AN INVESTIGATION OF PERFORMANCE IN THE BIOLOGY 5090 AT SELECTED HIGH SCHOOLS IN LESOTHO

by

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DECLARATION

I declare that AN INVESTIGATION OF PERFORMANCE IN THE BIOLOGY 5090 AT SELECTED HIGH SCHOOLS IN LESOTHO is my own work and that all sources I have used or quoted have been indicated and acknowledged by means of complete references.

[Signature]

JUNE 2014

DATE

(Ms M C Lebata)
DEDICATION

This work is dedicated to my late father, Mr. Tumo Lebata who always wanted me to be educated and to go as high as an eagle in the education ladder though he was not educated. It is also dedicated to my mother, Mrs. ‘Mathato Angelina Lebata who encouraged me to persevere and to my brothers and sisters for the support they gave me during my studies. And finally it is to almighty God with whom nothing is impossible.
ACKNOWLEDGEMENTS

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Second, my words of thanks are directed to UNISA postgraduate bursary office that sponsored my studies. Without your financial support, this study would have fallen through.

Third, I would like to pass my words of thanks to the management of Manonyane High School for making it possible for me to pursue my studies while still carrying out my daily teaching work.

Fourth, I also wish to thank Mr. Salemane Sekese who provided guidance and support throughout my studies and Ms. Rethabile Possa whose guidance was crucial at the first stages of my research.

Fifth, a word of thanks goes to all the principals from whose schools data was collected and to all Biology teachers who participated in the interviews I conducted.

Finally, my thanks are also directed to my friends and colleagues for all the support they gave me.
ABSTRACT

Performance in Lesotho at senior level (COSC) has been poor. One of the subjects which is performed poorly is Biology 5090. This prompted the researcher to examine factors responsible for the poor performance in Biology 5090. The study also aimed at finding ways in which teachers envisage to improve Biology 5090 performance. Data was collected from three schools through semi-structured interviews and document analysis. The study also adopted the General System Theory (GST) as the theoretical framework.

Data was analyzed in line with qualitative content analysis, and from the perspective of the GST. The data analysis scheme was developed and presented (appendix P). The results of the study showed that Biology 5090 performance was affected by factors such as human resources, and the transformation process. The study also suggested ways in which Biology 5090 performance could be improved in Lesotho. These include: in-serving training, team work and others.
ACRONYMS

CI- Central Inspectorate
SC- School Certificate
JC- Junior Certificate
UK- United Kingdom
HOD- Head of Department
BSC- Bachelor of Science
GST- General System Theory
JMB- Joint Matriculation Board
Paper 6- Alternative to Practical
STC- Secondary Teacher’s Certificate
UNISA- University of South Africa
NUL- National University of Lesotho
LEC- Lesotho College of Education
SSC- Senior Secondary Certificate
UCE- Uganda Certificate of Education
GCE- General Certificate of Education
ECOL- Examinations Council of Lesotho
MOET- Ministry of Education and Training
CIE- Cambridge International Examination
WAEC- West Africa Examination Council
COSC- Cambridge Overseas Schools Certificate
UCLS- University of Cambridge Local Syndicate
UACE- Uganda Advanced Certificate of Education
DBER- Discipline Based Educational Research
STEM- Science, Technology, and Mathematics
BSC ED- Bachelor of Science with Education
NCDC- National Curriculum Development Centre
AAAS- American Association for the Advancement of Science
LSMTA- Lesotho Science and Mathematics Teachers Association
KEYWORDS

Factors

Framework

Performance

Biology 5090

Assessment Methods

Improving Strategies

General System Theory

Qualitative Content Analysis

Selected High Schools in Lesotho

Cambridge Overseas Schools Certificate (COSC)
TERMINOLOGY USED AND WHAT IT MEANS IN THIS STUDY

COSC (Cambridge Overseas Schools Certificate) - It is a group examination whereby subjects examined are to be taken from groups I to VII with group VI not being part of the range. For examination, learners are to take the minimum of six subjects, but they have to pass five subjects to acquire the School Certificate. COSC is offered by the University of Cambridge.

SC (School Certificate) - The certificate learners acquire at the end of COSC level upon passing five subjects including English language.

JMB (Joint Matriculation Board) - The body responsible for examinations in the Universities of South Africa. It offers group examination. Lesotho used to offer JMB examinations before 1961. In 1961 Lesotho began to offer COSC moving away from JMB.

Biology - is a science that studies various living organisms. A Living organism could be a one-celled bacterium or several-celled organisms such as an animal or a plant. Biology has various branches and some are shown below.

[Diagram of Biology branches]

Pallai (2012)
UCLS (University of Cambridge Local Syndicate) - It is the department in the University of Cambridge responsible for setting the COSC examinations at United Kingdom.

Pure Biology (Biology 5090) - Biology which is done independently from any other science. It is not combined with other sciences. Examples of combined syllabuses are 5126 which is the combination of Biology and Chemistry, 5129 Combined Sciences. Biology 5090 is offered by GCE. It can be taken with other subjects when offered by COSC or singly when offered by GCE.

CIE (Cambridge International Examinations) - the body responsible for Cambridge Examinations Internationally. It provides syllabuses, past question papers, examiners reports, mark schemes and more on the internet.

ECOL (Examinations Council of Lesotho) - It is the body responsible for examinations in Lesotho. It ensures the smooth running of the external examinations at both junior and senior levels.

Paper 6 (Alternative to Practical) - There are four papers for Biology 5090. Learners are required to enter for papers 1, 2 and either paper 3 or 6.

Paper 1 - Compulsory multiple choice paper with the total of 40 marks.

Paper 2 - Theory paper consisting of two sections. Section A is a compulsory section carrying 50 marks. Section B is also a compulsory question carrying 30 marks divided into three sub-questions each carrying 10 marks.

Paper 3 - Practical test consisting of three compulsory, practical questions carrying 40 marks.

Paper 6 (Alternative to Practical) - Consists of series of questions designed to test past experience of practical work. It carries 40 marks.
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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

This chapter comprises the following: background of the study, statement of the problem, aim of the study, assumptions, research design, value of the research in education, scope of the study, limitations of the study, delimitations, organization of the study, and conclusion.

1.2 BACKGROUND OF THE STUDY

In Lesotho, the education system is modeled on the British education system, especially one that followed the colonial model that applied to many of the British colonies. Cambridge Overseas Schools Certificate (COSC), for instance, is a leaving legacy of the colonial type of education that is still practised in some of the former British colonies. A recent study (Ambrose 2008) explains that the Cambridge Overseas Schools Certificate Examination is set by the University of Cambridge Local Syndicate (UCLS) and functions administratively as a department of the University of Cambridge in the United Kingdom (UK). The syndicate is a non-profit making institution, income from fees being used to cover costs. Ambrose (2008, p.2) further explains that ‘Lesotho changed to Cambridge Overseas Schools Certificate in 1961 moving away from Joint Matriculation Board (JMB) of the Universities of South Africa, a group examination’.

Ambrose (2008) explains that COSC is a grouped examination. Examinable subjects are arranged in groups from I to VII with VI not being part of the range (this implies that there are no subjects for group VI). For examination, learners should take the minimum of six subjects from the groups and have to pass five subjects to secure a School Certificate (SC). Biology 5090, for instance, is one of the subjects falling under group V (science subjects) from which candidates can select. The requirement is such that at least one science subject must be taken from group V. General Certificate of Education (GCE) by contrast, is a subject examination with no groups and no particular subject requirements. GCE offers opportunities to take subjects singly and acquire a certificate on the subject or subjects taken.
At present the Examinations Council of Lesotho (ECOL) offers COSC jointly with GCE. For examinations, learners ought to take the minimum of six subjects of which others can be taken from GCE, though they will be independent subjects. GCE is offered to learners who have failed to qualify for group examination. One of the subjects of GCE includes Biology 5090. It is the subject that is offered specifically by GCE but forms part of the subjects that can be selected for science subjects with COSC in order to meet the minimum number of subjects to be registered for COSC examination. That is, it can be taken as a single subject when offered by GCE but can form a group of science subjects when offered by COSC.

Various science subjects are offered at high school level. Syllabuses are assigned different distinguishing codes. These are: Human and Social Biology (5096), Combined Science (5129), Additional Combined Science (5130), Science 5125 (Physics & Biology), Science 5126 (Chemistry & Biology), Pure Biology (5090) and others. The word Pure refers to Biology which is done independently from other sciences. Biology 5090 is of special interest because, of the other science subjects with Biology content such as Science 5125 and Science 5129 mentioned above, it is the only syllabus with a relatively extensive coverage of Biology content. The other syllabuses only have Biology as a component in science tailored subjects.

Amongst all science subjects offered at various schools, Biology 5090 performance has been very bad (below average for most years) for the past seven years from 2006 to 2012 in Lesotho high schools. In 2006 only 16.967% of learners who sat for 5090 examination obtained credits while 20.07% obtained passes and about 56.96% failed. In 2007 there was a slight difference in performance. About 20.55% of learners obtained credits, 27.99% obtained passes while 50.87% failed. For those two years, performance was poor because more than 50% of the learners failed and others could only manage the score ‘pass’ which is the lowest score, below the entry requirement for tertiary institutions (ECOL 2012).

In 2008, again, there was a positive change in performance though small. ECOL 2012 says 22.10% obtained credits, 30.88% obtained passes and 47.02% failed. One could expect better results on the years that followed especially on the basis that teachers had familiarized themselves with the syllabus, and methods of assessment. Teachers would also have read the examination reports provided by Cambridge International Examinations (CIE) and made use of the recommendations provided. However, in 2009 there was a dramatic drop in Biology 5090 performance. There were 5.26% credits less than in 2008, 3.06% less passes than in 2008 and an increase in fail of 8.32% more than what had been in 2008. In 2010, Biology
5090 results were worse than the previous years. Performance was falling at a faster rate than before. The percentage of credits dropped to 16.58%, the percentage of passes to 27.92%, and the percentage of fail increased to 55.48%.

In 2011, Biology 5090 results showed the same falling trend. The percentage of credits dropped by 3.77% compared with 2010 results when credits were at 16.58%. The percentage of passes had decreased by 0.73% and the number of failures had increased by 4.5% more than what had been the case in 2010. Comparing 2011 results with the results of the other years, performance in Biology 5090 was indeed worse since it was only in that year when most learners failed. About 59.98% learners failed.

A positive change in the performance of Biology 5090 was, however, recorded in 2012. The percentage of credits rose to 22.31%, passes to 33.55%, and fail was at 44.14%. In comparison, 2012 results were better than the other past six years. Most learners had performed better though most scored passes. Pass scores deny learners the chance of pursuing their studies further in sciences. For the previous seven years, performance in Biology 5090 had been deteriorating from better to worst in Lesotho at COSC level. For five years: 2006, 2007, 2009, 2010, and 2011 more than 50% of learners who sat for Biology 5090 failed. It was only for the two years 2008 and 2012 whereby more than 50% of the learners who sat for Biology 5090 passed. Most of them only achieved passes. Pass scores do not satisfy the requirements for tertiary institutions for those who want to pursue their studies in sciences in Lesotho.

**1.3 FORMULATION OF THE PROBLEM**

For the past number of years COSC results in Lesotho have shown a decline. This poor performance has been an ongoing problem. The majority of learners obtained a General Certificate of Education (GCE). However, the primary target for all candidates is always to obtain the School Certificate. While the poor academic performance is a national problem, this study has narrowed its focus to Biology 5090 performance at selected high schools in Lesotho. Given the large coverage of Biology content in this subject and its rigour, there is a notable under-achievement in the subject. As a result, there is a need to investigate what
actually are the causes of the low performance in Biology 5090. Tables 1.3.1 and 1.3.2 below show Biology 5090 performance from 2006 to 2012 in Lesotho high schools.

Table 1.3.1: Biology 5090 Performance in Lesotho from 2006 to 2012

<table>
<thead>
<tr>
<th>Years</th>
<th>A1</th>
<th>A2</th>
<th>B3</th>
<th>B4</th>
<th>C5</th>
<th>C6</th>
<th>D7</th>
<th>E8</th>
<th>U9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>5</td>
<td>22</td>
<td>142</td>
<td>100</td>
<td>105</td>
<td>349</td>
<td>490</td>
<td>619</td>
<td>2424</td>
</tr>
<tr>
<td>2007</td>
<td>19</td>
<td>41</td>
<td>172</td>
<td>114</td>
<td>119</td>
<td>343</td>
<td>497</td>
<td>574</td>
<td>1946</td>
</tr>
<tr>
<td>2008</td>
<td>6</td>
<td>32</td>
<td>156</td>
<td>117</td>
<td>140</td>
<td>416</td>
<td>526</td>
<td>685</td>
<td>1843</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>38</td>
<td>137</td>
<td>84</td>
<td>119</td>
<td>304</td>
<td>505</td>
<td>628</td>
<td>2253</td>
</tr>
<tr>
<td>2010</td>
<td>9</td>
<td>38</td>
<td>141</td>
<td>78</td>
<td>112</td>
<td>299</td>
<td>479</td>
<td>661</td>
<td>2265</td>
</tr>
<tr>
<td>2011</td>
<td>14</td>
<td>31</td>
<td>125</td>
<td>73</td>
<td>91</td>
<td>310</td>
<td>542</td>
<td>825</td>
<td>3014</td>
</tr>
<tr>
<td>2012</td>
<td>52</td>
<td>110</td>
<td>416</td>
<td>232</td>
<td>343</td>
<td>1055</td>
<td>1416</td>
<td>1906</td>
<td>4370</td>
</tr>
</tbody>
</table>

(ESCL 2011, 2012)

Table 1.3.2: Biology 5090 Performance in Lesotho from 2006 to 2012 in (%)

<table>
<thead>
<tr>
<th>Years</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>2006</td>
<td>0.117</td>
</tr>
<tr>
<td>2007</td>
<td>0.496</td>
</tr>
<tr>
<td>2008</td>
<td>0.153</td>
</tr>
</tbody>
</table>
The findings reflected that more than 50% of learners performed below average in Biology 5090 except in 2008 and 2012, and this performance was not satisfactory or promising a consistent change for the better. This high failure rate by so many learners could be attributed to many factors. The study therefore intends to find answers to the following questions:

1. What are the causes of low performance in Biology 5090 of selected high schools in Lesotho?

2. In what ways do teachers envisage to improve performance in Biology 5090 in Lesotho high schools?

1.4 AIM OF THE STUDY

The aim of this study is to find out causes of low performance. It also intends to find out how performance can be improved in Biology 5090 in Lesotho at COSC level in order to produce learners with scientific mindset, those who can pursue their studies in sciences so as to bring changes in our country as future pharmacist, nurses, and any other related science careers.

1.5 ASSUMPTIONS

An assumption is a kind of belief which is considered to be true and forms the basis of the research. This belief is not to be tested or supported with empirical data (Leedy & Ormrod 2010). The research assumptions for this study are as follows:
• Results of schools with equipped laboratories to engage learners frequently in laboratory experiments are higher than those without equipped laboratories. This is because learners are frequently engaged in experiments to acquire skills required for paper 3 and 6.

• Teachers who are qualified to teach the course produce better results than those who are not qualified.

• Learners who are motivated to learn the subject; that is, those who are punctual, do assignments and participate in class have higher scores than learners who are not motivated to learn the subject.

1.6 METHOD DISCRIPTION

The present research made use of qualitative research approach whereby interviews and document analysis were used for data collection. Qualitative research is described as a method of inquiry aiming to explore and understand the meaning individuals or groups ascribe to a social or human problem (Creswell 2008). Qualitative research gathers an in-depth understanding of a human behavior and reasons that govern such behavior. It gathers information that is not in the numerical form; instead, qualitative data is textual and descriptive in nature. Since qualitative researchers are interested in understanding the meanings people construct, and how they make sense of their world and experiences this method best suits this study.

The researcher therefore found qualitative approach appropriate for undertaking this study because the major concern was to find out causes of low performance in Biology 5090 and ways in which teachers envisage to improve Biology 5090 performance. Since more understanding was required, qualitative approach was indeed of more value for this research than any other approach. This is because words were required to express ideas, feelings and knowledge that people had regarding causes of poor performance in Biology 5090. Data for this research was audio taped and transcribed verbatim hence a lot of explanation using words was required rather than quantification. Moreover, the present research required data that was in narrative form whereby explanations and descriptions were used to collect enough data.
Again, responses for this research were more complex going beyond “yes” or “no” for better understanding. Therefore qualitative research approach was indeed suitable for this study.

### 1.7 THE VALUE OF THE INVESTIGATION IN EDUCATION

No research will be valuable if it does not contribute to the scientific knowledge in the domain in which the research is conducted, help to solve a pertinent problem or build on the existing knowledge of the research field (De Vos et al. 2011).

The most important aspect of this study to education is to draw attention to the poor performance in Biology 5090 in Lesotho high schools. The study shall also reveal possible reasons for the low performance in Biology 5090. Some causes might also be the hindrance in performance in other science related subjects. The remedy therefore could be found even for other subjects affected by the same factors. The study shall reveal how teachers envisage improving performance in Biology 5090. This study also intends to be a lens through which areas of weakness could be identified. A window shall be opened into ways of improving performance in Biology 5090. The study might also cast light on how best Biology 5090 could be taught and assessed such that learners can end up obtaining better results at the end of the course. Moreover, the study might further illuminate what really is happening during Biology 5090 lessons which results into poor scores. Through this study, readers will also “view” the happenings in a typical Biology 5090 lessons that give rise to such poor scores.

### 1.8 SCOPE OF THE STUDY, LIMITATIONS AND DELIMITATIONS OF THE STUDY

#### 1.8.1 THE SCOPE OF THE STUDY

Since the major concern was to find out causes of low performance in Biology 5090 and how teachers envisaged to improve 5090 performance. The scope of this study was based on Biology 5090 performance from 2006 to 2012 for three selected high schools in Lesotho whose performance had been below average.
1.8.2 LIMITATIONS OF THE STUDY

This study has been constrained by some limitations. To start with, the size of the sample has been rather small. The fact that one teacher per school participated in the interviews has yielded a limited scope of views to adequately assess the problems in each school. Difference of opinion per school would have enriched the data collected.

The costs of conducting this study, too affected the process of data collection. Schools that could be included in the data collection are distributed over a large area, and travelling costs imposed some limitations. As a result, it became imperative that only a limited number of schools be selected for this study.

1.8.3 DELIMITATIONS OF THE STUDY

This study focused its attention on Biology 5090 performance of three selected high schools in Lesotho. Only those schools whose performances were below average in most years since 2006 to 2012 were part of this study. This study further confined itself to interview and document analysis as methods of data collection because they provide a deeper understanding of issues better than other methods. One teacher per school participated in answering the interview questions, and provided the researcher with the data requested.

1.9 ORGANISATION OF THE STUDY

The study is divided into five chapters;

1. Chapter One

This chapter is the introduction to this study. It consists of an introduction, background of the investigation, statement of the problem, aim of the investigation, assumptions, description of the method of investigation, the value of the research in education, scope of the study, limitations, delimitations, chapter division, and the conclusion.
2. Chapter Two

Chapter two mainly focuses on the review of related literature for the investigation and the theoretical framework that underpins the study.

3. Chapter Three

This chapter focuses on the research approach (design), and the methodology.

4. Chapter Four

Chapter four focuses on data presentation and the analysis.

5. Chapter Five

This is the last chapter for this investigation dealing with the summaries, conclusions and recommendations.

1.10 CONCLUSION

This chapter is the introduction to this study. It consists of an introduction, background of the investigation, statement of the problem, aim of the investigation, assumptions, description of the method of investigation, the value of the research in education, scope of the study, limitations, delimitations, organization of the study and the conclusion. In the next chapter the literature review is presented.
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter explores the literature relating to this study. It focuses on general academic performance, grading in Lesotho high schools and previous studies investigating performance in Lesotho. Biology 5090 performance in Lesotho is the central issue. There are also discussions about how Biology is taught and its importance in secondary education. Suitable approaches to the teaching of the subject are explained. It further presents the General System Theory (GST) as the theoretical framework for the analysis of ‘An Investigation of Performance in the Biology 5090 at Selected High Schools in Lesotho.’

2.2 REVIEW OF RELATED LITERATURE ON PERFORMANCE

2.2.1 ACADEMIC PERFORMANCE

The Oxford English Dictionary (2006) defines performance as the accomplishment and execution of tasks. The accomplishment of tasks, in the context of the academic function of schools, refers to academic excellence or efficiency which is measured in terms of learner performance in class work and national examinations. In the context of teaching, performance refers to the teachers’ ability to teach consistently with diligence, honesty, and regularity. To learners, performance would mean excelling consistently in the examinations (both the internal and external) and inter-class tasks (Ogunmade 2005).

Academic performance has been described as the scholastic standing of a learner at a given moment (Adeymi 2010). This scholastic standing could be experienced in terms of the grades obtained in a course or groups of courses. Akiri and Nkechi (2009) see performance as a measure of outputs and that the main outputs in education are expressed in terms of learning. That is, there are changes in knowledge, skills, behavior, and attitudes of learners as a result of their experiences within the schools system. For the present study, performance or the academic performance means the outcomes of education, the extent to which a learner, teacher or an institution has achieved their educational goals. That is, if set goals are met, it
means that school outputs (examination results) are good or learners have performed well, but failure to meet the goals means there has been poor academic performance. In the context of Lesotho, performance is measured by the internal and external examinations. Good performance in the internal examinations sometimes indicates good performance at the end. However, this is not always the case as most learners work hard towards the end of the year in order to perform well in the external examinations. Entwistle and Wilsons (1997) support this and report that a learner’s success is generally judged by examination performance while the best criterion of performance is the sum of the learners’ academic performance in all subjects taken.

Researchers have deliberated much on performance as a measure of school output (Mlambo 2011). They argue that the only measure of performance of school leavers is the achievement in General Certificate of Education (GCE) examinations. Consequently, they measure output in terms of the number of school leavers weighted by different indices of quality or number of passes. They report that performance in GCE is one relevant criterion of education quality and that academic index measures output in terms of GCE results. Considering the grading of GCE and similar examinations, a fall in performance in many public examinations has been reported in many countries. A good example can be drawn from Lesotho where there had been a significant decline regarding the academic performance of COSC learners in the external examinations for many years (Molapo 2004). In Nigeria, Adeymi (2010) found out that there was a decline in learners’ performance in Senior Secondary Certificate (SSC) examinations. He reported that in topics where teachers found it difficult to teach, learners tended to perform below expectations. Learners performed poorly in subjects such as Mathematics, English, and Science.

2.3 LEARNERS PERFORMANCE IN LESOTHO

In Lesotho many learners fail to get a School Certificate or a first class because they do not meet the English Language requirement. English is a prerequisite to attain the school Certificate. Despite English being the medium of instruction in high schools in Lesotho, less than 10% of candidates achieve a credit in English at COSC, a very low figure which has continued for many years (Ambrose 2008). In a recent studies (Molapo 2004; Jackson 2009) agree that performance in Lesotho at COSC has been bad for many years. And this
phenomenon has turned out to be a great concern to the entire nation. There might be factors influencing poor academic performance of learners in Lesotho, especially at COSC level. The table below reflects the seriousness of the situation.

Table 2.3.1: Performance of Learners at COSC in Lesotho in Percentages from 1989 to 2012.

<table>
<thead>
<tr>
<th>Year</th>
<th>First class</th>
<th>Second class</th>
<th>Third class</th>
<th>Total no of candidates awarded the certificate</th>
<th>GCE AND FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>3.6</td>
<td>9.8</td>
<td>18.4</td>
<td>31.8</td>
<td>68.2</td>
</tr>
<tr>
<td>1990</td>
<td>2.3</td>
<td>7.5</td>
<td>18.0</td>
<td>27.8</td>
<td>72.2</td>
</tr>
<tr>
<td>1991</td>
<td>2.2</td>
<td>10.2</td>
<td>20.1</td>
<td>32.5</td>
<td>67.5</td>
</tr>
<tr>
<td>1992</td>
<td>1.8</td>
<td>8.9</td>
<td>18.0</td>
<td>28.7</td>
<td>71.3</td>
</tr>
<tr>
<td>1993</td>
<td>2.4</td>
<td>9.4</td>
<td>13.8</td>
<td>25.6</td>
<td>74.4</td>
</tr>
<tr>
<td>1994</td>
<td>3.7</td>
<td>10.8</td>
<td>23.4</td>
<td>37.9</td>
<td>62.1</td>
</tr>
<tr>
<td>1995</td>
<td>1.8</td>
<td>8.7</td>
<td>18.3</td>
<td>28.8</td>
<td>71.2</td>
</tr>
<tr>
<td>1996</td>
<td>1.7</td>
<td>10.1</td>
<td>22.4</td>
<td>34.2</td>
<td>65.8</td>
</tr>
<tr>
<td>1997</td>
<td>1.8</td>
<td>11.0</td>
<td>23.6</td>
<td>36.4</td>
<td>63.6</td>
</tr>
<tr>
<td>1998</td>
<td>0.9</td>
<td>10.0</td>
<td>22.0</td>
<td>32.9</td>
<td>67.1</td>
</tr>
<tr>
<td>1999</td>
<td>2.0</td>
<td>13.6</td>
<td>28.6</td>
<td>44.2</td>
<td>55.8</td>
</tr>
<tr>
<td>2000</td>
<td>2.4</td>
<td>12.1</td>
<td>28.6</td>
<td>43.1</td>
<td>56.9</td>
</tr>
<tr>
<td>2001</td>
<td>2.5</td>
<td>13.8</td>
<td>29.4</td>
<td>45.7</td>
<td>54.3</td>
</tr>
<tr>
<td>2002</td>
<td>2.9</td>
<td>16.0</td>
<td>31.3</td>
<td>50.2</td>
<td>49.8</td>
</tr>
<tr>
<td>2003</td>
<td>3.3</td>
<td>15.8</td>
<td>32.4</td>
<td>51.5</td>
<td>48.5</td>
</tr>
<tr>
<td>2004</td>
<td>4.0</td>
<td>16.6</td>
<td>31.9</td>
<td>52.5</td>
<td>47.5</td>
</tr>
<tr>
<td>2005</td>
<td>4.4</td>
<td>18.3</td>
<td>32.5</td>
<td>55.2</td>
<td>44.8</td>
</tr>
<tr>
<td>2006</td>
<td>4.2</td>
<td>18.2</td>
<td>33.8</td>
<td>56.2</td>
<td>43.8</td>
</tr>
<tr>
<td>2007</td>
<td>4.8</td>
<td>18.8</td>
<td>32.7</td>
<td>56.3</td>
<td>43.7</td>
</tr>
<tr>
<td>2008</td>
<td>5.6</td>
<td>19.3</td>
<td>32.7</td>
<td>57.5</td>
<td>42.5</td>
</tr>
<tr>
<td>2009</td>
<td>5.7</td>
<td>17.9</td>
<td>33.2</td>
<td>56.9</td>
<td>43.1</td>
</tr>
<tr>
<td>2010</td>
<td>5.9</td>
<td>18.7</td>
<td>32.7</td>
<td>57.3</td>
<td>42.7</td>
</tr>
<tr>
<td>2011</td>
<td>5.4</td>
<td>16.8</td>
<td>34.6</td>
<td>56.8</td>
<td>43.2</td>
</tr>
</tbody>
</table>
The last column shows the number of learners who failed to obtain the School Certificate from 1989 to 2012. This is a big disappointment to the nation as a whole to see many learners in Lesotho performing below average in the examinations and therefore losing the chance to pursue their studies at tertiary level. The situation could be even worse if private candidates had been included because they study on their own. Ambrose (2008, p.19) explains:

The numbers of private COSC candidates have been growing in recent years, and indeed unrecognized secondary and high schools seem to be almost as numerous as those which are recognized. If those schools were to be included as part of the COSC results analysis every year, their pupils who write as private candidates should be added to the overall figures. There is evidence that some recognized schools also enter their weaker pupils as private candidates, so that these schools appear to perform better than would be the case if all pupils were taken into account. Results of private candidates are not published in the same way as those for school candidates and without them; one cannot have a really complete picture of the COSC examination scene in Lesotho.

Due to poor performance of learners at COSC, schools in Lesotho are divided into the best performing and worst performing schools. A good school can be defined as one where over 80% of learners receive a school certificate. A very poor school is the one where less than 20% of learners receive a School Certificate. Learners in the very poor schools are denied the chance of receiving adequate education. Indeed their schools are high schools by name, not in terms of achievement. The same school names tend to appear in this very poor category year after year. Due to poor performance, Ambrose (2008) suggests that those schools should be given a major overhaul and upgrading, should be amalgamated with other nearby schools, or simply closed. He further explains that in Lesotho, amalgamations are difficult, given the denominational nature of most schools, but to allow schools which fraudulently call themselves high schools to continue to exist is not in the interest of the parents, proprietors or the educational system. At the other hand, the good schools need to be looked at to discover their main parameters to success. Where possible they might be linked to or given a positive role in upgrading the poorer schools so as to improve academic performance. However, this

| 2012 | 4.8 | 17.6 | 33.0 | 55.4 | 44.6 |

ECOL (2011) and Ambrose (2008)
is not possible and many learners still fail to obtain the School Certificate at the end of COSC. It would be better to find ways of improving performance since upgrading of poorer schools is not possible in Lesotho. This is a challenge for all educators and the Ministry of Education and Training (MOET) to see to it that performance at COSC is improved.

2.4 GRADING AT HIGH SCHOOLS IN LESOTHO

At COSC level in Lesotho, learners are to select subjects from the prescribed groups where group 1 is English Language and it is compulsory. In order to enter for the COSC examination, learners must take the minimum of six subjects and for each of these subjects and for each learner a symbol is allocated on a scale 1 to 9. According to the Examinations Council of Lesotho (ECOL) and the University of Cambridge Local Examination Syndicate (1994), grade one is the highest grade while grade nine is the lowest. Grades are as follows, A1 to A2 are regarded as very good grades, B3, B4, C5 and C6 indicate passes with credits. These are regarded as former GCE ordinary level pass standard. D7 and E8 are passes (styled a General Certificate of Education GCE) while U9 is fail (ungraded), and these are regarded as scores below the former GCE ordinary level pass (Ambrose 2008).

To be awarded a School Certificate, an aggregate of symbols in the six best subjects is calculated, so that the theoretical best aggregate is 6, while the worst possible aggregate is 54 for a learner who fails all subjects. A first class School Certificate is awarded to those with the lowest aggregates, with the additional stipulation that no first class is awarded without a credit in English. This implies that performance in Lesotho is mainly based on English, no matter whether a learner had credits in all the subjects and with a good aggregate as long as he or she did not pass English, he fails to attain COSC. Those that follow first class certificate are second and third class certificates. Those with high aggregates do not get a School Certificate, but are awarded a General Certificate of Education showing their performance in each subject, unless they have failed (obtained a 9) in all subjects.

The awarding committee of the syndicate uses its discretion in the award of certificates and divisions of pass. The normal conditions for a first class are five credits with English Language included one other pass and an aggregate not exceeding 23. Without a credit in English learners obtain GCE no matter how good their aggregates are. For a second class, the normal conditions are four credits including English, two passes and an aggregate not
exceeding 33. For the third class, the candidate must either obtain one credit and five passes including a pass in English Language, or obtain two credits and three other passes including a pass in English language (Ambrose 2008). It needs to be mentioned, however, that the distinctions and credits are only requisite grades for admissions into higher institutions such as universities. In Lesotho, learners must have at least credits in five subjects including English language in order to qualify for admission into the university or a pass in English and five credits to qualify for admission in Bachelor of Science (BSc). It is only in the faculty of science where a credit in English is not a prerequisite.

2.5 PREVIOUS STUDIES INVESTIGATING PERFORMANCE IN LESOTHO

Academic performance in Lesotho has been a problem throughout the whole country for the past years. This has led to various researchers carrying out investigations on learners’ academic performance in Lesotho at COSC level.

A recent study is that of Jackson (2009) who conducted a study investigating factors contributing to the poor performance of grade 12 (COSC) learners in Lesotho. She found out that poor academic performance of learners in Lesotho is attributed to various factors including educators. A poor performance by so many learners in Lesotho caused many learners to lose faith in the educators. They feel that their educators are prejudiced against them and care very little either about individual learners or their teaching. Much of the problem, according to Calitz, Fulgestad and Lillejord (2002) derive from the treatment the learners receive from educators and unintended consequences of the school organization and practice. The situation emphasizes poor performance in Lesotho High schools. It is clear from the report published by the Examinations Council of Lesotho on the pass rate for the four years prior to 2007 that showed a decline of 10% in COSC (Ambrose 2008).

According to Jackson (2009) the problem of poor performance at schools has caused disadvantaged learners to believe that the existing education system in Lesotho only affords learners from affluent families a chance to master useful concepts and skills to succeed in their examinations. This is because they are able to afford the expensive schools where education and school managements dedicate themselves to produce the best and desirable results. Poor performance of COSC learners in Lesotho has been linked to many factors
including: lack of parental care, an inappropriate curriculum, poor school management, a non-welcoming school climate, shortage of educational facilities and resources, second language as a medium of instruction, fear of external examinations, inadequate qualified educators, lack of discipline and poor school attendance by both the educators and learners.

In a different study (Ambrose and Nenty 1999) looked at all the 1999 COSC schools, and tested at 5% significance difference. They found that the location of a school, whether urban or rural, highland or lowland did not have a significant influence on school performance. On the other hand, the size of the school was important. Thus, larger schools out-performed smaller schools. The study also looked at the relative performance of older and younger schools, an old school being defined as one which had started entry of COSC learners at least thirty years earlier. It was found out that on the whole older schools performed better than younger schools.

In relation to differences between performance of boarding and days schools, it was found out that boarding schools performed better than day’s schools. Another variable which was looked at was whether single-sex schools on the whole did better than the mixed schools which are now the majority in Lesotho. Here it was found out that single sex schools perform better than mixed schools. Differences were also investigated between different proprietors. Although there were no significant differences between denominations, private community schools performed better than any other groups of schools. When trying to find out which subject has the greatest influence on the overall School Certificate, it was found out that English Language performance had a monopolizing influence on percentage of passes at COSC and on the quality of school performance in the examination (Ambrose 2008).

Ntsane (1996) conducted the study on performance, investigating the impact of school related factors on high school students’ academic performance in Mafeteng district in Lesotho. He found out that boys significantly out-performed girls in Mathematics and Science, and that rural schools out-performed urban schools in Mafeteng district. He also looked into what differences there were between districts and found out that over the period 1985 to 1994 COSC results were best in Mokhotlong (59.1%) and Thaba-tseka (56.7%), and the worst in Mafeteng (16.5%) and Butha-Buthe district (15.1%).
Amongst all the subjects offered at COSC level in Lesotho, one of the subjects which is poorly performed is Biology 5090. Biology 5090 performance has been bad for the past years in Lesotho high schools. Data collected from ECOL has shown that performance in this subject has been fluctuating and most learners fail to obtain credit in Biology 5090. This prevents learners wanting to pursue their studies in science careers such as nursing from moving any further. Tables 2.6.1 and 2.6.2 below give the summary of Biology 5090 performance from 2006 to 2012.

Table 2.6.1: Biology 5090 Performance in Lesotho from 2006 to 2012

<table>
<thead>
<tr>
<th>Years</th>
<th>A1</th>
<th>A2</th>
<th>B3</th>
<th>B4</th>
<th>C5</th>
<th>C6</th>
<th>D7</th>
<th>E8</th>
<th>U9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>5</td>
<td>22</td>
<td>142</td>
<td>100</td>
<td>105</td>
<td>349</td>
<td>490</td>
<td>619</td>
<td>2424</td>
</tr>
<tr>
<td>2007</td>
<td>19</td>
<td>41</td>
<td>172</td>
<td>114</td>
<td>119</td>
<td>343</td>
<td>497</td>
<td>574</td>
<td>1946</td>
</tr>
<tr>
<td>2008</td>
<td>16</td>
<td>32</td>
<td>156</td>
<td>117</td>
<td>140</td>
<td>416</td>
<td>526</td>
<td>685</td>
<td>1843</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>38</td>
<td>137</td>
<td>84</td>
<td>119</td>
<td>304</td>
<td>505</td>
<td>628</td>
<td>2253</td>
</tr>
<tr>
<td>2010</td>
<td>9</td>
<td>38</td>
<td>141</td>
<td>78</td>
<td>112</td>
<td>299</td>
<td>479</td>
<td>661</td>
<td>2265</td>
</tr>
<tr>
<td>2011</td>
<td>14</td>
<td>31</td>
<td>125</td>
<td>73</td>
<td>91</td>
<td>310</td>
<td>542</td>
<td>825</td>
<td>3014</td>
</tr>
<tr>
<td>2012</td>
<td>52</td>
<td>110</td>
<td>416</td>
<td>232</td>
<td>343</td>
<td>1055</td>
<td>1416</td>
<td>1906</td>
<td>4370</td>
</tr>
</tbody>
</table>

(ECOL 2011, 2012)
<table>
<thead>
<tr>
<th>Years</th>
<th>Grade</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>A1</td>
<td>0.117</td>
<td>0.517</td>
<td>3.337</td>
<td>2.35</td>
<td>2.444</td>
<td>8.202</td>
<td>11.51</td>
<td>14.56</td>
</tr>
<tr>
<td>2007</td>
<td>A1</td>
<td>0.496</td>
<td>1.496</td>
<td>4.496</td>
<td>2.980</td>
<td>3.111</td>
<td>8.967</td>
<td>12.99</td>
<td>15.00</td>
</tr>
<tr>
<td>2008</td>
<td>A1</td>
<td>0.153</td>
<td>0.816</td>
<td>3.978</td>
<td>2.983</td>
<td>3.570</td>
<td>10.6</td>
<td>13.41</td>
<td>17.47</td>
</tr>
<tr>
<td>2009</td>
<td>A1</td>
<td>0.098</td>
<td>0.933</td>
<td>3.364</td>
<td>2.062</td>
<td>2.922</td>
<td>7.465</td>
<td>12.40</td>
<td>15.42</td>
</tr>
<tr>
<td>2010</td>
<td>A1</td>
<td>0.220</td>
<td>0.930</td>
<td>3.540</td>
<td>1.910</td>
<td>2.747</td>
<td>7.324</td>
<td>11.73</td>
<td>16.19</td>
</tr>
<tr>
<td>2011</td>
<td>A1</td>
<td>0.278</td>
<td>0.616</td>
<td>2.487</td>
<td>1.452</td>
<td>1.810</td>
<td>6.169</td>
<td>10.78</td>
<td>16.41</td>
</tr>
</tbody>
</table>

Biology 5090 performance shown in tables 2.6.1 and 2.6.2 above indicate that most learners in Lesotho failed to obtain credits in Biology 5090 from 2006 to 2012. Those who wanted to pursue their studies in sciences requiring a credit in Biology would not be able to due to lack of credit in Biology. One may conclude that this poor performance in Biology was caused by various factors in different high schools in Lesotho. According to the report provided by ECOL (2010), most learners failed Biology 5090 because they could not answer questions as expected. They tended to provide unnecessary information. General recommendations made by ECOL (2010) were,

(a) Teachers should encourage learners to practise essay type of questions. Management of time should also be incorporated in the practice. They should also be prepared for the demands of the examinations.

(b) Teachers should expose learners to practical exercises as much as possible in order to enhance their experimental skills. They should also be given a chance to construct graphs as well as interpret them. This skill would help them to practise different graphing skills. The basic skill of drawing y-axis and x-axis should be honed to understand their applicability.
outside the mathematical context in which they are learned. Differences between biological terms should be emphasized to avoid the prevalent problem of learners confusing processes and the terminology. The art of comparing entities in any given situation also needs to be practised thoroughly.

2.7 PREVIOUS STUDIES WITH SIMILAR SCOPE

The issue of poor academic performance has been a concern to all and sundry. Poor performance in science subjects especially Biology 5090 is not a problem in Lesotho alone. In most countries, learners perform below average in science subjects. The problem is so much that it has led to the widely acclaimed fallen standards of education in many countries (Akiri & Nkachi 2009). Various science educators such as Uwadie (1997) have shown that learners perform poorly in science subjects. Besides, the results of learners in Biology, Chemistry and Physics in May/June Senior School Certificate Examination in Nigeria for seven consecutive years, 1995 to 2001, as shown in table 2.7.1 below, also corroborate the poor performance of learners in science subjects. Above all other science subject, Biology performance was the poorest except in 1998. This poor performance in science subjects is attributed to:

- Poor quality of science teachers whose methods of teaching such as excessive talking, writing of notes and rote learning of text books materials tend to inhibit interest.
- The prevalent exposition method of instruction rather than inquiry, with very little involvement of learners in experimentation.
- Shortage of laboratory facilities and equipment necessary for practical work.

Table 2.7.1: Performance of Learners in May/June WAEC Senior Secondary School Certificate Examination 1995 to 2001.

<table>
<thead>
<tr>
<th>Year</th>
<th>Biology</th>
<th>Chemistry</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%credit</td>
<td>%pass</td>
<td>%fail</td>
</tr>
<tr>
<td>A1 – C6</td>
<td>P7- P8</td>
<td>F9</td>
<td>A1 – C6</td>
</tr>
<tr>
<td>1995</td>
<td>18.90</td>
<td>30.20</td>
<td>50.80</td>
</tr>
<tr>
<td>1996</td>
<td>15.90</td>
<td>25.20</td>
<td>58.80</td>
</tr>
</tbody>
</table>
Mwirigi (2011) in his article explains that in Kenya there was a public outcry and concern by parents, teachers and educationists about poor performance in science subjects (especially Biology) and Mathematics in the national examinations. He explains:

Biology as a science subject requires an integration of both theoretical and practical work to make it easily understood by students. The largest proportion of teachers still use the conventional lecture method while teaching Biology and the teacher expectation have a bearing on the attitude and science anxiety levels of the learners particularly when learners are aware of the levels of expectation the teacher has of them. In relation to the teaching and learning of Biology, attitudes begin to develop on the first encounter between the teacher and the learner. Once performed, they play the key role in determining students learning and performance in Biology.

He further explains that authoritarian and impersonal teacher-learners interaction in class could be the major factors that precipitate negative attitude of the learners towards learning Biology. Similarly in most high schools in Lesotho, Biology is learned through lecturing. Learners are not involved to do the work on their own. This practice is one of the factors responsible for the poor performance in Biology 5090 in most high schools in Lesotho as learners develop negative attitude towards the subject. On the other hand, democratic and personal teacher-learner interaction in class elicit positive attitude towards the learning of Biology, but this practice is seen in few high schools in Lesotho. This is because teachers teach exactly the way they were taught (mostly by lecturing) but not the way they were taught how to teach. That is, even in teacher training institutions, lecturer may recommend a method but fail to practise. It is the practice that stays. The teaching approach, methodology, and how the professional skills and practices of the teacher are displayed may be dependent on the level of science anxiety the Biology teacher has. A teacher who is affected by career
dissatisfaction is likely to contribute negatively in terms of his inputs in the performance of the learners in Biology. Part of the reason is career dissatisfaction resulting from low salaries. This is because the teacher has high levels of anxiety. Such a teacher is likely to develop negative attitude towards learners. The impact of which is a negative attitude of learners towards Biology. There is also the likelihood of the learners developing high levels of anxiety towards the subject (Mwirigi 2011). Teacher perception, teaching methods applied, the type of teacher-learner classroom interactions, teacher expectations of learners in terms of performance, and science anxiety levels of the teacher, are the key factors that influence performance in Biology in Kenya secondary and high schools. This situation also applies to high schools in Lesotho.

The study conducted by Nsubuga (2008) investigating the relationship between leadership styles and school performance in secondary schools in Uganda indicated that the Ministry of Education (MOES) was frequently conducting workshops for head teachers and deputy head teachers on leadership skills. However, most school performance was still wanting. In some schools, there was an increasing poor performance mainly in science subjects. Tables 2.7.1 and 2.7.2 highlight the comparison in academic performance of schools in Uganda doing Uganda Certificate of Education (UCE) and Uganda Advanced Certificate of Education (UACE) from 2004 to 2006 (Nsubuga 2008). Poor leadership skills do affect performance negatively even in Lesotho High schools. In agreement with Nsubuga (2008), Molapo (2004) who carried out an investigation on teachers and management perceptions on factors that influence poor academic performance of form E learners at Maryland High School in Lesotho, explains that a good principal is the one who harnesses all the efforts of the staff members towards the success of the school. But on the other hand, if the principal does not offer any support to teachers, the performance may be poor as it is the case in Lesotho high schools. This is due to low morale amongst teachers.

Table 2.7.2: Comparison of Performance in Science Subjects in UCE from 2004-2006

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Percentage of Distinctions and Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Mathematics</td>
<td>27.2%</td>
</tr>
<tr>
<td>Physics</td>
<td>51.1%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>27.3%</td>
</tr>
<tr>
<td>Biology</td>
<td>25.6%</td>
</tr>
<tr>
<td>Subjects</td>
<td>Percentage of Distinctions and Credits</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Mathematics</td>
<td>48%</td>
</tr>
<tr>
<td>Physics</td>
<td>48.7%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>32.2%</td>
</tr>
<tr>
<td>Biology</td>
<td>39.1%</td>
</tr>
</tbody>
</table>

Source: Uganda Examination Board, MOES

Tables 2.7.2 and 2.7.3 provided above show that performance in science subjects in Uganda was below average from 2004 to 2006. The science subject which was performed badly is Biology in most years. The same thing applies to Lesotho; Biology 5090 performance has been bad for many years in Lesotho high schools and most learners failed to pursue their studies in science related courses requiring a credit in Biology such as in BSc nursing.

2.8 FACTORS AFFECTING LEARNERS PERFORMANCE

Poor learners’ achievement has prompted educational researchers worldwide to continuously identify factors that can account for academic outcomes in the classroom. Some research suggested that factors outside and inside the classroom affect learners’ performance. However, experts claim that the key factor in what comes out at the end of schooling is what goes on in the classroom (Orleans 2007). Researchers come up with various factors affecting learners’ performance. These include: teacher and teacher quality, English as a medium of instruction, study habits, motivation, and other factors (Anand 2004; Darling-Hammond 1997; Orleans 2007; Sternberg & Wagner 2005; Yong 2003 & Wankowski 1973).
2.8.1 TEACHER AND TEACHER QUALITY

The quality of education depends on teachers as reflected in the performance of their duties. Learners’ academic performance in both internal and external examinations has been used to determine excellence in teachers and teaching. Teachers also play a crucial role in educational attainment because the teacher is ultimately responsible for translating policy into action and principles based on practice during interaction with the learners (Afe 2001). Ineffectiveness of teachers in classroom interaction with the learners could be responsible for the observed poor performance of learners and the widely acclaimed fallen standard of education. Poor academic performance of learners can be linked to poor teachers’ performance in terms of accomplishing the teaching tasks, negative attitudes to work and poor teaching habits which have attributed to poor motivation (Akiri & Nkechi 2009).

In most schools in Lesotho, poor academic performance is due to poor attendance of educators. Most teachers miss their lessons even when they are present at work. And this behavior affects performance negatively. Furthermore, ineffective teaching is also due to conditions such as lack of resources facilitating teaching and learning. This in turn results into negative influence on the instructional quality in schools followed by poor academic performance, attitude and values.

To add on this, teacher quality too affects learners’ performance positively or negatively. It is believed that certificated teachers produce good results than non-certificated teachers. Certificated teachers are teachers who are trained to teach certain subjects while non-certificated are those teachers who are not trained to teach at all or those who teach subjects that they were not trained to teach (they are non-certificated in that area). Shortage of science teachers in Lesotho attracted unqualified teachers. And in some high schools science is taught by COSC holders. This affects performance negatively as they lack skills to deliver the content. Orleans (2007) agrees that teacher quality appears to be the most important factor influencing the learners’ performance. To illustrate this, the data of the proportion of measured variance in Mathematics score grains, Darling-Hammond (1997) shows that 51% of influence on learners’ achievement has to do with school factors, 49% with learners’ background (e.g. parents education, income, race, and location). 43% of the school factors were attributed to teacher quality alone. Similarly, the data from a teacher evaluation system for the Dallas Public Elementary School (Jordan, Mendro and Weeasingho 1997) confirm
that among other school related factors, teacher quality has the greatest impact on learners’ performance.

Teacher academic preparation, certification type (diploma or degree), and years of teaching experience, among others, are often taken as indicators of teacher quality (Mlambo 2011). Those teachers with sufficient academic preparation are seen to be competent in the subject matter and pedagogical skills enabling them to be effective in classrooms and produce larger learners’ grains (Orleans 2007). Licensed or certificated teachers are also considered to be effective because licensing typically requires prospective teachers to hold a college degree in pedagogy and in the subject they wish to teach (Orleans 2007).

2.8.2 ENGLISH AS A MEDIUM OF INSTRUCTION IN THE TEACHING AND LEARNING OF SCIENCE

Language plays an important role in the learning of science, and this is even more so when learners are second language learners. There has been much concern on underachievement in science in primary schools, junior, and senior secondary schools in Lesotho. Part of the reason is because learners are not sufficiently proficient in English to learn science. Because Biology is descriptive in nature, learners need to have sufficient language proficiency in order to understand the meaning of Biology concepts. Research studies have shown that learners encounter enormous problems learning Biology in English and this is particularly so for those who are second language (ESL) learners as in the case of Bruneian learners (Yong 2003). Yong (2003) and Mohudiu (2008) reviewed a corpus of research literature and reported that ESL learner’s encounter many problems in learning Biology in English and among them are:

A. Lack of Language Proficiency of ESL Learners

Many ESL learners did not have the necessary linguistic tools to construct advanced science concepts. Learners with limited English proficiency seemed to have a weaker knowledge of science and this inevitably affected their achievement test scores in science. They reasoned that those learners had difficulty reading science textbooks and deriving meaning from analogies and metaphors that are frequently used in science.
Another problem which was faced by ESL learners was their inability to understand teachers discourse during instruction. This prevented them from understanding the content presented to them. Lesotho language policy affected science performance negatively as learners are taught in their mother tongue from grade 1 to 4 (Jackson 2009). During the initial year of primary education, English is stipulated 30 minutes each day and there is no increase in time as learner’s progress through grades. The 30 minutes per day allocation gives learners inadequate exposure to English though is a medium of instruction and official language used for examination. As a result of this limited exposure to English, most learners in Lesotho fail science due to insufficiency of English which they critically need for their participation in the learning of the subject.

**B. Language Used in Science Textbooks**

The language used in many science textbooks exceeds the normal experience of many elementary and high school learners for whom they were written. It was reported that the language used in some African text books for science in some African Schools was too advanced for many of the learners (Jackson 2009). Similarly, high school Biology textbooks used in the Caribbean Islands were found to be difficult for the target learners to read and understand. That made it difficult for learners to continue reading independently (Mohidiu 2008). Similarly most learners in Lesotho cannot read Biology textbooks on their own as the language used is beyond their understanding. This is because learners do not have strong communication skills and strong grip on English. And of course, this results into low performance as learners cannot do the work on their own due to inadequate English.

**C. Nature of the Written Text in School Biology Textbooks**

Unlike Chemistry and Physics, Biology is more descriptive in nature (Mohidiu 2008). Biology textbooks are often found to consist of long and complex sentences that are laden with facts. Such structural complexities impose considerable cognitive demands on ESL learners. Lock and Richardson (1995) point out that Biology contains many technical terms in describing its concepts, principles and theories, and is therefore more susceptible to reading difficulties than other natural sciences. Many technical terms are derived from Latin and Greek words which are alien to learners. Mohudi (2008) indicates that in Brunei Darussalam, learners in private schools perform much better in Biology as compared with learners in public schools. This may be because learners in private schools had a better command of English when they were at primary level and had better skills in secondary level.
Similarly, in Lesotho learners in the public schools have limited English proficiency and cannot cope and do well in the external examinations because they are not competent in the usage of English since it is their second language. These learners experience difficulties with academic concepts and abstract ideas that are less easily understood and they perform poorly as compared with learners at private schools where access to English language is greatly enhanced.

2.8.3 STUDY HABITS

Study habits refer to the amount of the learners dislike or like of particular things. Sternberg and Wagner (2005) distinguish more simply among three intelligences: the academic problem solving, the practical intelligence, the creative intelligence, and all these have peculiar influence on performance. They explain that success in the study does not depend on ability and hard work alone, but also on effective methods of study. Individualized method of studying is adopted by every individual learner. A good study habit would mean the ability to learn and make use of what one is reading or studying. Study skills when properly embedded help learners to understand their own potentials for intellectual growth and self-direction. It is for this reason that the strategies of study habits among learners should be emphasized; if not, learners would perform below average (Balbalosa 2010).

Long et al. (2000) compared learners who were deaf and hard of hearing in mainstream classes with hearing peers. In both studies, the learners who were deaf had comparable study behaviors to those of their hearing peers. Similarly, both studies employed a survey design that precluded the researchers from obtaining an in-depth knowledge of participants’ skills and in particular, their use of notes as a study text. These studies are similar to several others that have attempted to survey the study habits of normal hearing learners. The study skills can be taught effectively only after identifying learners’ areas of weaknesses and levels of academic achievement that is appropriate to their grade level. They can be provided with development or enrichment exercises, which will enable them to become more proficient in the skills they have already acquired or which will help them learn new ideas. Balbalosa (2010) states that good study habits help learners in critical reflection and in skills such as selecting, analyzing, critiquing, and synthesizing. Learners with good study habits turn to perform better than learners with poor study habits. This is shown in some Lesotho high
schools where learners with good study habits were compared with learners without good study habits. During science fairs, learners from other schools did challenging tasks indicating that they had the ability to do the work involving high cognitive skills. This showed that learners from those schools had good study habits as compared with learners who did less challenging tasks from some schools. In order for learners to develop positive study attitudes and habits, guidance is important (Mushtag 2012). Guidance as seen in some Lesotho high schools is one of the factors through which a learner can improve his attitude and study habits. Learners who are directly guided perform better in both the internal and external examinations.

2.8.4 MOTIVATION

While there are a number of factors that affect performance at school, one of the most influential is motivation. Motivation, also referred to as academic engagement, relates to cognitive, emotional, and behavioral indicators of learner’s investment in an attachment to education (Anand 2004). It is obvious that learners who are not motivated to succeed will not work. In fact, several researchers have suggested that only motivation directly effects academic achievement; all factors affect achievement only through the effect of motivation (Herman, Tucker & Zyco 2007). However, it is not so easy to understand what actually motivates learners. Numerous studies have been conducted on this topic, which have led to the development of several theories of motivation.

One widely accepted theory is Goal Theory (Anand 2004). It postulates that there are two main types of motivation for achieving at school. Learners with an ability or performance goal orientation are concerned with proving their competence by getting good grades or performing well (Anand 2004). On the other hand, learners with a task goal orientation are motivated by a desire to increase their knowledge on a subject or enjoyment from the learning material. Studies have shown that learners with a task goal orientation are more likely to engage in challenging tasks, seek help as needed, and adopt useful cognitive strategies, and most importantly tend to be happier both with school and with themselves as learners (Anand 2004).
2.8.5 OTHER FACTORS

Performance has been affected by various factors as far back as the early 1970s. Findings from Wankowski (1973) for instance, report that academic failure seems to be associated with many factors such as lack of confidence, emotional instability, and temperamental tendency towards extraversion. Supporting this, Lloyd et al. (2009) maintain that failure of learners is due to lack of confidence in the knowledge they possess which in turn could affect their level of activity in the classroom, and this results into poor attendance. They argue that learners’ academic problems arise from personal inadequacies such as low ability, negative self concept, anxiety, maladjustment, environmental inadequacies such as poor classroom condition, curricular inadequacies, peer groups, and lack of home support. In Lesotho most learners fail to complete their studies due to various factors. Some learners often leave school before the school leaving age while others are in the habit of attending school irregularly. In the rural areas of Lesotho learners do not attend lessons regularly since they exchange because their major role is to look after animals. That is, if learner A went to school on Monday, learner B will go on Tuesday. This affects performance as they are not exposed to all content treated in their absence. Researchers have given other reasons why most learners find it difficult to pass their examination. Some these reasons include having to repeat, lack of adequate knowledge in their various subjects, inadequacy of professionally qualified teachers in schools, and insufficient facilities (Lloyd et al 2009). These reasons perhaps have led to the remarks made by Asadu (2003) that Ondo State in Nigeria recorded an unprecedented failure in Secondary Certificate examination in 2000. The failure was particularly in core subjects.

2.9 THE NEED FOR BIOLOGY TEACHING

Even though Biology 5090 performance is bad in Lesotho, it is very important for Basotho children and other learners around the world to learn it. Like many subjects offered at schools, Biology is found to be significant in a number of ways to the lives of learners. Shoop (2010) and Wood (2009) came up with various important purposes of teaching Biology at schools. These are:
To attract, motivate, and begin preparing the next generation of biologists, including the research stars of the future.

To help the large majority of our learners who will not become biologists or even scientists to achieve minimum biological literacy and to understand the nature of science, the importance of empirical evidence, and the basic principles that underlie biological systems. They will need this knowledge of Biology as twenty first century citizens and the world to make intelligent decisions about issues such as personal health, conflicting claims in media, energy policy, climate, and conservation of natural resources.

To help learners think critically. The best method to teach the child to think is through a problem solving attitude, and no subject deals more with problem solving than Biology. It gives the understanding of the manner in which organisms are adapted for life in their physical environment, of interdependence of organisms, of the manner in which natural forces are continually changing the surfaces of the earth, of the relation of the earth and other astronomical bodies, of a conception of the causes and effect relations.

It enables learners to understand the structure and functions of living things and how these living things interact with other members of their own species, with other species, and with their environment.

Biology learning gives learners the opportunity to engage with the work of classical and modern biologists and to join in and initiate debate about how Biology impacts on our lives, society, and the environment.

Learning of Biology helps mankind to find effective ways of preventing, treating and curing diseases and home management techniques. For example, better methods of food preservation, efficient food preparation and care of the family.

Helps in the improvement of agricultural yield through scientific research.
• It helps learners to understand changes in the environment and the factors affecting these changes, in order to know how human needs are influenced.

• It helps learners to know how to use natural resources more efficiently in industry. e.g. in bio-technology, food production, building, textile, and paper industry.

• Through Biology teaching learners develop skills and abilities to explain biological phenomena and to draw evidence-based conclusions from investigations of Biology related issues. Thus, assisting learners in the pursuit of various career pathways.

• In Biology, learners increase their own knowledge of biological principles and concepts. They also develop the ability to use that knowledge to identify questions, issues opportunities, and challenges and to acquire new knowledge through their own investigations.

2.10 HOW SCIENCE (BIOLOGY, CHEMISTRY AND PHYSICS) IS LEARNED AND TAUGHT

There is a great challenge in the way Biology and other sciences are taught in Lesotho high schools. The teaching of science in Lesotho high schools is faced with great challenges which, if not properly addressed, can hinder the learning process. Indeed there is a concern that science teachers are not engaging learners in laboratory inquiry as expected and this affects performance in sciences negatively. There are numerous reasons behind this failure of teachers to engage learners in an inquiry method such as lack of equipped laboratory. In most high schools, teachers use the traditional methods such as lecture method in teaching science. This method fails the majority of learners as teachers are the only source of information while learners remain passively. In agreement with this, Wood (2009) explains that most teachers use the traditional ‘cookbook labs’ associated with many large introductory lecture courses in teaching Biology. And learners perform prescribed exercises in which they learn some laboratory techniques but generally gain little understanding of biological concepts as opposed to scientific inquiry. According to Wood (2009), the traditional methods used fail the majority of learners, who leave the introductory course viewing Biology as a collection of
disconnected facts that have little relevance to their lives and will soon be forgotten. The traditional teaching methods employed in Lesotho high schools are far from optimal for adequate learning of Biology. Hestens, Swachkamer and Wells (1992) contend:

Most undergraduate students in their introductory courses are gaining only very superficial knowledge from traditional methods of instruction. Rather than integrated conceptual understanding and creative problem solving, students were learning fragmented factual information and rote problem solving methods, while retaining many misconceptions about Biology.

Hewitt and Seymour (1997) assert that too many talented learners get the impression from the introductory courses that science is simply a collection of facts to be memorized and consequently dropped out of Science, Technology, and Mathematics (STEM) majors, with little understanding or appreciation of what science is all about. For learners who do major in life science (Biology) there is a concern that future research biologists are being inadequately trained through the traditional methods of instruction (Wood 2009).

The best methods of teaching Biology are through the use of active methods which can substantially increase learners’ performance. Cater, Norbert and Verela (2011) asset that through active learning, learners learn more material, retain the information longer, and enjoy the lesson more as compared with those in a traditional classes. Sciences are best taught by involving learners as science requires hands-on activities. For the learning of Biology, and other science subjects there is a need to vary instructional methods and measuring tools such as simple recall questions on learners. This has been called ‘scientific teaching’ (Wiema 2007). Popular iconoclasts such as Hu (2011) points out the short-comings of passive learning environments for learners at all ages. Hu (2011) advocates instead, more learner-centered and open classrooms that promote active learning rather than simply listening, reading and watching. The learner-centered approach has been described by Weimer (2013) as that whereby the focus of the teaching and learning activity is shifted from the teacher to the learner. It is where the learners are actively involved in their learning and teachers are partners of the learners. However, the involvement of learners in Lesotho in teaching and learning is very scarce. Part of the reason is reluctance of teachers to supervise or monitor the class activities as they require teachers’ presence. Active learning or active methods of teaching Biology substantially increase learners learning grains. Table 2.10.1 below provides the comparison between the traditional methods and active methods.
Table 2.10.1: A Comparison between the Traditional Practice Methods and Active Methods.

<table>
<thead>
<tr>
<th>Course aspects</th>
<th>Traditional practice</th>
<th>Active methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student laboratories</strong></td>
<td>Learners carry out exercises that demonstrate very used techniques or verify important principles by following a prescribed protocol (&quot;cookbook labs&quot;)</td>
<td>Learners are required to solve a research problem, either defined (e.g. identify unknown) or more opened (e.g. determine whether commonly used cosmetic products are mutagenic), and less necessary experimental techniques and concepts in the process (inquiry-based labs)</td>
</tr>
<tr>
<td><strong>Learners-faculty interaction out of class</strong></td>
<td>Learners must initiate out-of-class interaction with each other and with the instructor.</td>
<td>Instructor facilitates interaction with and among learners by setting up online chartrooms, encouraging group work on homework and communicating with learners electronically.</td>
</tr>
<tr>
<td><strong>Out-of-class learning activities</strong></td>
<td>Learners read the text and may do homework to practice the application of concepts previously presented in class.</td>
<td>Learners read and do assigned homework on new topics and post results online for the instructor to review before the class on those topics.</td>
</tr>
<tr>
<td><strong>In class learning activity</strong></td>
<td>Instructor transmits information by lecturing. Some questions may be posted to learners, but only a small subset of the class is engaged in active learning activities facilitated by the teacher. These activities also provide formative feedback.</td>
<td>All class time engaged in variously active learning activities facilitated by the teacher. These activities also provide formative feedback.</td>
</tr>
</tbody>
</table>
Moreover, one of the fundamental problems facing science teaching today in Lesotho is the question of how current the professional teachers are. The majority of teachers who have been employed in the past have been doing the same thing, the same way all along and the just the way they have been taught. They have no knowledge of the current ideas and innovations that have taken place in the educational field in the recent past. What accounts for this is that such teachers have not been given the opportunity for re-training (Adesoji & Olakunoosun 2007). They therefore recommend that teachers should be encouraged to go for training workshops in areas of specialization.

### 2.11 BEST PRACTICAL TEACHING APPROACHES IN BIOLOGY

If the teaching of Biology is to make its maximum contribution to the education and well-being of the society, there are certain teaching approaches that ought to be employed fully in order to facilitate the learning of Biology. These approaches are fieldwork and scientific inquiry.

#### 2.11.1 FIELDWORK IN THE TEACHING AND LEARNING OF BIOLOGY

Fieldwork is one of the effective methods of teaching Biology at all levels. Fieldwork involves the learning of Biology outside the classroom when treating some topics such as

<table>
<thead>
<tr>
<th>Student organization</th>
<th>Likely to participate in discussion.</th>
<th>Most learners work is done individually and competitively.</th>
<th>Most learners work is done cooperatively, in small groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content organization</td>
<td>Prepare a syllabus, describes the topics that the instructor will present in class.</td>
<td>Formulate learners learning objectives in the form of “after this course, student will be able to……”</td>
<td>Floyd (2008)</td>
</tr>
</tbody>
</table>
pollution, ecology, and other topics. It involves out-of-classroom activities, including practical work in the school premises. This is the field whereby science becomes alive and where acting locally becomes thinking globally. During fieldwork, young people have the opportunity to have ‘hands on’ experience outside the classroom, and this enables them to recall easily the activities they have done during fieldwork. Baker, Slingsby and Tilling (2002, p.5) argue that, ‘Every little Biology from school, it is often the fieldwork aspect that is first recalled. It seems that we all remember what we saw and what we did more’.

They further indicate that in the field of education whereby there is a mixture of teaching and learning approaches including ‘hands on’ and differentiated learning, which characterize much outdoor teaching, fieldwork does help the need of the whole class. Fieldwork in the teaching of Biology is found to be very advantageous to both learners and teachers in various ways. Therefore, if employed in the teaching of Biology in Lesotho one would expect better results in the future.

Advantages of Fieldwork in the Teaching and Learning of Biology (Baker, Slingsby & Tilling 2002)

- Biology as a discipline has its roots in fieldwork in natural history. Indeed a long and distinguished line of British Biologists such as the Revered Gilbert White (1720-1793), John Ray (1628-1705) and Charles Darwin (1809-1882) used fieldwork as an essential tool to observe, collect and process data on species and habitats.

- Fieldwork offers learners a particularly good opportunity to collect numerical data on a large scale, either working individually or in groups, and to subject the data to statistical analysis in an open-ended manner. This can rarely be achieved in the laboratory where the tendency is for most practical investigations to be simplified or “sanitized”.

- In the teaching of Biology, fieldwork include: provision of an excellent opportunity for learners to work as a team, which is in itself an important part of personal and social education. It also helps to discover what it is like to work purposefully out-of-door in varying weather conditions, to learn to appreciate natural history and to link theory and observation.
• All science is rooted in observation of the real world, leading to questions, hypothesis, predictions and experiments. Biology fieldwork provides one of the places in science curriculum where learners quite literally observe the real world and use it as a basis for scientific inquiry.

• Outdoor Biological teaching introduces learners to unfamiliar environment, which they may not otherwise see; hence they are able to see the natural world which is remote from their everyday lives.

• Ecological fieldwork where living animals and plants are encountered in real habitats can help to put fun and enjoyment back into a content dominated curriculum.

• Fieldwork provides an opportunity for teachers to develop a different and, potentially, more positive and productive relationship with their learners. It can deliver a joined-up teaching at best.

• Fieldwork helps to motivate and inspire children who may otherwise be sidelined by a more classroom based situation. They further explain that the dynamics and interrelationships developed whilst working in groups can have a larger influence on how students develop socially.

2.11.2 THE INQUIRY APPROACH IN THE TEACHING AND LEARNING OF BIOLOGY

The other approach that can yield good results if employed in the teaching of Biology in Lesotho is the inquiry approach. It deals with the understanding of the nature of science. It requires the constant asking of questions about how and why things happen the way they do. Scientific inquiry is crucial for defining the characteristics of scientifically literate persons (Ogunmade 2005). And the understanding of the nature of scientific inquiry is an important goal of science education as it enables teachers to be creative and enrich learners’ abilities in understanding science concepts and processes.
The inquiry learning takes the form of investigation or practical work amongst learners. It involves learners investigating, asking authentic questions and constructing reasonable explanations for the questions formulated through an inquiry approach in science teaching and learning so that they understand the world around them and become scientifically literate. Also scientific instruction in Biology enables learners to formulate their own questions, devise ways to answer questions through data collection, analyze and determine the reliability of the knowledge acquired. Ogunmade (2005) further indicates that through inquiry-oriented teaching, teachers could help learners to build their interest in the materials and activities. It can encourage their thinking and discussion for a variety of investigatory paths which fits the lesson content and learners’ intellectual level with everyday social application problems.

Edelson, Gordin and Pea (1999) further argue that participation in inquiry can provide learners with the opportunity to achieve three interrelated learning objectives: the development of general inquiry abilities, the acquisition of specific investigation skills and the understanding of science concepts and principles. As a result, inquiry learning was called for by many governments and curriculum developers. The Lesotho Junior Certificate curriculum also encourages the use of this approach. Therefore, it is through this approach and others involving learners that can change Biology performance in Lesotho. The National Science Education Standard (NRC 1996, p.23) refers to scientific inquiry as:

... the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world.

Thus scientific inquiry involves learners ‘working scientifically’ through investigating, understanding and communicating as a way of learning science. Literature in science education describes three levels of inquiry-based teaching and learning. These include: structured inquiry, guided inquiry and open inquiry (Colburn 2000). Colburn (2000) describes structured inquiry as one that involves the teacher engaging learners in problem-solving activities and provides them with procedures and materials to discover and generalize on their own from data collected. Essentially, the approach prescribes what learners are to observe and which data they are to collect. General inquiry on the other hand involves the
teacher providing only the materials and problems to investigate while learners manufacture the material and solve the problems on their own. Open inquiry is similar to guided inquiry but there is the addition that learners also formulate their own problems to investigate. Open inquiry, in many ways, is analogous to doing science and a typical example of learners open inquiry could be the science fair or science talent search project (Hackling 1998).

Over the years, research in science education has compared inquiry-based and traditional teaching and learning approaches in science (Bell et al. 2003). A typical example is that of Lott (1995). Lott (1995) conducted an analysis of 39 studies involving exposing and inquiry-oriented approaches in science and found that teachers who encouraged inquiry approaches in their teaching have learners who perform better than those taught used traditional approaches when higher-level cognitive processes were emphasized, but perform equally well on low-level cognitive processes. Thus the inquiry-based approach helps to develop a high level of cognitive skills in learners and improves learning outcomes among learners. If Biology teachers in Lesotho could use inquiry approach in their teaching, learners would understand concepts much better.

In Nigeria, the inquiry approach has been recognized as a crucial teaching strategy for improving student learning of science (FGN 1998). The National Policy on Education (FGN) (1998) affirmed that the teaching of Biology in schools should be guided by discovery and inquiry approaches. However, studies indicate that inquiry teaching and learning approaches are rarely practical in science classrooms because of lack of resources for effective practical work, among other factors (Ajewole 1994).

Ogumbowale (2001) points out that the broad scope of the science curriculum and emphasis on quantity of content coverage are the major constraints on inquiry approaches in science teaching and learning in Nigerian schools. However, the literature suggests that when teachers teach less content, they teach it better by introducing ideas in a variety of ways and thus encourage learning (Wenning 1997). For this study, science inquiry could be referred to as an approach in which teachers create an enabling environment for students’ curiosity and engage them in scientific investigations to solve problems that satisfy their ideas about the natural world. Through engaging learners in inquiry method their understanding of science could be facilitated. As a result, they could be able to interpret questions correctly even in the examination.
2.12 THEORETICAL FRAMEWORK

This research employed the General System Theory (GST) as the theoretical framework for this study. Higgs and Jane (2008) define system theory as a general science of organization and wholeness; it is also regarded as a philosophy that claims that life is a system of which we are a part. The key assumptions in system theory are that, everything including human being is a system of some sort (Higgs and Jane 2008), and all systems are purposeful and goal directed (Bowen 2009). That is, systems are goal seeking and they move in the direction of goal achievement. Systems without well-defined goals often go in many different directions. In order to achieve goals of the system, all parts of a system should work in harmony with one another and their environment.

The General System Theory (GST) was originally developed by a Biologist Ludwing Von Bertalanffy (1928). His assumptions pertained primarily to the study of living organisms, machines, galaxies and organizations. He postulates that parts of a system do not work in isolation, they work within a system. His postulation countered a popular scientific view that a system could be understood first by breaking it down into its components so that each component could be studied and analyzed as an independent entity. And that the components could be added in a linear fashion to describe the totality of a system. Bertalanffy (1968, p.38) defines a system as ‘sets of elements standing in interrelation’. Systems can either be closed or opened. The system theory according to Ahrweiler (2011) postulates that an organized enterprise does not exist in a vacuum; system theory works on the inside and outside of the organization, as a way of understanding and anticipating the consequences of any decision. That is, the system depends on its environment in which it is established. The inputs from the environment are received by the organization, which then transforms them into outputs. The school is the example of an open social system in which two or more persons work together in a coordinated manner to attain common goals (Norlin 2009). This definition is useful; for it specifies several important features of schools: (1) they consist, ultimately, of people; (2) they are goal directed in nature; (3) they attain their goals through some form of coordinated effort, and (4) they interact with their external environment. All schools are open systems, though the degree of interaction with their environment may vary. The school is a system with the following components, environment, inputs, transformation process, out-puts and the feedback (Scott 2008) as depicted in figure 1.
The open system is that type of a system that receives inputs from the environment and releases the outputs to the environment. Any change in the environment can have a profound impact on the open system. Parts of the system interact for the school system to succeed in locating the source of the problem and hence find the solution.

**Figure 1. The open system**

**Environment**

**Organization**

**Feedback**

General System Theory advocates, according to Scott (2008), have recognized that any change in any factor within the organization (school) has an impact in other components. That is, schools inputs (learners), processors (teachers) and generator (management) should all function well in order to achieve the desired goal (obtaining good grades in Biology 5090 at the end of the course). In the context of managing the problems, either the internal or
external problems, systems develop group boundaries that define insiders and outsiders and rules for behavior that regulate interactions and exchange (Bowen 2009).

This theory is adopted in this study because the school is an example of the social open system with goals to achieve, boundaries, and rules governing behavior of people involved. One of the major goals of the school is to produce good results. But if parts of the system (schools) do not work together as expected, set goals would not be achieved as expected. That is, if the management, parents, teachers, and learners do not work together, obtaining good results would be impossible. Learners are human resources (inputs) admitted into schools at senior level with different admission points. For example, others are repeaters from various schools, direct entry from junior level with pass score in science and others with high scores, others without background of Biology. The management of the school through their teachers transforms them through the process of teaching and learning. Since the major goal of the school is to educate learners, the output which is achievement would be reflected as grades at the end of COSC.

With regard to this study, all parts of the school as a system could affect Biology 5090 performance negativley if there can be discrepancies between them. As knowing something about one part of the system helps us to know something about another part. This implies that, learners, Biology teachers, the management and parents can affect Biology 5090 performance negatively should there be discrepancies. This can be illustrated by these few examples:

(a) Failure by parents to buy books and pay school fees on time affects Biology 5090 performance because learners are expelled.

(b) Reluctance of the management to hire qualified Biology teachers, buy laboratory chemicals and other teaching aids affect Biology performance negatively.

(c) Poor school management leading to truancy for both learners and teachers is also a sign of poor performance in Biology.

(d) Failure of teachers to prepare their lessons as expected could lead to poor performance as they would always give summaries of topics rather than elaborating on the content.

(e) Learners not doing the work assigned to them by their teachers and being uncontrollable would also be a sign of poor performance.
The examples given above indicate that a school is a system, and if any part of the system does not work as expected, set goals would not be achieved as the parts are interrelated. This implies negative feedback or poor results. Higgs and Jane (2008) argue that parts of the system must work in harmony in order to achieve the overall goals. According to input-output model developed by Bertalnffy (1968), it is assumed that learners with high pass scores from junior to senior level or from senior to tertiary, with good economic background, and good school background perform well if the school facilities are good. And in the mix there should be qualified teachers, and diligent school management (positive feedback). This, however, is not always the case and it is the shortcoming of this theory though adopted in this study since schools are systems. There are goals set, too, that ought to be achieved at the end. That is, a school exists to achieve objectives (goals) through the collaborative effort of individuals and groups in the system. A good example could be the learners’ achievements as reflected in grades and end-of-the-year performance evaluations as a major purposeful goal of schools as a social system. Failure of people involved to work collaboratively would result in poor performance. Moreover, this theory is adopted because Biology is a subject of systems. A Biological system is a group of organs working together to perform a certain task. For example, circulatory system present in mammals is composed of organs such as the heart, blood, blood vessels and the lungs. For the circulatory system to function well, all organs should work as expected.

According to Onen and Oso (2005), the interrelationships among parts of the system have to be understood by all parties involved. This theory requires a shared vision so that people in each school have an idea of what they are trying to achieve from all parties involved, a task that is not easy to achieve. If the major aim is to produce good results in Biology 5090, for example, parents should buy text books, pay school fees on time, the management hire qualified Biology teachers, buy teaching aids and ensure a smooth running of the school daily. Learners, too, ought to be responsible for their work; they should always do the work assigned to them and consult teachers whenever possible. However, this is not possible and these discrepancies in the school system affect Biology 5090 performance negatively in Lesotho high schools.
2.3 CONCLUSION

This chapter has dealt with literature review on academic performance. To examine performance, data sources were obtained from international, regional and local sources. The data exist in the form of booklets, electronic materials from the internet, individual researchers, publications from the government departments, and personal experiences to name a few. General academic performance, grading and Biology 5090 performance in Lesotho were dealt with. Factors affecting performance were also provided and explained. Though performance is bad in Biology 5090 in Lesotho high schools, the value of teaching it was explained. Various ways on how science is learned, taught, and the best ways of learning it were also dealt with. The chapter also dealt with the General System Theory as the theoretical framework for this study. It explained that a school is system whereby parents, learners, teachers, and management should work together to achieve set goals such as good performance.
CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter addresses the following sub-topics: the research design, research approach, research paradigm, and the setting where this research was carried out. It also describes the process of choosing the cases. Data was collected through interviews and document analysis. Qualitative content analysis was used to analyze data collected. The sampling procedure, rigour, and ethical considerations were also described.

3.2 THE RESEARCH DESIGN

A research design is described as a plan or a strategy of how a researcher intends to conduct the research in order to address the research questions. It is essentially a plan aimed at enabling answers to be obtained from the research questions (MacMillan & Schumacher 2009). The research design can either be qualitative, quantitative or mixture of the two.

Since the study focused on causes of low performance and how performance can be improved in Biology 5090 at selected high schools in Lesotho, the qualitative interactive case study was adopted. The researcher required face to face interaction with the participants at their natural settings (schools) during data collection in order to obtain adequate data. Therefore, case study allowed the researcher to interact socially with participants during data collection using semi-structured interviews to achieve a deep understanding. Additionally, data required was in the form of words, requiring explanations and descriptions. That allowed the researcher to search and explore deeply the causes of low performance in Biology 5090 and how performance could be improved. A deep understanding was achieved by probing participants during the interviews and by looking at the participants’ words, beliefs and actions.

Due to the fact that qualitative research assumes multiple realities, case study allowed the researcher to study the phenomenon using different cases at different sites. The researcher gathered rich different views regarding causes of low performance and how performance
could be improved from three different teachers of three different schools. The primary data collected was complemented by secondary data whereby documents such as past tests, internal examinations questions papers and marks obtained in both were collected.

3.3 METHOD DISCRIPTION

This research employed qualitative research approach whereby interviews and document analysis were used for data collection. Qualitative research is described as a systematic subjective approach used to describe and explain a person’s life experiences and give them meaning. The main goal of qualitative researchers is to gain insight, explore the depth, richness, and complexity inherent in the phenomena (Creswell 2008).

A qualitative inquiry is found to be most appropriate when the goal of the research is to understand the phenomena, uncover the meaning a situation has for those involved, or delineate a process (Merriam 2009). Qualitative researchers strive to understand and make sense of phenomena from the participants’ perspective through field notes, interviews, conversations, photographs, recordings and research journals. Stake (2010) explains that there are four central characteristics of qualitative research. That is, qualitative research is characterized by the search for meaning and understanding of a particular phenomenon from the participants’ point of view. The researcher’s role is to collect and analyze data. Qualitative research is an inductive investigative strategy, and a richly descriptive end product.

Merriam (2009) delineates several characteristics regarding the major constituents of a qualitative inquiry paradigm. The first characteristic of the qualitative research lies in the purpose of the qualitative research. Thus, qualitative researchers emphasize that individuals in interaction with their world socially construct meaning. They are interested in understanding the meaning people have constructed so as to understand the phenomenon in its uniqueness as part of a particular context and interactions. It is assumed that meaning is mediated through the investigator’s own perceptions. In direct contrast to a quantitative research paradigm, qualitative researchers highlight the world or reality not as fixed, single, agreed upon, or measureable phenomenon, rather, reality as multiple constructions.
Qualitative researchers are interested in understanding specific interpretations at a particular point in time and in a particular context. Patton (1995, p.1) explains:

Qualitative research is an effort to understand situations in their uniqueness as part of a particular context and the interactions. This understanding is the end in itself, so that it is not attempting to predict what may happen in the future necessarily, but to understand the nature of that setting...what it means for participants to be in that setting, what their lives are like, what’s going on for them, what their meanings are, what the world looks like in that particular setting....The analysis strives for depth of understanding.

A second characteristic of all forms of qualitative research is that, the researcher is the primary instrument for data collection, generalization, and analysis. Since understanding is the primary goal for this research, the researcher can expand his or her understanding through non-verbal as well as verbal communication; processes data immediately, clarifies and summarizes materials, checks with participants for accuracy of interpretation, and explores unusual or unanticipated responses. Third, the qualitative research process is inductive, as the researcher uses data to generate concepts, hypotheses, or theories rather than deductively deriving postulates or hypotheses to be tested. Finally, the end product of a qualitative inquiry is richly descriptive, as data is in the form of words, pictures, quotations, field notes documents, or participant interviews are used to convey what the researcher has learned about a particular phenomenon. Morse and Richards (2002) suggest that research topics amenable to qualitative inquiry are those topics that either have been relatively ignored in the literature or require a new way of examining them.

Therefore, the researcher found qualitative approach appropriate for undertaking this study because the major concern was to find out causes of low performance in Biology 5090 and how performance could be improved in Lesotho High schools. As a result, the present research required data that was in narrative such as explanations and descriptions. The data generated by this method was more complex than what could be achieved through “yes” or “no” responses. Moreover, the researcher interacted socially with participants at their natural settings so as to conduct interviews that yielded adequate data. No research approach could have yielded more data in a narrative way than the qualitative approach as the views and recommendations of respondents were of value for the present research.
3.4 THE INTERPRETIVISM PARADIGM

The qualitative methodology shares its philosophical foundation with the interpretive paradigm which is used to obtain an understanding of the world from individual perspective (Morgan 2007).

The aim of interpretivism is to understand the subjective experience of those being studied, how they think and feel and how they act or re-act in their habitual context. The interpretive approaches rely on methods of data collection like interviews and analysis of existing texts (Crofts, Jeremy & Sylvia 2011). These methods ensure an adequate dialogue between the researcher and those with whom they interact in order to collaboratively construct meaning. Additionally, the interpretive paradigm supports the view that there are many truths and multiple realities, and is associated directly with the qualitative research as it possesses all the characteristics of the qualitative approach described above. And then it was adopted in this study.

The interpretive paradigm helped the researcher to select methods of collecting data that enabled her to interact with participants socially at their natural settings. It helped her to recognize the value and depth of understanding of different participants in relation to causes of low performance in Biology 5090 at their schools. Different participants at different schools understood causes of low performance in Biology 5090 differently and how performance could be improved. Since participants were from different schools, with different qualifications, and different periods of service, they viewed causes of low performance differently as interpretative paradigm assumes multiple realities. Participants were able to describe their different perceptions and understanding about causes of low performance in Biology 5090. That helped the researcher to better understand the phenomenon about which little was known, to gain new perceptive on causes of low performance in Biology 5090 about which much was already known, and also to gain an in-depth information on Biology 5090 performance in Lesotho which might be difficult to convey quantitatively.
3.5 THE RESEARCH SETTING

In Lesotho, where this research was undertaken, education is governed by the Ministry of Education and Training (MOET) through various departments. These include ECOL, responsible for examinations, National Curriculum Development Centre (NCDC), responsible for the development of the curriculum, and Central Inspectorate (CI), responsible for inspection of schools.

Sixty nine high schools are distributed over the ten districts into which the country is administratively divided. However, the study involved three high schools in the vicinity of Maseru which is the capital town. The general performance at COSC in Lesotho has been below average for the past years. The percentage pass in Maseru for 2012 was 54% and the overall performance in Biology 5090 for the whole country was 55.85% better than the previous year’s except in 2008.

There are two teacher training institutions in Lesotho. Namely, the National University of Lesotho (NUL), and the Lesotho College of Education (LCE). NUL offers degrees while LCE offers diplomas. Biology teachers with degrees were exposed to more laboratory work and more content than those with the diplomas. Due to this fact, they are said to be licensed and therefore had the ability to present content and run the practicals as expected as opposed to diploma holders. Teachers with degrees were believed to produce better results than those with diplomas.

3.6 SAMPLING PROCEDURE

For the selection of participants, the researcher employed purposive or purposeful sampling. Purposive sampling is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which most can be learned (Merriam 2009). Participants selection was based on the purpose that they could provide information required as their schools had been performing below average in most years from 2006 to 2012 in Biology 5090. Patton (2009, p.128) explains that ‘purposeful sampling focuses on selecting information-rich cases whose study will illuminate the questions under study’. In other words, these samples are chosen because they are likely to
be knowledgeable and informative about the phenomena the researcher was investigating. They were believed to have deep understanding regarding the study.

For this study, the researcher selected three schools whose performance in Biology 5090 was found to be below average for most years from 2006 to 2012. Those schools were identified easily using data from the Examinations Council of Lesotho indicating the performances of all schools doing Biology 5090 from 2006 to 2012. One Biology teacher per school participated in this study. The selection of schools was done deliberately because the participants (teachers) were believed to be knowledgeable within the focus of this investigation. That is, they were assumed to have useful information regarding causes of low performance in Biology 5090 and ways in which teachers can improve the performance. Schools selected and teachers taking part in this study were given fictitious names for ethical purposes. The criteria used to determine schools included:

(a) Schools whose candidates sat for COSC Biology 5090 examination from 2006 to 2012.

(b) Schools that performed below average in Biology 5090.

(c) Schools within reach.

Pseudonyms for schools selected were Machache high school, Popanyane high school and Moreneng high school. Participants were recruited through writing letters to principals of selected schools asking for permission to conduct interviews at their schools. Letters were also written to participants asking for their permission to participate in the study through answering interview questions.

Tables provided below indicate performance of schools selected for sampling from 2006 to 2012. A1 to C6 shows the alphabetical GCE grade awarded while D7 and E8 are ordinary level pass and U9 is ungraded or fail.

**Table 3.6.1: Biology 5090 Performance from 2006 to 2012 in Machache High School**

<table>
<thead>
<tr>
<th>Years</th>
<th>Grades</th>
<th>Total no of learners who sat for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>Grades</th>
<th>Total no of learners who sat for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
</tbody>
</table>
Table 3.6.2: Biology 5090 Performance from 2006 to 2012 in Popanyane High School

<table>
<thead>
<tr>
<th>Years</th>
<th>A1</th>
<th>A2</th>
<th>B3</th>
<th>B4</th>
<th>C5</th>
<th>C6</th>
<th>D7</th>
<th>E8</th>
<th>U9</th>
<th>Total no of learners who sat for 5090 exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>14</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>14</td>
<td>20</td>
<td>53</td>
</tr>
</tbody>
</table>

(ECOL 2011, 2012)
Table 3.6.3: Biology 5090 performance from 2006 to 2012 in Moreneng High School

<table>
<thead>
<tr>
<th>Years</th>
<th>A1</th>
<th>A2</th>
<th>B3</th>
<th>B4</th>
<th>C5</th>
<th>C6</th>
<th>D7</th>
<th>E8</th>
<th>U9</th>
<th>Total no of learners who sat for 5090 exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>26</td>
<td>45</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>26</td>
<td>39</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>19</td>
<td>32</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>15</td>
<td>21</td>
<td>56</td>
</tr>
</tbody>
</table>

3.7 THE PROCESS OF CHOOSING THE CASES

In choosing the cases, the researcher required teachers who had majored in Biology and any other science with at least three years teaching experience. The researcher wrote letters (appendix B) to principals of selected high schools asking for permission to conduct the study at their schools. The other letter (appendix C) was written to Biology teachers asking for their permission to participate in the study by answering the interview questions.
The researcher visited the schools one at the time, met with the principals and explained the purpose of the visit and of the research. Head of Department (HOD) for science was introduced to the researcher by the principal. The researcher explained herself and stated the purpose of the visit. After listening and asking questions, the HOD recommended one of his or her Biology teachers, whom he or she thought would be the suitable candidate to work with the researcher. After making the necessary introduction, the researcher was left with the relevant teacher. The researcher further explained the purpose of the visit and of the research to the teacher and handed the letter (appendix C). The participant read the letter and agreed to work with the researcher. The researcher explained that she would notify the participant about when to have the interview and asked the participant to write the letter indicating that she or he had agreed to take part in the study. The researcher got two agreement letters from each school.
3.8 THE CASES

The cases are well explained and fictitious names for the participants and their schools were used for ethical purposes.

3.8.1 MR MACHANGOENE FROM MACHACHE HIGH SCHOOL

Machache high school was established in 1982. It had the roll of 550 Basotho learners in 2013. It is a mixed-day school with adequate infrastructure such as classrooms. However,
there was one science laboratory at Machache high school with old furniture. It seemed as if it was a good laboratory in the past, but had deteriorated. There was a good stock of chemicals and equipment. Organization was poor because all those laboratory materials had been left everywhere in the laboratory, even on tables in the preparation room. Re-organization could put the laboratory back into its good shape. The teacher claimed that frequent breakdown of the taps and other equipment made the laboratory nearly unusable.

The school had three Biology teachers, the principal, the HOD and Mr. Machangoene. Though the researcher wanted participants with more experience, the principal and the HOD could not participate in the study. They claimed that they had not been teaching Biology 5090 for some years and it had been taught by other teachers. However, Mr. Machangoene agreed to take part. Mr. Machangoene had been teaching Biology 5090 at Machache high school from January 2010 to the date. He had approximately three years of teaching experience. His highest qualification was diploma in science education, and his subjects of specialization were Biology and Chemistry. Biology 5090 was apportioned six lessons per week, two double lessons and two singles. Table 3.6.1 shows the performance of Machache high school in Biology 5090 from 2006 to 2012.

3.8.2 MR PALI FROM POPANYANE HIGH SCHOOL

Popanyane high school was established in 1981. It had the roll of 173 Basotho learners in 2013. It is a mixed day school with many good empty classes which were not in use at the time. There was no science laboratory and it had never ever existed. There was no electricity at that school. The number of learners doing Biology 5090 from 2006 to 2012 had been less than 35 (see table 3.6.2).

Mr. Pali and the principal were the only Biology teachers. Mr. Pali had been teaching Biology 5090 for seven years, three years were spent at another school and four years at the present school. His highest qualification was Bachelor of Science (BSC general) with specialization in Biology and Chemistry. His degrees were not in education and he was, therefore, not a qualified teacher.

At Popanyane high school, Biology 5090 was given five lessons per week, two double lessons and one single lesson. Table 3.6.2 shows performance of Biology 5090 for Popanyane
high school from 2006 to 2012. The performance shown in table 3.6.2 is indeed poor since more learners failed to obtain credit in Biology. For example, in 2006 none of the learners who sat for Biology 5090 passed the course (the percentage pass was zero) while in 2007 one learner got credit (B3) the rest failed. This indeed showed the disappointing performance in Biology 5090 at Popanyane high school.

3.8.3 Mrs. Mamorena from Moreneng High School

Moreneng high school was established in 1965. It had the roll of 683 Basotho learners in 2013. It is a mixed-boarding school with a very good infrastructure though other learners were day’s scholars. There was electricity at that school.

There were three Biology teachers at Moreneng high school, Mrs. Mamorena who was the HOD for science and other two teachers. Mrs. Mamorena had thirty two years of teaching experience. She had taught at Popanyane high school for two years and transferred to Moreneng high school since then. Her highest qualification was the Bachelor of Science in education with majors in Biology and Chemistry. She had taught Biology 5090 at Moreneng high school from 1990 to 2004 and stopped and taught Mathematics at the junior level until 2010. In 2011 she once again began to teach Biology and the performance of her learners is shown in table 3.6.3 for 2012. The overall performance of Moreneng in Biology from 2006 to 2012 is provided on the same table 3.6.3. Biology 5090 had been allocated six lessons per week, two double lessons and two single lessons.

Moreneng high school had three science laboratories, Biology laboratory, Chemistry laboratory and Physics laboratory. Three of them had preparation room, store room and learners’ room. However, those laboratories were not in good condition. The furniture was old, the water taps were not functioning properly, and most chemicals had expired. They appeared to have been good laboratories in the past.
3.9 RIGOUR

In order to ensure rigour for the present qualitative design, the study incorporated traditional evaluation criteria and pilot study whereby the data gathering instruments were piloted. Traditional evaluation criteria for qualitative inquiry included credibility, auditibility, transferability, and conformability. For this study credibility and auditibility were used to achieve trustworthiness.

3.9.1 CREDIBILITY

*Credibility in research according to Bryman (2012, p.49) relates to the question ‘can these findings be regarded truthful?’ or ‘how believable are the findings? Credibility asks whether the expiation fits the description and whether the description is credible.*

In trying to find how truthful the qualitative results are, credibility or true value is involved. Credibility involves establishing that the results of the research are believable. It is only the participants of the research who can judge the credibility of the results (Mike 2011). Credibility refers to the degree to which a study’s findings represent the meanings of the research participants (Melkus 2008). True value is described as a twofold task. Firstly, researchers should conduct the qualitative inquiry in such a fashion that the probability that the findings will be credible is enhanced. Secondly, researchers should demonstrate the credibility of the findings by having them approved by the participants of the multiple realities being studied.

For the present study, credibility was achieved by avoiding bias and research reactivity. Research reactivity refers to the potential for the researcher or study procedures to exert an impact on the participants, thereby changing the findings of the study (Padgett 2008). With regard to the present study, this was avoided as much as possible by avoiding leading statements when constructing the interview guide, and of course, even when probing. For example, when the participants did not give enough factors affecting Biology 5090 performance, they were probed by saying, ‘what other factors did you have? Rather than saying, ‘do you think there is any connection between students’ behavior and their
performance?’ The researcher tried as much as possible to maintain the same tone and facial appearance so as to avoid research reactivity.

In order to avoid bias the same procedure was followed with all participants during the interviews and non-verbal communication was avoided as much as possible. All the interviews were allocated for one hour not more than that. For instance, each participant was given the opportunity to refuse to participate in the study so as to ensure that data collection strategies involved those who were genuinely willing to take part and ready to offer data freely. Moreover, the research findings were presented as accurately as possible so that participants involved could recognize them as their own. Sandelowski (1986) supports this by saying:

A qualitative study is credible when it presents such faithful descriptions of a human experience that the people having that experience would immediately recognize it from those descriptions or interpretations as their own.

Credibility of the results is also strengthened by the two researchers analyzing and discussing the results of the study (Padgett 2008). It can also be enhanced by the researcher describing and interpreting his or her own behavior and experiences as a researcher in relation to the behavior and experiences of the participants. In order to add credibility to the present data and findings, techniques used were triangulation and member checking.

3.9.1.1 TRIANGULATION

Triangulation can be described as the application of several research methodologies, two or more theoretical perspectives, data sources, investigations or data analysis methods in the study of the same phenomenon (Hussein 2009). It is done in order to improve the chances that the findings and interpretations would be found credible. It can further be explained as ‘the careful reviewing of data collected through different methods in order to achieve a more accurate and solid estimate of qualitative results for a particular construct’ (Allen & Oliver-Hoya 2006, p.102). The use of triangulation originated in the social sciences by the work of Campbell and Fiske (1959) through the idea of ‘multiple operationism’ towards validating the research results. At present it is used by many qualitative researchers to validate the results.
However, in the present study, the concept of triangulation refers to a powerful technique that facilitates validation of data through cross verification from more than two sources. This type of triangulation is said to be methodological. Specifically, in an attempt to triangulate my findings, data from multiple sources were cross checked to search for regularities in the search data. For the present study, interview and document analysis as methods of collecting data were used simultaneously to enhance triangulation. The researcher hoped to overcome the weakness or intrinsic biases and the problems that come with a single method. The intention of using it was to decrease, negate, or counter balance the deficiency of a single strategy, thereby increasing the ability to interpret the findings. For this study, the researcher related two types of information so as to leave the validity of each type of information intact. Triangulation allowed the researcher to capture a more complete, holistic and contextual portrayal and revealed the varied dimensions of a given phenomena, with each source contributing an additional piece to the puzzle. In using it, biases were minimized and validity enhanced.

3.9.1.2. MEMBER CHECKING

The other technique ensuring that the results of a qualitative study are believable and trustworthy from the perspective of a participant is member checking. Member checking involves asking participants whether or not the researcher accurately described their experiences. In other words, it can mean informants reading any transcripts of dialogue in which they have participated. This makes informants aware of whether their words match what they actually meant. In order to enhance credibility, the researcher returned the findings to the participants so as to determine if the findings reflected their experiences. That was of value to the present research because the participants were provided with the opportunity to recall exactly what happened during data collection, even to assess the degree of correspondence. That provided them with the opportunity to correct errors of facts and add facts or feelings that were not mentioned during the first meeting. Member checking further provided the opportunity to assess intentionality. That is, what it was that the participants intended to state.
3.9.2 AUDITABILITY

According to Padgett (2008) auditability refers to the degree to which research procedures are documented allowing someone outside the project to follow and critique the research process. Audit trail allows any researcher from outside to trace the course of the research step-by-step via the decision made and procedure described. In order for the present research process to be logical, traceable, and documented, an audit trail was constructed. Auditability was achieved throughout this study by leaving a clear decision trail concerning this study from its inception to its conclusion. This actually means that another researcher can follow the progression of events in this study and understand their logic. This involved describing the specific purposes of the study, how data was collected, how it was reduced or transformed for data analysis and rigour. For example, with regard to the present study, all background literature, the problem statement, aim of the study, assumptions, the research approach, methods of data collection and analysis, rigour and other related materials were adequately described throughout the length of this paper in order to achieve a logical and traceable methodology.

3.9.3 PILOT STUDY

The researcher carried out the pilot study at Machache high school. The nearest and more accessible school to where the researcher resides. The study comprised of one Biology teacher who had been teaching in that same school since 2010 to the date as his first experience. His highest qualification was a diploma in science education, with Biology and Chemistry as his areas of specialization. The teacher answered the interview questions (appendix E) and provided the researcher with the documents requested. These included both question papers and marks obtained in tests and internal examinations and some Biology 5090 analyses for external examinations (COSC) from 2006 to 2012 developed at the school.

The pilot study helped the researcher to determine if the interview questions were well framed to be easily understood by the respondents and whether they could be administered with ease for a large-scale study. It further assessed whether each question gave an adequate range of responses as expected. However, the respondent did not answer some of the questions as expected. That might be due to the limited experience in the field of teaching
and, of course, with little knowledge of history of the Biology 5090 performance of Machache high school. Sometimes answers were repetitive as if one question had been asked several times though it was not the case. The researcher, however, tried as much as possible to clarify questions to avoid similar responses not required and probed where necessary. Furthermore, responses were sometimes very brief although the researcher was expecting to hear more from the respondent.

It has to be noted that the respondent did not provide the researcher with all the documents requested since he was new at that school. He was only able to provide the researcher with some Biology 5090 results analyses for the years 2006 to 2012. The analyses were found from the principals’ office and some mark sheets for the internal examinations. As for the question papers for the tests and internal examinations, and marks for the tests, they were not traceable. Only a few questions papers and mark sheets for the tests were found and made available to the researcher. The researcher was expecting to collect more documents for this research, beginning with the pilot study, though few were collected. The analysis was based on the available data collected.

Indeed the pilot study was beneficial to the researcher in a number of ways: for the large-scale study, the research ought to probe the respondents often during the interview in order to get enough data as expected, clarify some questions where there was a need, and be patient until the missing documents were made available.

3.10 METHODS OF DATA COLLECTION

The methods used for data collection for the present study were interviews coupled with document analysis. These methods were used simultaneously due to the fact that a multi-method strategy enhances the credibility of the study. Data for the present research was audio taped and notes were taken and recorded in the field notebook.
3.10.1 INTERVIEWS

“The purpose of interviewing, then, is to allow us to enter into the other person’s perspective” (Patton 2009, p.341).

The fact that the main focus was to achieve sound reasoning, and thorough explanations as much as possible, the interview method using open-ended questions best suited the task. Through the interview, participants were given an opportunity to express their views at length and in greater detail regarding questions asked such as, ‘what are causes of low performance in Biology 5090?’ The interviews further provided in-depth information pertaining to the participants’ experience. Open-ended questions have high validity. They allowed for more depth in understanding and evoked responses that were rich and thick. They were explanatory in nature, meaningful and culturally salient to the participants. Open-endedness allows the participants to contribute as much detailed information as they desired (Turner 2010).

Through interviews, the researcher, too, had the opportunity to respond immediately to what the participants said by tailoring subsequent questions with regard to the information the participant had provided. It was also preferred because when participants did not give enough information as expected, the researcher probed them as a means of follow-up. They were prompted to elucidate further if necessary or to encourage the interviewee to consider the questions further, and even asked for explanations in some areas when the need arose (Turner 2010).

Probing can be described as a way for the interviewer to explore new paths which were not initially considered or the way the researcher stimulate participants to produce more information without putting herself in. Probing was important for this study because when participants did not answer questions satisfactorily, the researcher probed them. To add on that, when some questions seemed not to be clear, the researcher clarified them hence answering was easier. Furthermore, it gave participants the opportunity to respond in their own words rather than forcing them to choose from fixed responses. Qualitative interview is described as an interactive conversation between an interviewer and the participant on questions related to the research study (Merriam 2009). The major aim is to get detailed information in the form of narratives or stories of people’s experiences, and shared knowledge. Detailed descriptive data was obtained by asking people questions, making follow-ups or probing so as to get adequate responses as expected.
There are various types of interviews such as an in-depth interview, a structured interview, unstructured interview and semi-structured or standardized open-ended interview. For this study, the standardized open-ended interview was used. It is the type of interview characterized by its structure format in that, it is extremely structured in terms of the wording of the questions. Participants are always asked identical questions, and these questions are worded so that responses are open-ended (Wilson 2012). In this case open-endedness allowed the participants to contribute as much detailed information as they desired. Participants were also able to express their viewpoints and experiences at length as much as they desired since questions were open-ended. To add on this, it was further preferred because semi-structured interview allows flexibility. It involved the use of the interview guide that keeps the interview on track. However, in this study, the order of questions changed as some participants provided repetitive responses though questions asked were not similar. Indeed the interviewer could not always adhere to the set structured set questions.

The standardized open-ended interview allowed the interviewer to probe for clarity, for additional information or asked more detailed questions of respondents’ situations. The researcher explained and rephrased questions when the respondents were unclear about some of the questions. Moreover, additional questions were asked and they were questions that had not been anticipated at the beginning of the interview. This type of interview was preferred for this study because of the characteristics mentioned above.

Within one school, one teacher was selected for an interview. Following the recruitment of participants, each participant met with the researcher for open-ended interviews. All interviews were conducted at the participants’ schools and each interview lasted for one hour. Prior to the interviews commencing, participants were asked to sign the consent form (appendix D), indicating that they were informed of the purpose and the procedure of the study and their rights to withdraw at anytime. The interviews were audio taped and transcribed verbatim. Some notes were taken and recorded in the field notebook on occasions when the audio tape did not function properly. The researcher completed the summary based on the interviews conducted.
3.10.3 DOCUMENT ANALYSIS

In addition, document analysis was used for data collection. Document analysis in qualitative research entails analyzing a small number of texts and documents for a particular purpose. The major aim is to understand how the people involved or the participants were categorized and see how these categories could be used to provide data required for specific purposes. The constructionist orientation of many qualitative researchers means that they are more concerned with the process through which texts or documents depict "reality” than with whether such texts or documents contain true or false statements (Silverman 2010). In qualitative research, documents reveal what people do or did, and what they value. Sources are examined in order to gain knowledge of, and an insight into the phenomenon under study.

McMillan and Schumacher (2009) further explain that documents are records of past events. They comprise both written and printed materials and may be official or unofficial, public or private, published or unpublished, prepared intentionally to preserve a historical record or prepared to serve an immediate practical purpose. As such documents may be letters, diaries, wills, receipts, maps, autobiographies, journals, newspapers, court records, official minutes, proclamations, regulations, and statistical records such as enrolment records.

For this study, documents used were; past tests question papers, internal examination questions papers, marks for both, and the past COSC examination data analysis developed at schools. Following the interview, the researcher asked the participants to provide her with the documents mentioned above. The documents were analyzed in order to enhance credibility. The documents provided (mark sheets) helped the researcher to explain the attitude and behavior of learners doing Biology 5090 at the selected schools. Mark sheets enabled the researcher to compare performances of individuals throughout the whole year so as to find out if there were consistencies or inconsistencies in their performances. That is, when the researcher was focusing on learner A performance, his performance was looked at throughout the whole year. The analysis of different years was also looked at so as to find out if there were consistencies or inconsistencies between them. Question papers collected further shed more light on the type of questions asked during tests and internal examinations. The researcher was able to see whether the questions asked covered the learning outcomes stated in the syllabus or they focused on the recall of knowledge only. The documents also verified
particular details provided by the respondents during the interview, and whether they corresponded with data provided.

3.11 METHOD OF DATA ANALYSIS

3.11.1 ANALYSIS OF INTERVIEWS

Qualitative data analysis entails working with data in the form of words, non-numerical, organizing it and discovering what its value is, and deciding what to tell other people.

For the current study, data collected through interviews was analyzed by the aid of qualitative content analysis and by general system theory as the theoretical framework developed by Bertalanffy (1928). Each case was analyzed and interpreted as an individual case. The audio taped interviews were transcribed verbatim. That was followed by identifying and labeling (coding) items of data which appeared in each case and that was done in all transcripts so that all items of data in one interview were compared with data collected from other interviewees.

Steps in content analysis

(a) The researcher read the copy of one transcript (of one interview) and made brief notes in the margin of relevant information.

(b) Looked at the notes and made a list of different types of information found.

(c) Read through the list of items and categorized each item in a way that described what it was about.

(d) Looked at the categories identified from the transcript and considered if some of them could be linked or not. Similar categories were linked.

(e) Looked through the list of categories of data, compared and contrasted them. Some items were seen differently from others in one category, and were moved to another category.

(f) Same steps were repeated from (a) to (e) with other transcripts and new categories emerged, but were belonging to the already identified categories. All items of relevant and
interesting information were accommodated in the existing categories but the information of each case was treated separately.

(g) The researcher collected all extracts from the transcribed interviews that were put in one category due to the similar relationship. She examined each extract in turn and found out if they belonged together or to different category.

(h) When the entire relevant data transcript had been sorted out into categories, the researcher looked again at the data contained in each category. Some items were moved from one category to another category.

(i) Once all items had been sorted out and make sure that items were in the right category, the researcher looked at the range of categories to see whether two or more categories seemed to fit. If so, they formed a major theme.

(j) Then the researcher went back to the original copies of the transcripts made in the margin, and looked at the texts which were not relevant at that time. Now the researcher had themes and categories clearly sorted and considered whether the previously excluded data was relevant and should be included in the results or not.

3.11.2 ANALYSIS OF DOCUMENTS

Documents collected were analyzed by interpreting them to give voice and meaning around causes of low performance in Biology 5090 at selected high schools in Lesotho. Content was coded into themes in the same way the interview transcripts had been analyzed.

3.12 DATA PRESENTATIONS AND THE DISCUSSION OF THE FINDINGS

Once the analyses of both primary and secondary data had been completed, data was presented using tables. The description of data contained in each table was provided. Then the researcher presented a summary of the findings descriptively so as to convey the findings accurately.
3.13 ETHICAL CONSIDERATIONS

There are important issues that need to be taken into consideration when conducting research. Some of these issues are explained in the paragraphs below.

For the present research, the guidelines of the University of South Africa (UNISA) were used to guide this study. For example, plagiarism is against the code of research and it was avoided throughout the length of this paper. All sources of data and information were acknowledged within the text and in the list of references. Falsification or fabrication of results at any stage of this research was avoided throughout. All the findings of this study were reported truthfully.

Research is a very tricky exercise for those who are not aware of ethical issues. That is, the researcher was not aware of the involvement of the UNISA Ethical Review Committee in relation to data collection. The researcher aimed to collect both the primary and secondary data immediately after the completion of the interview guide and the consent form. This would be without the ethical clearance from the UNISA Ethical Review Committee. However, the researcher suspended the data collection until the ethical clearance certificate (appendix A) was received. After receiving the Ethical Certificate the researcher then followed the appropriate procedure to obtain both primary and secondary data. The first step was the pilot study which involved the collection of data for the small scale research.

Moreover, respondents were allowed to respond anonymously or under a pseudonym. That was done in order to protect their privacy. For the present study, schools involved in this study were given fictitious names. Participants also had the right to choose whether or not to be part of the study. The agreement was to be done by signing the consent form (appendix A). Unless that was done, the researcher could not collect data. The UNISA ethical policy states that it is the responsibility of the researcher to ensure that the findings of the research reach the participants in the language that can be understood by the participants. Indeed the findings of this study were made available to participants as suggested by the UNISA policy upon completion.
3.14 CONCLUSION

This chapter provided the research design and the definition of qualitative research approach and its of value in ‘An Investigation of Performance in the Biology 5090 at Selected High Schools in Lesotho’. Due to the fact that data required involved descriptions and explanations, the interpretive paradigm possessing all characteristics of qualitative research were of importance in this study. This chapter further explained ways of collecting data, sampling procedure and how data was analyzed using content analysis. Rigour was also dealt with whereby credibility, auditibility and pilot study were covered. Lastly, the attention was also paid to the ethical considerations whereby the guidelines for UNISA were used to guide this research.
CHAPTER 4: PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

This chapter focused on data presentation, analysis, and interpretations of the findings of the study. The chapter aimed at answering the following research questions:

(a) What are the causes of low performance in Biology 5090 at selected high schools in Lesotho?

(b) In what ways do teachers envisage to improve performance in Biology 5090 in Lesotho high schools?

Only data that provided answers to the two main research questions was presented and discussed. Each case was presented as unique case since factors affecting Biology 5090 differed from one school to another. Three teachers involved in this study were Mr. Machangoene, Mr. Pali, and Mrs. Mamorena. Using qualitative content analysis and system theory, the researcher identified two themes and different categories were developed. Categories were developed by reading one copy of the transcript and made notes of relevant information in the margins. A list of various types of information found was made and the items found were categorized and described, making it clear what each category was about. Some of the categories with similar information were linked while others remained the same. The same procedure was followed with the other two remaining transcripts. New other categories emerged, but belonged to the already existing ones. All items were accommodated in the already existing categories but each case was treated separately. When the entire data transcript was sorted out into categories, similar categories were put together to form a major theme. At the end of the process two themes were formed. The findings were discussed in a narrative and descriptive formant. There were further supported by the literature reviewed, and by the relevant verbatim quotations from the transcribed interviews. Some additional information used in the analysis was borne out of the researcher’s knowledge of Biology 5090 performance in Lesotho high schools.
4.2 CASE 1 (Mr. Machangoene from Machache High School)

4.2.1 Data Presentation

This part of the research presents data collected at Machache high school through interviewing Mr. Machangoene. Table 4.2.1 below illustrates factors which affected Biology 5090 at Machache high school. There were five major factors. These include: human resources, physical resources, information resources, financial resources, and methods of assessing Biology 5090 performance (transformation process). Characteristics were also presented and coded. Ways of improving Biology 5090 in Lesotho according to Mr. Machangoene were presented in table 4.2.2.

Table 4.2.1: Factors Affecting Biology 5090 at Machache High School by Mr. Machangoene

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
|       | A. Human resources | **Researcher:** For how long have you been teaching Biology 5090 in this school or at any other school?  
**Mr. Machangoene:** 3 years. (Teacher quality)  
**Researcher:** What is your highest teaching qualification and in what areas of specialization?  
**Mr. Machangoene:** I hold diploma in Science Education. My majors are Biology and Chemistry. (Teacher quality)  
**Researcher:** Biology 5090 performance in your school has been below average, what factors have contributed to this low performance?  
**Mr. Machangoene:** Teachers |
Factors affecting Biology 5090 at Machache high school.

Contribute to low Biology 5090 performance as they neither come to school daily nor do they attend their lessons as expected. Sometimes they miss the lessons because of laziness and do not have time to help learners with problems. (Teachers impact).

- Poor performance in Biology is caused by shortage of Biology teachers. Sometimes learners were not taught for the whole session. (Teachers impact).

**Mr. Machangoene:** Learners affect performance in Biology as they do not come to school daily. (Learners impact).

- They do not attend lessons as expected, they come when they feel like, and it is difficult to work with such learners. (Learners impact).
- They do not do the work assigned to them. They want to be pushed to read, and unless this is done they cannot do the work on their own. (Learners impact).
- Admission standard criteria are part of the problem. Some learners who are admitted to this school do not have basic knowledge on the subject to support their further study.
- Most of the time learners do not answer questions asked. They write what they know. (Learners impact).
Some learners have low ability in learning Biology and this affects performance. (Learners impact).

| B. Physical resources | **Researcher:** Biology 5090 syllabus requires practical activities. Do you think your learners have adequate exposure to practical activities?  
*Mr. Machangoene:* No. Our science laboratory lacks chemicals and equipment. (Limitation of resources).  
**Researcher:** Do you have adequate facilities and equipment to do experiments at your school?  
*Mr. Machangoene:* No. Our laboratory is not equipped at all, sometimes I demonstrate due to lack of equipment. (Limitation of resources).  
**Researcher:** Are there challenges that you face in trying to carry out experiments in the teaching and learning of Biology 5090? Please explain them.  
*Mr. Machangoene:* Yes. Absence of equipped laboratory at our school hinders the teaching and learning of Biology. And most learners fail because they were not involved in carrying out experiments because of shortage of equipment. (limitation of resources). |
Mr. Machangoene: The lack of equipped library at this school affects Biology 5090 performance negatively. (limitation of resources)
- The present library does not meet the demands of Biology learners. (Limitation of resources).
- There are few Biology textbooks in the library and they are not designed to provide information required by the syllabus. (Limitation of resources).

C. Information resources

Mr. Machangoene: Learners fail because they do not have enough English. (Problems of jargon).
- Being unable to understand English hinders their understanding of the examination questions. They also refuse to speak English at school claiming that it is difficult. (Problems of jargon).
- They fail because they find Biology terminology difficult to grasp (Problems of jargon).

Researchers’ findings about the documents: There were no records of marks for tests and internal
examinations for some years and the question papers. (Limitation of documents)
- Few tests were given per year but questions were of good standard. (Inadequate assessment).
- Little content was examined for the internal examinations. (Inadequate assessment).
- COSC analysis for some years was not provided. (Limitations of documents).

| D. Financial resources | Mr. Machangoene: Biology performance is also affected by shortage of money at our school. (Financial constraints).
- There are no Biology textbooks in the library due to shortage of money. (Financial constraints).
- Lack of funds leads to Biology being taught by unqualified teachers sometimes. (Financial constraints).
- Not enough teaching aids are available because of financial shortages. (Financial constraints). |

Mr. Machangoene: (i) Question and |
answer method. At the beginning of the lesson, during the lesson, and at the end of the lesson.
- I use question and answer method in order to find out if learners have grasped concepts presented to them.
(ii) Topic tests - to find out if they understood the topic.
(iii) Pen and paper quiz: in order to find out if they take their work seriously by reading daily.

(Assessment methods and their effectiveness)

| Table 4.2.2 below contains different views on how Biology 5090 performance could be improved according to Mr. Machangoene. The focus was on in-service training. Other aspects included: the development of Biology resource centres to enhance the teaching and learning of Biology 5090 in Lesotho high schools, team work, in service training and improvisation. |
Table 4.2.2: Strategies to Improve Biology 5090 Performance by Mr. Machangoene

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Ways of improving Biology 5090 performance | A. Team-teaching or teamwork | **Researcher:** What remedial measures do you take in cases where the performance is not satisfactory in the internal examinations?  
**Mr. Machangoene:** I re-teach the concepts that learners did not grasp in the internal examinations or ask my colleagues to re-teach them. (Ways of improving performance).  
**Researcher:** What steps do you usually take to raise the level of interest in the subject so as to overcome the problem of low performance?  
**Mr. Machangoene:** I do corrections with them and advice them to read. (Ways of improving performance).  
**Researcher:** In your opinion what measures do you think Biology teachers ought to take in order to improve Biology 5090 performance? Please explain.  
**Mr. Machangoene:** It can be improved by asking other teachers to treat concepts which are difficult to teach,
| **B. The resource centres** | **Mr. Machangoene:** There must be development of resource centres. (Ways of improving performance).  
- Resource centres will help a lot as schools can rent apparatus, charts, and buy chemicals in small quantities as most schools in Lesotho do not have science laboratory. (Ways of improving performance). |
| **C. In-service training and workshops** | **Mr. Machangoene:** The must be re-freshing workshops for Biology teachers where their problems could be discussed. (Workshops to improve performance).  
- Teachers will learn how to treat topics which present problems during the workshop. (Workshops to
### D. Improvising

**Mr. Machangoene:**
Teachers should improvise to facilitate the process of teaching and learning Biology by developing apparatus enabling them to carry out experiments. (ways of improving teaching)

### 4.3 DISCUSSION

#### 4.3.1 FACTORS AFFECTING BIOLOGY 5090 AT MACHACHE HIGH SCHOOL

The school is an example of an open system composed of sub-systems that work together to achieve desired goals (Norlin 2009). One of the major goals of the school is to produce good results. However, if parts of the system (school), the inputs, transformation process and the environment do not work in harmony with one another, the goals set cannot be achieved (good results). The sub-systems turn to be other factors which affect performance if they do not function as expected. This means that the inputs, transformation process, and management affect the outputs (performance) differently, either positively or negatively. Positive feedback means that there were no deficiencies in the system while negative feedback implies that there were deficiencies that ought to be corrected. Deficiencies can be the transformation process or the inputs or both which in turn will have an effect on the
schools future outputs (Lunenburg 2010). Factors affecting performance are divided into human, physical, information, financial resources and the transformation process (methods of assessment).

A. HUMAN RESOURCES

According to Lunenburg (2010) human are resources compost of the administration, teachers, learners and parents. Human resources are considered as inputs to the system and can affect performance in Biology 5090 positively or negatively.

(i) Teachers as Factors Affecting Biology 5090 Performance

Systems tend to be goal seeking; that is, they move in the direction of goal achievement. One of the major goals of a school as a system is to produce good results at the end of the course. However, this is not always the case as Biology is taught by unqualified teachers at some schools in Lesotho. At Machache, it was taught by a diploma holder with three years of teaching experience. He had inadequate exposure to teach it effectively and promote better performance because he was underqualified. Lemmer (2002) explains that teachers with the longer period of service have more experience in exercising effective teaching and learning. Jackson (2009) supports this by saying that experience together with adequate training is needed for the responsibilities and demands imposed on educators. The more experience and training an educator has the more confidence and expertise he will have acquired to be an effective educator (Jackson 2009).

In the teaching of Biology 5090, suitable minimum qualification expected is Bachelor of Science in Education (BSC ED) with majors in Biology and any other related science. Licensed teachers are considered to be effective and have sufficient academic preparation, because licensing typically requires prospective teachers to hold a college degree in the subject they wish to teach. They are seen to be skilled and competent in the subject matter. They have been enabled to be effective in classrooms and produce large learners’ grains (Orleans 2007).
Teaching qualification and length of service can affect performance negatively. Anthony and Goldhaber (2003) do support this by saying, ‘teacher quality does affect students’ performance positively or negatively and there is a believe that certificated teachers produce better results than non-certificated teachers’. Teacher quality appears to be the most important factor influencing learners’ performance (Jordan, Mendro & Weeasingho 1997). Lefoka and Ntoi (2002), Lesotho Review (2008), and Jackson (2009) all agree that there is high shortage of relevant and qualified educators in Mathematics and Science subjects in Lesotho high schools. This indeed affects performance negatively.

Moreover, lack of teacher discipline and commitment affect Biology 5090 performance negatively. Mr. Machangoene explained:

> Teachers do contribute to low Biology performance as they do not come to school daily nor attend lessons as expected. Sometimes they miss lessons because of laziness and do not have time to teach and help learners with problems.

According to Lefoka and Ntoi (2002) the high rate of absenteeism and truancy amongst teachers are proof of low morale and lack of commitment. The causes of the latter are poor management and working conditions, unclear and confusing government policies and overcrowded classrooms. These affect performance negatively as they fail to finish the syllabus on time and learners write the external examinations without having ideas on some biological concepts. This indeed affected Biology 5090 negatively at Machache high school as Mr. Machangoene explained that teachers at his school miss lessons and they did not have time to teach nor to help learners. As a result of this, it was difficult for teachers to finish the syllabus and this resulted into low performance.

(ii) Learners as Factors Affecting Performance

In order for the school to produce desired outcomes, people involved should work hand in hand. However, this is not the case at Machache high school. Learners too contributed in various ways to the level of performance in Biology 5090. Mr. Machangoene said, ‘some students do not attend Biology lessons as expected and it is very difficult for me to work with such students. They come to class when they fell like coming’.
Jackson (2009) also indicates that learners affect performance negatively as they deliberately ignore instructions from teachers, leave classes while lessons are still in progress, come to school late or disappear before school closes and they miss a lot of content presented in their absence. Mr. Machangoene further disclosed that learners contributed to the failure rate in Biology 5090 at Machache high school as they did not do the work assigned to them most of the time. He said, ‘they wait so that they can be pushed to read. Unless this is done they will not do the work on their own’. This indicates that learners as inputs into the system did not work in harmony with their teachers. And of course this affected performance negatively.

The respondent further explained that poor performance in Biology 5090 at Machache high school was due to admission standards into Senior Secondary at Form D level. He explained that sometimes most learners who were admitted into the school lacked the basics or had not done science at junior level at all. That affected Biology performance as it was difficult for them to understand the subject. At the end they performed badly. He added that learners performed badly in Biology because they could not answer questions as expected. They always wrote almost everything they knew about a certain concept, not answering what had been asked.

B. PHYSICAL RESOURCES (BIOLOGY LABORATORY AND LIBRARY)

Lack of physical resources at Machache high school had affected Biology 5090 negatively. As a result, teachers did not teach Biology 5090 to their fullest potentials. These included the absence of an equipped Biology laboratory and an equipped library.

Biology is demanding and it is taught best by involving learners. The lack of an equipped laboratory at Machache high school made the provision of education difficult. Tobin (1990) asserts that hands-on activities facilitate the understanding between the relationships among the variables studied. At Machache high school, learners were not exposed to investigations which equipped them for paper 6 (a practical paper) due to lack of Biology laboratory. Instead some experiments involving simple apparatus were only taught by demonstration. Jackson (2009) argues that many of the laboratories in some schools in Lesotho are inoperative because of lack of equipment to carry out practical exercises. These include: lack of gas, running water, electricity to name a few. Mr. Machangoane explained:
Lack of laboratory at our school hinders teaching and learning and most students fail because they are not involved in carrying out experiments due to lack of laboratory equipment.

Methods of teaching according to system theory are considered as part of the transformation process (Lunenburg 2010). In the absence of laboratories the transformation process gets affected and this affects the whole system as goals set would not be achieved.

Machobane (2000) points out that more schools in Lesotho are talk- chalk and they do not have proper resources hence teaching and learning becomes difficult. Therefore, the unavailability of resources such as equipped laboratories contributes to poor performance since Biology is learned better through hands-on activities. Words alone are insufficient to explain concepts to learners to capture and retain their attention and interest. Tobin (1990, p.405) argues:

Laboratory activities appear as a way of allowing students to learn with understanding and, at the same time, engage in a process of constructing knowledge by doing science.

Mr. Machangoane also pointed out:

In some topics where demonstrations were done, some students performed better during tests and internal examinations and one assumed that they would do better if there is equipped laboratory.

Indeed lack of laboratory affected performance in Biology 5090 negatively at Machache high school. Laboratory work is an important medium for enhancing attitudes, stimulating interest and enjoyment, and motivating learners to learn science (Tobin 1990). Learners recall easily things they have seen with their own eyes. In agreement with Machangoene, whenever possible teachers should demonstrate to enhance the teaching and understanding of Biology.

Moreover, there was no equipped library at Machache high school. The present library did not meet the demands of Biology learners. Mr. Machangoene said, ‘there are few Biology books in the library and there are not of standard as they do not provide information required by the syllabus’.
Biology requires the use of various standard Biology textbooks to enhance the understanding of learners. Therefore, for the fact that the library had irrelevant Biology textbooks it meant that the performance of Biology 5090 at Machache high school would be negatively affected, especially when learners could not extent their reading by using library books. And indeed they only depended on notes from teachers which were, too, not enough for Biology 5090.

C. INFORMATION RESOURCES

Inputs as components of the system include among others, the information resources. Typical examples of information resources are knowledge of which language is part, curricula, syllabus and data. The problem of communication does affect the whole system which leads failure to achieve desired goals. Kyoshaba (2009) asserts that any change in any factor within the system has an impact on all components. To add on this, lack of information resources such as Biology textbooks affected Biology 5090 negatively at Machache high school. As it has been mentioned in the above paragraph, there were no relevant books in the library as resources and of course that affected performance because the learners did not have the books necessary to do the work on their own. For this study, information resources studied included: language and Biology terminology, class tests and internal question papers, marks obtained in both and the COSC results analysis developed at Machache high school from 2006 to 2012.

(i) Language as a Medium of Instructions and Biology Terminology.

Language is not only a tool for communication but it is also a resource for creative thought, a framework for understanding the world, a key to new knowledge, human history and a source of pleasure and inspiration (Kern 2008).

English is the language of power worldwide, and it is the main language of communication, learning, teaching, and assessment in Lesotho schools. It carries most of the world’s written knowledge and it is the second or foreign language to the majority of the learners in Lesotho. Setoi (1999) indicates that the language policy in Lesotho prescribes English as a medium of
instruction in schools. The policy does not make provision for any special support or preparation to assist learners in meeting the challenges that English, as a second language and medium of instruction presents to COSC learners. Only 21% of the Lesotho population can speak English fluently (Seotsanyane 2000). Accordingly, English has been designated as a medium of instruction in all educational establishments however acquiring English literacy is a challenging task facing learners in Lesotho.

English as a medium of instruction in Lesotho plays a vital role in affecting Biology 5090 performance negatively. Most learners fail because they do not have enough English. When trying to explain concepts in Sesotho, that leads to misconceptions. In addition, failure can also be attributed to the level of content or the type and standard of questions asked. Mr. Machangoene had noted:

> Being unable to understand English prevents them to understand examination questions as they refuse to speak English at school.

He further explained that as a way of improving performance the management tried to punish them in order to speak English. However, all the strategies employed failed as learners refused to obey the orders. Indeed that led to the low performance shown in Biology 5090 at Machache high school. Learners did not answer questions as expected due to poor of English, and that came out clearly during tests and internal examinations. For teaching and learning to occur as expected the mode of communication should be easier to everybody. The inadequacies English which learners had at the school affected performance negatively as some learners struggled with the language rather than content presented.

(ii) Tests Questions and Marks Scored

Records used indicated that the number of tests given and questions administered to learners at Machache high school differed from one year to the next. That difference was due to the fact that teachers rotated. That is, if Biology 5090 was taught by Mr. Machangoene the previous year the following year it would be another teacher. However, the tests administered for the various years were of the proper standard as they did not test the recall of knowledge only. Some of the questions asked required learners to apply or to analyze the given information in order to answer the questions. However, few tests were given per year and for
the other year’s data was not provided. Data provided indicated that learners were not tested as frequently as required, and this could be another factor affecting Biology 5090 performance. Frequent testing is important in teaching and learning (Angelo & Cross 1993).

Records further showed that most learners at Machache high school performed badly in most tests (see appendix F). Few learners scored high marks ranging from 60% to 80%. The majority of learners scored marks ranging from 20% to 40% in most tests. Records further indicated that performance in tests was fluctuating as the number of learners scoring certain marks changed from one test to the next. The table below shows tests performance in Biology 5090 for Machache high school from 2006 to 2012.

Table 4.3.1.1: Summary of Biology 5090 performance (tests) for Machache high school from 2006 to 2012.

<table>
<thead>
<tr>
<th>Year</th>
<th>Tests</th>
<th>Marks obtained in % and the number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 -19</td>
</tr>
<tr>
<td>2006</td>
<td>No records</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>No records</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>No records</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>No records</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>2</td>
</tr>
<tr>
<td>2011</td>
<td>I</td>
<td>3</td>
</tr>
<tr>
<td>2012</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4.3.1.1 provided above indicates that there were no records of test performance from 2006 to 2009. The available records indicated that learners were not tested frequently in Biology 5090 as expected. This meant that there had been no tests given as expected. Assessing learners is indeed important as this can help the teacher to see areas in which learners did not understand hence find the remedy. That produces evidence that learners are learning the outcomes stated (Angelo & Cross 1993). Lack of frequent testing affected performance negatively as teachers could not find areas of weakness on learners. Learners
often carry the problems to the examination room which could have been corrected if they had been tested frequently. And of course, this led to the learners writing the final examinations still carrying the misconceptions resulting into low performance. Management, too, was not doing the work as expected because it was not even aware that learners were not tested as frequently as it should be. System theory indicates that parts of the system should work in harmony in order to produce desired outputs. Tasks performed by the management do affect the outputs negatively. If the management does carry out its tasks effectively, achievement in Biology 5090 at Machache would be better.

(iii) Internal Examination Questions and Marks Scored

The internal examinations were given three times during the year as the preparation for the external examinations. They were given in March, June, and September. Records showed fluctuations in performance in every internal examination in Biology 5090 for Machache high school. Generally, most learners did not perform well, only few individuals did well (appendix G). Learners who performed better in tests were found to have performed better in the internal examinations. Comparing the three exams, learners’ performance seemed to be the same.

Questions asked during the internal examination were of standard as they tested various levels of knowledge. Indeed they did not test recall of knowledge alone. Learners were asked application questions so as to apply what they had learned (appendix H). Table 4.3.1.2 below shows marks scored in different internal examinations at Machache high school in Biology 5090.

<table>
<thead>
<tr>
<th>Years and months</th>
<th>Marks obtained in % and number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 -19</td>
</tr>
<tr>
<td>2006</td>
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<tr>
<td>June</td>
<td>No records</td>
</tr>
<tr>
<td>September</td>
<td>No records</td>
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</table>
### 2007

<table>
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<th></th>
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</thead>
<tbody>
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<tr>
<td>September</td>
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### 2008

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<tr>
<td>September</td>
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### 2009

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<td>3</td>
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<td>September</td>
<td>3</td>
<td>14</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

### 2010

<table>
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<th>16</th>
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<td>5</td>
<td>1</td>
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<td>June</td>
<td>3</td>
<td>14</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>1</td>
<td>14</td>
<td>11</td>
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### 2011

<table>
<thead>
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<td>September</td>
<td>0</td>
<td>10</td>
<td>11</td>
<td>1</td>
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</tbody>
</table>

### 2012

<table>
<thead>
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</thead>
<tbody>
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<td>14</td>
<td>6</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>0</td>
<td>10</td>
<td>11</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>0</td>
<td>10</td>
<td>11</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

(iv) Analysis of COSC Results Developed at Machache High School

The analysis of Biology 5090 results developed at Machache high school (appendix J) was used simultaneously with ECOL analysis in examining Biology 5090 of Machache high schools. They were used at the same time in order to find out if there was consistency. It has to be noted at this point that there were variations in records. The researcher used ECOL analysis where there were variations as it is the body responsible for examinations in Lesotho in order to correct the errors made at the analysis developed at the school. The analysis
indicated that from 2006 to 2012 the highest grade scored in Biology 5090 at Machache high school was B3. None of the learners who had sat for the COSC at that school scored a credit higher than B3. Records further indicated that most learners obtained fail in Biology 5090. Since 2006 most learners who sat for Biology 5090 at Machache high school obtained a pass score (D7 and E8) while others failed (U9) and few obtained credits (from B3 to C6). That performance was indeed not satisfactory as it did not meet the demands of most learners who wrote the examination during that period.

**D. FINANCIAL RESOURCES**

Financial resources refer to the capital the school uses to finance both the ongoing and long-term operations (Lunenburg 2010). Lack of financial support at any school affects performance negatively. In order for the transformation process to occur as expected there must be aids facilitating the process of teaching and learning. Learners understand better if teaching aids are used. Jackson (2009) supports this by explaining that words alone are insufficient to explain concepts to learners to capture and retain their attention and interests. Educational resources prevent the blind memorization of words without any association to definite object. Chilisa (1997) states that educational resources boost the morale of both the teacher and the learner. They also inspire both the spirit of teaching and learning.

Mr. Machangoene indicated:

> It is even impossible sometimes to run some simple investigations in the laboratory as my school does not have enough funds and most learners are orphans. This prevented me from carry out simple investigations to facilitate the understanding of the learners.

Mr. Machangoene further explained that due to lack of money their library was empty of relevant Biology textbooks. The available text books were of low standard, and of course, it was difficult for learners to carry out mini researches due to lack of textbooks. Akiri and Nkechi (2009) support this by saying that ineffective teaching is due to conditions such as lack of recourses facilitating teaching and these result into negative influence on the instructional quality in schools which may translate to poor academic performance, attitude and values.

The interview conducted disclosed that sometimes Biology was taught by unqualified teachers at Machache high school due to lack of money to hire qualified teachers. In Lesotho,
teachers are hired by the government by giving schools grants. However, in situations where there were no grants, it is the responsibility of the school to hire teachers and pay them. This is also considered as another factor affecting performance in Biology 5090 at Machache high school. Biology 5090 is a rigorous syllabus and it has to be taught by qualified teachers, if not, performance would remain very poor. Mr. Machangoene further disclosed that:

Sometimes it is difficult to get qualified teachers and Biology was not taught for the whole session. That led to the management hiring unqualified teachers.

Printy (2008) is of the opinion that when educators are unqualified, the aim and purposes of the curriculum will not be fulfilled because such educators lack skills to address and implement the curriculum as desired. Unqualified teachers are not even aware that there are various methods to use when teaching it. As a result, they experience many problems in delivering the content and that leads to poor performance.

E. METHODS OF ASSESSESING BIOLOGY 5090 BY MR. MACHANGOENE.

Assessment is a basic tool in teaching and learning. Assessment of learners is defined as a participatory, interactive process that provides data or information one needs on learners’ learning and on teaching (Banta & Palomba 1999). The purpose of assessment is to improve learning, inform teaching, help learners to achieve the highest standards they can and provide meaningful reports on learners’ achievements. Methods used by teachers to assess learners’ performance in Biology can affect performance negatively or positively. The most common methods of assessing learners by Mr. Machangoane were question and answer method, tests, and quizzes.

(i) Question and Answer Method
In the teaching and learning of Biology 5090 at Machache high school, Mr. Machangoene used question and answer method in assessing learners. He explained:
I use question and answer method at the beginning of the lesson, during the lesson and at the end of the lesson. I use it in order to find out if students had understood concepts presented to them or not.

He explained that this method was advantageous as he was able to see whether learners were still on the right track or not.

(ii) Tests
There are different types of tests used in assessing Biology 5090. These include weekly tests, topic test, and practical test. Amongst these, Mr. Machangoane explained that he frequently used topic tests in order to reflect on learners’ performance. He administered tests to learners at the end of every topic. He explained that it was indeed important to give learners topic tests because they reflected whether learners had understood the topic or not. Should they perform badly in the topic test; he was in the position to find the remedy for the existing problem before moving to the next topic by re-teaching parts of test where they had not scored well. This type of assessment is very important as it recalls school science knowledge, the content knowledge learned at schools. However, this is not true as data collected showed that learners were not tested as frequently as expected and lack of frequent testing at Machache high school could be related to low performance. Inadequate testing implies that Mr. Machangoene as an input into the system and taking part in the teaching process did not work well with learners because he gave them few tests and this affected performance negatively.

(iii) Quizzes
Then other method of assessing Biology 5090 used by Mr. Machangoene was giving learners a quiz. He explained that he planned the lesson as usual but did not tell learners. He usually gave learners a pen and paper quiz. Written quizzes were normally based on content treated in class. That enabled Mr. Machangoene to find out if they had been reading and understanding the concepts presented to them in class. Writing quizzes on topics covered in class involves measuring recall from scientific knowledge content.
4.3.2 WAYS OF IMPROVING BIOLOGY 5090 PERFORMANCE IN LESOTHO HIGH SCHOOLS BY MR. MACHANGOENE

A. DEVELOPMENT OF SCIENCE RESOURCE CENTERS

In order to improve Biology 5090 performance in Lesotho high schools, Mr. Machangoene proposed the development of Biology or science resource centres. A resource centre is defined as any central location where information and assistance are available. They are established to serve as places where teachers’ needs and challenges are discussed, examined, and planned for, while deficiencies are aired and discussed and ways of correcting practices are discussed (Mbambo 2009). Mr. Machangoene explained:

Resource centres will help a lot as schools can rent apparatus, charts, and buy chemicals in small quantities because most schools in Lesotho do not have science laboratories.

Development of science resource centres in Lesotho can help a great deal in improving Biology 5090 performance since resource centres are to aid and assist people. They provide opportunities for learning by providing knowledge, help and material resources. They also serve as a meeting place for like-minded individuals, making them important social centres. They further provide training or classes to help to find answers to questions in the form of reference materials. They also provide teachers with access to the widest range of up-to-date printed and audio-visual educational resource materials such as like production of teaching and learning aids of all kinds (Brain 2009). Scientifically literate assistants will suggest the easiest ways of carrying out some biological experiments at the resource centres if teachers had problems relating to certain investigations. Through the development of resource centres in Lesotho, one may expect a positive change in Biology as the problems of teaching materials could be minimized.
The schools as the example of the system have the internal and external inputs and outputs. For schools to produce good results, external inputs should work in harmony with the internal inputs. In this case, the government as an example of the external inputs should organize workshops and in-service training for teachers. This would have a positive effect on Biology 5090 in Lesotho high schools.

Biology 5090 according to Mr. Machangoene could be improved by in-service training. He explained that the government should frequently organize re-freshing workshops for Biology teachers so as to equip them with the recent discoveries. During workshops, teachers should mention their problems in relation to treating some biological concepts. And it is in those workshops whereby tricky topics could be treated. Teachers could assume different roles to create a teaching and learning environment in order to allow for an ideal practice of teaching methods. In this manner remedies to problems of learners to and teachers can be tackled. Epstein (1993) supports this by saying that there must be multi-session distributive learning instead of single workshop for a single topic. What accounts for low performance is that teachers have not been given the opportunity for re-training. Adesoji and Olakunoosun (2007) are of the opinion that Biology 5090 performance is low due to lack of re-training. They therefore, recommended that teachers should be encouraged to go for workshop trainings in areas of their specialization where they would reflect on their learning and share their experiences.

According to Mr. Machangoane Biology 5090 could be improved by in-service training. In-service program is described as a series of short courses and programs designed to equip teachers with skills and content (Conco 2004). In-serving training helps teachers to expand their knowledge of a subject matter and develop new knowledge. Sometimes it is meant for those whose professional preparation is below the accepted standard and who wish to upgrade themselves. As in the case of Machache high school, Biology 5090 was taught by Mr. Machangoene with diploma in education. Given the exacting nature of Biology 5090 his qualification is not of standard; only degree holders are qualified to teach the subject. In order to upgrade the standard of teaching of the diploma holders, in-service training should be organized. However, in-service training could also be organized for the growth of the teacher.
as the general objectives or as the apprenticeship teaching for beginners, to lead teachers to plan and carry out an adequate educational and social program for children (Conco 2004). Unfortunately the in-service mainly provided by MOET in Lesotho is found to be limited and sporadic, and therefore ineffective for teachers (Khanyane, Mabejane & Qhobela 2013).

**C. TEAM TEACHING OR TEAM WORK**

Learning can be described as an interactive process and a product of a learner and teacher activity within the classroom. If teaching and learning fails to go as planned due to the failure of the teacher to present the content, teachers opt for team teaching. Mr. Machangoene said:

> Biology 5090 performance can be improved by asking other teachers to treat some concepts which are difficult for them to teach and this will help students a lot because they can understand the concepts better when presented by another teacher. The subject teacher can also learn together with the students. This is called team teaching.

Fall (2006) defines team teaching as a process in which two or more teachers plan together for a single group of learners in order to achieve instructional needs of learners. Through the use of team teaching, Biology 5090 performance can improve for the better because teachers would be working as a team in treating concepts which are presenting the greatest challenge. Sharing of knowledge is indeed important in the teaching and learning process. If teachers work together as system theory indicates, performance in Biology would improve while at the same time failure to do that can bring negative feedback.

**D. IMPROVISING**

Mr. Machangoene further explained that Biology performance could be improved by improvisation. Biology is learned better by involving learners in carrying out laboratory experiments. Since most schools do not have equipped Biology laboratories, teachers ought
to improvise in order to facilitate teaching and learning. Kathuri, Munguai and Ndirangu (2003) explain improvisation as the act of creating something or using something in the absence of the ideal tool as a result of lack of funds or not having access to the resources needed to perform experiments. Innovative teachers use cheaper products to simulate experiments. Through improvisation teaching and learning would occur as expected.

4.4 CASE 2 (Mr. Pali from Popanyane High School)

4.4.1 Data Presentation

This part of the research presents data collected at Popanyane high school through interviewing Mr. Pali. Table 4.4.1 below illustrates factors affecting Biology 5090 at Popanyane high school. Categories and characteristics were also presented. Ways of improving Biology 5090 in Lesotho according to Mr. Pali were presented in table 4.4.2.

Table 4.4.1: Factors Affecting Biology 5090 at Popanyane High School by Mr. Pali

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| A. Human resources         |                     | **Researcher:** For how long have you been teaching Biology 5090 in this school or at any other school?  
Mr. Pali: 7 years. (Teacher quality).  
**Researcher:** What is your highest teaching qualification and in what areas of specialization?  
Mr. Pali: Bachelor of science (general). My Subjects of specialization are Biology and Chemistry. (Teacher quality).  
**Researcher:** Biology 5090 in your school has been below average, what factors contributed to this |
Factors affecting Biology 5090 at Popanyane high school

<table>
<thead>
<tr>
<th>Low performance?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mr. Pali:</strong> Performance in this school had been bad because people who had been teaching Biology for the past years were not qualified like me. They did not take education courses and lacked skills to deliver the content. (Teachers impact).</td>
</tr>
<tr>
<td><strong>Mr. Pali:</strong> I’m using lecture method in teaching Biology and I don’t know other methods of teaching as I’m not a teacher by profession. (Teachers impact).</td>
</tr>
<tr>
<td><strong>Mr. Pali:</strong> Learners at this school do not have good background of Biology and this affected our results negatively. (Learners impact).</td>
</tr>
<tr>
<td>- Learners are not motivated to learn Biology. They do not do the work assigned nor do corrections on their own. (Learners impact).</td>
</tr>
<tr>
<td>- They need to be reminded of their work and always chased. (Learners impact).</td>
</tr>
<tr>
<td>- They are lazy and this results in poor performance. (Learners impact).</td>
</tr>
<tr>
<td><strong>Mr. Pali:</strong> Parents do affect Biology 5090 performance negatively because they do not buy Biology textbooks for learners.</td>
</tr>
</tbody>
</table>
Only one learner has a Biology textbook and it is used by everybody. (Parents impact).
- Parents do not pay school fees on time and this results in low performance as learners are expelled for fees and they come back after some time. (Parents impact).

| B. Physical resources | **Researcher:** Biology 5090 syllabus requires practical activities. Do you think your learners have adequate exposure to practical activities?  
**Mr. Pali:** No. (Limitation of resources).  
**Researcher:** Do you have adequate facilities and equipment to do experiments at your school?  
**Mr. Pali:** No. Our school does not have science laboratory. (Limitation of resources).  
**Researcher:** Are there challenges that you face in trying to carry out experiments in the teaching and learning of Biology 5090? Please explain them  
**Mr. Pali:** Yes. I have never carried out experiments in my teaching because there is no laboratory here. This is the other reason why my learners perform |
| Information resources | Mr. Pali: Learners do not have Biology textbooks and this affect performance negatively. (Limitation of resources). - Biology syllabus is long and learners fail because sometimes they wrote the final examination without having finished the syllabus. (The impact of the syllabus). - Researcher’s findings about the documents: There were no question papers and records of marks from 2006 to 2012 for the tests and internal examinations. (Limitation of documents). - Only marks for the internal examinations for 2010 to 2012 were provided. (Inadequate assessment). - No COSC analyses as results were never analyzed at Popanyane high school. (Limitation of documents). |
| Financial resources | Mr. Pali: lack of funds affected Biology 5090 performance as there are no teaching aids. (Financial |
E. The transformation process (assessment methods)


Mr. Pali: Class work, weekly tests and assignments. They indicate whether learners have understood content presented or not. (Assessment methods and their efficiencies).

Table 4.4.2 below contains different ways in which Biology 5090 performance could be improved according to Mr. Pali. The focus was on in-service training and on ways in which learners could be given more work as well as team teaching.

Table 4.4.2: Strategies to Improve Biology 5090 Performance by Mr. Pali

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ways of improving Biology 5090 performance</td>
<td>A. In-service training and workshops</td>
<td>Researcher: What remedial measures do you take in cases where the performance is not satisfactory in the internal examinations? Mr. Pali: I do make corrections with them and give them extra work. (Ways of improving performance). Researcher: What steps do you usually take to raise the level of interest in the subject</td>
</tr>
</tbody>
</table>
in order to overcome the problem of low performance?

**Mr. Pali:** Give high performers incentives for tests and internal examinations (the first three). (Motivating learners).

**Researcher:** In your opinion what measures do you think Biology teachers ought to take in order to improve Biology 5090 performance?

**Mr. Pali:** There must be in-service training for Biology teachers. (Re-fresher workshop as a way of improving performance).

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>B. Giving learners more work</td>
<td><strong>Mr. Pali:</strong> learners should be given more work in order to increase their understanding of Biology. (Ways of improving performance).</td>
</tr>
<tr>
<td>C. Team work</td>
<td><strong>Mr. Pali:</strong> Teachers should work as a team to treat tricky topics. (Collaborative teaching).</td>
</tr>
</tbody>
</table>
4.5 DISCUSSION

4.5.1 FACTORS AFFECTING BIOLOGY 5090 AT POPANYANE HIGH SCHOOL

A. HUMAN RESOURCES

Human resources as inputs to the system, directly affect Biology 5090. If there is something wrong in the inputs to the system, expected goals would not be met. Any negative impact brought by the human resources to the school would affect the learners’ performance as the major goal of education. To obtain good results, teachers’ qualification should be of the required standard, learners should work hard, parents should pay fees on time and the transformation processes should occur as expected.

(i) Teacher Quality

Teacher quality, too, stands out as one of the key factors. The suitable minimum qualification in teaching Biology 5090 is BSC ED, majors in Biology and any other science subject. Certificated teachers are usually those who have graduated from accredited teacher education programs (Dillon 2008). However, at Popanyane high school, Biology was taught by an unqualified teacher and that affected performance negatively. Mr. Pali said:

Performance in this school had been bad because people who had been teaching Biology for the past years were not qualified like me. They had not taken education courses and lacked skills to deliver the content.

Ingersoll (2003) indicates that in the United States 42% to 63% of teachers teach other subjects other than those that they had formal qualifications. Therefore, they are said to be unqualified in those areas. Mr. Pali’s qualification is BSC general. He did not take education courses and this affected Biology 5090 performance negatively as he could not present Biology concepts as expected. He lacked skills in presenting biological concepts.

He said:
I’m using lecture method in teaching Biology and I’m not aware of other methods of teaching as I’m not a teacher by profession.

Teacher academic preparations, certification type (diploma or degree), among others, are often taken as indicators of teacher quality (Anthony and Goldhaber 2003). Learners taught by teachers trained to teach Biology performed better than those taught by teachers who had not taken educational courses (Maagan 2007). Teachers gone for training are considered to be quality teachers. Quality teachers according to Berliner (2005), Fenstermacher and Richards (2005), and are often seen:

Simply as ‘good’ teachers and are considered to be those who exhibit desirable traits and uphold the standards and norms of the profession. They are also considered to be those who bring about ‘students learning’ and called effective or successful teachers.

By ‘good’ teachers they mean that content taught corresponds with the disciplinary standards of adequacy and completeness and the methods employed are age appropriate, normally defensible and undertaken with the intension of enhancing the learners’ competence with respect to content. By successful ‘teaching’ they mean that the learner actually acquires some reasonable and acceptable level of proficiency from what the teacher is teaching.

As in the case of Popanyane high school, Biology 5090 performance was indeed affected by teacher quality. Mr. Pali was not exposed to teacher education or in-field preparation. In-field preparation is the teacher education in the subject matter of teaching. It is related to the subject matter knowledge teachers acquire during formal studies and the pre-service teacher education course. Darling-Hammond (2002) asserts that there is a appositive relationship between teachers’ preparation in the subject they later teach and learners’ achievement. Learners taught by teachers from teacher training perform better as compared with those taught by teachers who did not go for the teacher training. Learners’ achievements as reflected in grades and end-of-the year performance evaluation are major purposeful goals of the school as a social system. However, in cases where the management had not hired a qualified teacher like at Popanyane high school, goals of the school would not be achieved. This again, is evidenced by the fact that the teacher could not use proper methods of teaching.
Therefore, the transformation process did not occur in such a way that yielded good outcomes.

(ii) The Effects of Learners on Biology 5090 Performance

Learners are an example of inputs under the human resource. Good inputs produce good results while bad inputs produce bad results. Learners too affect Biology 5090 negatively in various ways. The interview with Mr. Pali revealed that the learners’ poor background in Biology affected performance negatively at Popanyane high school. He said, ‘students at this school do not have good background of Biology and this affected our results’. In order for learners to perform well at school they must have a good foundation. Learners with poor background are seen to have problems in subjects in which they did not have good background. Uzoechi (2009) argues:

Students’ knowledge backgrounds in Biology have significant effect on students’ performance. A student therefore with poor background is likely to have poor performance in Biology.

To add to that, lack of motivation too affected Biology 5090 performance negatively at Popanyane high school. According to Anand (2004) motivation refers to the cognitive, emotional, and behavioral indicators of students’ investment in an attachment to education. Learners’ who are not motivated to succeed do not work. However, those who are motivated to learn perform better. They always do the work assigned to them and consult teachers whenever there is a need. Their major goal is to perform well and get good grades. They have performance goal orientation (Herman, Tucker & Zyco 2007). At Popanyane high school learners were not motivated to learn Biology at all and they did not show any interest in the subject. Mr. Pali said:

Students are not motivated to learn Biology. They neither do the work assigned nor do corrections on their own. They need to be constantly reminded of their work or else they fail.
To motivate learners is not an easy task. In order to achieve at school one ought to have intrinsic motivation. Psychologists believe that motivation is a necessary ingredient for learning (Herman, Tucker & Zyco 2007). They believe that satisfactory learning is unlikely to take place in the absence of sufficient motivation to learn. However, even teachers do not know exactly what motivate learners as performance has been low in Biology for the past years.

(iii) The Effects of Parents on Biology 5090 Performance by Mr. Pali

Parents according to the system theory are regarded as external inputs. They have influence in the learning process so that achievement can be good. Parental involvement in children’s education has a definite impact on the children’s level of academic success (Nzelum 2010). Parents do affect learners’ academic performance either positively or negatively. The major role played by parents in education is to pay fees on time and buy books, assisting in the learning of their children. Failure to do their roles in time affects performance negatively. Barrow and Rouse (2006) observe that economically disadvantaged parents are less able to afford the cost of education of their children and learners do not do their work to their fullest potential because sometimes they are expelled from school due to unpaid fees. In their absence the learning and teaching continue and this affects performance. Even the most capable learners’ fall short of achieving what was within their reach. At Popanyane high school, some parents did not pay school fees on time and that resulted in learners missing some concepts treated in their absence. Mr. Pali said:

Parents do not pay schools fees on time and this results into low performance as learners are expelled for fees and they come back after some time.

Eamon (2005) is of the opinion that low socioeconomic status affects academic achievement negatively because low socioeconomic status prevents access to vital resources and creates additional stress at home. At Popanyane high school parents further affected achievement by not buying Biology textbooks for their children. Mr. Pali said:
Parents do not buy books for learners, only one learner has Biology textbook used by everybody.

If parents do not do their responsibilities as external inputs into the system, they too affect Biology 5090 performance. In order for the school to produce desired results all people taking part should work together (Norlin 2009).

B. PHYSICAL RESOURCES

The school as an example of the open system should have enough physical resources to enable the transformation process to occur easily. Lack of physical resources such as laboratory affects learners’ achievement negatively. Biology is learned better by involving learners. Learners should be exposed to laboratory work in order to learn scientific skills such as measuring, observation, prediction, inferring and others. Contemporary science educators such as Rad, Ruffat and Shah (2007) have expressed the views that the major uniqueness of the laboratory lies in providing learners with the opportunities to engage in processes of investigation and inquiry. Experimentation exposes learners to activities that would help them answer paper 6 and 3 which are based on laboratory activities. Hands on activities facilitate the understanding between the relationships among the variables studied. Tobin (1990) argues:

Laboratory activities appear as a way of allowing students to learn with understanding and, at the same time, engage in process of constructing knowledge by doing science.

Laboratory work is an important medium for enhancing attitudes, stimulating interest and enjoyment, and motivating learners to learn science. Learners enjoy laboratory work and this result in positive and improved attitudes and interest in learning science. In the case of Popanyane high school, learners were not exposed to any investigation at all, and that affected Biology 5090 performance negatively. Mr. Pali disclosed that there was no laboratory at his school and said, ‘I have never carried out experiments in
my teaching because there is no science laboratory here. This is one major reason why my students perform badly’.

Lack of science laboratory hinders learners’ performance since learners learn differently. Others perform better once they are involved in laboratory investigations. Tobin (1990) too is of the opinion that science laboratories are central in attempting to vary the learning environment in which learners develop their understanding of scientific concepts, science inquiry skills, and perceptions of science and as a result do better. Rad, Ruffat and Shah (2007) suggest that laboratory activities have the potential to enhance constructive social relationships among learners as well as positive and cognitive growth. Hofstein and Lunetta (2003) support this by saying:

Laboratory allows students to learn with understanding and offers an opportunity to engage in a process of constructing knowledge by doing science. Laboratory work enhances attitudes, stimulate interest and motivate students to learn science.

At Popanyane high school performance in Biology was drastically affected by lack of science laboratory. This made it very difficult for the teacher to even demonstrate some experiments as a way of facilitating the understanding of biological concepts.

C. INFORMATION RESOURCE

Information resources are classified as inputs in to the system enabling the system to work as expected. Lack of information resources does affect the way the system functions. As a result, it would be impossible to achieve goals of the system. Examples of the information resources which affected Biology 5090 at Popanyane high school included: lack of Biology textbooks, lengthy syllabus and variation in content asked for external examinations. The following were also not available; tests and internal examination records of the previous years, question papers for tests and internal examinations and COSC analysis results developed at school.
(i) The Effects of Shortage of Biology Textbooks on Learner’s Performance at Popanyane High School

The other factor which affected Biology 5090 performance at Popanyane High school was lack of Biology textbooks for learners. Mr. Pali explained that learners did not have Biology textbooks and that prevented them to extend their understanding of the content presented in class. He said:

Students do not have books and this affects performance as just one student has a textbook used by the whole class. Some parents are ignorant and do not want to buy books their kids.

In the absence of Biology textbooks, they depended on notes entirely which were not enough indeed. This was found to be problematic because if they had books they would read on their own and expand their knowledge and increase their vocabulary.

(ii) The Effect of the Lengthy Biology Syllabus on Performance

The other cause of low performance in Biology 5090 at Popanyane high school was the failure to finish the syllabus. Biology 5090 syllabus is long, and in order to complete it, teachers and learners should sacrifice and have extra lessons beyond the school time. This helps a great deal because teachers would be able to cover the content which would otherwise not be easy to cover. Cimer (2011) argues that Biology curriculum is broad and in order to let learners to perform better it would be of advantage to reduce the content of the Biology curriculum. This may increase the quality of learning. He further explains that the biological level of organization and the abstract level of concepts makes learning Biology difficult. Zeidan (2010) is of the opinion that Biology performance is affected negatively by the broad curriculum laden with concepts. He asserts:

Overloaded biological curriculum, the abstract and interdisciplinary nature of Biology, and difficulties with the textbooks are the other factors preventing students from learning Biology effectively.
Mr. Pali indicated that the Biology 5090 syllabus is broad and sometimes questions were asked on parts of the syllabus not treated. And this resulted in failure as most learners would leave questions not attempted.

(iv) Lack of Records on Performance

There are various advantages of keeping records at school. Silverman (2010) explains that records reveal what people did and what they value. They are used to gain knowledge and insight on the behavior of people involved. Schools records tell the history of the school and are useful historical sources (Durosaro 2007). Records further provide the information needed on ex-students either for institutions or for the research purposes. For this study, records to be collected at Popanyane high school included: marks for both tests and internal examinations together with question papers, and the COSC results analysis developed at Popanyane high school.

A. Question Papers and Marks Scored in Tests and Internal Examinations from 2006 to 2012 at Popanyane High School

The researcher was not provided with the question papers for the tests and the marks obtained. However, the respondent indicated that he used testing as a way of assessing learners. But there was no proof indicating that learners had been tested. That raised some doubts about whether learners at Popanyane high school had ever been tested. Marks obtained were for internal exams from 2010 to 2012 (see appendix I) but there were no question papers showing the kind of questions asked. Lack of records on learners assessment could be paired with low performance as one may conclude that learners were never given tests at Popanyane high school in order to see whether they understood content presented to them. This implied that the teacher had not done what he was supposed to do as an input into the system. System theory indicates that if any part of the system does not work in harmony with other parts, the whole system is affected and set goals would not be met (Kyoshaba 2009). In the case of Popanyane high school low performance in Biology was indeed caused by poor assessment.
The internal examinations were given three times in a year. Table 4.5.2 below indicates the performance of learners at Popanyane high school from 2010 to 2012 in the internal examinations. Records for other years were not provided by Mr. Pali.

**Table 4.5.1.1: Summary of Biology 5090 Performance for Internal Examinations at Popanyane High School from 2006 to 2012**

<table>
<thead>
<tr>
<th>Years and months</th>
<th>Marks obtained in % and number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 -19</td>
</tr>
<tr>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>No records</td>
</tr>
<tr>
<td>June</td>
<td>No records</td>
</tr>
<tr>
<td>September</td>
<td>No records</td>
</tr>
<tr>
<td>2007</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>No records</td>
</tr>
<tr>
<td>June</td>
<td>No records</td>
</tr>
<tr>
<td>September</td>
<td>No records</td>
</tr>
<tr>
<td>2008</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>No records</td>
</tr>
<tr>
<td>June</td>
<td>No records</td>
</tr>
<tr>
<td>September</td>
<td>No records</td>
</tr>
<tr>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>No records</td>
</tr>
<tr>
<td>June</td>
<td>No records</td>
</tr>
<tr>
<td>September</td>
<td>No records</td>
</tr>
<tr>
<td>2010</td>
<td></td>
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<tr>
<td>March</td>
<td>4</td>
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<tr>
<td>June</td>
<td>3</td>
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<tr>
<td>September</td>
<td>3</td>
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<tr>
<td>2011</td>
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<tr>
<td>March</td>
<td>1</td>
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</tbody>
</table>
Data presented above shows that from 2010 to 1012 learners at Popanyane high school were performing below average in the internal examinations. However, there were some who did better especially in 2011 and 2012 though the numbers fluctuated.

**B. COSC Results Analysis Developed at Popanyane High School**

The researcher was not provided with the COSC results analysis for all the years covered by this study. Mr. Pali said, ‘results are never analyzed and we do not have those’. Negative feedback implies changes in the inputs so that the future results could be better. But since results were never analyzed at Popanyane high school, this meant that teachers and the management did not bother about the output (performance). So no steps were taken to effect modifications in the transformation process which might lead to better performance. This indicates that ignorance of teachers and the management contributed a lot to the low performance in Biology 5090 at Popanyane high school.

**D. THE EFFECT OF FINACIAL RESOURCES ON BIOLOGY 5090 PERFORMANCE AT POPANYANE HIGH SCHOOL.**

_Lack of funds at any school stands out as number one problem in preventing the process of teaching and learning to occur as expected (Ochu 2010)._ 

The interview disclosed that at Popanyane high school teaching and learning of Biology 5090 was restricted by shortage of funds. Indeed lack of financial support from the school administration did affect performance negatively and it was difficult for Mr. Pali to run even
the simplest investigations. In order for teaching and learning to occur as expected for every school, there must be funds aiding that process. In the absence of funds, teaching and learning processes were restricted. Lack of financial support indeed affected Biology 5090 negatively at Popanyane high school.

E. METHODS OF ASSESSESING BIOLOGY 5090 BY MR. PALI

Assessment in teaching is very important because it is the main indicator of the level of achievement for the learners. The purpose of assessment is to improve learning, inform teachers, help learners to achieve the highest standards they can and provide meaningful reports on learners’ achievement (Banta & Palomba 1999). Frequent testing does affect performance positively. Mr. Pali explained that he used weekly tests, class work and assignments in assessing his learners’ performance. For the purposes of this research, the documents which were to be collected were marks for tests and internal examinations together with the question papers for both. However, the researcher was not provided with tests and internal question papers and marks obtained by learners.

The absence of the documents requested by the researcher left some doubts about whether learners had ever been given weekly tests as the teacher had explained. Records are very important and act as proofs for data collected during the interviews. Indeed the absence of data indicated that the learners received very little or no assessment at all.

4.5.2 WAYS OF IMPROVING BIOLOGY 5090 PERFORMANCE IN LESOTHO HIGH SCHOOLS BY MR. PALI

Performance in Biology 5090 is affected by many factors in Lesotho high schools. However, the remedy for the existing problems could be found. Mr. Pali indicated that Biology 5090 could be improved by in-service training, giving learners more work, and by team teaching.
A. IN-SERVICE TRAINING OF BIOLOGY TEACHERS

According to Mr. Pali, Biology 5090 in Lesotho high schools could be improved by in-service training. It is required even to those whose qualifications meet the present standards. They need to increase their knowledge or skills in some phases of their work or to add the general outlook and cultural background (Conco 2004). Teachers who attend in-service training are usually equipped with the subject matter and various methods of teaching which involve learners. The development of in-service training in Lesotho is certainly a reliable means towards raising the level of performance in Biology 5090.

B. GIVING LEARNERS MORE WORK

Another way in which performance could be improved in Biology 5090, according Mr. Pali, was to give learners more work. This could help them a lot because they would be busy most of the time reading and answering questions. Indeed they would even consult their teachers in cases where they met problems. Consultation could facilitate the understanding of some concepts that are hard to grasp. He stated that, ‘giving learners more work will lead to removing misconceptions they have’. He further explained that giving learners more work could lead to having a positive attitude towards Biology. However, giving learners more work could lead to demotivation as they would be required to finish a certain piece of work within a given time. Due to the pressure exerted by extra work, some learners may develop negative attitude towards the teacher and the subject. This would lead to low achievement instead of improving it. Kohn (1999) is of the opinion that giving learners more work does not improve performance as sometimes they lose interest in the subject and end up having poor scores at the end of the course.

C. TEAM WORK

System theory suggests that people should work together to achieve desired goals. Mr. Pali supported this by saying ‘performance in Biology in Lesotho high schools can be improved by teachers working as a team’. Team work or team teaching in Biology involves teachers working together, sharing materials, giving advices, preparing lessons together. Team work improves skills required by teachers in presenting other concepts (DFES 2002). Through
collaborative teaching, performance in Biology in Lesotho high schools could improve as teachers will learn skills and how best other topics could be presented through team teaching.

4.6 CASE 3 (Mrs. Mamorena from Moreneng High School)

4.6.1 Data Presentation

This section of the research presents data collected at Moreneng high school after interviewing Mrs. Mamorena. Table 4.6.1 below shows factors affecting Biology 5090 at Moreneng high school. Factors were divided into categories which were human resources, physical resources, information resources, financial resources and assessment methods. Characteristics were also presented. Suggested strategies of improving Biology 5090 in Lesotho high school by Mrs. Mamorena were presented in table 4.6.2.

Table 4.6.1: Factors Affecting Biology 5090 at Moreneng High School by Mrs. Mamorena

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Human resources</td>
<td><strong>Researcher:</strong> For how long have you been teaching Biology 5090 in this school or at any other school? <strong>Mrs. Mamorena:</strong> 14 years. (Teacher quality). <strong>Researcher:</strong> What is your highest qualifications and in what areas of specialization? <strong>Mrs. Mamorena:</strong> Bachelor of science in education. My majors are Biology and Chemistry. (Teacher quality). <strong>Researcher:</strong> Biology 5090 performance at your school has been below average, what factors contributed to this low</td>
<td></td>
</tr>
</tbody>
</table>
Factors affecting Biology 5090 at Moreneng high school performance?

Mrs. Mamorena: Teacher qualifications do affect Biology 5090 performance. (Teachers impact).
- Sometimes Biology was taught by unqualified teacher and the performance in Biology declined significantly. I think his methods of teaching were not appealing. Then I had to come back and teach Biology although I was teaching Mathematics at JC where there were problems. (Teachers impact).

Mrs. Mamorena: Learners contribute a great deal in Biology 5090 performance because they are lazy to read. They only depend on their notes which are always not enough. (Learners impact).
- They do not go to the library to extend their reading. (Learners impact).
- They have negative attitude towards the subject. They say it is as difficult as Mathematics. (Learners impact).
- They fail because they do not want to use Biological terms when answering the questions. They use ordinary language and obtain low marks. (Learners impact).
- They translate from Sesotho to English leading to loss of meaning of what they wanted to say. For example, syphilis is transmitted when people are sleeping together or sharing blankets. (Learners impact).
- They have very poor spelling which leads to loss of marks. (Learners impact).
- Poor admission of learners affects Biology 5090 performance. (Learners impact).
- The type of learners admitted in Form D affect performance as some did not pass well at JC and some did not do science at all at JC and others were rejects from other schools. (Learners impact).

| B. Physical resources | Researcher: Biology 5090 syllabus requires practical activities. Do you think your learners have adequate exposure to practical activities? **Mrs. Mamorena:** No. (Limitation of resources). **Researcher:** Do you have adequate facilities and equipment to do experiments at your school? **Mrs. Mamorena:** No. We do not have enough equipment and facilities. (Limitation of resources). **Researcher:** Are there challenges |
that you face in tying to carry out experiments in the teaching and learning of Biology 5090? Please explain.

**Mrs. Mamorena:** Yes. Our laboratory does not have enough chemicals and equipment to run practicals as required though our learners write paper 3. (Limitation of resources).

| C. Information resources | **Mrs. Mamorena:** Learners do not have Biology textbooks as they are expensive. They depend on notes only. (Lack of Biology textbooks).
- Learners struggle with the English instead of Biological concepts and sometimes Biology is taught in Sesotho. (Problem of jargon).
- Biology syllabus is long and it is difficult to finish and sometimes questions are asked on the part that was not covered. (Impact of the lengthy syllabus).

**Researcher’s findings about the documents:** No question papers for the tests and internal examinations and records for both. (Limitation of documents).
- No COSC results analysis from 2006 to 2012. (Limitation of documents). |
| D. Financial resources | Mrs. Mamorena: The manner in which Biology is taught here affects the students’ ability because we do not have enough chemicals due to lack of funds. (Limitation of resources and financial constraints).  
- Rather than letting learners to do investigations on their own I demonstrate at the expense of experimentations. (Limitation of resources).  
- Biology was taught by a non-certificated teacher due to lack of financial support. (Teachers quality and financial constraints).  
- No funds to buy teaching aids. (Lack of resources and financial constraints). |
| --- | --- |
Mrs. Mamorena: (i) Giving learners group work. Learners are able to share their ideas, clarify |
questions to one another, and to remove misconceptions. They remember things they have done in groups easily. (Assessment method and its effectiveness).

(ii) Giving learners tests. So as to see areas of weakness and find the solution as soon as possible. (Assessment methods and their effectiveness).

(iii) Drilling: I drill using the past question papers - help the teacher predict the performance of the learners as this method is used towards writing the final examination. (Teaching methods and their effectiveness).

The table 4.6.2 below presents different views on how Biology 5090 performance could be improved in Lesotho high schools according to Mrs. Mamorena. The focus is on teaching strategies, how teachers update themselves about the latest discoveries of Biology, and teamwork.

**Table 4.6.2: Strategies of Improving Biology 5090 Performance by Mrs. Mamorena**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Researcher: What remedial measures do you take in cases where the performance is not satisfactory in the internal examinations?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mrs. Mamorena: I go over</td>
<td></td>
</tr>
</tbody>
</table>
Ways of improving Biology 5090 performance

A. Devising methods of teaching

the questions with the learners; give them more work by letting them to answer questions in their Biology text books at the end of every topic. (Ways of improving performance).

Researcher: What steps do you usually take to raise the level of interest in the subject so as to overcome the problem of low performance?

Mrs. Mamorena: I make them to compete for small prizes such as pens. (Motivation)

Researcher: In your opinion what measures do you think Biology teachers ought to take in order to improve Biology 5090 performance?

Mrs. Mamorena: They should vary the methods of teaching. Opting for methods that favor child-centered approach. (Learners centered- approach).

- Teachers should try as much as possible to involve learners in learning by engaging them. (Learners centered-approach).
B. Reading about the latest discoveries about Biology

Mrs. Mamorena: Updating themselves on new Biology discoveries. (Researching about Biology discoveries).

C. Team work

Mrs. Mamorena: Teachers should work as a team at schools even at the cluster level to treat tricky concepts. (Collaborative teaching).

D. Remedial lesson and the use of LSMTA question papers.

Mr. Mamorena: There must be remedial lessons because the Biology syllabus is long. (Extra lessons and the lengthy syllabus).
- Schools should join the LSMTA and use its questions papers, performance in Biology 5090 could be better. (Schools subscribing for LSMTA and using its question papers).

4.7 DISCUSSION

4.7.1 FACTORS AFFECTING BIOLOGY 5090 AT MORENENG HIGH SCHOOL

A. HUMAN RESOURCES

Human resources are examples of inputs to the system from the environment. Human resources among others include teachers and learners. Both teachers and learners play the
important role in the transformation process. However, both do affect Biology 5090 negatively or positively.

(i) Teacher and Teacher Quality on Biology 5090 Performance at Moreneng High School

Teachers’ academic preparation, certification type, and years of teaching experience, among others, are often taken as indicators of teacher quality (Orleans 2007). Certificated teachers are those who acquired education certificates on the subjects they were trained to teach. If a particular teacher is teaching the subject not trained to teach he is unqualified in that area. Non-certificated teachers are believed to produce poor results (Orleans 2007) as compared with certificated ones. The same thing applies to the teaching of Biology at Moreneng high school. Mrs. Mamorena explained that one of the major factors affecting Biology 5090 was teacher quality. She said:

Sometimes Biology was taught by unqualified teacher and performance in Biology went down so badly. I think his methods of teaching were not appealing. Then I had to come back and teach Biology as I had left it and taught Mathematics at JC where there was a problem.

This shows that teacher quality affects performance as unqualified teachers have problems in delivering the content due to lack of skills. Eamon (2005) supports this by saying that untrained teachers lay the blame on learners when results are bad rather than correcting their methods of teaching.

(ii) The Effect of Learners on Biology 5090 Performance at Moreneng High School

Learners are seen to play the major role in precipitating poor performance in Biology 5090. Jackson (2009) has the opinion that learners affect performance negatively. He said:

Lack of learners’ discipline affects performance badly. Some learners are ill disciplined, uncontrollable, and difficult to work with in class. Such learners deliberately ignore instructions from teachers, leave the classes during lessons, come to school late or disappear before the school close.
In the case of Moreneng high school, learners contributed a lot towards poor performance. Mrs. Mamorena explained that learners were lazy to read when asked to do so. They depended on notes which were not enough. They did not go to the library to extend their understanding and some did not even copy the notes. And that resulted into poor performance at Moreneng High school. Again learners at Moreneng high school had a negative attitude towards the subject. They complained that it was as difficult as Mathematics. That led them to fail to answer questions as expected and they were always panicking. That is, they were very brief when answering questions which required them to describe. Instead of giving full description of the phenomena they just gave few lines and that resulted into loss of more marks.

Moreover, Mrs. Mamorena said:

They fail because they did not want to use biological terms when answering the questions. They use ordinary language and obtain low marks and they translate from Sesotho to English leading to loss of meaning of what they wanted to say. For example, syphilis is transmitted when people are sleeping together or when sharing blankets.

Biology has its own language which ought to be used every time in order for learners to obtain good marks. Dillion (2008) has the opinion that Biology has abstract concepts making it difficult to be learned by learners. He adds that in order for the learners to do well in Biology they ought to be exposed to observations or practical work. Nzelum (2010) explains that several researchers have pointed out different reasons for learners’ poor performance in Biology. Some are the abstractness of certain aspects of Biology, lack of understanding of Biological concepts and terminology. Mrs. Mamorena further indicated that they failed due to poor spelling. No marks could be allocated to these examples as they did not contain any meaning. If the learners had written ‘the head pumps blood’ instead of the heart pumps blood or having written ‘the ear instead of the eye’ that resulted in loss of marks.

Moreover, poor admission of learners into Form D affected Biology 5090 performance negatively at Moreneng high school. Mrs. Mamorena said:

The type of students admitted into Form D affects performance as some did not pass the integrated science well at J.C and some did not do science at all at J.C. and others had been rejected from other schools.
Uzoechi (2009) supports this by saying that learners’ knowledge backgrounds in Biology have significant effect on learners’ performance. Therefore, a learner with poor background is likely to perform badly in Biology.

**B. PHYSICAL RESOURCES**

**Lack of an Equipped Biology Laboratory on Biology 5090 Performance at Moreneng High School**

Physical resources include materials, facilities and equipment. The absence of the physical resources in the school as an example of the open system could affect performance in Biology 5090 negatively while their presence could affect it positively. Lack of an equipped Biology laboratory does affect Biology performance negatively as it was the case at Moreneng high school. Biology is best taught by engaging learners. However, at Moreneng high school the present Biology laboratory did not have enough facilities to run practical’s as expected. Mrs. Mamorena said, ‘our laboratory does not have enough chemicals and equipment to run practicals as required for our learners. Whenever possible I demonstrate in order to facilitate the learners understanding’.

Indeed the lack of Biology laboratory at Moreneng high school affected performance negatively as learners were not given enough chance to carry out practicals which could prepare them for paper 3. Nzewi (2008) explains that whenever possible learners’ work in Biology lessons should be practical and visual in nature as laboratory work is the hallmark of education in science and technology based fields. Learners’ laboratories are mostly costly resources yet their educational potential is often not fully realized in practices. It is high time that their design and delivery and the forms of learners assessment used to examine critically for their contribution to high quality learning be shown (Al-Abri 2010). It is hard to imagine learning science without an equipped laboratory. Learners’ experimentation underlies all scientific knowledge and understanding. Biology laboratory provides learners with the opportunity to think about, discuss, and to solve real problems (Nwagbo 2007).

Lack of an equipped Biology laboratory hindered performance at Moreneng high school as parts of the system (school) do not work in isolation Norlin (2009). Through experimentation learners do Biology as opposed to learning it. Laboratory work is seen as an integral part of most science courses and offers learners a learning environment that differs in many ways
from the traditional method (Fisher et al. 1998). Poorly equipped laboratories in most schools in Lesotho such as at Moreneng high school deny learners to learn science by inquiry. This makes the teaching and learning process very difficult. The learner’s experiments should be the central part of science teaching. They serve many purposes such as finding relations among concepts or to verify hypothesis (Ocak 2009).

C. INFORMATION RESOURCES

One of the inputs into the school system includes information resources. The information resources amongst others included knowledge, curricula, data, and other kinds of information utilized by the school. Information resources like other inputs into the system do affect Biology 5090 performance negatively or positively.

(i) The Effect of Shortage of Biology Textbooks on Biology Performance at Moreneng High School

For the effective teaching and learning to occur during Biology lessons, learners must possess Biology textbooks. Biology requires a lot of reading. That is, learners should read their notes together with their Biology textbooks in order to enhance their understanding. Learners can also test their understanding by answering questions found at the end of every topic voluntarily. Without Biology textbooks the learning of Biology is indeed a problem.

At Moreneng high school lack of Biology textbooks for learners affected Biology 5090 performance negatively. Mrs. Mamorena explained this by saying:

Students do not have Biology textbooks because they are expensive. They only depend on the notes and this affects performance badly. They are lazy to go to the library where there are reference books.

Learners are able to learn more Biology when they have textbooks because they can extend their learning after school hours. However, most learners in Lesotho high schools view textbooks as reference materials rather than as learning tools. Klymkowsky (2007) indicates that learners need to learn the latest discoveries to have valid conceptual understanding of biological systems and Biology textbooks are the best way to provide such information.
Lack of Biology text books does affect performance negatively in Lesotho high schools. Without text books, skills, concepts and content required by the curriculum cannot be taught. Furthermore, learners and teachers have access to alternative materials, but Biology text-books remain the sole basis for examination and assessment (Klymkowsky 2007). Textbooks have a direct impact on what is taught in schools and how it is taught. This resulted into book sectors in industrialized countries receiving both direct and indirect subsidies for books. For the school to achieve the goal of producing good results, learners must have Biology text-books and use them effectively. Failure to have them affects achievement negatively.

(ii) Language Used in Teaching Biology and Terminology on Performance

Language used in the teaching of Biology and terminology does affect performance badly. English is the second language and the medium of instruction in Lesotho. Most learners are not fluent in English and this affects Biology achievement negatively as learners cannot express themselves satisfactorily when answering the questions (Seotsanyane 2000). Learners fail to understand questions asked correctly, rather they interpret them wrongly and that results into loss of marks. In order to express themselves, they translate from Sesotho into English. Mrs. Mamorena said, ‘students are struggling with English instead of biological concepts and sometimes Biology is taught in Sesotho’.

During discussion, learners explain to one another how they understood concepts individually mostly using Sesotho. This results into bringing misconceptions in the discussion and they carry them to the final examination if they do not consult their teachers. Dugan and Weffer (1992) observe that learners with limited English proficiency seemed to have a weaker knowledge of science and this inevitably affects their achievement test scores in science. In Brunei Darussalam, like in Lesotho, learners in private schools achieve much better in Biology as compared with learners in public schools. This may be because learners in private schools have a better command of English acquired from primary and have better skills in secondary level (Mohudui 2008).

Moreover, terminology used in Biology affected performance negatively at Moreneng high school. Mrs. Mamorena explained that since Biology has its own terminology, most learners find it difficult to learn and they loss hope of passing it. This resulted into lack of motivation and interest to learn the subject. Nzeln (2010) points out that several researchers give out many factors affecting performance in Biology and amongst others are certain biological
concepts and terminology. He further explains that as a result of failure to understand the terminology of Biology, some learners begin to doubt their intellectual abilities and come to believe that their efforts to achieve are futile. This leads to learners giving up quickly when something appears to be difficult. Lock and Richardson (1995) point out that Biology contains many technical terms in describing its concepts, principles and theories, and is therefore more susceptible to reading difficulty than other natural sciences. Many technical terms are derived from Latin and Greek words which are alien to learners in Lesotho and of course this makes Biology very difficult.

(iii) The Lengthy Syllabus and Limited Biology Lessons

According to Mrs. Mamorena the other information resources affecting biology 5090 at Moreneng high was the lengthy syllabus. The Biology curriculum is overloaded with facts and the syllabus is very long (Dillion 2008). Mrs. Mamorena explained that due to the long syllabus it was always very difficult to finish it. Sometimes as a result, learners fail the examination due to questions being set on the part of the syllabus not covered. Therefore, learners left questions not attempted.

At Moreneng high school sometimes Biology 5090 was allocated five lessons. Because of the demand of the subject those lessons were not enough, and that made it difficult for teachers to finish the lengthy syllabus. And of course, learners’ performance was affected by this constraint which was not of their own making. In response to this problem, she said:

I had to teach after the working hours on Fridays in order to cover enough content before they wrote the final exam.

(iv) Lack of Data Indicating Insufficient Testing

Record keeping at any school is important because it can be used to provide the history of a school needed by researchers. The secondary data that was to be collected included past question papers for the internal examinations and tests and their records of marks from 2006 to 2012 including COSC analysis developed at the school. Unfortunately at Moreneng high school the researcher was not provided with any of the question papers for the internal
examinations or for the tests nor the COSC analysis. Question papers for both the tests and
the internal examination and the COSC analysis were not traceable. One wonders if
assessment was ever carried out at that school. One may conclude that the major factor
affecting performance at that school was poor assessment. Inefficiency of the management
too, played the major role because the analysis could not even be found in the principal’s
office. However, the researcher was only provided with records of four tests given in 2012,
and marks of March examination for 2012 (see appendix J). Records provided showed that
most learners were not performing well as the majority scored below average.

Table 4.7.1.1: Summary of Biology 5090 Performance (tests) for Moreneng High School
from 2006 to 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Tests</th>
<th>Marks obtained in % and the number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 -19</td>
</tr>
<tr>
<td>2006</td>
<td>No records</td>
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<tr>
<td>2007</td>
<td>No records</td>
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<td>2008</td>
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<tr>
<td>2011</td>
<td>No records</td>
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<tr>
<td>2012</td>
<td>I</td>
<td>13</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>VI</td>
<td>3</td>
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</tbody>
</table>

Table 4.7.1.1 provided above indicates that few learners were able to perform well in tests
given while the majority performed poorly.

Table 4.7.1.2: Summary of Biology 5090 Performance for Internal Examinations of
Moreneng High School from 2006 to 2012.

<p>| Years and | Marks obtained in % and number of students |</p>
<table>
<thead>
<tr>
<th>months</th>
<th>0 -19</th>
<th>20 - 39</th>
<th>40 - 59</th>
<th>60 -69</th>
<th>80 - 100</th>
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</thead>
<tbody>
<tr>
<td>2006</td>
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<tr>
<td>March</td>
<td>No records</td>
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<td>June</td>
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<td>September</td>
<td>No records</td>
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<td>2007</td>
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<td>March</td>
<td>No records</td>
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<td>June</td>
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<td>2008</td>
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<td>June</td>
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<td>2009</td>
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<td>March</td>
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<td>2011</td>
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<td>March</td>
<td>No records</td>
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<td>September</td>
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<tr>
<td>2012</td>
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<td></td>
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<tr>
<td>March</td>
<td>0</td>
<td>18</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>No records</td>
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<tr>
<td>September</td>
<td>No records</td>
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</tbody>
</table>
Table 4.7.1.2 provided above shows March 2012 internal examination. It shows that most learners did not perform well as the majority of learners scored marks less than 40% while few performed better.

**D. FINANCIAL RESOURCES**

**Effects of Shortage of Funds on Biology 5090 Performance at Moreneng High School**

One of the major goals of the school as an example of the system is to produce good results at the end of the course. However, if parts of the system do not work together as expected feedback would be negative. For all processes to occur easily within the school there must be enough funds. For example, there must be enough money for teaching aids, hiring qualified teachers and equipped Biology laboratories. In the absence of funds the teaching and learning of Biology 5090 would not happen as expected which implies negative feedback. Teachers would tend to use suppositions instead of carrying out experiments (Ochu 2010).

At Moreneng high school there were not enough chemicals to use in the laboratory due to lack of financial support. Mrs. Mamorena said:

> The manner in which Biology is taught here affects student’s ability because we don’t have enough chemicals due to lack of funds. Rather than letting students to carry out investigation on their own I demonstrated at the expense of investigations.

Mrs. Mamorena further explained that Biology was taught by an unqualified teacher at Moreneng high school paid by the school. Shortage of financial support also affected the task of Biology curriculum delivery because that teacher was not motivated due to a low salary. Sometimes teachers earning low salaries become unnecessarily harsh to learners. They would not take time to give proper explanation on any concept taught. That led to learners losing interest in class activities thereby affecting the impartation of such knowledge. Nzelum and Okafor (2010) argue that many Biology teachers due to lack of motivation, prompt payment of salaries, and other allowances cannot meet their daily needs due to the high cost of living brought about by economic crisis. These conditions bring about divided attention and poor concentration on the teaching job thereby reducing their outputs. Adikwi (2008) is of the opinion that if teachers are motivated enough, they will put in their best and find a way to
obtain materials necessary to teach. Places like Moreneng where private teachers were not motivated, results were affected negatively as teachers did not put more effort in their school work due low salaries.

E. ASSESSMENT METHODS

Assessment is used to find out the status of learners in the learning process. Methods of assessments can too, affect Biology 5090 performance negatively. Biology teachers should choose methods of assessment which would enable them to notice the status of learners and find ways of helping them. Mrs. Mamorena assessed learners in three different ways: giving them questions to answer in groups, testing, and by drilling using the past question papers.

(i) Answering Questions by Groups

Mrs. Mamorena explained that she assessed learners by dividing them into groups and giving each group questions to answer. She explained that this method of assessment was very good as learners were able to share their ideas, clarify some points and even remove any misconceptions they had. In answering questions as groups, there was strength in numbers. Some members understand questions differently and they can explain to one another what exactly the question requires and how best can it be answered in order to earn more marks.

(ii) Tests

The second method of assessing Biology 5090 by Mrs. Mamorena was giving learners tests after covering some topics or giving them topic tests. She explained that giving learners tests after completing the topic helped a great deal as she was able to see areas of weakness and found the solution as soon as possible. She explained that though there were various ways of testing learners, giving topic tests was better because existing problems could be solved before proceeding to the next topic. James (2000) had the opinion that frequent testing is very important as it provides information about learners’ progress. Frequent testing helps the teacher to diagnose specific learners’ strengths and weaknesses and can lead to improved instruction for learners.
(iii) Drilling Using the Past Question Papers

The last preferred method of assessing Biology 5090 by Mrs. Mamorena was drilling method. According to Mrs. Mamorena drilling refers to ‘giving learners one past external question papers after another to work on them’. This method of assessment was used as a preparation for the external examinations. She said, ‘it is used toward the end of the year as most content would have been covered at that time’. Drilling helps as teachers would have a picture of how learners would perform in the final examinations. Mrs. Mamorena stated that drilling helped learners a lot as they were made aware of how examination questions were likely to appear. It equipped them with skills on how to answer the examination questions and this makes teachers to help them frequently.

However, she also pointed out:

Drilling may lead to loss of skills on how to set standard questions because we depend on the previous question papers. Some students may concentrate on the question papers given and fail to read for the examinations. If questions appear on topics that were not covered on the question papers given this will lead to poor performance.

4.7.2. WAYS OF IMPROVING BIOLOGY 5090 PERFORMANCE IN LESOTHO HIGH SCHOOLS BY MRS. MAMORENA

System theory regards schools as open systems with people working in a co-ordinated behavior to achieved set goals. Negative feedback in system theory implies that there are discrepancies in the parts of the system. It can be used to correct deficiencies in the transformation process or in the inputs or in both, which in turn will have an effect on the schools future output (Lunenberg 2010). Mrs. Mamorena suggested three ways of improving Biology 5090 in Lesotho high schools. These were: devising methods of teaching, remedial lessons and using LSMTA question papers, reading about the latest Biology discoveries and team teaching.
A. DEVISING METHODS OF TEACHING

In order to improve Biology 5090 in Lesotho high schools Mrs. Mamorena suggested that Biology teachers should device methods of teaching Biology. She said, ‘teachers should try as much as possible to involved learners in learning by engaging them in hands-on activities’. Uzoechi (2009) explains that there is a need for modern innovative teaching approaches in line with the latest development in science and technology to help the conventional methods for better performance. Practical experience is very fundamental in the Biology class. Nwagbo (2007) observed that most Biology teachers use all the Biology periods for theoretical aspect of the subject neglecting the weightier practical aspect which has potential for developing critical thinking and objective reasoning abilities in learners. Mrs. Mamorena had the opinion that if teachers can try as much as possible to engage learners in activities, Biology 5090 in Lesotho could improve for the better. Uzoechi (2009) asserts that research has, however, shown that many Biology teachers lack competencies, skills and creativity to organize practical classes.

Biology 5090 can also be improved by making corrections with learners for the tests and internal examinations. Mrs. Mamorena stated, ‘going over the questions together will help them to recognize how best they should interpret the questions’. She further explained that learners should be given more work, and this would help a lot because they would expand their knowledge and remove misconceptions if they were exposed to more reading. However, Kohn (1999) is of the opinion that giving learners more work results into loss of interest in the subject. This implies that learners loaded with more Biology work may end up losing interest in the subject and, of course this will result into poor performance in Biology 5090.

B. REMEDIAL LESSONS AND USING LSMTA QUESTION PAPERS

Mrs. Mamorena explained that Biology syllabus is long and most of learners wrote external examinations without having completed the syllabus. It would be better if Biology teachers had extra classes so that they could finish the syllabus in time. The remedial classes are for learners, who, for what-ever reason, are not yet at the level they should be for their grade. The remedial classes will teach the content they are missing so far (Ljusbery 2009). Remedial lessons are meant to catch up people who are behind. Again she suggested that if schools join the Lesotho Science and Mathematics Teachers Association (LSMTA) and use questions
papers set by the LSMTA (at the district level) performance could improve. This is because the association helps teachers exchange teaching and assessment strategies.

C. READING ABOUT THE LATEST DISCOVERIES

Mrs. Mamorena further explained that Biology 5090 could also be improved by teachers reading the latest discoveries either online or using recently published Biology textbooks. She said ‘Teachers should read the latest discoveries and this will help them be able to explain a particular concept differently making learners to understand better’. Through researching, teachers would be able to modify their teaching styles as they continually acquire new information that helps them explain new concepts in different ways.

D. TEAM WORK

Team work involves teachers planning together for a certain group of learners and helping one another in presenting various topics. She stated that team work could help a great deal as some teachers tend to excel in some topics which might be difficult for others. And of course, at the end, all topics would have been treated effectively. This would result into better performance in Biology 5090 in Lesotho high schools. According to Fearon (2008) team work is described as an instructional situation where two or more teachers possessing complementary teaching skills cooperatively plan and implement the instruction for a single group of learners using flexible scheduling and grouping techniques to meet the particular needs of learners.

Mrs. Mamorena indicated that teachers should work as a team at schools even during cluster meetings in order to find solutions for the existing problems. A cluster is formed by the neighboring schools working together to achieve a common goal in education which is to produce better results. She stated that, during cluster meetings, teachers are free to tell their problems pertaining to the teaching and learning of Biology 5090 at their schools. And it is in these meetings where problems experienced by Biology teachers get solved.
4.10 CONCLUSION

In this chapter, various factors affecting Biology 5090 at the selected high schools were discussed. Each case was treated as the unique since participants were different in a number ways. That is, they were different in terms of location, qualifications, and length of service. The information gained offers strong evidence that there are many problems associated with the teaching and learning of Biology 5090 in Lesotho high schools. Major factors affecting performance in Biology were elements of the open system namely inputs and the transformation process. Suggested ways of improving Biology 5090 in Lesotho high schools were discussed. The next chapter will focus on summary of each chapter, summary of the results, conclusion and the recommendations.
CHAPTER 5: SUMMARIES, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This last chapter of the dissertation focuses on the summary of each chapter. It also discusses the results obtained in this study and provides conclusions derived from the research problem, aim of the study and the research assumptions. Recommendations for school management, parents and teachers are also provided as well as and recommendations for further research.

5.2 SUMMARIES

5.2.1 SUMMARY OF PREVIOUS CHAPTERS

Chapter one is the introduction of the study and has focused on the background information relating to the education system in Lesotho. The chapter has discussed the formulation of the problem and the aim of the study. In general, COSC performance in Lesotho has been so bad and most learners have failed to get the School Certificate which is the primary target for all learners. Due to the high failure rate at COSC, the study has focused its attention on Biology 5090 performance as it is one of the subjects which are performed poorly. The study intended to find out causes of low performance at selected high schools in Lesotho and how performance could be improved. The research assumptions stated that schools with laboratories produced better results than schools without them. Secondly, qualified Biology teachers produced better results than unqualified teachers, and lastly learners who are motivated to learn Biology have higher score than those who are not motivated to learn.

Qualitative method was found to be suitable since an in-depth understanding and reasoning were required in order to understand causes of low performance in Biology 5090 and how performance could be improved. Interview and document analysis were used for data collection. The value of the research in education was discussed in this chapter. This research was to reveal possible causes of low performance in Biology 5090 which might also affect other subjects. And of course, the remedy could be found even for other courses. This
research is to be of value in the sense that Biology teachers would be aware of how best they could teach Biology and how they could improve performance in Biology 5090.

However, this study has limitations. The sample size has been rather small, and not enough data was gathered since one teacher per school participated in this study. Secondly, the cost of conducting the study affected data collection. Some schools that would have been used were distributed over a large area. As a result traveling costs imposed limitations. Therefore, just few schools were part of this study. The study constrained itself on Biology 5090 performance from 2006 to 2012 of three selected schools.

Chapter two focused on related literature whereby performance was defined and explained as the measure of the school output (Mlambo 2011). It further looked at: the performance in Lesotho at COSC level, studies investigating performance in Lesotho, and grading at COSC level. Then it narrowed its focus to Biology 5090 performance, paying a particular attention to reasons by ECOL as to why learners failed Biology 5090 and to the recommendations given. The recommendations made by ECOL (2010) were that, teachers should as much as possible let learners to practise essay type of questions and expose them to experimentation so as to enhance their practical skills.

This chapter also looked at studies investigating performance in some countries and factors affecting academic performance as a whole. It was found out that subjects which registered scores were: Biology, Chemistry, Physics, and Mathematics. But Biology topped the list of the most poorly performed subjects. The literature reviewed showed that there were many factors affecting academic performance. Some of the factors that emerged included: teacher and teacher quality, English as a medium of instruction in the teaching and learning process, study habits, and motivation. The need for teaching Biology was explained in this chapter and the ways in which science is learned and taught were also discussed. The best practical methods of teaching Biology which ought to be employed were also discussed in detail.

This chapter also presented the general system theory as the theoretical framework for the analysis of ‘An Investigation of Performance in the Biology 5090 at Selected High Schools in Lesotho’. General system theory was developed by a Biologist Ludwing Von Bertalnffy in 1928 primarily to study living organisms, machines, galaxies, and organizations. However, it was found to be applicable to this study as it regarded a school as an open system with sub-systems and Biology as a subject of systems. The school as a system is made up of the
flowing parts: inputs, the transformation process, outputs, the environment, and the feedback (Scott 2008) as depicted in figure 1 in chapter 2.

According to the general system theory, parts of the system (inputs and the transformation process) should work in harmony to achieve desired goals as systems are goal directed. One of the major goals of the school is to produce good results at the end of the course. For this study: learners, teachers, parents and the management should work together to achieve the desired goals. Any discrepancy in the system results into negative feedback. Negative feedback can be used to correct the deficiencies in the transformation process or inputs or both, which would in turn have positive change on the outputs for the schools’ future.

Chapter three described qualitative interactive case study as a suitable research design for this study. This was because the researcher required face to face interaction with participants at their natural settings. It allowed the researcher to study the phenomena using different cases. The study employed qualitative research approach so as to gain an in-depth understanding of causes of low performance in selected high schools.

This chapter further described the interpretivism paradigm adopted in this study. It was adopted because it possesses all the characteristics of the qualitative approach. For example, the interpretivism paradigm relies on methods of data collection such as interviews and documents analysis used for data collection for this study. In this chapter, the setting where the research was carried out was well described. Schools involved were selected purposely because their teachers were assumed to be knowledgeable since they had been performing below average in Biology 5090 from 2006 to 2012. The criterion for selecting the schools was also described. The schools selected and the teachers involved were given fictitious names for ethical purposes. The process of choosing the cases was well explained and depicted in figure 2 below. Only participants with three years of teaching or more with majors in Biology and any science were selected. Letters were written to principals of schools selected asking for permission to conduct the study at their schools and for Biology teachers asking for them to participate in the study. The reply was provided by means of letters.
Ways of establishing rigour were also discussed. The study incorporated the traditional evaluation criteria and pilot study. The traditional evaluation criteria were discussed including, amongst others, credibility and auditibility. This chapter also discussed in detail methods used to collect data. These included semi-structured interviews and document analysis. Documents collected included past question papers for tests and the internal examinations and marks obtained in both, and the COSC analysis developed at schools. Data
collected was analyzed with the aid of qualitative content analysis and the general system theory as the theoretical framework for this study. The ethical considerations concerning this study were also described.

Chapter four dealt with the presentation of data collected for the present study. Each case was treated as unique since factors affecting Biology 5090 differed from one school to another. For all the three cases, data collected was analyzed separately under the same themes and categories. The characteristics were also coded. Data collected was presented through the use of tables. Two themes were identified; these included, factors affecting Biology 5090 performance and the ways of improving it. Categories identified included: human, physical, financial, information resources and the transformation process (assessment methods). Data collected for each case was discussed separately and the characteristics were coded.

5.2.2 SUMMARY OF FINDINGS

5.2.2.1 FACTORS AFFECTING BIOLOGY 5090 AT SELECTED HIGH SCHOOLS IN LESOTHO

It was found out that performance in the Biology 5090 at the selected high schools has been affected by various factors. Those factors were inputs to the school as the system and the transformation processes. Factors were divided into human, physical, financial, information resources and methods of assessing Biology 5090.

A. THE EFFECT OF HUMAN RESOURCES ON BIOLOGY 5090 PERFORMANCE

Human resources included, amongst others: the management, teachers, learners, and parents. It has been found out that teacher quality affected performance in most schools. Biology was taught by unqualified teachers who admitted that they did not have teaching skills. The usage of inappropriate strategies resulted in failure to deliver the content correctly. Sometimes it was taught by diploma holders whose qualifications were below the required level of skill
and competency in the teaching of the subject. Teachers also affected performance since they did not attend lessons regularly as expected of them; they dodged lessons and did not have time to help slow learners.

Learners, on the other hand, affected performance negatively. They mostly failed to do the work assigned, attend the lessons, and answer questions as asked. They often wrote briefly when answering essay type of questions and they were apathetic towards Mathematics. This apathy is evidenced by the poor performance in Biology paper 6 as it involves the usage of graphs, magnification and tables. The cause of these was nothing except negative attitude towards Biology and undoubtedly they were not motivated to learn the subject. The entry point into Senior Secondary at Form D played a role in affecting performance negatively. That is, some learners admitted into Form D had a poor background of Biology and some did not do well in the integrated science at the junior level and, of course, this affected performance badly. The other examples of the human resources were parents. Parents play a very important role in the education of their children. The failure of parents to participate fully in their children’s education resulted into poor performance in Biology 5090. Thus, parents did not pay school fees on time and this led to learners being expelled from school. In the absence of those learners, teachers continued with their work leaving those learners out. To add on this, parents did not buy books for their children. That made it difficult for learning to occur as expected since learners could not consult their Biology textbooks during extra times.

B. THE EFFECT OF PHYSICAL RESOURCES ON BIOLOGY 5090 PERFORMANCE

The physical resources that were found to have affected Biology 5090 very negatively were lack of science laboratories and libraries at some schools. Most schools had laboratories, but were not in operation because they lacked proper equipment and chemicals. Biology as the science a subject is learned better by letting learners to carry out the investigations on their own. But in the absence of science laboratories, the teaching and learning of Biology 5090 in most schools was indeed found to be problematic. Ambrose et. al (2000) support this by saying that most science laboratories in most high schools in Lesotho were not in operation.
due to lack of equipment. This affected performance negatively. The other factor was the lack of libraries. Libraries played a very important role in the teaching and learning process as learners could research easily if standard books were available in libraries. But lack of libraries hindered performance negatively as learners did not have their own text books to read and there were no libraries at their schools.

C. THE EFFECT OF INFORMATION RESOURCES ON BIOLOGY 5090 PERFORMANCE

Overdependence of learners on the information given by the teachers in class proved problematic in Biology performance. The knowledge the learners had often fell within the scope of the notes provided by the teacher. Sometimes notes given were brief and with limited content. This imposed problems because learners cannot extend their knowledge due to the shortage of text books. English language as a medium of instruction affected performance, too. Learners fail to understand concepts presented to them due to lack of English. In response to this problem, they translate from Sesotho to English of vice versa and this resulted into loss of marks as translations sometimes lose meaning. For those with text books, it was difficult for them to understand concepts presented due to inadequacies resulting from the usage of the foreign language and the extra hurdle biological jargon used in describing concepts.

Availability of documents presented a great challenge to the researcher. Most schools did not furnish the researcher with test and internal questions papers and marks obtained from 2006 to 2012 including the COSC analysis. However, the analysis was based on data available. The unavailability of the documents implied that learners had not been assessed as frequently as it was supposed to be, contrary to the way the respondents had explained during the interviews. And for the analysis of the COSC results, some schools had them, but as for other schools there were no analyses at all. The respondents explained that results were never analyzed. Biology syllabus is an example of information resource that had affected performance negatively. Respondents explained that since the syllabus was long, it was very difficult to finish it and that lead to failure as sometimes questions were asked based on sections of the syllabus which had not been covered.
D THE EFFECT OF FINANCIAL RESOURCES ON BIOLOGY 5090 PERFORMANCE

Shortage of funds at all schools affected performance negatively. Procurement of teaching aids and hiring of qualified teachers were barely possible. Most respondents explained that the lack of science laboratories affected teaching and learning severely. This was due to the fact that schools did not have funds to build laboratories no matter how important they were in the teaching and learning process.

E. THE TRANSFORMATION PROCESS (ASSESSMENT METHODS)

The transformation process refers to the teaching and learning processes and the assessment methods. For this study only methods of assessment were dealt with. Teachers at their various schools used different methods in assessing Biology 5090. Assessment was carried out using these methods: question and answer method, quiz, tests, class work, assignment, and drilling with past question papers.

Table 5.2.1.1 Summary of Factors Affecting Biology 5090 Performance at Selected High Schools in Lesotho

<table>
<thead>
<tr>
<th>Factors affecting Biology 5090 performance (inputs and the transformation process)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Human resources</td>
<td>• Teachers</td>
</tr>
<tr>
<td></td>
<td>• Learners</td>
</tr>
<tr>
<td></td>
<td>• Parents</td>
</tr>
<tr>
<td>B. Physical resources</td>
<td>• Lack of Biology laboratories</td>
</tr>
<tr>
<td></td>
<td>• Lack of libraries</td>
</tr>
<tr>
<td>C. Information resources</td>
<td>• English as a medium of instructions</td>
</tr>
</tbody>
</table>
|                                                                                 | • Lack of Biology textbooks for
learners and teachers.
- The lengthy syllabus.
- Lack of tests and internal examination question papers and their marks and the COSC results analysis developed at schools.

D. Financial resource
- Lack of funds to buy resources and to hire qualified teachers.

E. The transformation process (methods of assessing Biology 5090).
- Methods of assessment
  - Quiz
  - Class work
  - Assignment
  - Tests
  - Question and answer method
  - Drilling with past question papers

5.2.2.2 SUGGESTED STRATEGIES FOR IMPROVING BIOLOGY 5090 PERFORMANCE IN LESOTHO

System theory suggests that there should be corrections on the inputs or the transformation process or both if feedback is negative. Respondents came up with many ways in which they thought would bring positive changes in Biology 5090 performance if employed.

In-service training for teacher development was found to be one of the strategies that would bring positive changes if employed. Teachers from time to time ought to have training as a means of empowering them. It is during the in-service training whereby problems they experience in their teaching could be solved. Secondly, there must be the development of the resource centres where teachers could find help regarding teaching aids such as charts for
treating certain topics. Resource centres should also have the resource persons knowledgeable enough in the subject to help teachers with problems they meet in their teaching. Respondents further suggested teamwork by Biology teachers. Through collaborative teaching, learning and teaching would be possible as teachers would work hand in hand to facilitate the process of learning. Teaching and learning could also be facilitated by improvising. Improvisation involves development of structures to aid teaching or using certain equipment instead of something which is not available. Biology is learned better by involving learners. But most schools did not have equipped laboratories. To make the learning of Biology meaningful teachers suggested improvisation which would promote hands on activities.

Teachers also thought of changing teaching strategies (traditional methods) opted for the ones involving learners as they learned more when involved (inquiry based strategies). Development of cluster schools would also enhance the teaching and learning of Biology as teachers in one cluster would share their problems and advise one another on how certain topics could be treated. Schools in a cluster should also join the Lesotho Science and Mathematics Teachers Association (LSMTA) as there are some experts that would help teachers with specific problems in teaching. Lastly, performance in Biology 5090 could be improved by teachers reading more about the latest discoveries concerning Biology. This would help significantly as their understanding of some concepts would be expanded.

5.2.2.2.1: The Summary of Suggested Strategies to Improve Biology 5090 Performance in Lesotho High Schools

- Team work
- Improvisation
- In-service training
- Devising methods of teaching
- Development of school clusters
- Development of resource centres
- Reading about the latest discoveries
5.3 CONCLUSIONS

5.3.1 THE RESEARCH PROBLEM, AIM OF THE STUDY, AND THE RESEARCH ASSUMPTIONS

The research problem explained that the majority of learners in Lesotho failed to get the school certificate at the end of COSC. One of the subjects which was poorly done was Biology 5090 except in 2008 and 2012 (1.3 chapter 1). The high failure rate by many learners in Biology 5090 could be attributed to many factors. The study intends to find answers to the following questions:

1. What are the causes of low performance in Biology 5090 of selected schools in Lesotho?

2. In what ways do teachers envisage to improve performance in Biology 5090 in Lesotho high schools?

The aim of the study was to find out causes of low performance in Biology 5090 and how performance could be improved in Lesotho high schools (1.4 chapter 1). The research assumptions were formulated (1.5 chapter 1) and they included:

- Results of schools with equipped laboratories to engage learners frequently in laboratory experiments are higher than schools without equipped laboratories. This is because learners are frequently engaged in experiments to acquire skills required for paper 3 and 6.

- Teachers who are fully qualified to teach the course produce better results than those who are not qualified.

- Learners who are motivated to learn the subject; that is, those who are punctual for Biology 5090 lessons, do assignments, participate in class have higher scores than those who are not motivated to learn the subject.

A number of conclusions were made to establish whether the research questions, the aim, and the research assumptions were achieved.
5.3.2 THE RESEARCH QUESTIONS AND THE AIM OF THE STUDY

Performance in Biology 5090 at selected high schools was indeed affected by many factors. Those factors included, teacher and teacher quality, learners, parents, English as medium of instruction, lack of textbooks for learners, the lengthy syllabus, lack of frequent testing, lack of functional science laboratories, lack of financial support, lack of libraries, and the transformation process involving methods of assessment.

Secondly, teachers were aware of how poorly Biology performance was. Indeed they tried very hard to response to this problem in their lessons. They re-taught what the learners failed to grasp. They did corrections with them so as clarify concepts better. They further suggested strategies they assumed would bring positive changes in Biology 5090 performance in Lesotho if employed (see 5.2.2.2.1).

5.3.3. THE RESEARCH ASSUMPTIONS

Schools that took part in this study did not have equipped laboratories. Others did not have science laboratories at all. The study revealed that learners performed badly in Biology 5090 due to lack of science laboratories. Absence of laboratories in most schools prevented learners from carry out the investigations on their own and, of course, their learning was theory driven. This led to high failure rate as Biology requires hands on activities.

Qualified Biology teachers were assumed to produce better results than unqualified teachers. This is evidenced by the fact that Biology was taught by unqualified teacher at Popanyane high school. The results of Popanyane high school had been bad for the past years. The conclusion made was that, teacher quality was the major factor affecting performance because the teacher lacked methods of teaching. In fact, the teacher had no idea of different methods of teaching.

Learners who were not motivated to learn Biology performed poorly. The interview revealed that due to lack interest, learners dodged the lessons, misbehaved, and did not take pieces of advice given by their teachers and this resulted in poor performance in Biology 5090.
5.4 RECOMMENDATIONS

5.4.1 RECOMMENDATIONS TO THE SCHOOL MANAGEMENT

- The primary target for all schools in Lesotho is to produce educated citizens who will be beneficial to the communities, even to Basotho as a whole. However, poor academic performance is associated with poor management. In some schools, performance in Biology 5090 was below average as teachers dodged lessons as much as the learners did. Therefore, if schools managers could receive in-service training frequently through the Ministry of Education and Training (MOET) on how to manage their schools, this would result into better performance.

- School boards play a very important role in the management of schools. Some teachers and learners are very difficult to work with; they misbehave and do not obey the school regulations and rules. Indeed this affects performance negatively. In order to solve this problem, it would be very important if the Ministry of Education (MOET) could organize workshops where the board members and principals could be trained and equipped with skills in order to solve problems arising from the misbehavior of both teachers and learners.

- Most learners have problems of acquiring Biology textbooks because they are very expensive and most learners come from disadvantaged families. At the junior level MOET introduced book rental scheme in responding to the same problem of lack of textbooks by learners. MOET should to introduce the book rental scheme at the senior level as it had done at the junior level to tackle the problem of unavailability of textbooks.

- There is a shortage of Mathematics and Science teachers in Lesotho. This problem led to these subjects being taught by unqualified teachers (teachers who did not take education causes). In response to this problem the government through MOET should organize in-service training that impart skills and ethics appropriate for teachers.
• Most schools do not have equipped science laboratories and libraries. In response to this problem schools should include science fee in their school fees. The money paid in this should directly be apportioned towards purchasing laboratory equipment.

In schools where there are unequipped libraries, the management should at least buy few standard books every year so as to uplift the standard of their school libraries.

• School management should regularly organize series of parents’ meetings to inform them about the performance of their children and how it could be improved. In this manner parents will value the education of their children and pay school fees as well as buy books required.

5.4.2 RECOMMENDATIONS FOR TEACHERS

• Teachers should do collaborative teaching, improvise, and attend workshops so as to improve their development. They should also advise one another to avoid unacceptable practices in teaching and learning environments.

• Teachers should make learners aware that mathematical concepts are applied in Biology and they should avoid having negative attitude towards Mathematics because this could affect Biology performance negatively.

5.4.3 RECOMMENDATIONS FOR FURTHER RESEARCH

This investigation has shown that effective teaching and learning is the responsibility of a school as a system composed of sub-systems. Various high schools in Lesotho experience poor performance in Biology 5090 for different reasons. The recommendations for further qualitative research are that investigations ought to be undertaken in other nine districts of Lesotho. The purpose is to develop concrete strategies that would be employed by all Biology teachers in Lesotho to improve Biology 5090 performance. It is necessary that research
studies be conducted to find appropriate assessment methods that could be used by all schools in Lesotho so as to enhance good performance in Biology 5090.

5.6 CONCLUSION

In this chapter, summaries of the previous chapters were briefly given. Conclusions based on the research questions, aim, and the research assumptions were also provided. Recommendations for school managements and for Biology teachers in response to how they could better manage their schools so as to produce better results were included. Lastly, the recommendations for further research were also provided.
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APPENDICES

APPENDIX A: THE ETHICAL CLEARANCE CERTIFICATE

Research Ethics Clearance Certificate

This is to certify that the application for ethical clearance submitted by

MC Lebata [45676558]

for a M Ed study entitled

An investigation of performance in the biology 5090 at selected high schools in Lesotho

has met the ethical requirements as specified by the University of South Africa College of Education Research Ethics Committee. This certificate is valid for two years from the date of issue.

Prof CS le Roux
CEDU REC (Chairperson)
lrouxcs@unisa.ac.za

Reference number: 2013 APR/45676558/CSLR

18 April 2013
APPENDIX B: THE LETTER TO PRINCIPALS

APPENDIX C: THE LETTER TO BIOLOGY TEACHERS
Dear Sir/Madam

Re: A Request to Conduct a Research Interview for MED Degree

I wish to be granted the permission to interview your teacher for Biology 5090. This is in pursuance of a masters degree in science education with the University of South Africa (UNISA). My aim is to investigate the causes of low performance in Biology 5090 in Lesotho schools and what could be done to bring about some improvements. All information that will be generated by the intended interview is only for the purposes of the research; and it is with the hope that it will contribute to providing solutions to the various problems we encounter in the teaching and learning of Biology 5090. Your assistance will be highly appreciated.

Yours Faithfully

[Signature]

Memalanga C. Lebata.
Dear Sir/Madam

Re: A Request to Conduct a Research Interview for MED Degree

I would like to have your permission to interview you about the performance of Biology 5090 in your school. I am doing a research for the degree of Masters in Science Education with the University of South Africa. The information that will be obtained through this interview is strictly for purposes of this research, and my hope is that it is through these kind of investigations that we as teachers of Biology might find solutions to some of the major problems in the teaching of this subject.

Your assistance will be highly appreciated.

Yours Sincerely

Mamalanga C. Lebata
APPENDIX D: CONSENT FORM

First of all I want to thank you for showing interest to meet with me today and for taking your time. You are invited to participate in the study entitled ‘An investigation of Performance in the Biology 5090 at Selected High Schools in Lesotho’. Please read this form carefully and feel free to ask any question you might have.

**Researcher:** Mamalanga Calextina Lebata, MED Candidate, Supervisor Dr. Mudau A.V. University of South Africa (UNISA).

**Institution that guides:** University of South Africa (UNISA): Dr. Mudau A.V. (Thesis Supervisor), Department of Science Education.

**Purpose and procedure:** The purpose of this study is to find out causes of low performance and how performance can be improved in Biology 5090 in Lesotho at COSC level and also to find out ways in which teachers envisage to improve Biology 5090 performance. You are being asked to participate in the interview designed to find answers to questions provided above. I want you to talk freely and I am prepared to listen to you. For data collection you are going to be interviewed. The interview should take less than an hour and I will be taping the session because I do not want to miss any of your comments. Although I will be taking notes during the lesson, I cannot possibly write fast enough to get all down. Because we are on tape, please be sure to speak up so that I do not miss your information. All the responses will be kept confidential. This means that the interview responses will not be disclosed to anybody and I will make sure that the information included in my report does not identify the name of your school and your name as the responded. I will further ask you to provide me with records showing the performance of your students during the past internal examinations, tests, quizzes, questions asked in each, and the analysis of the past COSC Biology 5090 results. Moreover, you do not have to talk about anything you do not want to and you may end up the interview at anytime.

**Risks or Discomforts to Participants:** There are no risks associated with study. Participation is strictly voluntary and you have the right to withdraw at anytime. It is possible that you may experience some discomfort during the interview therefore you are also free to determine what you want to discussion, and you can end the discussion or refuse to answer to any question, and you have the right to turn off the recorder at any time. If you do
not feel fine at the end, your participation may be terminated or if you decide you want to end your involvement.

**Potential Benefits:** Talking about the performance of your school can help a great deal in finding better ways in which teaching and learning of Biology 5090 can be improved. This can also help a great deal in finding factors affecting Biology 5090 performance at your school so that the remedy can be found. This study can indeed bring positive changes in your school in the manner in which the subject is learned and taught.

**Summary of findings or Debriefing:** At the end of the interview, participants will be verbally debriefed and thanked for their willingness to participate.

**Confidentiality:** To protect your confidentiality and privacy, imaginary names will be used in place of participants’ real name and the name of the school. The interview tape will be erased following completion of the thesis. Although excerpts of the transcripts will be included in the final study, no direct identifying information will be used. As a participant, you have a right to request that portion of the transcripts not be included in the thesis. Following completion and prior to the data being included in the final report, you will be provided with a summary of the interview.

**Voluntary participation and termination without penalty:** Participation for this study is voluntary. That is, you may withdraw from the study at any time or refuse to answer any question for any reason, without penalty or loss of services. If you withdraw from the study at anytime, any data that you have contributed will be destroyed.

**Selection of participants and numbers involved:** Three teachers are selected from four schools that perform poorly in Biology 5090 from 2006 to 2010. That is one teacher from each school. Criteria used to determine schools where participants are selected includes;

(a) Schools whose candidates sat for COSC final examination from 2006 to 2010.

(b) Schools that performs poorly in Biology 5090.

(c) Schools within reach.

Schools were identified easily by using data from ECOL.

**What does participation involve?** It involves participants answering interview questions at their schools. Participants are also required to provide documents to be analyzed. These
include Biology 5090 scores obtained in tests, quizzes, internal examinations, questions asked in each case, and the analysis of past COSC results developed at schools.

**Contact details of the Researcher:** If you have any questions concerning the study, please feel free to ask at any time; you are also free to contact the researcher at this number +26658943334 should you have any question at a later time. The results of the study can also be obtained by contacting me at +26658943334 or at mamalanga.lebata@gmail.com

**Consent to participate:** I have read and understand the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my future records.

_________________________                              _________________________________
Signature of participant                                            Date

__________________________
Signature of the researcher
APPENDIX E: THE INTERVIEW GUIDE

Questions for the interview

Background/General Information

1. (a) For how long have you been teaching Biology 5090 in this school or any other school?

Teacher Quality

2. (a) What is your highest teaching qualification and in what areas of specialization?

Teaching, Learning, and Assessment/ Evaluation

3. (a) (i) Biology 5090 syllabus requires practical activities. Do you think your students have adequate exposure to practical activities?

(ii) Do you have adequate facilities and equipment to do experiments at your school?

(iii) Are there any challenges that you face in trying to carry out experiments in the teaching and learning of Biology? Please explain.

(iv) To what extend do you think your teaching is enhanced by practical activities? Please explain.

(b) Apart from experimentation. Which methods of teaching do you frequently use in teaching Biology 5090? Please explain advantages of those methods over others.

(c) (i) What methods of assessment or evaluation do you use in teaching Biology 5090? In what ways do you think those methods are effective? Please explain.

(ii) Are there ways in which your methods of evaluation could be improved?

(d) Do you think there is consistency or inconsistency between your internal and external examination results? Please explain the consistency or the inconsistency.

(e) (i) What remedial measures do you usually take in cases where the performance is not satisfactory in the internal examinations?

(ii) What steps do you usually take to raise the level of interest in the subject so as to overcome the problem of poor performance?
(f) The performance of Biology 5090 in your school has been poor. In your opinion, what factors contributed to this low performance?

(g) Although your school’s performance is generally below average, there are significant fluctuations for the past years. What in your opinion are the causes of these fluctuations?

(h) (i) Do you think the students’ ability and the manner in which the subject is taught here at your school could be some of the factors which contribute to the low performance? Please explain.

(ii) Apart from students’ low abilities, do you think there are other ways in which they contribute to low performance? Please explain.

(i) In your opinion, what measures do you think Biology teachers ought to take in order to improve performance in Biology 5090?

(j) Do you think there are ways in which Biology 5090 teaching could be made more interesting particularly to new teachers? Please explain.

(k) Is there anything more you would like to add?

I will be analyzing the information you and others gave me and present data in my research. I will be happy to send you a copy to review at it over time if you are interested.

Thank you very much for your time.
APPENDIX F: RECORDS FOR BIOLOGY 5090 TESTS GIVEN IN 2012 AT MACHACHE HIGH SCHOOL

<table>
<thead>
<tr>
<th>Class List</th>
<th>Test I</th>
<th>Test II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beka Pulefha</td>
<td>33</td>
<td>59</td>
</tr>
<tr>
<td>Chibo Koebekeke</td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td>Khupa Telebule</td>
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<td>30</td>
</tr>
<tr>
<td>Escu Kudjato</td>
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</tr>
<tr>
<td>Kelaqone Nkule</td>
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</tr>
<tr>
<td>Laka Pule</td>
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<tr>
<td>Mekane Nkopo</td>
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<tr>
<td>Letka Lule</td>
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<td>Lekuana G'Sebo</td>
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<td>Lekosa Mokgale</td>
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<td>Lembi Letsoeng</td>
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<tr>
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# APPENDIX K: DATA ANALYSIS SCHEME

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<th>Themes</th>
<th>Major categories</th>
<th>Characteristics</th>
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<td>Human resources</td>
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<td>Factors affecting Biology 5090 in selected high schools in Lesotho</td>
<td>Teacher and teacher quality</td>
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<td>Poor class attendance by teachers and learners.</td>
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<td>Poor admission of learners into Form D</td>
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<td>Learners’ carelessness</td>
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<td>Learners laziness and phobia for Mathematics</td>
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<td>Poor answering of questions by learners.</td>
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<td>Poor Biology background of learners</td>
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<td>Parent’s negligence of paying school fees and buying Biology textbooks for their children.</td>
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<td>Physical resources</td>
<td>Lack of equipped science laboratories and libraries</td>
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<td>Information resources</td>
<td>Inadequacy of English language on the part of learners.</td>
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<td>Lack of Biology textbooks for both learners and teachers.</td>
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<td>Lengthy Biology syllabus</td>
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|                     | Lack of frequent
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<tr>
<th>Ways of improving Biology 5090 performance</th>
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<tr>
<td>Financial resources</td>
<td>• Shortage of funds for teaching aids even to hire qualified Biology teachers</td>
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<td>Transformation process (assessment methods)</td>
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<td>Development of resource centres</td>
<td>• Question and answer method</td>
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<td>• Testing</td>
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<td>• Quiz</td>
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<td>• Class work</td>
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<td>• Assignments</td>
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<td>• Drilling using past question papers</td>
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<td>Team work by Biology teachers</td>
<td>• Biology teachers working together through sharing experiences to enhance teaching.</td>
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<td>Improvising</td>
<td>• Developing structures or models that would enable teachers to facilitate learning and teaching.</td>
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<td>• Using certain equipment in place of another one due to lack of equipment.</td>
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<td>In-service training</td>
<td>• Workshops for teacher development and motivation.</td>
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<td>• Solving teaching related problems and equipping one</td>
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another with skills on how to treat other topics.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Purpose</th>
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<tr>
<td>Giving students more work</td>
<td>To facilitate their understanding of Biology</td>
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</table>
| Devising methods of teaching and assessment strategies | Opt for methods allowing for learner participation.  
• Remedial classes  
• Using LSMTA question papers  
• Doing corrections with learners and re-teaching where necessary |
| Reading the latest discoveries on Biology      | To update themselves to avoid challenging situations in teaching        |
| Development of school clusters                | To share skills, challenges, problems and to find solutions for the existing problems |