felt that teachers were not motivating them, giving them encouragement and opportunities to participate and promote active learning during lessons. Teachers were encouraged to conduct lessons where students play active roles, thus indicating the introduction of aspects of cooperative learning (Kazembe, 2010).

Teachers should act as facilitators in the learning process. Students should discover on their own. Students are expected to solve problems on their own. Teachers should avoid depositing information in children. Most of the teachers concentrate on examination papers. Concentration on past examination papers will leave less time to learn the concepts besides encouraging memorization of concepts. Use of the constructivist’s approach equips students with knowledge which they can use to solve problems from first principles, enhancing meaningful learning. The complaint by some students that there is too much content to be memorized tends to vindicate that memorization of information by students is rampant.
4.2.2.5 The abstract nature of chemistry

Most of the concepts met in chemistry learning at this level are abstract, for example the atomic structure, stoichiometry and mole, equilibria, molecular and ionic structures, substance structures, intermolecular forces. Learners experience difficulties in learning such concepts because they cannot visualize or touch the objects or phenomena. These causes poor performance in chemistry. This was shown by observation lessons. The researcher observed one of the teacher teaching equilibria. A very few students were participating during this lesson. The students who were participating were physics students. Those doing biology were not even participating. This is because most physics students enjoy topics that involve calculations and biology students do not like calculations. Students with a good mathematical background enjoy topics with calculations.

4.2.2.6 Inadequate Practical work

From the interviews results 9.8% of the students complained that chemistry practical work was difficult due to the following reasons: there seems to be no link between the practices and the theory, the teachers were not teaching them how to carry out the experiment and there appear to be no textbooks that give advice on how to approach practicals. Questions on the “assessment of planning skills” section require students to design experiments from given situations which examiners assume students should do as they cover the syllabus but students who have only done practicals related to the usual titration, enthalpy change, reaction rate and qualitative analysis will find this section difficult.

Observation of practical lessons indicated that the laboratories were generally overcrowded. In one of the schools, twenty students were doing their practicals in a laboratory that can accommodate a maximum of twelve students, leading to a high frequency of breakages and accidents. It was very difficult for the teacher to monitor the individual student’s work. In another school, there were 16 students where the students were split into two groups. This was time consuming and increases teacher’s load. The practicals were limited to previous practical examinations because the materials available are those left from previous examinations. The teachers blamed the low frequency of practical sessions on lack of resources and stated that they frequently only had resources for titration, qualitative analysis exercises and irregularly enthalpy change or reaction rate practices.
Teachers self-proclaimed that students had difficulties in practical work due to inadequate apparatus to carry out the experiments, lack of reagents, uncooperation of administration to buy the required materials, overcrowded environment so that pupils end up sharing apparatus. Teachers suggested that students should do more practicals. However, students’ reactions and examiners’ expectations suggest that the remedy would be in hands-on learning during theory lessons, to illustrate the theories and laws of chemistry. The practical section of the syllabus should be revised and linked to the theory section.

This research study was necessary in Epworth Mabvuku Tafara District so that the teachers and administration can improve their attitude towards chemistry.

From chapter 2, literature says experiments are most recommended in the teaching and learning of Chemistry, because according to the constructivist theory, the learners can construct knowledge as they learn actively from experiments, leading to knowledge that lasts a long time. This learner-centered approach is a more effective way of learning than the teacher-centered approaches where knowledge is transmitted from the teacher to students who then memorize the ideas, leading to knowledge that is short lived and frequently of little use.

According Hodson (1994), practical work facilitate the learning of some important scientific procedures such as observation, hypothesis proposals or the analysis and interpretation of results and can help students to elaborate an appropriate image of scientific activity. However, analysis of the practical work traditionally carried out in schools has pointed out a general tendency of practical work to be ill-conceived, confused, unproductive and lacking in educative value (Hodson, 1994). Due to this mismatch between what would be expected and what is actually carried out in schools, this research has devoted a lot of effort in trying to clarify which should be the main objectives of practical work. Literature has concluded that these objectives are to develop in students: manipulative and observational skills, the ability to interpret experimental data and to plan experiments, the interest in the subject and a feeling of reality regarding the phenomena being studied in theory (Johnstone & Al-Shuaili, 2001).

4.2.2.7 Negative Attitudes towards chemistry

Interview results have shown that some students’ responses revealed a negative attitude towards chemistry. Students who develop positive attitudes usually work hard and do well. Chemistry is
manageable if one develops a positive attitude towards it. Yücel (2007) reported that the effect of attitudes toward science on student achievements in science lessons is greater than the effect of students’ abilities. Most of the students had a negative attitude towards chemistry. They viewed chemistry as being more abstract, difficult to understand, the syllabus being too long and also involves a lot of calculations.

### 4.2.2.8 Inappropriate presentation of information in textbooks

Students consult textbooks to consolidate what they learn during lessons. Interview results have shown that 13.7% of the students wrote that their low achievement rate resulted from the way information was presented in the Chemistry textbooks. The textbooks do not clearly elucidate the topics, as can be concluded from the questions asked in. Pupils requested to have textbooks that are user friendly and Zimsec must ensure publication of books for practical skills. Other students added that e-learning would improve the range of sources of information. In the sampled schools one school had internet facilities which was only accessible to the administration and the students and the teachers had no access to the internet.

### 4.2.2.9 Challenges of textbooks

The theory observation results has shown that the textbook: pupil ratio is as low as 1:8. One teacher even specified that the school only has four advanced level Chemistry textbooks by JGR Briggs, which is the main textbook in the chemistry syllabus. The other teacher from another school however has other reference textbooks such as Cambridge Chemistry Course, GCSE Chemistry and Chemistry in context A’ Level Chemistry, which the pupils can borrow and use for writing, notes. This is in line with the findings of the Nziramasanga commission of inquiry set up in 1999, which discovered an acute shortage of textbooks in schools. Therefore a study of this nature will help the administration to cooperate with teachers in buying the required materials.

**Fig 4.4 CHALLENGE OF TEXTBOOKS**
4.2.2.10 Challenges faced in the teaching method

The data gathered on method of instruction used by teachers during chemistry lessons observations revealed that the most common method was the question and answer method which had 95 %, followed by the lecture method which had 62.5 % and lastly read/write which had 20% as shown in the table below.

**Table 4.3 Challenges faced in the teaching method**

<table>
<thead>
<tr>
<th>TEACHING METHOD</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture method</td>
<td>95</td>
</tr>
<tr>
<td>Read/write</td>
<td>20</td>
</tr>
<tr>
<td>Question and answer</td>
<td>30.5</td>
</tr>
</tbody>
</table>

According to Teichert and Stacy (2002), many studies conducted worldwide clearly revealed that the traditional approach to teaching is awkward and misguided and pauses challenges to learner’s integration of concept. In Epworth Mabvuku Tafara District the teachers are still preferring the lecture method. The teachers stated that it is fast and enables them to be able to finish the extensive chemistry syllabus.
4.2.2.11 Challenges of inadequate written work
Since different teachers are teaching the pupils, 75% stated that they write an average of one piece of work per week while 25% write two times. According to the Ministry of Education, Sport, Arts and Culture circular number 36 (2006) this is not adequate for the Sciences, Chemistry in particular. The students in chemistry are supposed to do one practical test every week without considering the written exercises.

4.2.2.12 Challenges faced in the use of teaching aids
All the teachers observed during theory lessons had no media in chemistry. The teachers self-proclaimed that they only use media during practical lessons. The teachers complained that the use of media is time consuming. They highlighted that they had no time of preparing charts.

According to the Ministry of Education, Sport, Arts and Culture circular number 36 (2006), teachers must use a diversity of teaching methods and teaching aids in order to make the lessons more vibrant and exciting especially the use of computers and the internet was mentioned on section 2.3 of the circular under scheming and lesson delivery. All the pupils in their responses stated that teachers use textbooks and charts while 25% of the pupils included PowerPoint notes and molecular models on teaching aids used during chemistry lessons. Since the 1960’s numerous science curriculum development projects had emphasised the value of hands-on, laboratory-based practical work as an enjoyable and effective way of learning science (Hodson, 1992). However, the results from this study indicate that the schools in the sample are grossly under-resourced. These findings are also the same with those in the Report of the Presidential Commission of Inquiry into Education and Training (1999), which noted the same challenge in Zimbabwean secondary schools. The use of a variety of teaching aids has been documented in literature as an important factor that helps learners understand chemistry concepts better (Karacop & Doymus, 2013). Generally, Literature has confirmed that students learn best by doing – particularly in science courses (Dalton et al., 1997). When students are involved in “actively constructing knowledge from a combination of experience, interpretation and structured interactions with peers and teachers” (Roschelle et al., 2000, p.79), they are more likely to acquire a proficient understanding of science concepts.
4.2.2.13 Examination malpractice

Observation of students during studies and discussions revealed that they only concentrated on the revision of past examination questions. Most of the students frequently read Red Spots or Blue spots which are collections of past examination questions and suggested solutions. The tendency of students is that they read the question, attempt to answer the question and then refer to the suggested solution.

From the interviews done students reported that exam malpractice has done so much harm than good to students’ performance in chemistry. Students who did not learn properly cannot perform well in final examination. Since examination is still the common index for measuring performance especially in our society, passing has become a do or die affair, such that, a teacher who did not do his work very well probably because of lack of time but want to please the school and the parents indulge in exam malpractice and the students come out colorful but no good knowledge of the subject. The students stated that their teachers teach them to memorise answers from red spot. The students are aware that even if they are not serious and well taught, they will still be made to pass at the end either by their parents or teachers. These findings collaborate with those of (Angaye C, 2007).

4.2.2.14 Lack of qualified teachers

Table 4.6 Teachers’ Distribution by Professional Qualifications

<table>
<thead>
<tr>
<th>QUALIFICATION</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGDE/DIP EDU + BSC</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BED</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BSC</td>
<td>2</td>
<td>66.7</td>
</tr>
<tr>
<td>DIPLOMA</td>
<td>1</td>
<td>33.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 4.4 data shows that none of the teachers in the sample has an education professional qualification; two have a BSc degree while the other one has a diploma. This correlates well with findings of the research by Thornburg in 2009 in California.

4.2.3 STRATEGIES TO INCREASE THE PERFORMANCE

RESEARCH QUESTION 3

3. How could the learners performance be improved?

Both interview and observation have shown that teachers gave the following suggestions to improve performance:

- Revisiting of the curriculum, reducing and up-dating the curriculum content
- Standardization of the examination questions
- In service training of teachers and reducing the class sizes
- Students should be motivated so that they built a more positive attitude to the subject and work hard.
- Making use of the computers, models and more practical in teaching and learning of chemistry.
- Use of appropriate text books for the Zimbabwean syllabus.
- Examination practice
- Integrating indigenous knowledge
- Use of the scientific knowledge
- Using constructivist approach in teaching and learning

There was a strong consensus for both teachers and students, between the information obtained through the observation and that obtained by the interview.
4.2.3.1 Examination practice
Interview results have shown that 33.3% of the students suggested that more time should be allocated to examination practice. Some students wrote that "Students should be given more examination questions for practice". Teaching and learning process is examination oriented with emphasis on imparting and acquiring knowledge for examination rather than understanding the concepts. Such performs promote receptive learning, mechanical memory and passive imitation which do not prepare students for critical thinking. Students get stuck when confronted with examination questions which need application of concepts and the questions would appear as if they do not resemble with the syllabus content. Thus, teaching and learning for examination approach leaves gaps between what students learn and what they come across in the examinations. Teachers and students coincided that improvement in examination performance can be achieved through examination practice. Examination-oriented learning is centred on the centralised national summative assessment that is used for entry into universities, technical colleges, work, etc. and, therefore, it determines the future of the student. National examination is used to assess the effectiveness of the teacher, the school, the district, the province and the nation (the system) instead of assessing the learning process. Both the teacher and the student find it beneficial to have examinations passed by any means.

4.2.3.2 Teaching approaches and methodologies
One of the student interviewed said: “Teachers should teach what come in examinations”. Use of teacher-centred methods encourages students to memorise what the teachers give them and will fail to develop scientific attitudes, values, processing skills and high order tasks, which they require to solve high-order tasks, through application and evaluative reasoning. Students’ responses indicate that they think teachers are not teaching what comes in examinations. Use of student-centred approaches would equip students with higher cognitive skills. Another student wrote: “Teachers should conduct lessons where students play active roles, because they do not forget what peers teach them”. Since the teaching and learning in these schools in Epworth Mabvuku Tafara District is focused on passing the examinations, the teaching has remained largely teacher-centred, ignoring the development and mastery of scientific methods of solving problems as required by the curriculum (UNICEF, 2000). In chapter 2, Literature says cooperative learning enables students to exchange ideas, argue and contribute their conceptions, a practice that would allow misconceptions to be exposed and be corrected (Kazembe, 2010a).
This practice will be in line with the constructionist theory of learning in which the student constructs knowledge through the activities or experiences, which lead to permanent understanding of concepts. Some students suggested that, teachers should refer to examples of things met in everyday life for better understanding. Linking concepts to everyday experiences makes the concepts more relevant and useful. Teachers need to contextualise the concepts so that the students can realise their importance. However, even with that excuse, teachers and curriculum developers apparently hold the key to improvement of chemistry learning.

The curriculum planners should ensure that science education concentrates on developing higher-order cognitive skills based on critical thinking and problem solving (Zoller & Pushkin 2007). Research from chapter 1.2.1 has established that students who are trained in problem-solving skills demonstrate greater conceptual understanding than those who are not trained. Several students are able to resolve problems algorithmically but lack the understanding necessary for solving conceptual questions (Zikovelis & Tsapalis, 2006).

Most chemistry curricula treat conceptual understanding and the appreciation of the nature of science as if insignificant, yet they are of great value for functionality in students’ lives, influencing the relevance of chemistry to the home, the environment, future employment and developments within the society. These curricula put more emphasis on examination content than on applications. Teachers should understand how their students learn so that they can create effective teaching strategies (Clow, 1998; Holbrook, 2005; Yücel, 2007).

4.2.3.3 Use of teaching media in teaching and learning

The abstract nature of the chemistry concepts leads to low achievement in chemistry examinations so teachers should find strategies to enhance understanding of students in teaching and learning. Students have stated that it is difficult to understand concepts about things which cannot be seen. This was shown in topics like molecular orbital and shapes of molecules. As a result, the teacher must make good use of visual aids when teaching chemistry. This enhances the understanding of concepts in chemistry. The teacher must also encourage students to use the internet for research. Teachers must make use of Powerpoint in displaying information to students. Models, charts, videos, TV educational channels, etc. are useful tools to help students understand the complex abstract concepts in chemistry. Teaching media also motivate student self learning and provide a rich environment for students creativity.


4.2.3.4 Introduction to chemistry associations
Chemistry teachers’ associations are necessary because they would lead the staff development of Chemistry teachers on current issues in science education. Therefore, attending staff development workshops or seminars organized by these associations, would give the teacher the opportunity to interact and share ideas with colleagues. Some efforts have been made since Zimbabwean gains its independence in 1980 to improve the teaching of science, especially at secondary school level. Programmes such as the Zim-Science project were introduced in 1981 with a view of improving the teaching of science particularly in rural secondary schools. The QUEST (Quality Education in Science Teaching) project was also designed to accommodate secondary science education. The SEITT (Science Education In-service Teacher Training) programme was introduced as a staff development organ, which caters for advanced level Science and Mathematics teachers. All these programmes referred to above were donor funded hence their sustainability depended on the good will of the donors who eventually withdrew their sponsorship. Therefore, there is need to establish vibrant Chemistry teachers’ associations to spearhead the development of Chemistry education.

4.2.3.5 INCREASE THE NUMBER OF CHEMISTRY TEACHING PERIODS PER WEEK
In Epworth, Mabvuku Tafara District, advanced level chemistry was only allocated a maximum of eight periods per week instead of 10. The teachers gave those results. Consequently, most topics are hurriedly done and mostly theoretically as time to go to the laboratory for experiments is inadequate. Therefore, the teachers suggested an increase for time allocated to their subject so that they can interact more and give more hands on activities to the pupils.

4.2.3.6 GIVE A LOT OF HOMEWORK INSTEAD OF CLASS EXERCISES
The teachers observed give only one exercise per week. One teacher give after the end of the topic and the other one give after 2 weeks.

The teachers noted that to maintain the minimum amount of written exercises as per Circular 36 (2006) of the Ministry of Education, Sport, Arts and Culture, teachers could give more work to learners as homework in order to give more time to practical work during lessons.
4.2.3.7 ORDER A VARIETY OF TEXTBOOKS

The schools interviewed and observed have clearly indicated that they do not buy textbooks for students. The observed schools had only one copy for the teacher.

The Head of departments for Chemistry/Science needs to order a variety of textbooks from different authors. This helps learners to get different explanations from different authors on the same concepts. This will increase pupils’ understanding of concepts and subsequently improve success in Chemistry examinations.

4.2.3.8 EMPLOYING QUALIFIED TEACHERS

Highly qualified teachers should be employed with pedagogical skills. (Stevenson, & Stigler, 1992) further asserts that standards set the course, assessment provide the benchmarks, but it is the teaching that must be improved to push us along the path to success.

Students consider teaching as a distasteful career, only to be taken as a last resort. Those who acquire good grades in sciences will take up sciences or technology-related careers and leave the mediocre to join the teaching profession (UNESCO, 2000), adversely affecting the quality of education in schools.

An effective teacher should have mastered the content as well as pedagogical knowledge. Students suggested that there is need to improve teacher competency. There is need to teach teachers how to teach certain topics. Thus, either the teachers do not have sufficient subject content knowledge or pedagogical content knowledge. Highly qualified teachers are needed in teaching chemistry subject. However, at this level we normally have one person teaching all chemistry topics. It is impossible for a person to like all divisions of chemistry. Circumstances force teachers to teach even the areas they do not enjoy and are still expected to produce high pass rates. This study revealed that some teachers are teaching chemistry but they are not graduates of chemistry. It could be understood from the findings that the teaching profession has been reduced to a transit job. For people awaiting better jobs, they do not have passion for teaching. Such attitude reflects in the way they teach their subjects, and this has adverse effect on students’ performance.
4.2.3.9 Use of relevant text books for the Chemistry Curriculum

Interview results have shown that 17.7% of the students suggested that textbooks that correspond to the Zimbabwean syllabus should be published so as to improve performance during examinations. Pupils protested that ZIMSEC must publish textbooks which are relevant to the ZIMSEC Chemistry syllabus. Students use textbooks to consolidate the concepts that they learn during the lessons. Most textbooks that are used correspond to the Cambridge syllabus, for instance Briggs, Ramsden and chemistry in context.

4.2.3.10 Motivation and Attitude

Motivation is one of the most important factors that control learning and teachers face challenges when their students are not motivated to seek to understand the required concepts. Johnstone & Kellett (1980) recognized that the difficulty of a topic as perceived by students is a major factor in their ability and willingness to learn it. 7.8% of the students expected teachers to motivate them and foster development of positive attitudes and encouraging them to think that chemistry is manageable as well as get rid of the phobia towards chemistry. From this research study it is evident that students negative attitude towards chemistry is what often led to the low performance we experience today, this is consistent with (Ojo 1989 ;Adesokan 2002) assertions.

Teachers should avoid telling students that chemistry is difficult and requires intelligent students to pass it. Teachers should motivate students to like chemistry.

4.3 DISCUSSION OF RESULTS

This section presents a discussion of results focusing on the performance of students in Epworth Mabvuku Tafara District. Specifically the discussion focuses on first data on causes of poor performance at advanced level chemistry. Second the discussion pays attention to strategies to enhance the poor performance.

4.3.1 Findings of the study

The findings of the study are guided by some research questions specifically research question

**Research question 1**

What factors are contributing to causes of poor performance in chemistry?
The issue of enrollment did not support the research findings. The students enrolled for advanced level chemistry had grade A or B passes in chemistry or physical science at ordinary level. Results have shown that there is a clear distinction between topics enjoyed by physics students and those enjoyed by biology students. Physics students have a good mathematical background and enjoy topics that involve calculations. Biology students have a bad mathematical background and do not enjoy topics that involve calculations.

**Research question 2**

What are the factors contributing to poor performance in chemistry?  

The research findings have shown that the major causes of poor performance in chemistry were nature of examination questions, abstract nature of chemistry, teaching methodology, lack of adequate resources, negative attitude towards the subject, uncooperation of administration, nature of syllabus, examination malpractice. These results confirm the research findings of Papanastasiou (2001) who reported that “those who have positive attitude toward science tend to perform better in the subject”. Abstract nature of chemistry concepts, which are central to further learning in both chemistry and other sciences (Taber, 2000; 2002), “are important because further chemistry concepts or theories will be difficult to study if these underpinning concepts are not sufficiently grasped” (Zoller, 1990; Nakhleh, 1992; Ayas & Demirbas, 1997; Coll & Treagust, 2001; Nicoll, 2001).

The research findings also conform with (Johnstone, 1984; Bodner, 1991; Kazembe, 2010) on the use of rote learning in teaching and learning because what is taught is not always what is learned (Sirhan, 2007). In chemistry, “students need to actively construct their own personal awareness and meaning (Usman I.A., 2000).

Literature has shown that, the major factors contributing to poor performance in schools are poor teaching methodologies (Friedman, 2000), poor capital investment in terms of provision of science resources (Agusiobo, 1998), low teacher morale, substandard internal evaluation, poor administration and leadership, inadequate supervision and inspection of schools (Chiriswa, 2002), lack of support from parents, insecure working relationship between head teachers and their staff and indiscipline (Yeya, 2002) among others. Therefore the research findings of this study has confirmed to most of the researchers. What researchers viewed as the major causes of
poor performance in chemistry was also obtained in this research study. But it has deviated from Yeya 2002 research findings on the issue of insecure working relationship between head teachers and their staff and indiscipline. So it was necessary to do such a research finding.

**Research question 3. What are the strategies to enhance performance in chemistry**

Firstly Integration of indigenous knowledge epistemologies in the school curriculum helps learners to improve their performance. This piece of work has shown that teachers are adopting the use of western language in teaching. Teachers use English as their medium of instruction. Literature has shown that English proficiency contribute to the academic performance of schoolchildren. Bonga (2010) also theorized that the language spoken at home would affect student learning. Most Zimbabwean families use vernacular language yet the language of instruction at schools is English. This clearly express that schools use the wrong language to talk about their culture resulting in poor grasping of concepts or ideas by students. Teaching/learning of chemistry is of no exception. This results in failure of students to grasp chemistry concepts and view it as being too abstract. The findings of these results confirm to Bonga (2010) research findings. As a result it was necessary for the researcher to do a research study of this particular nature.

Secondly the teachers should adopt the use of modern methods in teaching and learning of chemistry. The research findings has shown that the chalk and talk method dominates in teaching and learning chemistry in Epworth Mabvuku Tafara District. Research findings has shown that teachers are using the traditional method in teaching chemistry. Teachers are teaching students to memorise concepts, using demonstration, explanation, drilling method. Teachers highlighted that they are using the traditional method in an attempt to finish the immense chemistry syllabus. They also expressed that they are forced to employ that method in teaching and learning of chemistry due to inadequate resources in their schools. lack of text books and resources for conducting practical lessons determine the type of method to employ during teaching and learning of chemistry. This promote rote learning in students. Students will not be able to attack challenging questions when they are confronted with new questions that they are unfamiliar with. Chemistry is a practical subject which requires students to observe, record and measure on their own. Literature has shown that traditional approach to teaching is problematic and misconceived (Teichert & Stacy (2002). Kwale SMASSE (2004) found that some
“Chemistry teachers subjected learners to traditional telling or the narration marathon leads to ineffective learning of knowledge, skills and concepts required in Chemistry as a practical subject”. The findings of this study confirm to (Teichert & Stacy (2002), Kwale SMASSE (2004) research findings. As a result this study was necessary to be done in Epworth Mabvuku Tafara District

Thirdly using the constructivist teaching approach. This piece of work has shown that teachers are using traditional approach in teaching chemistry. Findings have also shown that students are not exposed to practical lessons due to inadequate resources to conduct lessons. Teachers are using traditional approach due to lack of facilities such as textbooks, internet sources, lack of computers, poor home background. Literature has shown that a teacher who exposes learners to a variety of experiences give them an opportunity to form, test and transfer concepts. It is by reflecting, exploring, testing, amending and revising our current concepts to meet new circumstances and experiences that we undertake meaningful learning (Twoli, 2006).

Khatete (1995) further suggests that teaching and learning process should be a spiral mode of teaching which would facilitate the restructuring of students’ concepts hence better understanding of science (Chemistry) which translates to high achievement. However, in Zimbabwe schools, teaching and learning practices are examination-oriented at all levels of schooling. Twoli (2006) talks of teachers who ignore serious treatment of concepts as they work for the exam hoping that their students will survive. This practice reduces students to passive recipients who are supposed to imbibe knowledge from teachers, memorize it and reproduce it all in examination. Failure to reproduce means low achievement on the part of the students. The practice has great implication for the curriculum developers and teachers who may not be aware of the adverse effects of the practice on students learning of sciences and Chemistry in particular. The findings of this study conforms with Khatete, (1995) and Twoli(2006) research findings.

The findings of this study clearly shows that teachers are producing high school graduates who are scientific illiterate. The graduates lack the skill of observing, measuring, recording results, concluding, evaluating and rejecting or accepting a hypotheses. In Zimbabwe the use of scientific method normally begins at tertiary institutions. There is need to use the nature of science in the classroom. This is caused by inadequate resources to conduct practical lessons.
frequently. This shows the lack of concept of Nature of science in teaching and learning of science.

Nature of science encompass investigating in science, communicating in science, participating and contributing (Lederman, 1992, 2007). Nature of science instills the skills of exploring, elaborating, engaging, explaining discovering. The students will develop the skill of using the scientific method in chemistry. Literature has shown that Nature Of Science is widely renowned as a critical element of scientific literacy, it is also recognized as one of the vital aims of chemistry education (Lederman, 1992, 2007). This helps to improve learners’ performance in chemistry. The research findings conform to the literature.

The findings of the study has shown that teachers are not employing the scientific method in teaching chemistry. This shows that these advanced level students will be ill equipped for tertiary education. Using the scientific method in teaching and learning instills the scientific skills in students. The high school teachers are not able to produce young scientist. Nature of science helps teachers and learners in understanding of science and its nature, mainly to find ways for improving learners’ performance (Hodson, 2009) and for achieving scientific literacy (Webb, Cross, Linneman & Malone, 2005, Lederman, Lederman & Antick, 2013 in Zinyeka, 2014).

4.4 Summary

The chapter outlined and analysed data from the research instruments. The data was discussed instrument by instrument. The chapter also analysed the actual causes of poor performance in Zimbabwe and in Epworth Mabvuku Tafara District and suggested solutions to enhance the poor performance. It was discovered that there was need to address the issue of class size, teacher professionalism, teacher remuneration, student and teacher attitude towards chemistry, availability of resources, amount work given to students and socio economic background. This chapter outlined the views of various stakeholders including Chemistry students, Chemistry teachers, school Heads with regard to issues responsible for the persistent poor performance of students in Chemistry within the District of Epworth Mabvuku Tafara.
CHAPTER 5: SUMMARY CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION
This study attempts to establish the exact causes of poor performance in Advanced level chemistry in Epworth Mabvuku Tafara District focusing on strategies to enhance the poor performance. The chapter also aimed at establishing whether data collected answered questions raised in this research study. The research findings are based on the research questions and consequently conclusions and recommendations were drawn from the findings. Data for analysis was obtained through observations and interviews. Chemistry students, Chemistry teachers, school Heads were used as subjects of the study. Information obtained was analysed qualitatively.

5.2 Summary
The study specifically focused on the actual causes of poor performance in Advanced level chemistry in Epworth Mabvuku Tafara District. The researcher was driven into carrying out this research project after discovering that there was persistent poor performance in A Level chemistry from 2011 to 2015 as compared to other science subjects.

Chapter 2 was about literature review informing us about the research that were done pertaining to causes of poor performance in chemistry. These included language of instruction, lack of facilities, lack of qualified teachers, nature of examination question, extensive nature of chemistry syllabus, examination malpractice, teaching methodologies and inadequate resources. The research study also sought to establish attitudes of teachers heads and pupils on matters pertaining to poor performance in Epworth Mabvuku Tafara District.

In Chapter 3 the research study analyzed the data that was obtained in order to ascertain the exact causes of poor performance in A Level chemistry in Epworth Mabvuku Tafara District. Generally, most of the teachers, heads and students were willing to take part in the research. The chosen methodology that was found to be appropriate for use to deal with the above problem was the qualitative research approach involving the case study method within a descriptive method to address the research questions. The data collection procedure used purposive sampling. The sample was made up of 51 (30 males and 21 female) students and 4 chemistry teachers (3 males and one female). Advantages and disadvantages of each of the instruments that were used in the
collection of data in this research study were analysed. Data was collected through observations and interviews.

Having used these techniques, in chapter 4, results were presented and analysed and these results were followed by a discussion. The results revealed that the major causes of poor performance in chemistry were lack of practicals, examination malpractice, teaching methodologies, lack of textbooks, abstract nature of chemistry, nature of examination questions, language of instruction.

5.3 Conclusion
Several conclusions were drawn from this research.

From the foregoing summary, it can be concluded that the poor performance of students in Chemistry in Epworth Mabvuku Tafara District can be attributed to students’ background characteristics, abstract nature of chemistry, nature of examination questions, attitude factors, particularly the teacher’s negative perception of their learners’ abilities, inappropriate learning environment, inadequate use of resources in the teaching and learning process and negative attitude towards chemistry.

5.4 Recommendations
In order to improve the learners’ performance in Advanced level chemistry, the following recommendations were made:

1. Integrating Indigenous Knowledge Systems in the teaching and learning chemistry and also in school curriculum. Some schools of thought contend that “Western science is the only vibrant science that leads to universal reality and truth” (Cobern and Loving, 2001). Nevertheless, others who think about development among indigenous peoples, advocate that, “the use of both local and western science since indigenous knowledge on its own is still far from propelling development to the extent of solving pressing problems” (Brown-Acquaye, 2001). To those who think about pedagogy, inclusion of indigenous knowledge in teaching and learning chemistry is viewed (beside other things) as a means for laying a foundation for celebrating cultural heritage among the minority cultural groups that may result into the motivation of indigenous learners (Klos, 2006) or reconciliation of traditional knowledge with science (Hooley, 2000).
Integration of IK with school science is essential in order to prevent a cultural clash whenever students attempt to learn meaningful school science (Aikenhead & Huntley, 1999). A science curriculum that is receptive to IK permits environmental responsibility, sustainable development, and cultural survival (Emeagwali, 2003). School science integrated with IK will “facilitate the easiness with which students cross cultural boarders into school (western) science”, (Ogunniyi, 1988). Jegede (1995) refers to this as “collateral learning, which according to Aikenhead (2002) encourages meaningful learning of science”.


Constructivists learning environment provides real world settings or case based learning, provide multiple representations of reality, encourages thoughtful reflections on experiences. Constructivism is a new approach in education that claim humans are better to understand the information they have constructed themselves. According to constructivists theories, “learning is a social advancement that involves language, interaction and collaboration among learners”, (Jonassen, 1994)

3. Using Nature of science in in the chemistry classroom

4. The responsible authorities should provide and retain qualified teachers and provide adequate teaching and learning facilities and equipment to schools. The teachers’ academic and professional qualifications should be based on the required discipline, that is, chemistry. Non-chemistry graduates should not be employed to teach chemistry as this will affect the effectiveness of such teachers as he/she can easily run away from difficult topics. The teachers’ should employ the student centred approach in teaching and learning of chemistry. Teachers should show equal apprehension and treatment to students ‘and have knowledge of classroom interaction that serves to weaken students ‘self-esteem, academic achievement and ultimately professional preparation so that they are adequately prepared to face the future with hope. Teachers should create a conducive environment for learning so that students do not feel scared to ask questions.
5. Chemistry teaching methods must be re-oriented. The chemistry curriculum must be properly addressed and the scheme of work must not be overloaded. The classroom teachers should be involved in the drawing of scheme for the teaching of chemistry.

6. Affective and cognitive teaching strategies should be intertwined during chemistry teaching and learning since both have influence on chemistry reasoning. Chemistry laboratories should be established in all the school system. Practical solutions to problems both simple and complex concepts should be assured. Both teacher and students should be involved in the design of teaching and learning materials.

7. The Ministry Primary and secondary Education should incorporate laboratory of primary to Secondary levels so that students can have good foundation in science before proceeding to tertiary institutions. These laboratories should be well equipped and developed in Teacher Education Institution, Faculties of Education and Institutes of Education. Practical should also carry some credits in grading of students.

8. Qualified laboratory attendants must be employed to help the teacher in preparation of laboratory for practicals. This will make the work of the teacher to be less cumbersome and thus promote effective teaching.

9. Question and answer in chemistry is very vital and their importance cannot be emphasized. Question and answer helps the teacher to identify the students’ weaknesses. The value of asking and attempting to answers questions has been established by finding from research studies. An instructional environment that encourages asking of questions is known to have positive effect on comprehension (Costa et al 2009). There is a link was also that exist between question asking and improved problem-solving skills. (Dori and Herscovitz 2010) add that question asking aids in developing independent learning skills (Marbach-Ad and Sokolove 2008).

7. Provision of relevant and up-to-date textbooks for both teachers and students that will promote effective teachings as the teacher can prepare ahead from different textbooks and the students can read ahead of the class. The government should prevent the infiltration of those irrelevant and low standard textbooks into the schools. Since not all students can afford to buy expensive chemistry textbooks, every school should have an adequate and functionally library, operated by at least one professional librarian. The contents of such a library should be supportive of the
curriculum and reflective of our indigenous culture and home experiences and should accommodate future development and desirable world-view.

8. There should be effective school psychological services which would lead to good teacher-pupils’ relationship, effective classroom management and motivated teachers and pupils. This will eventually provide a conductive school climate for effective and learning process of chemistry.

10. The Chemistry teachers should: Organise excursions to Chemistry-based industries and Chemistry symposia as a way of motivating the students to have positive attitude towards the subject.

11. Teachers should enhance their testing policy by giving the students more Chemistry tests and assignments apart from the school controlled midterm and end of term tests.

5.5 LIMITATIONS AND AREA FOR FURTHER RESEARCH

This research study focused on only a small sample size, which was utilized in this study and did not cover a large sample size and it included only some selected high schools in the area but did not cover all the high schools in the Epworth Mabvuku Tafara District, Harare province Zimbabwe. This research study investigated the factors influencing poor performance in teaching of chemistry in high schools using 51 respondents and three high schools instead of ten high schools. The future researcher may repeat this study by using larger population such as a whole Harare province or the whole nation. The researcher may look at the causes of poor performance in the whole country that is Zimbabwe and find strategies to enhance the performance in the country. The researcher may also look into the causes of poor performance in science subjects at advanced level.

The following areas are suggested for further study:

- A comprehensive study on the causes and effects of Chemistry teachers’ negative perception of their students’ abilities in Chemistry.
- A comprehensive study of effects of students’ primary school science background on performance in Chemistry.
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RESULTS AT THE THREE HIGH SCHOOLS IN EPWORTH MABVUKU TAFARA DISTRICT

APPENDIX 1

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APPENDIX 2. Interview guide for students

1. How is your performance in Chemistry comparing with other science subjects?
2. What could be the reasons for the performance?
3. Which topics do you consider to be very difficult in Chemistry?
4. What makes them difficult?
5. Do you consider Chemistry to be a useful subject? Explain.
6. Are there any topics you consider to be of no use in chemistry?
7. How do you rate Chemistry lessons?
8. Do you find Chemistry homework easy or difficult?
9. What do you think the teachers could do so that your performance in chemistry improves?
10. What could you do to change yourself so that your performance improves?

APPENDIX 3. INTERVIEW FOR STUDENTS
1. How is the performance of students in Chemistry in comparison with other subjects?
2. What could be the reason for this performance?

3. Which topics do you consider difficult to teach?

4. What makes these topics difficult?

5. Which topics are difficult for students in chemistry?

6. How do you rate the Chemistry curriculum?

7. How do students participate in chemistry lessons?

8. How do students do their homework?

9. How can the performance in chemistry be improved

**APPENDIX 4. Interview questions for student**

Dear Student

This questionnaire is part of a study being conducted to establish factors affecting students’ performance in chemistry at A-level. You are kindly requested to contribute to the study by answering questions on this form. Your identity is not required. Your views will be treated as a group data and used for the improvement of chemistry teaching and learning at A-level.

Questions

1. Indicate your age in years by ticking in the correct box:

| 15 | 16 | 17 | 18 | 19 |

2. Indicate your gender by ticking in correct box

| male | female |
3. Indicate your O-level results (symbols)

<table>
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<th>mathematics</th>
<th>Physical science</th>
<th>chemistry</th>
<th>biology</th>
<th>physics</th>
</tr>
</thead>
</table>

4. Total number of A-grade passes

5. State the subjects that make up your combination

6. State the order of subjects in terms of preference starting with the best

7. Why do you have this order of preference?

8. How do you compare chemistry with the other subjects in terms of level of difficult?

9. Chemistry is a very difficult subject

Yes / No. Give reason for your above response

10. List the topics you enjoy in chemistry

11. What makes you enjoy the topics?

12. List the topics you do not enjoy in chemistry

13. What makes the topics enjoyable?

14. Do you enjoy chemistry homework? Yes / No. Why?

15. Do you enjoy chemistry lessons? Yes/ No Explain

16. Do you intend to continue with chemistry as a major after secondary school? Yes/ No

17. What would you like to do after your studies?
18. What are the challenges that the schools in Epworth Mabvuku Tafara face in the teaching and learning of chemistry?

19. List some factors that cause poor performance in chemistry.

20. What improvements should be made to enhance your performance in chemistry?

Thank you for your cooperation.

APPENDIX 5. Questions for interviews for teachers

Dear Sir/ Madam

This questionnaire is part of a study being conducted to establish factors affecting students’ performance in chemistry at A-level. You are kindly requested to contribute to the study by answering questions on this form. Your identity is not required. Your views will be treated as a group data and used for the improvement of chemistry teaching and learning at A-level.

Questions

1. Indicate your qualifications by ticking in the correct box

Cert. in Education /B. Ed/ B. Sc Any other (specify)

2. A-level chemistry teaching experience

Below 5 years/ 5-10 years/ Above 10 years

3. Did you major in Chemistry? Yes/ No If no, what did you major in?

4. Did you want to be a chemistry teacher from the beginning?

Yes /No If no what did you want to be?

5. What are the difficulties faced by A-level students in chemistry?

6. Which topics are difficult to teach in A-level chemistry?

7. What makes them difficult to teach?
8. Which topics are easy to teach? What makes them easy to teach?

9. How do students participate during lessons? Actively/ Moderately /Passively

10. What could be the reason for the above answer?

11. How is the A-level curriculum in terms of:
   Depth of content? /Amount of content? /Time for content coverage?

12. How do you rate final assessment?

13. What changes can be made to improve the performance in chemistry by A’ level students?

Thank you for your cooperation

Appendix 6. QUESTIONEER FOR BOTH TEACHERS AND STUDENTS
TICK YOUR GENDER AND TICK THE REASONS WHICH YOU THINK CONTRIBUTE TO POOR PERFORMANCE IN ADVANCED LEVEL CHEMISTRY

<table>
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<tr>
<th>Reason</th>
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<th>Female</th>
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<td>Lack of qualified teachers</td>
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<td>Lack of incentive for teachers</td>
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<tr>
<td>Incompetent teacher</td>
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<tr>
<td>Teachers’ absenteeism</td>
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<tr>
<td>Lack of interest</td>
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<td>Lack of understanding</td>
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<td>Poor background</td>
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<tr>
<td>Lack of consideration</td>
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<tr>
<td>Chemistry difficulty</td>
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</tbody>
</table>
Many topics that aren’t understood

Abstractness of chemistry

Chemistry language

Lack of teaching facilities

Obsolete materials

Library not well equipped

Expensive textbooks

Financial problem to buy textbooks

Lack of parental encouragement

Lack of help from parents

Lack of time of practice

Appendix 7. LETTER TO THE HEAD

Dear Sir/Madam

Re: Application for authority to carry out research at your school

I write this letter to apply for authority to carry out research at your school. The research is intended to be carried out in September 2016. The research topic is: Exploring factors influencing the poor performance in chemistry by A’ level students.