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DISSERTATION TITLE : PROBLEMS IN THE INTEGRATION OF TEXT BOOK AND INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE TEACHING AND LEARNING OF ADVANCED LEVEL BIOLOGY : A CASE OF CHIBI HIGH SCHOOL IN CHIVI DISTRICT
Approval Form

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Dissertation Submission: Approval Form

The undersigned certify that they have read and recommended to Bindura University of Science Education for acceptance: a research submitted in partial fulfilment of the requirements for the Master of Science Education Degree.

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Declaration

I, GuniMuchineripi, declare that the Dissertation represents my own work and has not been reproduced from someone else’s work. Where use has been made of the work of others, it has duly been acknowledged in the text.
Acknowledgements

I would like to express my heartfelt appreciation to my supervisor, Prof I. Ramirez for her tireless effort and patience in marking my work which she constantly encouraged me to continue correcting after she looked at it. I would also not forget to sincerely thank my friend Dzingirai who provided me with WIFI facility most of the time when it was not available at my School. Many thanks also go to my School Head, Mr B. Machingauta, Deputy Head, MrNdega , Senior Master, MrMukwazvure , Senior Lady , MrsMutsauki , HOD Sciences, MrZishura , U6 and L6 2018 Biology classes of Chibi High School. These all participated in my research and their cooperation cannot go unmentioned. My wife, Mavis, son, Joshua and daughters, Prayer and Faithful also deserve a pat on the back for their sacrifice to soldier on with life in my absence during this study.
Dedication

I dedicate this work to my late father, Mr Phillip Guni, who encouraged me to pursue Sciences.
Abstract

With the emphasis on STEM subjects in Zimbabwe, it has become imperative to teach learners using ICT tools. However, use of textbooks in schools cannot be ruled out. This study focused on problems that impede integration of textbook and ICT in the teaching and learning of Advanced Level Biology. Qualitative research paradigm was used and a case study done at Chibi High School. Purposive sampling of participants was done and a total of 28 participants was used 3 of which were biology teachers and 20 were learners. There was also head, deputy, senior master and lady and HOD sciences. These were subjected to interviews, focus group discussions and document analysis. The study found out that one of the problems impeding the integration of ICT and textbook in the teaching and learning of Advanced Level Biology had to do with teachers who lacked computer competencies for example Google. Furthermore, the administration’s stance on the use of cell phones by learners was problematic. No learner was allowed to use a cell phone at school yet there are few ICT tools at the school. It was also discovered in the study that the administration was determined to positively effect change on the feasibility of integrating ICT and the textbook. Among other things, the administration wishes to secure more ICT resources and to have teacher capacitated to use the ICT. Some of the conclusions drawn from the study were that more ICT and textbook resources were needed at the school. In addition, both teachers and learners need to improve the competences if integration of ICT and textbook is to be realised. Many recommendations were made including the following: the government and responsible authorities should find ICT resources and textbooks for schools; schools should upgrade the internet facilities; ICT department should work hand in glove with other departments like the Sciences department; schools to have linkages with tertiary institutions. All these measures will help to facilitate integration of ICT and textbooks.
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CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.0 Introduction

Chapter one outlines the background to the research problem and the pertinent research questions guiding this study. The rational or justification for this study is spelt out under the subheading titled the significance of study. The last two sections of chapter describe the physical and theoretical delimitations and definitions of key terms in the study.

1.1 Background to the study

As asserted by Shavinina (2009), the impending use of ICT in secondary Biology teaching and learning is a colossal aspect which is highly unnerving to newcomers. Computer learning packages and the web can offer a variety of opportunities for learning, ranging from non-interactive content provision to highly interactive student-centred learning experiences. In United States of America (USA), use of ICT in teaching Science subjects has seen use of Computer Assisted Learning (CAL), Computer Assisted Instruction (CAI) and many other packages in learning in secondary and tertiary institutions (Tylor, 2000). These computer

South Africa, use of computers in education was mostly availed to white and affluent communities in the 1990s (Hawkridge and McMahon 2010). However, in the non affluent rural schools there are no computers for use by learners and teachers at all. The use of textbook learning software packages are used to complement the textbook use in these institutions.

In in teaching and learning is predominant in the teaching and learning process of these non affluent rural schools (Musarurwa, 2011).

In Zimbabwe and the world over, there is no doubt that ICT provides productive teaching and learning in order to increase people’s creative and intellectual resources especially in today’s information society. Through the combined use of audio, text, multicolour images, graphics, motion, ICT gives sufficient and exciting opportunities to the students to develop capacities for high quality learning and to increase their ability to innovate (Isaacs, 2007). According to Musarurwa (2011), in Zimbabwe, there has been incremental provision of ICT resources in
universities, colleges, and schools since 2002. ICT resources were provided to these institutions to complement the textbook as the basic and fundamental resource in the teaching and learning. The Nziramasanga Commission (1999), inter alia, recommended the use of computers for teaching and learning in educational institutions. Subsequently, National ICT policy was promulgated in Zimbabwe in 2005 (Ministry of Education, 2010). The policy laid the framework of using computers and other information technologies in teaching and learning.

To promote the use of computers and information technologies, the Zimbabwean President’s office also propelled a massive campaign to provide most schools with computer related equipment. This resulted in most schools (including schools in the remote areas of the country) and universities benefitting and, thus, enabling them to utilise ICTs in the teaching and learning process, although an audit still needs to be carried out to ascertain how far the equipment has been put to good use. It is rather disturbing that in some certain cases, the computers donated by the President are merely white elephants because there are no competent teachers to take up the teaching of computer in schools.

At the school where this research was conducted, important strides towards a robust use of ICT technologies have been accomplished. A WIFI has been established. The school has procured one overhead projector for use in the school teaching and learning activities and other support programmes.

Currently, Zimbabwe has embarked on a curriculum to promote science, technology, engineering and mathematics (STEM). What it implies is that the teaching and learning of Sciences (Biology included) requires a paradigm shift from textbook dependency syndrome to an integration approach where ICT should be fused and complements the use of the textbook in the teaching and learning of the new curriculum subjects.

1.2 Statement of the problem

Most secondary high schools in Zimbabwe, (in particular rural high schools) are lagging behind in the integration of ICT and textbook in the teaching and learning of Sciences as mandated by STEM. There apparently is too much dependency on the use of the textbook. This study therefore undertakes to investigate the problems impeding the integration of textbook and Information and Communication Technology (ICT) in the teaching and learning of Advanced Level Biology: A case of Chibi High School in Chivi District.

1.3 Research questions
In view of the above statement of the problem, the following pertinent research questions guide this study:

1. What ICT skills do Advanced Level Biology teachers at the school have which promote teaching and learning of Biology?
2. To what extent is the adequacy of the availability of Advanced Level Biology textbooks at the high school?
3. What ICT resources are available at the school which promote integration with textbook in the teaching and learning of Advanced Level Biology?
4. What challenges are faced by Biology teachers and Advanced Level Biology learners in the integration of textbook and ICT approaches in the teaching and learning of Biology?
5. What measures should be taken by the school administration to promote integration of textbook and information and communication technology in the teaching and learning of Advanced Level Biology at the school?

1.4 Objectives of the study

Guided by the above research questions, the objectives of this study are:

1.4.1. To identify the ICT skills possessed by Advanced Level Biology teachers at the school that enable promotion of integration of textbook and ICT in the teaching and learning of Biology

1.4.2. To ascertain the adequacy of Advanced Level Biology textbooks in order to establish the possibility of integration with ICT in the teaching and learning of Advanced Level Biology

1.4.3. To identify ICT resources at the school which promote the integration of textbook and ICT in the teaching of Advanced Level Biology?

1.4.4. To identify teacher and learner factors that impede integration of ICT and textbook approaches in the teaching and learning of ‘A’ Level Biology.

1.4.5. To ascertain the extent of the measures undertaken by the school administration in the promotion of textbook and ICT integration in the teaching and learning of Advanced Level Biology

1.5 Significance of the study
The integration of textbook and ICT in the teaching and learning of Zimbabwean updated education curriculum is a new dispensation and innovation whose implementation should be guided by research. To this end, this study is justified for five reasons as given below:

1.5.1 Knowledge and skills to the teachers and learners

First, the study should generate knowledge on how best textbooks and ICT can be used together in the Sciences department. Where these direct beneficiaries fall short, the study will provide benchmarks for skills training to enable effective and sustainable integration of textbook and ICT. Teachers who are computer literate and competent are able to integrate ICT and textbook in the teaching and learning of Biology in schools.

1.5.2 School educational curriculum planning

This study hopes to inform school curriculum planning so that it becomes relevant to the particular school station. Thus, this study will contribute to the formulation of what can be referred to as school based curriculum (SBC) – a kind of innovation seeking among other things an effective teaching and learning of Advanced Level Biology.

1.5.3 Benefits of the study to the government of Zimbabwe

In addition, the study will support the Zimbabwean government’s pursuit in use of ICT in schools. As challenges faced by teachers and learners are unearthed in this study, the government may plan and carry out capacity building workshops where integration of textbook and ICT in the teaching and learning of Biology shall be emphasized.

1.5.4 Curriculum development planners

In Zimbabwe, school curriculum is planned at the Curriculum Development Unit (CDU). There is need for the CDU to develop curriculum based on real and practical situation analysis in different schools in Zimbabwe. This study hopes to provide such evidence of conditions concerning the use of textbook and the ICT in the teaching of Biology in high schools.

1.5.5 Researchers’ Benefits from the study

Researchers on the other hand can also develop improvements on integration of ICT and textbook in the teaching and learning of Biology at Advanced Level in high schools of Zimbabwe. Thus, the study can be a pointer to new areas of study or innovation pertaining
integration of textbook and ICT in the teaching and learning of Biology at Advanced Level in Zimbabwean secondary schools.

1.7 Delimitations of the study

The study is to be carried out in Chivi District where one rural high and mission school is to be selected as a case study. The high school is the best in Chivi and has a large number of Advanced Level Biology students (20) and three Biology teachers; hence, it is ideal to carry out this study at this school in order to obtain a deep insight into the integration of textbook and ICT in the teaching and learning of Advanced Level Biology at the school.

The study is limited to focus on the problems hindering the integration of textbook and ICT in the teaching of Advanced Level Biology. Contemporary teaching and learning of Advanced Biology requires innovations that concern integration of textbook and ICT. This is because most rural high schools largely depend on the use of the textbook. There is need, however, to complement the use of the textbook in modern society where WIFI and internet facilities are available.

1.8 Limitations of the study

Time frame

The constraints include the time frame given to complete this study to submit it for marking. This study was completed in partial fulfillment to the requirements of Bindura University of Science Education. Given a much longer period, the study could be more credible.

Role strain

Delamont (2010) says that sociologists use the term role strain to describe the difficulty that arises when the same position imposes conflicting demands and expectations. The researcher is based far away from the supervisor and assumes duty as a teacher in the rural areas of Chivi which needed constant calling to accommodate for comments and confirmation. Nevertheless, use of email covered up for quick feedback from the supervisor.

Financial constraints

Movement to Bindura University of Science Education is rather expensive for the researcher. Use of email helped reduce this expense. Chivi being remote from bigger cities means that the researcher finds it difficult to obtain adequate literature to accommodate all the needed information which is suitable to the study. Though the school has a WIFI, the latter is relatively slow hence is problematic in gathering data from the internet.
1.9 Definition of terms

Textbook

This refers to a book used in the study of a subject: such as; one is containing a presentation of the principles of a subject (Merriam, 2010). It is a book which is used to study facts and knowledge about a particular subject. In this study, it refers to Advanced Level Biology textbook (ZIMSEC, 2016).

Information and Communication Technology (ICT)

Is an extended term for information technology (IT) which focuses on the role of systematic and unified communications and the integration of telecommunications, computers as well as necessary software applications, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information (Canton and Danowski, 2015). In this study, ICT shall refer to use of various information and communication technologies embracing use of computers, WIFI, satellites, internet, tablets cell phones and many others in the teaching and learning of Advanced Level Biology.

Advanced Level Biology

The subject is coded as 6030 with the Zimbabwe Schools Examination Council (ZIMSEC). For purposes of this study, Advanced Level Biology (6030) shall be referred to as Biology and has both Theoretical and Practical sections in its syllabus.

Integration of textbook and ICT

Integrated teaching and learning means that Advanced Level professionals (teachers) build opportunities in STEM programs for learners to interact with their learning resources, physical, technological and social, in response to their own hypotheses or curiosity about how living organisms in the world work, and to interact with other children and professionals to extend this learning (Earl, 2005). In this study, integration of textbook and ICT implies combined use of textbook and ICT media to foster effective teaching and learning of Biology at Advanced Level.

1.9 Summary
This chapter commenced by highlighting the background and motivation of this study. High schools in Zimbabwe are currently encouraged to teach STEM subjects which include Biology. Effective teaching and learning of Advanced Biology requires contemporary teaching methods to support the most prevalently used method and resource - use of the textbook. Because of the advent of ICT, this study seeks to investigate problems impeding the integration of textbook and ICT in teaching and learning of Advanced Level Biology at one rural mission high school. Five research questions have been formulated to guide this inquiry. Five reasons were outlined as justification of undertaking this research. The reasons included; Generation of knowledge and skills to the teachers and learners, contribution to the school curriculum planners, the government of Zimbabwe, curriculum developers and pertinent educational researchers who seek to carry out further studies concerning the innovation to be used in the teaching and learning of STEM subjects in high schools of Zimbabwe. The chapter concluded by giving the key terms as they are used in the context of this study. The next chapter looks at review of related literature.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This study is guided by the cognitive theory of constructivism with particular emphasis on a category of learning styles associated with it. The chapter looked at what other authorities say concerning the use of ICT in countries world over. There are three sub-headings under this chapter, namely: Advent of ICT in Secondary Schools; Availability of Science textbooks in High Schools in Zimbabwe; Challenges in the Use of ICT in Secondary Schools of Zimbabwe and a chapter summary. However, the theory of constructivism is first of all discussed.

Constructivism is a theory of learning propounded by Seymour Papert who was influenced by Piaget's teachings (Orodho, 2009). According to Papert, when an individual encounters a new experience or idea, he/she reconciles the new experience or idea with the previous experience and ideas. This process of reconciliation results either in discarding the new idea or changing the original belief. Proponents of constructivism thrive to establish or make sense of the world. In constructivism, learning is an active contextualised process in which an individual builds or constructs knowledge based from experiences and interaction with the environment.

According to Patton (2016) knowledge is constructed and not acquired. Constructivism rejects the view that the learner’s mind is a kind of blank box (tabula rasa) whereby knowledge is planted in an individual or one’s faculty. Instead, learning according to constructivism is built through interaction with social, physical and cultural environment. The critical factor in constructivism is that, the learner is not a passive recipient of knowledge but, rational and meaningful learning involves active creation of knowledge through observation, reflection and interpretation of information from the world or environment. When ‘A’ Level Biology learners learn about Biology, they use existing knowledge, perceptions and interpretations so that they reconstruct or modify their knowledge giving rise to new concepts.

According to Akpan (2013), there are forms of learning derived from constructivism based on their sources or experiences. These include mental, physical, and social environment or sources. Mental experiences refer to contemplation or thinking about what one has observed. Physical experiences refer to contact with the objects from the environment and social experiences refer to interaction with adult peers and different people from the social realm. Thus individuals interact with and interpret these different experiences subsequently
constructing and reconstructing knowledge. Piaget is the founder of the cognitive constructivism, where knowledge is built through mental reconstruction, and, Vygotsky is the proponent of social constructivism where knowledge is constructed and learnt in particular social and cultural contexts (Lemke, 2009).

According to cognitive constructivism, Biology teachers must take a peripheral role where they provide appropriate Biology experiences which allow students to think and master Biological concepts. Thus the teacher’s role is to facilitate thinking and subsequent learning. The teacher takes a mediational role rather than taking an instructional role. The Biology teacher must create conditions, expose learners to situations where the learners are stimulated to discover new ideas, stimulated to reflect and make some changes thus constructing and reconstructing new ideas.

As for social constructivism the role of the teacher is to provide learning experiences through rich communication language and interactions with both adults and peers. This is more applicable to Social Sciences. Cognitive constructivism is more akin to Biology and other Science subjects.

There is a general application of constructivism in the classroom where a constructivist teacher is guided by the principles of constructivism. Constructivist teachers emphasise building knowledge through diverse learning activities. The constructivist teacher is obliged to provide textbooks and experiments and the thrust is to make learners build knowledge through more learning activities instead of learning through textbooks. Nevertheless, the teacher will try to understand learners’ pre-existing conceptions and use techniques such as real world problem solving methods and experiments to address learners’ conceptions and build on them. In constructivist classrooms, teachers encourage learners to question themselves, their learning and problem solving strategies and evaluate how the diverse activities are enriching their understanding of the subject. The ultimate goal is to make learners become expert learners who actively construct knowledge rather than reproduce a series of facts. Biology which has to do with the living organism is best taught using constructivism principles. This is because the advanced learners have many questions whose answers are provided by step by step discovery through experiments, applications of acquired knowledge to new Biological scenarios, reflections of acquired Biological knowledge and reconstructing Biological concepts.

It is very important however for the Biology teacher to select appropriate learning styles in order to effectively appeal to cognition of the learners. A learning style is a simple way to
describe a fundamental complex acquisition of knowledge but is an attempt to explain how we construct knowledge. Learning style can be defined in many ways, including: “the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn” (Pritchard and John, 2013, P:167). A Biology teacher should be cognisant of the fact that there are diverse learners who use different learning styles and therefore, it is imperative for the teacher to appeal to every learner’s learning dispositions so that learning is achieved.

Literature is awash with diverse learning styles as their writers are diverse. The field of cognitive psychology is well established in human being learning styles which guide teachers in their instruction. Three main learning style frameworks found in cognitive psychology include Multiple Intelligence, Dimensions of Learning styles and VARK, an acronym for four major sensory modes of learning: visual, aural, reading and kinaesthetic (Coe, 2014). These styles are very applicable to teaching Biology. This study greatly leans on the commonest learning style based on sensory functionality termed the VARK. Suffice to explore this learning style as it guides this study.

Visual learners learn through seeing and prefer to learn through drawings, pictures, and other image-rich teaching tools. Visual learners can also be effectively taught by using videos. They effectively learn by seeing cartons, colourful charts and diagrams to illustrate parts or structure of living organism. Thus to effectively exploit the visual learning style, the Biology teacher should make sure that the Biology laboratory is fully decorated with colourful posters, overhead projectors to show Biology videos and an effective WIFI and other internet facilities for learners to download Biology related materials for constructing and reconstructing concepts in Biology. Whenever a Biology teacher is planning a lesson, there is need to think about how to visually stimulate the ‘A’ Level Biology learners. Poor planning on the part of the Biology teacher thus may impede visual learning style.

Auditory learners learn preferentially through hearing and are proficient at listening to lectures and exploring material through discussions and might need to talk through ideas. In ICT there is need to use videos where there are sounds to illustrate certain concepts. These sounds may not be well illustrated in the use of textbooks hence the need to link textbook and ICT approaches. In U-tube, certain Biological processes and concepts may be well illustrated.

Reading/writing learners learn preferentially through interaction with textual materials, whereas kinaesthetic learners learn through touching and prefer learning experiences that
emphasize doing, physical involvement, and manipulation of objects. In trying to shed more light in the VARK learning style, this study examines the principles of integrating ICT and Textbook approach in teaching and learning of Biology at Advanced Level. As this study shall show, knowing the nature of the Biology learners enables the teachers to select appropriate learning style and subsequently lead to more learners pursue Biology studies.

2.2 The advent of ICT in secondary education

Information and communication technology explosion started in developed nations long back and later reached developing nations. The USA government developed robust policies encouraging usage of ICT in USA in 2006 (Victoria, 2011). Being the leading ICT giant in the global village, USA has supported use of ICT in schools, homes, industries and many sectors of human life in the country. Even in Early Childhood Development (ECD), the USA government has funded use of electronic equipment in children play and learning centres. In senior secondary schools and tertiary education, the chalkboard and overdependence on use of textbook have been abandoned and use of projectors and other electronic gadgets have been taken on board in USA. This has given birth to what is known as e-learning.

China is currently rated the second best provider of ICT in various development sectors covering health, agriculture, mining and education (Victoria, 2011). Computer education in China starts from the ECD level. Japan is rated number three in the world and has put in place an ICT policy where schools have easy access to e-learning equipment such as tablets, computers, flash boards, and many others. According to Victoria (2011), in 2007, Japan launched the u-Japan (Ubiquitous Japan) project and the USD 13.6 billion Zero Broadband Areas Elimination policy with a goal of increasing broadband availability to 100% across Japan by 2011. Controlled access to internet information in schools and at homes became a prerogative for use of ICT for school children in the country. Currently, use of ICT has become mandatory for all learning institutions in Japan.

In Africa, there are some countries which have taken a leading position in use of ICT in education. Nigerian context has seen a high level of ICT application in secondary schools. The Nigerian government promulgated the 2004 National Policy on Education in which it officially recognised the critical role of ICTs in the modern world and has integrated ICTs into education in Nigeria (Adon and Kpangban, 2010). Nigeria has further made computer education a prevocational elective in junior secondary schools and a vocational elective at senior secondary school. The ultimate goal was to make Nigerian learners computer proficient. This enabled
learners not to over rely on the use of the textbooks but to turn to information provided through ICT.

Zimbabwe has since 2000 joined the global village to achieve the Millennium Development goals (MDGs) scheduled by the United Nations emphasizing the critical role of ICT in the global development agenda. The Zimbabwean government developed a national ICT policy in 2005. Nziramasanga Education Commission Report of 1999, the national science and technology policy of 2002 and vision 2020 are examples of efforts taken by the Zimbabwean government to encourage use and development of ICT in education. In particular, the Nziramasanga Commission recommended the use of computers for teaching and learning in all educational institutions in Zimbabwe. The National ICT policy that was promulgated and adopted in 2005 makes significant references to the promotion of ICTs in education including their instructional use in educational institutions (Isaacs, 2007). Former President of Zimbabwe, Mugabe’s office also launched a campaign to provide most schools with computer related equipment. This resulted in most schools (including schools in the remote areas of the country) and universities benefitting and, thus, enable them to utilise ICTs in the teaching and learning process, although an audit still needs to be carried out to ascertain how far the equipment has been put to good use.

In 2016, Zimbabwe launched STEM Initiative providing free education to learners for Advanced Level (senior high school) registered for STEM (Science, Technology, Engineering and Mathematics) related subjects like Maths, Physics, Chemistry and Biology. To this end, there is need to ensure that the teaching and learning styles should include use of ICT in order to succeed in this new curriculum dispensation (Konyana and Konyana, 2013). What is pleasing is that ICT is promoted by the government of Zimbabwe and it has commenced teacher training in ICT at universities through scholarship programme. One such example of university is the Bindura University of Science Education whose main thrust, among other things, is to train and educate teachers who are proficient in ICT. Initially in the post independent Zimbabwe, the Science teachers were trained in Cuba on a government to government agreement.

A research by Konyana and Konyana (2013) found out that there were so many challenges faced by some rural schools in Chipinge District which militate against the use of computers and ICT. Konyana and Konyana’s (2013) study was directed on the use of ICT in Science subjects and to Biology in particular.
The health sector for Zimbabwe currently faces a shortage of medical doctors. This puts the human life of the general populace at risk since the diseases which attack people cannot be treated due to shortage of medical doctors. This is the reason why STEM through Biology aims to direct Advanced Level learners to take Biology at high school, so that, in future more doctors can be availed through pursuing medicine studies at tertiary level, as well as other Biology related careers. Yet, in schools, Biology is one of the subjects which are poorly performed.

This study wishes to characterise the integration of ICT approach and textbook approach in the teaching and learning of Biology in rural secondary schools. Thus, this study treads on the same path of identifying the impeding conditions for successful and effective integration of ICT and textbook approaches in the teaching and learning of Biology as STEM subject in Zimbabwe.

2.3 Availability of Science textbook in high schools in Zimbabwe

Cornell (2013) carried out a research to establish the resource potential of teaching Science in rural day secondary schools of Buhera. Findings from Cornell (2013) research indicated that there was a dire shortage of Advanced Level Biology textbooks and this impacted negatively on teaching and learning of Biology. What is to be noted about this research is that, it was looking at resource potential of teaching Science in rural areas in general. There is need to focus on the nature of Biology textbook availability at one rural high school and to characterise the best way of integrating use of ICT and textbook approach in the teaching and learning of the subject.

In 2010, the government of Zimbabwe’s Ministry of Education, Sport, Arts and Culture, Unicef and other donors entered into a partnership to produce a total of 13 250 000 textbooks and stationery kits nationwide under the Education Transition Fund (ETF) in a bid to improve the quality of education in the country (Ministry of Education, Sport and Culture, 2010). The fund helped to provide some new but few Biology textbooks for high schools in the country. As such, this study goes further to suggest integration of ICT and textbook approaches in order to facilitate teaching and learning of Biology as one of the STEM subjects. The major reason for a proposition of integration is that there are very few Science textbooks in Zimbabwe. It is a robust conviction by this research that it is imperative to integrate ICT and textbook approaches in the teaching of advanced level Biology.

2.4 Challenges in the use of ICT in secondary schools of Zimbabwe
A research to identify challenges faced in the use of ICT was carried out by Konyana and Konyana (2013). The research was a qualitative one based in Chipinge District. The findings of this research indicated three major challenges: (a) there was a general shortage of computers and associated equipment in schools. This was largely caused by inability of schools to purchase the computers. In schools where computers were donated by former Zimbabwean President, Mugabe, the quantity was rather low and inadequate to cater for learners. (b) There was a general lack of computer teachers in secondary schools. Most teachers who were staffed in schools by the time of the research were old teachers who were trained long back in the 1990s and lacked computer skills. (c) Most of the rural schools did not have electricity and were not able to offer computers.

The new curriculum and the new Science education with its bias on STEM, requires that there be a high use of ICT in all schools in Zimbabwe. One way to support use of ICT in schools is to integrate it with the textbook approach. Whist Konyana and Konyana (2013) focused on general challenges of computers in schools, this study focuses on integration of ICT and textbook approaches in the teaching and learning of Biology at one rural high school in Masvingo Province.

The readiness and political willingness to accept the innovation in provision of Science skills through the STEM is one condition which was put to test by Redd, cited in Mathieu et al (2009) in which the ICT Network Readiness Index was reached. This index postulated that Zimbabwe was amongst the bottom ten. Very recently, Bindura University of Science Education and Higher life Foundation in 2016 carried out a diagnostic study to establish the status of STEM education in Zimbabwe. Amongst the findings of the study, Bindura University of Science Education found out that STEM policy lacked specificity and clarity in the manner of implementation (Gadzirayi et al, 2016). What is important to note is that their research was generally focussed on all the STEM subjects. It left a gap where there was need to focus on one particular STEM subject. This research sought to produce an in depth study on one STEM subject- Biology at Advanced Level at Chibi High School.

Another researched area by Gadzirayi et al (2016) of Bindura University of Science Education is the adequacy of the STEM subjects’ infrastructure in secondary schools. Their findings indicate that infrastructure availability such as computer laboratories varied from school to school and were not clear about availability at rural day schools and boarding schools. This gap remained the focus of this research.
2.5 Summary

This chapter commenced by describing the conceptual or theoretical framework guiding this study. The study is guided by the Constructivism theory of learning and its VARK learning style. In this new Science curriculum in schools based on STEM, teachers need to exploit the four major sensory modes of learning: visual, aural, reading/writing and kinesthetic, depending on the neural system with which a learner prefers to receive information. Full knowledge about VARK helps Biology teachers to achieve integration of ICT and textbook in the teaching and learning of Biology.

The second section of this chapter dealt with the advent of computer literacy and the historical birth of ICT education in schools in Zimbabwe. The country has policies which support the Millennium Development goals pertaining to use of ICT. Recommendations from the Nziramasanga Commission (1999), the 2005 National ICT policy and the STEM policy of 2016 were important milestones towards promotion of ICT in education system of Zimbabwe. These were meant to support use of textbooks in Zimbabwe.

The third section of this chapter focused on the availability of Biology textbooks at Advanced level. Researches carried out by Bindura University of Science Education showed a general shortage of Science textbooks in Zimbabwean secondary schools. Efforts by the Zimbabwean government through UNICEF support and acquisition of books through education transitional fund proved inadequate. Perhaps, integrating ICT and Textbook approaches would yield increased uptake and improved pass rate in Advanced Biology. This is the focus of this research.

The last section of this chapter covered the challenges researched in Zimbabwe about use of computers in rural schools. All this literature helped to put into context this qualitative study to be based on a case study of one mission school in Chivi District.
CHAPTER THREE

Research Methodology

3.0. Introduction

This chapter describes the qualitative research paradigm used in this study in order to explore the scope and pertinent impediments to integration of textbook and ICT in the teaching and learning of Advanced Level Biology at one rural mission high school in Chivi District. It also outlines the case study research design used in this study, the purposive sampling technique,
and the target population of this research. The following research methods will be described as they are used to gather data showing their dependability and credibility: the interview, the questionnaire, and document analysis. The last section of the chapter shall describe steps to be undertaken in the collection of data from participants and how that data is to be analysed.

3.1. The Research Paradigm

The main aim of this research is an investigation into the problems encountered in the integration of textbook and ICT in the teaching and learning of Advanced Level Biology: A case of Chibi High School. A qualitative research paradigm is used in this research. According to Bogdan and Taylor (2004), qualitative paradigm is concerned with comprehension of phenomenon from the actors’ perspective through participation in the life of actors. Following this tenet, the qualitative paradigm is considered suitable in this research for it accords a detailed study for one rural mission high school in Chivi. The rationale for using the qualitative approach is that, the approach enables the researcher to shed light on the phenomenon of integration of textbook and ICT in the teaching and learning of Advanced Biology in a rural high school.

The other reason why this research uses the qualitative paradigm is that, qualitative research uses the natural setting as the source of data. The researcher attempts to observe, describe and interpret settings as they are, maintaining what Patton (2010) calls “empathic neutrality”. This study is to be carried out by this researcher who is a teacher at the area of research (Chibi High School). The teaching and learning of Advanced Level Biology at the school shall be observed in its daily teaching and learning routine at a high school.

As one of the Biology teachers at the school where this research is carried out, qualitative research approach allows close researcher involvement, subsequently, the researcher gains an insider's view of the field. This allows the researcher to find issues that are often missed (such as subtleties and complexities) by the scientific, more positivistic enquiries (Huberman and Miles, 2011).

When researchers undertake research, they, among other things aim to produce a full description of the phenomenon under investigation. To use Strauss and Corbin (2010) view, the researchers use the holistic description of events, procedures and philosophies as they occur in a natural setting. Being a teacher at the school where this research is carried out there is need to give a holistic or complete description of the use of textbook and ICT in the teaching and learning of Biology at Advanced Level at the rural mission school. In that way the qualitative
paradigm allows an accurate selection of situational analysis of problems encountered in the use of textbook and ICT in the teaching and learning of Biology at Advanced Level. This differentiates it from quantitative research in which selected pre-defined variables are studied in order to study the phenomenon. So, it has been considered rational to use the qualitative research to explore the impediments for integration of use of textbook and ICT in the teaching of Biology at a rural high school.

Schools are considered by various researchers as social organisations which must be studied in their natural setting. To this end, they must be studied (using qualitative paradigm) in their natural setting as Biology lessons unfold. Qualitative research has an interpretive character, aimed at discovering the meaning events have for the individuals who experience them and the interpretations of those meanings by the researcher (Strauss and Corbin, 2010). Thus, this study engages the qualitative research to allow appropriate interpretation of integrated use of textbook and ICT in the teaching and learning of Biology at Advanced Level.

Finally, the qualitative research paradigm is adopted because it permits the researcher to analyse the data inductively. According to Patton (2010), usually the data is not pre-specified and so cannot be predetermined. It is emergent. Therefore, the researcher is going to search for emerging themes concerning integrated use of textbook and ICT in the teaching of Biology at ‘A’ Level.

3.2. Research Design

This study uses an in-depth investigation of an integrated use of textbook and ICT in teaching and learning of Biology subject at a Reformed Church mission school in a rural area of Chividistrict—a case study of Chibi High School. According to Yin (2003:23) case study research design is defined;

“...as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.”

A case study is a unique way of observing any natural phenomenon which exists in a set of data (Yin, 2003). Here, unique implies that only a very small geographical area or number of subjects of interest is studied in detail. In this study, the geographical area covered is Chibi High School with a focus on Biology teachers and Advanced Level Biology learners as the participants. Unlike quantitative analysis which observes patterns in data at macro scale level
on the basis of the frequency of occurrence of the phenomena being studied, case studies observe the data at the micro level (Chibi High School).

This study uses an explanatory case study approach which examines the data closely at both surface and deep level in order to explain the phenomenon in the data (Stake, 2010). This is because it allows clarifying the conditions inhibiting the integration of textbook and ICT in the teaching and learning of Biology at Advanced Level at a rural high school.

The advantage of using this case study approach is that it can use the primary approach to collect data (Opie, 2004). In this research, the researcher will collect data from the participants i.e. Advanced Level Biology learners, ‘A’ Level Biology teachers, Head of Department (HOD) Sciences, deputy head and the school head. The researcher is another primary source as well. Case studies apply a range of different research methods within the research procedure. For example, interviews, observation, focus group and documentary analysis will all be used to gather data relating to the integrated use of textbook and ICT in the teaching and learning of Biology at the school.

The rationality of case study in this research is that, it can accomplish many of the same goals as other methods (Opie, 2004). For example, the case study can be exploratory resulting in the creation of new knowledge, constructive (solve some problem), or confirmatory (test a hypothesis with empirical evidence). In this study, use of the case study is intended to generate knowledge about the integration of textbook approach and ICT in the teaching and learning of Biology at ‘A’ Level.

Another yet robust merit of using the case study approach is that the gathering and examination of data is done in the context of its use. Data will be gathered as the teaching and learning of Biology is taking place at the high school. To explore the factors impeding an integrated use of ICT and textbook approaches, the researcher must observe the teaching and learning of the subject within its environment.

Despite the merits of why this study engages the case study, there are some certain weaknesses associated with this research which this researcher had to take caution of in order to produce credible findings. First, case studies are accused of lack of rigour (Huberman and Miles, 2011). There is need for this researcher to gather as much data as possible in order to allow credible interpretation of findings.

Second, case studies provide very little basis for scientific generalisation since they use a small number of subjects some conducted with only one subject. The question commonly
raised is: “How can you generalise from a single case?” (Yin, 2003:21). This study does not focus on generalising findings, but aims to produce deeper insights pertaining the use of textbook and ICT in the teaching and learning of Biology at ‘A’ Level. Third, case studies are considered as being too long, difficult to conduct and producing a massive amount of documentation (Yin, 2004). This is not the case with this study since it is conducted in partial fulfilment of the requirements of Bindura University of Science Education, hence will take place over a short period of time.

3.2.1 Population

In research, population refers to any group of individuals that have one or more characteristics in common that are of interest to the researcher (Best and Khan, 2009). The following constitute the population of this research; the school head and his deputy head, and 36 teachers at the school. The learners at this school (950) also form part of the population in this research. Nevertheless, the size of this school population is too large to engage all participate in this study. As such, there is need to sample the population and to establish the population parameters so as to clearly define the desired target population and the defined target population (Opie, 2004). In this research, the desired population refers to the population of interest to the researcher (all the teachers and the learners at the school.) The practical and time frame circumstances of this research make this researcher to exclude some sections of the population. To this extent, in this research, all relief teachers, teachers in the humanities, languages and commercial departments are to be excluded. The reason for excluding the relief teachers is that they are not trained, hence, are not familiar with the effective methods of using the textbook and ICT. Thus, the desired target population minus the excluded population forms the defined target population (Baron, 2010). The defined target population in this study comprises the school head, deputy head, senior master and senior lady, the HOD Sciences Department, and three Biology teachers at the school.

3.2.2 Sample and sampling procedure

The population of this study consisted of 28 participants. These participants were purposively sampled. The purposive sampling technique, also called judgment sampling, is the deliberate choice of an informant due to the qualities the informant possesses (Creswell, 2008). It is a non-random technique that does not need underlying theories or a set number of informants. Three ‘A’ Level Biology teachers participated in this study. These teachers are considered critical in this research because they are directly involved as they use textbook and ICT in the
teaching and learning of Advanced Level Biology. These are the participants who face impeding factors in their attempt to integrate the textbook and ICT in the teaching of ‘A’ Level Biology. The school administration (head, deputy head, senior master and senior lady) are also considered relevant in that they take a significant role in facilitating integration of textbook and ICT in the teaching and learning of ‘A’ Level Biology. The HOD for sciences and all the 20 Biology students participated in this study in order for them to express their experiences with regard to the nature, scope and use of textbook and ICT approaches in the teaching and learning of Biology. The type of purposive sampling to be used is heterogeneous where it is intended to capture a wide range of perspectives from different participants (Creswell, 2008), relating to integration of textbook approach with ICT in the teaching and learning of Biology at Advanced Level (the phenomenon that the researcher was interested in studying). A summary of samples of participants in this study are shown in the table below.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>School administration</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Biology teachers</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>HOD Sciences</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Biology students (F5&amp;F6)</td>
<td>13</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>8</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>
3.3.0. Research Methods and Instruments

This research makes use of four methods to collect the data for this study, namely interviews, document analysis, focus group and observation. The instruments to be used include interview guide, observation guide, and document checklist. The methods are used concurrently in order to increase the validity of the research outcome. This concurs with Cohen et al, (2007)’s contention that if two or more different data collection instruments are used, then the validity of the research results is not merely increased but assured. Presentation of how each of the three instruments is used is included below.

3.3.1 Interviews

The first data collection technique to be used is qualitative interviewing in which semi-structured interviews are carried out in order to gain access to ‘A’ Level Biology teachers’ experiences with regards to integration of textbook approach and ICT approach in the teaching and learning of Biology at Advanced Level at a rural mission high school. According to Cresswell (2008), semi-structured interviewing refers to situations that have been analysed prior to the interview. It proceeds on the basis of interview guide-specifying topics related to research questions as given in chapter one. This method is preferred because it enables the respondents (Biology subject teachers and school administrators) to express their views in own words thereby enabling the researcher to obtain accurate information concerning the integration of textbook and ICT in the teaching of Biology at Advanced Level. More importantly, the semi-structured interviews are to be used to examine the notions of integrating textbooks and ICT approaches in the teaching and learning of advanced Biology. Participants are asked semi-structured questions about six key areas:

- The ICT skills inherent in teachers to facilitate promotion of integration of textbook and ICT in the teaching of Biology at the school
- Availability of ICT resources at the school
- Availability of Biology textbooks at the school
- Factors impeding the integration of textbook and ICT in the teaching and learning of Biology- teacher factors
- Factors impeding the integration of textbook and ICT in the teaching and learning of Biology-learner factors
- Measures undertaken by the school to facilitate the integration of the textbook and ICT in the teaching and learning of Biology at Advanced Level.
In semi-structured interview, there is the advantage that the answers are written in the presence of the informant unlike informal interviewing (Leedy and Omrad, 2010). Thus, the information could be captured as it is provided by the respondent, hence, ensure accuracy and validity of data. To ensure that the answers given by the respondent are accurately recorded, there is need to use contemporary methods of recording by use of cell phones. These should be transcribed to support clarity and credibility of the data.

3.3.2 Document analysis

Documents are very important sources of data for the phenomenon under study. This is because they offer additional sources for analysis and interpretation of the phenomenon under study. In this study, this is done by critically analysing teachers’ documents such as Biology lesson plans, and scheme-cum plans. The purpose of analysing these documents is to generate insights about the extent of integration of textbook and ICT in the teaching of Biology at the school.

It is important to note that document analysis allows the researcher to compare data from interviews and observations with information from these documents.

The greatest advantage of this method is that information is readily available and, therefore, easier to obtain. Nevertheless, documents prepared by teachers need to be treated with caution for they can leave out a lot of information for they are sometimes:

“.......subjective representing the biases of promoters and, when written for external consumption, presenting an unrealistically glowing picture of how the organisation functions” (Bogdan and Biklen, 2000:99)

3.3.3 Observation strategy

Patton (2010) claims that the prevalent and typical way of gathering data from field is observation. This is because in observation, data is gathered from the participants as they are engaged in their natural context. Being an ‘A’ Level Biology teacher at the school where this study is conducted, participant observation is considered appropriate to gather data from teachers, learners and administration members. Using an observation check list, the observer must witness the conditions impeding the use of textbook approach and the use of ICT in the teaching and learning of Biology at the school.

The aim of participant observation is to hear, see and experience reality as participants live it. Thus, as teachers interact with their ‘A’ Level learners in the teaching and learning of Biology,
they are studied in that real situation enabling gathering of valuable, reliable and valid data concerning the integration of textbook approach and the ICT in the teaching and learning of Biology at Advanced Level. However, the method is prone to bias. This is because the researcher is in some way too accustomed with certain kinds of teacher behaviour and may take them for granted. To ensure credibility of the findings, the researcher should use multiple entries into observation times. There must be a prepared checklist in order to guide for what to observe. There is need to observe the time when Biology is taught and how it is taught. It is also imperative to observe the attitude, the methods and frequency of integration of textbook and ICT. This observation helps to reveal the perception teachers have concerning integration of textbook and ICT in the teaching and learning of Biology.

One of the drawbacks of using participant observation in this research has been pointed out by Best and Khan, (2009) which pertains reactivity problem, which Patton (2010) calls the Hawthorne effect. Participants may change behaviour especially when they become cognizant that they are being watched. Thus, there is need to clearly convince the participants of the goal of the researcher. In this research, where this researcher is a Biology teacher at this high school (where the research is conducted), there is the need to create a good rapport with the other Biology teachers at the school.

3.3.4 Focus group

Focus groups are used in qualitative researches together with other methods of gathering data. Krueguer (2009) defines a focus group as a small group which is made up of demographically diverse people whose reactions are studied to allow analysis to reflect the views of a larger group. It is a form of qualitative research comprising of interviews in which a group of people are asked about their perceptions, attitudes, and beliefs about the subject in question (Opie, 2004).

In this research, the study used focus group discussions comprising of Advanced Level Biology students in upper six and lower six in order to express their opinion of conditions influencing integration of textbook and ICT in the teaching and learning pertaining Biology. Their views shall help clarify the credibility crisis of lack ICT skills and resources at the school.
The rationale for using the focus group is that it allows interviewers to study people in a more natural conversation pattern than typically occurs in a one-to-one interview (Strauss and Corbin, 2010). In conjunction with participant observation, focus group can be used to learn about patterns of interaction and behaviour for teachers and learners as they use textbooks and ICT in the teaching and learning of advanced Biology. In that way, factors affecting an integration of the textbook and ICT approaches can be discerned.

3.4 Credibility

According to Patton (2010), credibility refers to the degree or extent to which an instrument measures what is supposed to measure. In order to uphold maximum credibility, a research interview schedule is carefully designed using the main objectives of the study. Some items of the semi-structured interview questions were pretested to ensure validity by correcting interview guide before it is put into use. The ambiguities on the part of items in the interview guide should be clarified as pointed out by the pre-test exercise. As for the observation strategy, there is need to formulate an observation checklist in order to ensure that all that needs to be observed is covered.

To further ensure credibility, methodological triangulation is undertaken. Oliver (2010) notes that to counter biases that may be brought by one method, different data collection methods should be used. The researcher shall use participant observation, interviews, focus group and document analysis. These different sources of information will allow comparison of data and therefore enhances credibility.

One important action to be taken by the researcher to ensure credibility is to employ member checks. Strauss, and Corbin, (2010) posit that member checks involve the researcher returning to the participants in order to counter check the accuracy of data collected. This method is to be used to make some amendments and updating data based on participant remarks. The results and interpretation of findings from the interviews may be handed back to the interviewees lest he/she may confirm the content of what previously stated during the interview encounter.

3.5. Dependability

Dependability of an instrument relates to its accuracy and precision in measuring the attribute of concern (Opie, 2004). Thus, the instrument should yield similar results if used on a different sample of participants from a similar target population in a similar context (Borg et al, 2002).
Each item of the questions in the interview guide is carefully phrased to guard against ambiguity to guarantee maximum transferability of the tool.

3.6. Ethical Issues

In this research, the researcher must ensure that the information provided by the respondent is kept confidential, e.g. name, address etc. The interviewer did not solicit for the teachers’ names, and addresses. In reporting, pseudonyms must be used in order to ensure confidentiality.

It is mandatory that participants must provide informed consent prior to answering the interviews, and are made aware that they have the right to withdraw their information at any time during the study. The researcher should not coerce the participants to give their views.

It is also imperative for the researcher to obtain permission to use the school as study area. To this extent the researcher should obtain an introduction letter from Bindura University of Science Education so that the study can freely be done at the school.

Findings or results of research must not be “manufactured”. Therefore, the researcher must ensure that an accurate reporting of results shall be done.

3.7 Data collection procedures

The researcher drew a data collection plan. This is a series of steps that the researcher carries out in the process of gathering data on phenomenon of concern in a systematic way that enables him to evaluate the outcomes and to accurately answer the research questions. The researcher conducted the interviews after getting the permission from the school authorities after showing them his introductory letter from Bindura University of Science Education.

For the interviews and research group the researcher made appointments through the head of the school so as to obtain meaningful contributions from all the participants. Data was recorded in cell phone and on sheets of paper for use in report writing and data analysis. Three focus group discussions were conducted. The first group comprised of four teachers (HOD, and three Biology teachers). The second will be the lower six ‘A’ Level Biology students and the last group comprised upper six ‘A’ Level Biology students.

3.8 Data presentation and analysis

Borg et al (2002) indicate that data analysis involve reducing accumulated data to a manageable size, developing, summarising, looking for patterns and at times applying statistical techniques.
Through interviews, data shall be collected and recorded on sheets. All sheets made after having semi-structured interviews shall form thick volumes of raw data which then is used for analysis. The semi-structured interviews shall be conducted in private setting of classroom, school head’s office or deputy head’s office and any other place which is a conducive environment where there are no disturbances.

Demographic data is tabulated to show the gender of the respondents. Word descriptions of responses are given in order to shed light on opinions, beliefs, and attitudes expressed by teachers, relating to the use of textbook and ICT in the teaching and learning of Advanced Level Biology.

Transcribing of data from recorded cell phones shall be done to allow comparison of data from interviews, observation and document analysis.

It is important to note that sometimes data presentation and analysis can occur simultaneously. To use comment from Bogdan and Bilken (2000:145);

“……presentation refers to organising data, breaking into manageable units searching for patterns, discovering what it is important and what is to be learned…..”

On the case of interpretation, Bogdan and Biklen (2000: 145) refer to it as;

“……symmetrically searching and arranging the interview transcripts, field notes and other materials that you accumulate to increase your understanding of them and to enable you to present what you have discovered to others”

One can discern from the above view that, data analysis and interpretation are inextricably intertwined. As one breaks data into small units, patterns and linkages are revealed and meanings (interpretations) can subsequently be attached. Analysis of data from interviews, focus group, participant observation and document in this research are both quantitative and qualitative. As alluded to earlier, the quantitative data are to be shown in tables. The qualitative data are descriptive arising from interviews and participant observation. From interviews, data shall be coded to enable classification of data into themes and issues of propositions. The next chapter shall give data presentation and analysis. It must be noted that analysis shall be guided by the research questions as given in chapter one.

3.9 Summary

This third chapter commenced by describing the qualitative research paradigm used in this research. This paradigm was chosen because it allowed the researcher to explore into the
integration of textbook and ICT approaches in the teaching and learning of Biology using a case of a rural mission school. The study thus, used an explanatory case study research design. The advantage of using this design was that it allowed gathering data from a real learning experience where teachers and ‘A’ Level learners were studied during their Biology learning sessions as they used textbook and ICT approaches. Chapter three also described the purposive sample of 28 participants being ‘A’ Level Biology teachers and learners as well as the HOD Sciences and the administrators-head, deputy head, senior master and senior lady and three Biology teachers. Four methods of gathering data were described. These were: interviews, focus group, document analysis and observation. In order to uphold dependability and credibility of these methods, conditions were laid down. Ethics guiding the study were given. The chapter concluded by describing thematic approach as a way to analyse data obtained from the four methods.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0. INTRODUCTION

This chapter of the study presents the data gathered from interviews, document analysis, observation and focus group. In this qualitative research, data collection was not a one off exercise. The researcher had to revisit the respondents in order to make follow ups to clarify certain matters of concern and to ensure validity of the study. The data are presented thematically as guided by the objectives of the research. It is, however, imperative to first provide the background details of the participants before presenting data.

4.1. Background information of the participants

The school head, deputy head, HOD Sciences, two senior teachers, and three Biology teachers, were subjected to interviews. Twenty “A” Level learners were subjected to two sessions of focus group discussions. All respondents who participated in this research were all given
pseudonyms in order to protect their anonymity and confidentiality (Nyawaranda, 1999). Below is a table showing background information for participants:

Table 2: Background information for school heads and teacher participants

<table>
<thead>
<tr>
<th>Teacher (pseudonym)</th>
<th>Sex</th>
<th>Academic qualifications</th>
<th>Professional qualifications</th>
<th>Post of special responsibility</th>
<th>Teaching experience(yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magaka Toro</td>
<td>Male</td>
<td>Bed Accounting</td>
<td>Diploma In Educ</td>
<td>School head</td>
<td>28</td>
</tr>
<tr>
<td>XosaTembo</td>
<td>Male</td>
<td>Bed Admin</td>
<td>Dip In Educ</td>
<td>Deputy head</td>
<td>20</td>
</tr>
<tr>
<td>MulaShapu</td>
<td>Male</td>
<td>Med Admin</td>
<td>Dip In Educ</td>
<td>Senior master</td>
<td>17</td>
</tr>
<tr>
<td>ShashaHoto</td>
<td>Female</td>
<td>Bed Geography</td>
<td>Dip In Educ</td>
<td>Senior lady</td>
<td>15</td>
</tr>
<tr>
<td>Nhanga Rose</td>
<td>Male</td>
<td>Bed Chemistry</td>
<td>Dip In Educ</td>
<td>H.O.D Sciences</td>
<td>23</td>
</tr>
<tr>
<td>Kanga Wangu</td>
<td>Male</td>
<td>Bed Biology</td>
<td>Dip In Educ</td>
<td>Biology Tr</td>
<td>18</td>
</tr>
<tr>
<td>ToseNyemba</td>
<td>Male</td>
<td>Bed Biology</td>
<td>Dip In Educ</td>
<td>Biology Tr</td>
<td>20</td>
</tr>
<tr>
<td>Maya Musvetu</td>
<td>Male</td>
<td>Bed Biology</td>
<td>Dip In Educ</td>
<td>Biology Tr</td>
<td>17</td>
</tr>
</tbody>
</table>
The above tabulated participants were important in this study in that their roles as school teachers with special responsibilities were considered very critical. To achieve gender balanced views and avoid gender bias, both males and females were equally given the chance to participate. It was the composition of teacher establishment which dictated that only one female teacher participated in this research. Nevertheless, the inclusion of this female administrator ensured that the voice of a female was echoed pertaining use of textbook approach and ICT.

What is considered important was the fact that, all the participants underwent professional training and are degreed, hence were considered to have some knowledge about use and integration of textbook approach and ICT in the teaching and learning of ‘A’ Level Biology. To that extent, their views were considered credible and reliable. Their long teaching experience (of above ten years) was considered critical as well in that, they had a lot to say about use of Biology textbooks and ICT.

The total number of ‘A’ Level learners who participated in this research was twenty as shown in table 3 below:

Table 3: ‘A’ Level Biology Participants by sex and age

<table>
<thead>
<tr>
<th>Participants’ age in years</th>
<th>Females</th>
<th>Males</th>
<th>Total number</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>8</strong></td>
<td><strong>12</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

Table 3 indicates the composition of ‘A’ Level Biology learners who participated in this research. As depicted by the table, there were more boys than girls. This is a common scenario in Zimbabwe where there are fewer girls in Advanced Level studies and in particular in STEM.

Table 3 also shows that the research attempted to capture various views from as many as possible of the ‘A’ Level Biology learners. Both lower and upper 6 learners were considered relevant. The total number of twenty respondents was suitable as the time frame of the research could not permit a larger number. The number of female students (8) constituted 40% of the student participants. Males (12) constituted 60% of the adolescent participants. Thus, the research managed to get almost gender balanced views in this project.
4.2 Data presentation and analysis

4.2.1 What ICT skills do Advanced Biology teachers at the school have which promote teaching and learning of Biology?

In order to establish the feasibility of integration of textbook approach and ICT at the school the above question was rendered. Responses to this question were varied just like their various respondents. One respondent MrMagaka Toro (pseudonym) commented as follows:

“During our teacher training times, there were no computers and other contemporary electronic gadgets. We solely relied on the textbook. To that extent I don’t have strong computer background.

The computer knowledge I have is very shallow and my second man does all the computer work for us. But I know and comprehend the use of computers in these modern times ...”

A similar view to the above was given by MrMulaShapu (pseudonym) who echoed his lack of computer skills:

“I learnt about computers through distance education. Our course had a strong theoretical bias over the practical... as a result I want to affirm that I have some difficulties in using computers”

“Am computer literate having undertaken introduction to computers as module when I did my B.Ed....We just learnt basic computers and not to say we could use them for imparting knowledge. We learnt how to keep students’ marks and to write reports. The so called e learning which I hear people talking about is new to me...”

Such were comments that indicated the lack of computer competencies in school teachers and administrators. Nevertheless, comment from Mr Kanga Wangu (pseudonym) indicated a different view altogether. He commented as follows:

“I acquired computer skills when I did my B.Ed Biology training at University of Zimbabwe some time in 2007. Initially I trained at Gweru Teachers college where I obtained Diploma in Education. My computer skills were furthered improved at University of Zimbabwe. However, since I left college, the school where I am working had no computer library until 2015. We sometimes encourage our learners to use the internet but the internet facility at the school is very slow”
The above comment suggested that the teacher had some skills to use computers and the internet. However, the teacher alluded to a lack or limited computer facilities at the school he claimed that the internet at the school is very slow.

There was yet another dimension revealed when this question to establish teacher computer skills inherent in teachers was asked. From teacher Nhanga Rose (pseudonym) came the following comment:

“...I have competence in using the computer to record marks using excel, can write my reports and notes using word application. Using my cell phone I can goggle and search for new knowledge. I have not engaged my Biology learners to use the internet because the school WIFI is rather weak and very slow. Further, the school administration gives a restriction to use of the computer so that you cannot use the WIFI without sanction from the school. This bureaucratic restriction is rather disturbing...”

The above comment revealed a drawback in the use of ICT at the school. There appears to be an administration factor where the teachers are hindered to use the WIFI by bureaucratic protocol.

To further clarify the existence of computer skills in teachers, teachers were asked about their ability to use e mails, power point and publisher applications. The three Biology teachers (100%) concurred that they were not conversant with the use of power point. As for use of e mails, the three Biology teachers concurred that they had e mails hence could use the application.

From question 1 of Appendix (i) it was established that three Biology teachers had shallow ICT skills hence this debilitated the effective integration of ICT and textbook approach.

4.2.2 What are the major Biology textbooks at your school and how adequate are these textbooks in the teaching and learning of Biology for Advanced Level Learners?

The HOD Sciences at the school enumerated the following as major Biology textbooks at the school:

Table 4: Major ‘A’ Level Biology textbooks available at the school.

<table>
<thead>
<tr>
<th>Title</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Science Book 1 and 2</td>
<td>15</td>
</tr>
</tbody>
</table>
Table 4 depicts the extent of adequacy of textbooks at the school. There apparently is a great inadequacy of Biology textbooks at the school where learners need to share at the ratio of 1 textbook being used by three learners. The quality of teaching and learning therefore is negatively affected by the inadequacy of major textbooks. There was need, therefore, (where textbooks were inadequate) to integrate ICT and textbook approaches in the teaching and learning of Biology at the school. The two methods would complement each other to achieve effective teaching and learning of Advanced Level Biology at the school.

As for the availability of Biology textbooks in the school library, one ‘A’ Level Biology teacher (Maya Musvetu) commented:

“The school library is inadequate for the ‘A’ Level students. There are very few, old and outdated textbooks which are not in keeping with the new curriculum and STEM. For instance, there are only six copies of a textbook titled Understanding Biology... our learners are not allowed to bring cell phones so they can’t google...”

The teachers indicated that integrating text books and internet could help in the teaching and learning of ‘A’ Level Biology.

4.2.3 What ICT resources are available at the school which promote integration of ICT and Textbook approaches?

Both the administrators and Biology teachers cited the following

Table 5: ICT resources available at the school

<table>
<thead>
<tr>
<th>ICT resource available</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers</td>
<td>70</td>
</tr>
<tr>
<td>WIFI</td>
<td>1</td>
</tr>
<tr>
<td>Projector</td>
<td>1</td>
</tr>
</tbody>
</table>
As shown in the above table the school has seventy computers which are used by over seven hundred learners at the school. This is just inadequate. The WIFI connectivity cannot sustain such large numbers of learners where one computer is shared by 20 learners.

Integration of ICT and textbooks appeared to be problematic in such a case where learners are not accorded use of tablets and browsers like Econet’s Ruzivo. The learners are, thus, denied opportunity to google for Biology information available on internet. Thus, where such ICT resources are not available, integration of textbook and ICT approaches are rendered futile.

4.2.4 What challenges are faced by the Biology teachers in the integration of textbook and ICT in the teaching and learning of Advanced Biology at the school?

The three Biology teachers (100%) concurred that one greatest challenge was the poor computer competence and lack of computer skills. Second, the teachers and the HOD lamented that the WIFI at the school was very slow and this inhibited them from engaging learners in the teaching and learning of Advanced Level Biology. Third, the three teachers also concurred that they had poor comprehension of how integration of ICT and Textbook approaches could be achieved in the teaching and learning of Advanced Level Biology. This challenge is caused by the fact that even at teacher training level, the teachers did not fully train in how to use computers and other computer associated teaching and learning strategies. This has been exacerbated by shortage of ICT personnel at the school. To show this idea, one Biology teacher remarked:

‘...we have one ICT teacher for the whole school. It is very difficult for the teacher to help us in integrating text book approach and ICT approach in the teaching and learning of Advanced Level Biology.”

The challenges faced by teachers in the teaching and learning of Advanced Level Biology clearly show the difficulty to achieve integration of ICT and Textbook approaches at the school.

4.2.5 What learner challenges impede the effective integration of textbook approach and ICT in the teaching and learning of Advanced Biology?
When asked to give the learner challenges which impede effective integration of ICT and Textbook approaches, teachers and learners had this to say:

“Learners do not have adequate computers. In the computer laboratory, ten learners have to share a computer ... this makes it difficult for learners to find information on internet...”

From focus group discussion, it was revealed that learners have a problem of not focussing on education when using the internet. One learner remarked:

“...we tend to use the computer for entertainment and rarely use the computer to learn about new concepts in Biology. This is very common when the teacher is absent or when the teacher does not fully supervise us.”

The other problem expressed by the learners in focus group discussion provided that:

“The school does not allow us to use our cell phones or tablets. Our parents can afford and appreciate that we are ‘A’ level students who should now be allowed to get on internet to explore and find educational concepts. We are to go for tertiary education later and so we require to be prepared for this through allowing us to use internet. Yet the school denies us...”

The learners went further to point out that:

“... We are not encouraged by our Biology teachers to go on internet to gather new information. Instead, we are taught how to use word, how to use excel, how to save data and other basic ways of using computers. This is done by our computer teacher and not Biology teacher...Such ICT lessons are meant to give us some computer literacy”

From focus group discussions with the “A” Level learners came out the idea that Biology teachers did not guide their learners on computer assisted instructions (CAI). Rather, learners could use computers in a more beneficial way provided they were guided by their teachers. To use one learner’s comment:

“Our teachers appear to have no interest in us using the internet for learning Biology concepts. When we went for seminars at provincial level, the teachers who explained some Biology concepts used projectors and clearly gave interesting material in pictorial videos which our teachers have not done at our school.

Such a comment revealed that teachers were not playing their role to engage learners in computer assisted instructions. The teachers never bothered to use guided discovery learning (GDL) through integrating ICT and Textbook teaching approaches.
The school management members were further asked to suggest measures that could be used to promote integration of ICT and textbook approaches for effective teaching and learning of ‘A’ Level Biology at the school.

One important measure suggested was about acquiring of relevant computer assisted instruction which cater for individualised learning. The member remarked:

“Our classes are big though in ‘A’ Level Biology the size of a class is fairly large... we need to have computer software programmes which help in individual learning and offering quick feedback ...”

The other suggestion referred to the contemporary ‘A’ Level Biology teacher in the school. On this issue the school management member called for the school to capacitate the Biology teachers by using workshops and refresher courses on use of ICT:

“I advocate the idea that the school should ensure that ‘A’ Level Biology teachers should further be trained in computer technology so that he/she appeals to the contemporary learner whose faculty largely responds to computer technology. Today’s learners, marvel to work through the videos, sounds, graphic and pictorial illustrations ... thus a contemporary Biology teacher should be therefore someone who is computer literate...”

The third suggestion concerned the improvement in school internet facilities. The two Biology teachers agreed that there was need for the school to widen its WIFI facility. One teacher remarked as follows:

“The school must widen its WIFI so that it must be fast and allow learners and teachers to access information for Biology and other subjects...”

This was supported by another Biology teacher who referred to use of modern fibre driven internet to access information for teaching and learning of ‘A’ Biology. The teacher commented:

“The current school WIFI is not easily accessed by teachers and learners. The school head should make sure that a policy should be put in place for the expanding the system and even allow use of tablets by learners. Currently, the school policy prohibits learners to bring cell phones or tablets to school yet these are important in the integration of ICT and textbook approach...”
4.3. Discussions

From the school administrators’, teachers’ narratives and learners’ narratives, it became apparent that four main themes could be identified with regards to these experiences towards integration of ICT and textbook approaches in the teaching and learning of ‘A’ Level Biology.

**Theme 1: the ICT skills/competencies inherent in ‘A’ Level Biology teachers at the school towards promoting integration of ICT and textbook approaches in the teaching and learning of ‘A’ Level Biology**

The competencies identified were very low; being computer literacy and ability to use word processing, emails and recording information using basic excel. It was very clear that the old teachers who were trained in the 1980s were not conversant in using computers. These, however, later improved their computer skills when they undertook B.Ed in Sciences at university. That being the case, it was clear that these teachers confirmed that they possessed shallow ICT skills which cannot fully promote integration of ICT with textbook approach. This has been cried out by the senior teachers who argued that they were victims of time when during their teacher training computer skills were not included. The teachers confirmed that they rarely used google to obtain information from the internet. When they used the internet, they were assisted by young teacher mates at the school. Thus, teachers had a very low mental disposition to explore the internet hence this in some way, inhibited the integration of textbook and ICT approaches.

**Theme 2 Adequacy of the availability of Advanced Level Biology textbooks at the high school, the major Biology textbook titles at the school, linkage with internet like EconetRuzivo browser.**

For effective teaching and learning of Biology, there is need for adequate availability of Biology textbooks. Learners and teachers need to explore new Biological concepts in textbooks and on internet. As such, a question was asked to solicit the extent of availability of Biology textbooks at the school. Responses given by the HOD Sciences indicated the textbook title and extent of availability (see table below).

**Table 6: Textbook availability by title**

<table>
<thead>
<tr>
<th>Textbook title</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Science Book 1 and 2</td>
<td>15</td>
</tr>
</tbody>
</table>

The data in table 6 show that the Biology textbooks are not adequate. Whilst the textbook ratio is not 1:1, the sharing level for Biological Science Book 1 and 2 is 1:2 and for Understanding Biology it is 1:4 and for Advanced level Biology, the ratio is 1:4. The above table further portrays that there is a very serious shortage of Biology textbooks at the school. One may be driven to think that where textbooks are scarce, there is need, therefore, to make maximum utilization of the internet subsequently complementing the textbook approach.

Responding to an interview item about any linkage between textbook and internet approach, the HOD Sciences and Biology teachers concurred that there was very little linkage. This is because the school has not yet acquired a resource person from Econet to implement usage of the ruzivo (an e-learning based teaching and learning strategy provided by Econet to schools in the country). In addition the teachers indicated that the WIFI at the school was rather weak and slow.

The greatest reason why there was no linkage between textbook and ICT approach was the low disposition and lack of ICT skills in ‘A’ Level Biology teachers at the school. For effective implementation and use of an innovation, the capacity of the human beings in terms of skills and disposition must be adequate. The Biology teachers were found wanting in this regard hence linkage between ICT and textbook approaches was non-existent at the school.

**Theme 3: challenges faced by ‘A’ Level Biology teachers and learners in the teaching and learning of ‘A’ Level Biology at the school.**

There were four main challenges faced by teachers. These challenges could be grouped into two categories; (a) human challenges and (b) lack of ICT resources. Human challenges pertained low or no computer competence. This was due to the fact that by the time these teachers were trained, there was no computer literacy offered at their training colleges. Further, there was no ICT expert at the school who had the responsibility to capacitate teachers with ICT skills. As for lack of ICT resources, the school WIFI was slow and needed to be upgraded. In addition, the school had only one overhead projector which could be used in Biology lessons by the teachers. This was worsened by the school policy which prohibited learners to bring cell phones and tablets to the school.
The learners however, pointed to the lack of interest among their Biology teachers who did not encourage them in using the ICT facilities at the school. The learners had weaknesses for which they blamed themselves. They blamed themselves for their low disposition in using the internet for learning purposes. In fact learners used the internet facilities for downloading music, fashion and games (which have nothing to do with learning).

**Theme 4 Actions and strategies used by the school management board to achieve integration of textbook and ICT approaches in the teaching and learning of ‘A’ Level Biology at the school.**

These concerned human skills and resource acquisition. The school administration suggested the following:

- Teacher capacity building in ICT competencies through staff development workshops convened by the Ministry of Primary and Secondary Education
- Consulting Econet for ‘Ruzivo’ facility
- Purchasing of computers and other ICT facilities.
- Upgrading school WIFI
- Changing the school policy
- Encouraging learners to use ICT facilities at school

The above measures emanating from the challenges fall in two categories, i.e. *human measures and resources acquisition measures*. Those that had to do with teachers and personnel with relevant ICT competencies and policy matters could be considered as human measures. Upgrading existing school WIFI, purchasing of computers and other ICT facilities fall in *resource acquisition measure*.

**4.4 Summary**

Chapter four commenced by tabulating information about the background of participants who took part in the study. This was followed by presentation of responses from interviews and focus groups. The last section of chapter four covered the themes derived from the thematic analysis done by the researcher. Four themes were highlighted.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Summary

The first chapter commenced by giving a general background to the integration of ICT and Textbook approaches in the teaching and learning of Advanced Level Biology. As given in section 1.1 of chapter one, the advent of ICT in the area of teaching various subjects with associated merits of engaging computers and ICT, has led Zimbabwe to seriously promote use of computers in schools in the country. The Nziramasanga Commission of Inquiry (1999) and the National ICT policy of 2005 resulted in a framework of using computers and other information technologies in teaching and learning of various subjects in the Zimbabwean schools. The campaign by the then President of Zimbabwe - Mugabe for use of computers in schools has seen various secondary schools receiving computer donations from the latter. Use of these computers has been met with some challenges relating to lack of computer teachers in schools and low attitude of using computers by both the learners and teachers. With a new thrust of STEM in the Zimbabwean education curriculum, integration of ICT and Textbook approaches in the teaching of Science subjects and Biology in particular has become inevitable. It was against this background that this study was crafted in order to explore and interrogate the conditions impeding the integration of ICT and Textbook approaches in the teaching and learning of Advanced Level Biology at one rural high school in Chivi District of Masvingo Province in Zimbabwe.

The research questions and pertinent research objectives of the study were given in sections 1.3 and 1.4 respectively. The significance of the study was given in section 1.5 highlighting five reasons for justification of the study: generation of knowledge and skills in the teaching and learning of Advanced Level Biology, school education curriculum planning, the contribution of the study in supporting Zimbabwean government’s pursuit in use of ICT in schools, the decisions in CDU about ICT in schools, and researchers in the improvement of the innovation of integration of ICT and Textbook approaches in the teaching and learning of Advanced Level Biology. Section 1.6 described the physical and theoretical delimitation of the
study. Three constraints to this study – (time, finance and role strain) were identified in section 1.7. The last section of chapter gave operational terms of the study.

Chapter two provided a literature review in four areas related to the study: (1) the theoretical framework guiding the study, (2) the advent of ICT in Zimbabwean secondary schools, (3) availability of Science textbooks in high schools in Zimbabwe and (4) challenges in the use of ICT in secondary schools in Zimbabwe. The theoretical framework guiding this research was the cognitive theory of constructivism with particular emphasis on a category of learning styles associated with it- (sensory functionality termed the VARK). The theory and the learning styles were deemed relevant to this study since teaching and learning of ‘A’ Level Biology requires learners to actively construct or build knowledge and concepts based upon prior knowledge based on experience and information. The learning styles are varied based on visual, aural, reading/writing and kinesthetic, - (VARK) depending on the neural system with which a learner prefers to receive information. Section 2.2 described the advent of use ICT in schools of developed nations. Developed nations have for long been involved in the use of ICT in schools and later through UNICEF have embarked on capacity building to allow use of ICT in schools in African countries. Literature for use of ICT in Nigeria and South Africa show them as leading countries in Africa. Zimbabwe through its National ICT policy of 2005 and the recently declared STEM has necessitated integration of ICT and Textbook approaches in order to effectively teach and learn ‘A’ Level Biology in high schools in the country. This study thus explored the factors impeding this integration process.

Chapter three described the qualitative research paradigm and the case study research design used in this study. It further described the target population and the purposive sampling technique in identifying the participants for this study. Four research methods to collect the data for this study, namely interviews, document analysis, focus group and observation strategy were described. Credibility and dependability measures were given in section 3.5 and 3.6 respectively. Ethical considerations which were followed in data collection were given in section 3.7 Chapter three concluded by describing the thematic approach in qualitative data analysis used in this study.

Chapter four started by describing (in table form) the participants who took part in this study. Teacher and learner participants showing their gender were illustrated as shown by table 3 and 4. The findings were presented in sections 4.2. This was followed by discussions of findings following emerging themes.
5.1 Conclusions

This study had three main goals. First, it aimed to characterise the use of integration of textbook and ICT approaches in the teaching and learning of Advanced Level Biology. Second, to establish the challenges faced in the integration of textbook and ICT approaches in the teaching and learning of Advanced Level Biology. Finally, the study sought to come up with some measures to improve the integration of textbook and ICT in the teaching and learning of Advanced level Biology. The following are the findings based on the research questions and objectives of the study:

5.1.1 What ITC skills do Advanced Level Biology teachers at the school have which promote teaching and learning of Biology?

Though the teachers showed possession of the following skills, they categorically pointed out that these skills were weak in them and needed update:

- Word processing (preparing Biology notes and exercises)
- Internet (to browse for Biology information)
- Excel (for recording marks)

5.1.2 What are the major Biology textbooks at your school and how adequate are these textbooks in the teaching and learning of Biology for Advanced Level Learners?

There was a very serious shortage of ‘A’ Level Biology textbooks at the school. Further, there is limited variety of Biology textbooks (see Table 4). This inhibited a varied and wide reference of Biology literature.

5.1.3 Availability of ICT resources

The common resource (computer) was rather relatively fair especially that the ‘A’ Level Biology learners were few (20). The overhead projector availability was very poor. The WIFI facility was provided though teachers complained of its low speed and malfunctioning. Some other forms of ICT resources were absent.
5.1.4 Challenges faced by ‘A’ Level Biology teachers and learners in the teaching and learning of ‘A’ Level Biology at the school.

The human challenges related to the limited or poor computer use competencies. This was evident in both learners and teachers where there was a deep cry for inability to use computers in various relevant applications. The other human challenge concerned school policy in the use of ICT at the school. Learners are by school policy, prohibited to use cell phones and they are not at liberty to use the WIFI in the absence of their teachers. Finally, the other human challenge concerned the low attitude and low disposition in the use of ICT at the school by both learners and teachers.

5.1.5 Measures to promote integration of textbook and ICT in the teaching and learning of ‘A’ Level Biology at the school

Here the findings pertained obtaining of qualified ICT teachers and Computer literate Biology teachers at the school. The school had taken efforts in linking itself with Bindura University of Science Education in capacitating the Biology teachers. The other measure concerned procuring of more computers to enable many learners to use in the integration of ICT and textbook approaches in the learning of ‘A’ Level Biology.

Other measures to facilitate integration of ICT and textbook approaches concerned establishing fairly small and manageable class size for Biology learners. Furthermore, there was an effort where the school was working on upgrading of WIFI using modern fibre driven internet.

It was also found out that a very critical measure to promote integration of ICT and the textbook was evidenced in Biology lessons. In these lessons the teacher used videos downloaded from U-Tube to teach concepts on mitosis and meiosis as well as protein synthesis. The videos showed pictorial illustrations supported with audio explanations. This facilitated comprehension of concepts by learners. The teacher also noted that the learners were highly excited and motivated to learn. In this way, ICT complemented the textbook approach.
5.2 Recommendations

From the findings given above, several recommendations were made. For instance, there is need to improve the ICT skills in both teachers and learners for effective integration of ICT and textbooks in the teaching and learning of Advanced Level Biology. In addition, the school should procure more textbooks and ICT resources so that integration of the two is made easier. Over and above, the school should establish a strong link with tertiary institutions to keep abreast with modern ICT tools needed in the teaching and learning of STEM subjects.
References


Appendix(i)

Interview guide for interviewing teachers and the administrators

The question items used in this instrument coincided with the research questions given in Chapter One

The objectives of the interview

a) To identify the ICT skills in ‘A’ Level Biology teachers at the school and establish their relevance in the promotion of integration of ICT and Textbook approaches in the teaching and learning of ‘A’ Level Biology.
b) To explore the scope and availability of ICT resources at the school in order to establish the integration of ICT and textbook approaches in the teaching and learning of ‘A’ Level Biology at the school.
c) To identify and enumerate the challenges faced by the ‘A’ Level Biology teachers and learners in the integration of ICT and textbook approaches.
d) To establish the measures taken by the school to remedy challenges to integration of ICT and textbook approaches in the teaching of ‘A’ Level Biology.

Interview question items

1.5.1 What ITC skills do advanced Biology teachers at the school have which promote teaching and learning of Biology?
1.5.2 To what extent is the adequacy of the availability of Advanced Level Biology textbooks at the high school?
1.5.3 What ICT resources are available at the school which promote integration with textbook in the teaching and learning of Advanced Level Biology?
1.5.4 What challenges are faced by the Biology teachers in the integration of textbook and ICT in the teaching and learning of Advanced Level Biology at the school?
1.5.5 What learner challenges impede the effective integration of textbook approach and ICT in the teaching and learning of Advanced Level Biology?
1.5.6 What measures are taken by the school administration to promote integration of textbook and information and communication technology in the teaching and learning of Advanced Level Biology at the school?
Appendix (ii)

Document analysis checklist

Objectives of document analysis

a) To identify the existence of linkage between ICT and textbook approaches in ‘A’ Level Biology teachers’ planning in the teaching and learning of ‘A’ Level Biology

b) Establish the role taken by the administration in the integration of ICT and textbook approaches in the teaching and learning of ‘A’ Level Biology.

c) What evidence appears in learners’ exercise books, Biology syllabus and seminar reports to support integration of textbook and ICT

The checklist

• Scheme cum plan (evidence of integration of textbook and ICT)
• Supervision reports by HOD, Head and school head (any encouragement from the administration for integration of textbook and ICT)

• Learners’ exercise books
• Biology syllabus
• Seminar reports

The above documents were checked to verify the extent to which ICT tools are made use of together with textbooks at the school in biology
ABBREVIATIONS AND ACRONYMS

B.Ed- Bachelor of Education
CAI- Computer Assisted Instruction
CAL-Computer Assisted Learning
CDU- Curriculum Development Unit
ECD- Early Childhood Development
ETF- Education Transition Fund
HOD- Head Of Department
ICT – Information Communication and Technology
IT- Information Technology
MDGs- Millennium Development Goals
SBC-School Based Curriculum
STEM – Science Technology Engineering Mathematics
VARK- Visual, Aural, Reading, Kinaesthetic
ZIMSEC- Zimbabwe Schools Examinations Council